

## **7. ESTABLISHING PRICES, COSTS AND ELIGIBILITY FOR AGRI-ENVIRONMENTAL PAYMENTS**

### **7.1 Introduction**

To address the research task: Establishing Prices, Costs And Eligibility for Agri-Environmental Payments, this section is divided into four parts:

- The Economic Valuation of Environmental Goods and Services, describing the theoretical problems in economics regarding the economic valuation of environmental benefits as public goods and services;
- Establishing Dollar Values for Specific Practices, describing several methods to calculate the costs of implementation of programs and the grant amounts for selected agri-environmental incentive programs implemented in Ontario;
- USDA Environmental Benefits Index; used for targeting areas of agri-environmental concern and establishing eligibility in the US and its potential use by Ducks Unlimited Canada in its proposed national Conservation Cover Incentive Program;
- Eligibility for Incentive Programs, discussing ways in which eligibility for funding has been established in past Canadian programs.

### **7.2 The Economic Valuation of Environmental Goods and Services**

Ascribing a dollar value, or other forms of monetary accounting, to the external environmental benefits of good farm practice forms a difficult problem in environmental

economics. This is because agri-environmental benefits provided by landowners are in the public interest as well as the private individual's interest. That is, they are "public goods and services," in economic language. Public goods and services are not part of a real market and so they have no price. Since there is no price it is impossible to attach a direct dollar value. A dollar price is difficult even to estimate. But no one doubts that environmental goods and services do indeed have various kinds of "value" in formal economic language. As a result, agri-environmental economic modelling and/or accounting remains one of the more difficult theoretical and practical challenges of environmental economics.

There is no hard and agreed-to formula to derive a value for environmental goods and services in either real or proxy dollars for the purpose of voluntary incentive programs or environmental payments. The grant schedules in existence do not seem to have been calculated on the basis of a dollar cost or benefit for the service or good in question. Therefore the answer to the research task: Establishing prices and costs for agri-environmental payments provided by farmers is not directly answerable.

A reliable and rigorous original investigation using one of the methods described in this section to provide a proxy value for environmental goods and services associated with the agri-environmental incentive programs implemented in Ontario would occupy much time and money to design, conduct and analyse. It would be well beyond the original scope of this research project.

Nevertheless, because of the need to relate on-farm projects to actual incentive payment schedules of programs and because of the need for public accountability, economists continue to create theoretical models to integrate agri-environmental goods

and services with economic modelling, program design and decision-making. The volume of theory and case applications on this subject is now large. The literature review and bibliography of this report give an indication of the size of this body of knowledge. The following sections briefly sketch some of the existing approaches to establishing a proxy dollar value for environmental goods and services.

### **7.2.1 Transactional Valuation of Public Environmental Goods and Services**

By transactional, I mean any form of negotiation between the agency disbursing the funding and the participant who provides environmental “goods or services.” For certain stewardship activities, this negotiation could take the form of: verbal or written agreements, covenants, management agreements, leases, conservation easements, land trusts etc. (see e.g. Reid and Hilts, 1990).

Some agri-environmental schemes, such as the USDA Conservation Reserve Program (CRP) described in the section below, rely on bidding for contracts to perform certain on-farm actions or supply certain environmental services. They could be considered a transactional form of valuation. In the American case the onus appears to be on the bidder to establish the costs of supplying the service in his or her project and weigh them against what the funding agency is willing to offer in terms of compensation.

One form of transactional analysis suggested by Asafu-Adjaye (2000) is stakeholder analysis (also called multi-stakeholder analysis). It is used today by governments and investigators as part of the public consultation done in policy formation and in natural resource management, to name two examples. Stakeholder or multi-stakeholder analysis provides a consistent framework for evaluating and incorporating

various interests in the decision-making process. Stakeholders could be: governments, NGOs, individuals, community groups or firms (including e.g. farms and their operators) which can potentially affect or be affected by a proposed policy or project. The aim of engaging a broad range of stakeholders in a discussion is to take into account distributional and equity issues in policy design or awarding of projects and grants. The range of opinions might be quite variable among stakeholders, with their diverse needs and perceptions of environmental problems. Various decision-support systems, including computer software, are available to help stakeholders weigh alternatives and make considered decisions in these kinds of negotiations. Stakeholder analysis remains essentially a process of negotiation, not one of pure economic rationality, and is therefore very unpredictable and variable for different groups, places and situations.

Stakeholder analysis is used in different ways. It might be used by researchers to generate new knowledge and theory, or by stakeholder groups to come to a decision affecting only themselves. Or, it might be used as a form of public consultation by government, which itself retains decision-making power. Stakeholder techniques lend themselves well to the type of democratic and participatory (see Glossary) exercise which many governments now encourage. Adhering to the principle of subsidiarity (see Glossary), governments frequently place much decision-making at the level of society which is directly affected by the policy or decision in question.

Asafu-Adjaye identifies seven steps involved in an effective stakeholder analysis but otherwise does not provide much in the way of guidance. There is a large body of knowledge elsewhere on different ways to construct a stakeholder agreement.

### **7.2.2 Economic Valuation of Environmental Public Goods and Services**

Following Asafu-Adjaye, public “goods and services” provided by farmers through agri-environmental programs are called intrinsic or non-use/passive values, in the language of economics. He further divides these into three non-use value categories, observing (as I do above) that, while use values can be readily measured by market prices, non-use values are not traded and therefore cannot be valued by market prices. Non-use values can nevertheless be a significant part of the total economic value and using wildlife as just one example of a public good, “failure to consider such benefits, whether quantitatively or qualitatively, in the decision-making calculus could lead to gross underestimation of the contribution of wildlife to total social welfare” (Asafu-Adjaye, 2000, p. 103).

Asafu-Adjaye discusses the two major non-market methods of valuation which can be used to estimate a price for environmental goods and services. They are, in effect, a proxy for the non-existent market value. The available methods are: revealed preference (RP) approaches and stated preference (SP) approaches. According to the logic of economics, SP methods are the only forms of valuation which can estimate the passive use-value of a public environmental good or service.

RP approaches analyse the behaviour of individuals in actual or simulated markets to infer the value of an environmental good or service. They are also called indirect or surrogate market approaches. But they can only measure use values, not passive or non-use values such as environmental benefits.

The only alternative, then, is to use SP methods and even then there are some serious limitations. SP methods do, however, have a broader application by attempting to

derive environmental values directly from respondents using survey techniques. They literally ask those surveyed to “state their preference.” The fact that these preferences can be purely subjective, emotional and perceptual is besides the point.

SP methods are further broken down to take the form of either choice experiments (CE) or contingent valuation (CV) methods. Choice experiments can take the form of conjoint analysis or choice modelling and each of these has various sub-types as well, all carefully defined in economic language.

Contingent valuation (CV) methods use a survey or interview technique to establish the respondents’ willingness to pay (WTP) to preserve the given environmental good or service, or what they are willing to accept in compensation (WTA) to forego the given environmental good or service. In this method, the respondents are selected to represent broad society, not simply those providing the environmental good or service. This reflects the fact that in a market, there are always two sides: a seller and a buyer. Asafu-Adjaye suggests some current methods for both CE and CV experiments. He is careful to note the numerous types of potential bias inherent to all SP models.

SP methods, especially CV, have proponents and detractors and they remain controversial in the academic literature. Nevertheless, Asafu-Adjaye notes that they are straightforward and require few theoretical assumptions beyond assuming that the respondents have an idea of their own preferences and can truthfully report their willingness-to-pay.

CV is the most commonly-used SP method and is used in a large number of theoretical studies and case studies to derive a monetary value for environmental goods and services. It too remains controversial, but is considered to be a valid method of

placing a dollar value on external environmental benefits from on-farm activities. To construct a valid CV survey is a large undertaking, requiring considerable logistical resources and analytical expertise.

CV can be combined with other methods to estimate the value of environmental benefits. For example, Brethour and Weersink (2000) completed a study which used a physical risk assessment approach using Ontario pesticide use data combined with CV data from an American study. They made the assumption that Ontarians' stated preference behaviour would be similar to the American sample of people. They concluded that the reduction in external costs associated with the changes in pesticide use in Ontario agriculture between 1983 and 1998 was \$305 per household. This figure then is an estimate of the value of the environmental benefit provided by a change in farm management practice relating to pesticide use.

Kimberly Rollins of the University of Guelph's Department of Agricultural Economics and Business is an important investigator using market and non-market methods such as CV to estimate a value for environmental goods and services in Ontario and elsewhere in Canada for use in policy design and analysis. She and colleagues have an extensive research program in progress. Their project investigates the economic assessment of environmental policy instruments for agricultural production, agriculture and wildlife interactions and the impact of environmental farm planning in the Grand River watershed and elsewhere in valuing outdoor recreational environments. One of her projects was conducted for the Ontario Soil and Crop Improvement Association (OSCIA) on behalf of the Ontario Agriculture Commodity Council (see: [www.uoguelph.ca/research/omafra/environ/tbls/emstbl.html](http://www.uoguelph.ca/research/omafra/environ/tbls/emstbl.html)).

Rollins estimates that wildlife damage to Ontario farm production exceeds \$33 million annually. She found in her survey that Ontario farmers spend more than \$7.5 million and 800,000 hours annually in wildlife abatement. As well, she reports that farmers felt their losses could be reduced by improving programs that link hunters and farms; increasing financial compensation and subsidies for preventive techniques. She is careful to state that for 90% of farmers the damage from wildlife is minimal; for the remainder, however, the damage and financial loss can be high (News Release, August 31, 2001, Communications and Public Affairs, University of Guelph).

Ducks Unlimited Canada (DUC) has proposed a national Conservation Cover Incentive program for Canada mainly in the form of provision of riparian buffer zones by farmers to protect river and adjacent ecosystems from agricultural impacts (DUC, 2001). This proposed program would rely on financial incentives to farmers for provision of environmental services in agricultural settings. DUC provides a scheme to account for both the financial benefits to farmers of retiring marginal land near rivers and streams and also the benefits to wider society of such a program. The main ways farmers would gain financially is from cost-cutting and financial incentives. DUC's proposed cover program would help farmers lower their input costs on cropland through the reduced need for gully repair, reduced stone and rock picking, reduced herbicide and fertilizer inputs and reduced machinery operating costs. The revenue from incentive payments would increase the farmer's income. Their proposal also notes that landowners could capitalize on land taken out of production through increased tourism and recreation such as Bed and Breakfast operations, nature trails and guiding services. Reduced costs associated with reduced soil erosion from retiring marginal land are also predicted. The non-market

benefits (i.e. environmental benefits) predicted by implementing their proposal include reduced soil erosion, improved water quality, improved fish and wildlife habitat and cleaner air. The program would increase the available riparian habitat for increasing waterfowl population considerably, the major mission of DUC. They have estimated that approximately 340,000 hectares of riparian buffer zones exist in Ontario now. Of these 170,000 are targeted by the DUC proposal.

DUC proposes that the provision of environmental goods and services should be through long-term agreements between government (or its delegated agencies) and landowners using an Environmental Benefits Index (EBI) similar to the one used with the Conservation Reserve Program (CRP) of the USDA. This will result in a cost-effective program.

To estimate the costs and benefits of their program, DUC uses real rental costs of farmland and estimates of the non-use value of environmental benefits in the Upper Grand River Valley made by Belcher *et al.* (2001). Because rental costs vary considerably across Canada, the estimated costs to enrol land into a cover program would also vary greatly in different parts of the country. Their estimate for Ontario is \$129 per hectare, or a total of about \$22 million per year for the province.

DUC's proposal states that Belcher *et al.*'s study estimated the sum of the benefits to society associated with a riparian restoration program would be in the order of \$200 per hectare per year. Extending this to the whole province would provide annual benefits worth about \$26 million. The specific benefits were not done through contingent valuation, but rather calculated in terms of reduced costs of water treatment, increased

recreational opportunities, reduced net greenhouse gas emissions and carbon sequestration.

DUC's proposal also notes that there would be savings of up to \$7.9 million in foregone safety net and program payments, although how this would enter into the question was not directly addressed. The overall annual benefits of this program in Ontario were estimated to be \$33.5 million with net benefits of \$11.3 million after administrative and delivery costs were subtracted. This breaks down to an average net benefit of \$66.62 per hectare per year. The DUC proposal estimates incentive payments to farmers would be \$128.63 per hectare per year (all figures are from the DUC draft proposal, 2001).

An economic evaluation of the Food Systems 2002 program is in progress by Alfons Weersink of the Department of Agricultural Economics and Business, University of Guelph. Food Systems 2002 is a program designed to reduce pesticide active ingredients by 50% in Ontario agriculture by the year 2002, largely through research. Weersink's study includes an estimate of the potential environmental benefits from both the quantitative and qualitative aspects of pesticide risk reduction.

Pesticide use in Ontario decreased 41% from 1983 to 1998, largely due to a shift from corn to soybeans. About 9% of the reduction was directly attributed to Food Systems 2002. Weersink finds that the value of reduced environmental risks associated with the changes in pesticide use between 1983 and 1998 was \$311 per Ontario household. These environmental benefits were due to a reduction in the total amount of pesticides applied and a shift in the share of those pesticides away from high risk to lower risk pesticides. The largest benefits accrued to mammalian species, avian species, aquatic

species and acute human health. The external costs increased over the time period for chronic human health and arthropods.

### **7.3 Establishing Dollar Costs for Implementing Specific Practices**

Although this report cannot establish a dollar value for specific agri-environmental benefits as public goods and services, three types of cost accounting could be used to estimate the costs of implementing on-farm projects to provide public goods and services. These provide some guidance to landowners in considering whether to enrol in voluntary agri-environmental programs. The three types are by:

- Estimating the costs to the participant of implementing on-farm practices;
- Estimating the value of lost production on land which has been taken out of production or when a management practice has been introduced which reduces the potential yield for specific crops, and;
- Estimating the amount of incentive program payments or environmental payments awarded to farmers for specific on-farm activities.

Existing data are available from several incentive programs implemented in Ontario to provide these estimates and are presented next.

#### **7.3.1 Estimating the Costs to the Participant of Implementing On-Farm Practices**

In current incentive programs, a pre-determined amount of public money is made available by government and disbursed to eligible, voluntary “good actors” willing to participate. These are generally cost-sharing agreements, where a grant partially offsets costs incurred by the participant to implement an on-farm project. Each program

establishes its own percentage share of eligible costs. The level of such shared costs are probably a strong influence on uptake in voluntary programs. They are also important to estimate when certain environmental standards are regulated, in order to estimate the costs of compliance to a regulated practice. Cost-sharing schemes are typically mandated when any equipment or supplies purchased for the environmental project might have further uses on the farm. But since the equipment, labour and other capital costs of these projects can be used to provide a production-related benefit (a private good) as well as an environmental benefit (a public good) they are not truly equivalent to the value of a public environmental good or service since we have seen that the public good i.e. non-use value is difficult to estimate. The incentive grants are to encourage the adoption of a specific practice which is known or presumed to have a beneficial environmental outcome.

#### *7.3.1.1 CURB*

In their report of the CURB program for the Maitland Conservation Authority, Fuller and Foran (date unknown) give ratings and capital costs for manure storage calculated on 1988 data provided by R. Fleming..

Ann Loeffler (1999) provides some empirical evidence of the actual expenditures by farmers in absolute terms and as a ratio of money spent against the amount granted for projects undertaken as part of the Clean Up Rural Beaches (CURB) program. In this cost-sharing program a grant rate of between 50% and 75% of the individual projects was allocated. However, she found that participants tended to submit receipts only enough to cover the allowable grant. Therefore the true costs lay at an unknown level somewhere

beyond those collected. Compounding this uncertainty, Loeffler reports that only a partial record of the participants' spending was made available to the delivery agency.

Therefore, the true costs to farmers of participation in CURB remain unknown.

### *7.3.1.2 Land Stewardship Program II Incentive Schedule*

Taylor and Mysik's (1993) evaluation of the Land Stewardship II program (LSP II) reports that grants to farmers were of two types: 1) operational grants for stewardship practices such as crop residue management, cover crops, strip cropping and, 2) conservation equipment and capital grants for stewardship structures such as manure storages, milkhouse waste management structures, erosion control structures and pesticide storage and handling facilities.

A total of \$18.6 million was awarded to 6,628 participants for LSP II as operating and capital grants, an average of \$2800 to each. Much of the operational grant money was for managing crop residues. The largest capital grant category awarded was for erosion control projects. No details for operational or capital activities are provided in the evaluation, however.

The CURB program compiled costs to the participant to implement specific eligible activities. Farmers purchased goods and/or services from the marketplace and then submitted the bills to the delivery agency for a partial refund. These direct costs could be measured from records kept by individual participants in the schemes, although Loeffler (1999) noted that not all invoices were submitted for CURB participants. Various CURB reports contain this type of information and the formulas used to estimate

the costs of participation in that program. But since these costs were derived from 1988 data, they are now outdated.

One project is in progress at the University of Guelph to determine the current costs of compliance to municipal nutrient management by-laws (personal communication, John Fitzgibbon, 2001). This information will be valuable to the CFFO's onward projects once complete.

Current data are also available for the province-wide Environmental Farm Plan (EFP) program and programs delivered by the Grand River Conservation Authority (GRCA). Data from these two programs are presented next.

#### *7.3.1.3 EFP Project Cost Data*

The EFP provides a lump sum grant of \$1,500 for proper completion of the workshop and preparation of a self-directed environmental farm plan. The Ontario Soil and Crop Improvement Association (OSCIA), the delivery agent for the EFP, compiles statistics on costs of equipment purchases of participants in this program on a county basis. OSCIA has kindly forwarded this information and related information on the EFP for use in this report.

I have tabulated OSCIA's data below to arrive at global and average figures for all recorded claims to the EFP from April 1993 to July 31, 2001. Wide variation occurs throughout the province, except in the amount of each claim. This is relatively constant around an average of \$1,293. This indicates very large differences in both the type of activity and the level of personal commitment to share in the cost of the incentive program.

## EFP INCENTIVE PROGRAM SUMMARY COUNTY LISTING

This Report Contains All Recorded Claims

April 1993 - July 31, 2001

Source: Ontario Soil and Crop Improvement Association, 2001

County	# of Claims	Total Project Costs	Cheque Amount	Unclaimed Hours	Average Project Costs	Average Claim	Claim/Cost Ratio
Algoma	11	\$16,817.40	\$11,316.78	530	\$1,528.85	\$1,028.80	0.67
Brant	43	\$162,568.22	\$52,829.18	1879	\$4,245.77	\$1,228.59	0.29
Bruce	232	\$1,065,476.78	\$298,712.90	6375	\$4,678.78	\$1,287.56	0.28
Carleton	240	\$1,258,732.35	\$304,472.62	6041	\$5,244.72	\$1,268.64	0.24
Cochrane	15	\$21,680.51	\$18,913.89	335	\$1,445.37	\$1,260.93	0.87
Dufferin	254	\$737,609.46	\$302,439.89	5491	\$2,903.97	\$1,190.71	0.41
Dundas	159	\$1,405,729.77	\$218,489.02	5436	\$8,841.07	\$1,374.14	0.16
Durham East	30	\$158,068.53	\$32,911.44	262	\$5,268.95	\$1,097.05	0.21
Durham West	67	\$245,482.97	\$94,291.03	2089	\$3,683.92	\$1,407.33	0.38
Elgin	186	\$1,161,293.77	\$242,960.79	4110	\$6,243.51	\$1,308.24	0.21
Essex	391	\$2,460,788.84	\$454,255.15	7471	\$6,293.58	\$1,161.78	0.18
Frontenac	63	\$368,048.93	\$87,285.76	2782	\$5,842.05	\$1,385.49	0.24
Glengary	267	\$1,814,292.00	\$343,261.14	6956	\$6,795.10	\$1,285.62	0.19
Grenville	100	\$534,289.28	\$123,905.24	3951	\$5,342.89	\$1,239.05	0.23
Grey	399	\$1,173,296.80	\$501,521.06	10073	\$2,940.59	\$1,256.95	0.43
Haldimand	41	\$346,987.47	\$52,973.74	1180	\$8,463.11	\$1,292.04	0.15
Halton	43	\$182,770.00	\$53,478.81	764	\$4,250.47	\$1,243.69	0.29
Hastings	267	\$891,764.53	\$330,406.12	8476	\$3,339.94	\$1,237.48	0.37
Huron	946	\$5,545,849.36	\$1,212,384.27	15831	\$5,862.42	\$1,281.59	0.22
Kanora	11	\$26,442.01	\$14,000.00	1088	\$2,403.62	\$1,272.73	0.53
Kent	454	\$2,555,082.97	\$619,303.38	81256	\$5,627.94	\$1,364.10	0.24
Lambton	606	\$4,390,618.73	\$854,368.48	13264	\$7,245.25	\$1,409.85	0.19

Lanark	137	\$531,032.80	\$181,518.42	5441	\$3,876.15	\$1,324.95	0.34
Leeds	136	\$675,633.52	\$189,918.84	4805	\$4,967.89	\$1,398.46	0.28
Lennox & Addington	71	\$271,716.34	\$96,363.76	2415	\$3,826.99	\$1,357.24	0.35
Manitowlin	22	\$55,673.39	\$27,722.87	552	\$2,530.61	\$1,260.13	0.50
Middlesex	521	\$3,367,575.20	\$657,812.84	9899	\$6,463.68	\$1,262.60	0.20
Muskoka	7	\$27,323.28	\$9,607.49	381	\$3,903.33	\$1,372.50	0.35
Niagara North	180	\$956,756.42	\$230,563.62	3175	\$5,315.31	\$1,280.91	0.24
Niagara South	46	\$153,574.01	\$58,243.56	1151	\$3,338.57	\$1,266.16	0.38
Nipissing	33	\$249,486.58	\$43,166.45	1315	\$7,560.20	\$1,308.07	0.17
Norfolk	172	\$869,490.22	\$232,343.80	4740	\$5,055.18	\$1,350.84	0.27
Northumberland	310	\$1,268,556.63	\$421,354.30	7675	\$4,092.12	\$1,359.21	0.33
Oxford	115	\$854,399.23	\$160,622.38	3081	\$5,690.43	\$1,396.72	0.25
Parry Sound	8	\$24,227.85	\$11,992.50	517	\$3,028.48	\$1,499.06	0.49
Peel	66	\$311,842.53	\$80,775.02	1616	\$4,724.89	\$1,223.86	0.26
Perth	304	\$2,266,591.63	\$396,724.55	9534	\$7,455.89	\$1,305.01	0.18
Peterborough	359	\$1,224,703.36	\$477,206.35	11868	\$3,411.43	\$1,329.27	0.39
Prescott	134	\$1,237,812.57	\$190,802.96	3329	\$9,237.41	\$1,423.90	0.15
Prince Edward	41	\$339,118.85	\$54,801.80	1162	\$8,271.19	\$1,336.63	0.16
Rainy River	54	\$166,423.43	\$74,334.93	1750	\$3,081.92	\$1,376.57	0.45
Renfrew	248	\$920,277.98	\$338,653.56	7377	\$3,710.80	\$1,365.54	0.37
Russell	104	\$806,707.70	\$136,289.74	2701	\$7,747.19	\$1,310.48	0.17
Simcoe North	150	\$699,506.57	\$178,379.14	5799	\$4,663.38	\$1,189.19	0.26
Simcoe South	134	\$915,120.03	\$182,271.87	2649	\$6,829.25	\$1,360.24	0.20
Stormont	122	\$826,275.33	\$169,715.28	3218	\$6,772.75	\$1,391.11	0.21
Sudbury	18	\$63,054.35	\$18,657.55	814	\$3,503.02	\$1,036.53	0.30
Thunder Bay	25	\$52,179.36	\$32,063.83	431	\$2,087.17	\$1,262.55	0.61
Timiskaming	64	\$190,318.00	\$83,032.15	1479	\$2,973.72	\$1,297.38	0.44
Victoria	105	\$441,426.55	\$143,857.72	3937	\$4,204.06	\$1,370.07	0.33
Waterloo	58	\$441,959.06	\$73,860.51	1581	\$7,619.98	\$1,273.46	0.17
Wellington	277	\$1,069,820.59	\$334,426.00	5156	\$3,862.17	\$1,207.31	0.31
Wentworth	88	\$546,582.34	\$94,428.99	2174	\$6,211.16	\$1,073.06	0.17
York	76	\$314,019.56	\$103,145.80	1722	\$4,131.84	\$1,357.18	0.33
<b>TOTALS</b>	<b>9010</b>	<b>\$48,501,875.74</b>	<b>\$11,709,139.27</b>	<b>299084</b>	<b>\$268,620.22</b>	<b>\$69,824.54</b>	<b>16.58</b>
<b>Average</b>	<b>167</b>	<b>\$898,182.88</b>	<b>\$216,835.91</b>	<b>5539</b>	<b>\$4,974.45</b>	<b>\$1,293.05</b>	<b>0.31</b>

Ending July 31, 2001 some 9,010 claims had been submitted, an average of 167 per county. Total costs of \$48,501,876 have been incurred in on-farm projects by participants, for a county average of \$898,183. The average costs per project varied from a low of \$1445 in Cochrane to \$9237 per project in Prescott.

Over the same period, some \$11,709,139 was disbursed in claims, for a county average of \$216,836. We see then that wide variations in both participation and grants occur throughout the province. The number of claims varied from 7 in Muskoka to 946 in Huron during this period. Therefore it follows that Huron also received the largest outlay in grant funding, and Muskoka the lowest. Huron participants also account for the highest project costs whereas the lowest costs were incurred in Cochrane.

The average amount of each claim varied little between counties, doubtless a reflection of the upper limit of the grant schedule. The average county claim varies from \$1,029 in Algoma to \$1499 in Parry Sound. The average grant, then, pays about 31% of the actual project cost.

However, the average claim-to- cost ratio varies greatly between counties. This obviously depends on how much beyond the grant threshold the participant was willing to pay. The capital costs farmers are willing to pay over and above the grant threshold is likely proportional to the size and income of the farms themselves. The lowest claim to cost ratio was 0.16 in Dundas and the highest in Cochrane at 0.87. That is the participants in Dundas made personal contributions to projects far beyond the grant ceiling.

A total of 299,084 unclaimed hours were also indicated in the OSCIA data, representing a large hidden cost of implementing the incentive programs. Again, these unclaimed hours are highly variable throughout the province but generally in proportion

to the number of claims. No data are available to estimate the value of this hidden contribution. These unclaimed hours range from a low of 262 in Durham East to 81,256 in Kent.

There are very clear geographic differences across the province reflected in these data. They would appear to be related to the types of on-farm activity chosen by the participants under the eligibility requirements of the program. OSCIA has provided further cost and price data on specific activities from April 1, 1993 to June 30, 2001, as shown in their graph below:

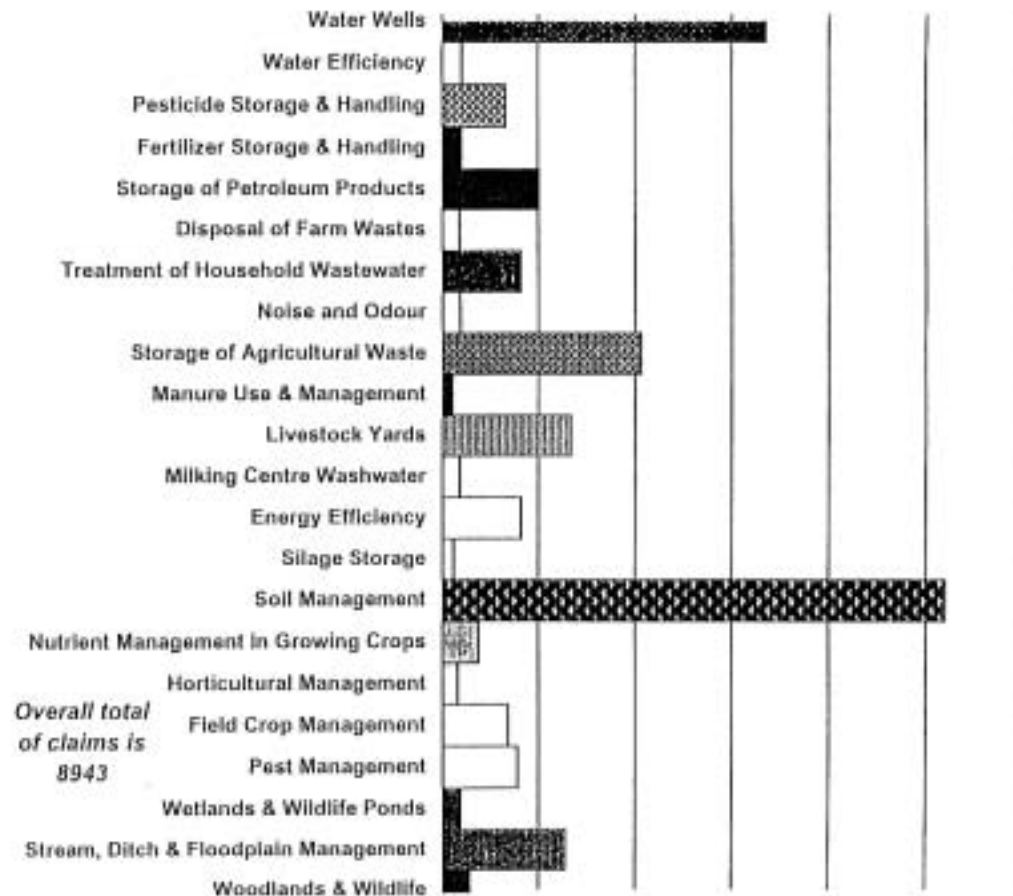
source: OSCIA, 2001

# EFP Percentage of Total Claims

By Worksheet

April 1, 1993 to June 30, 2001

0% 5% 10% 15% 20% 25% 30%



Overall total  
of claims is  
8943

Federal Contribution: \$11.6 million Farmer Contribution: \$36.5 million

We see that claims relating to soil management are the most common category, being about 26% of the total number of claims. This is followed by claims relating to water wells (about 17%) and for storage of agricultural waste (at just over 10%). Projects having to do with livestock yards accounted for about 7% of claims, as did stream, ditch and floodplain management. Storage of petroleum products comprised 5% of claims. The fewest number of claims related to water efficiency, pesticide storage and handling, fertilizer storage and handling, disposal of farm wastes, treatment of household wastewater, noise and odour, manure use and management, milking centre washwater, energy efficiency, silage storage, nutrient management in growing crops, horticultural management, field crop management, pest management, wetlands and wildlife ponds and woodlands and wildlife (less than 5% in each category).

The OSCIA data clearly demonstrate that most of the EFP grant funds in Ontario have been used in soil management projects. The great majority of this has been to assist in the purchase of no-till or other conservation tillage systems. The second most important category of expenditure has been to protect on-farm wells. Data provided by OSCIA prepared for the use of the Agricultural Adaptation Council list show each purchase. The total equipment costs for the period between 1993 and 2001, most of it devoted to no-till equipment, totals \$1,991,218. The total project costs were \$48,501,876 during this period showing that equipment costs were 4.1% of the total.

This emphasis on conservation tillage within the EFP program clearly suggests that, as of July 2001, a traditional emphasis on on-farm soil conservation remains intact. It is not known whether vested interests are encouraging adoption of no-till technology to the exclusion of other types of best management practices. The graph and the heavy

capital outlay on conservation tillage does indicate that there has been little interest in voluntarily engaging in many other types of stewardship activities which could potentially produce external environmental benefits for which farmers could receive payments.

OSCIA field staff provide to their office selected examples of purchase costs of equipment etc. to implement on-farm projects and the names of local companies providing such equipment and services (see Appendices). These have been kindly forwarded for the use of this project and are summarized below:

- Well head protection; new wells cost between \$1200 and \$10,000, with an average cost over 31 well drilling claims of \$4000. The cost for abandoning and sealing a well is \$1000 for either a 24-30 foot dug or drilled well. Concrete well caps cost about \$100. A 30- inch diameter well casing section is about \$200. Raising a drilled well casing from below ground level required the welding of a piece of casing onto existing casing and the addition of a pitless adapter. The pitless adapter allows water pipes and wires to be located at below frost level, but allows the equipment to be removed for inspection and repair. The cost ranges between \$500 and \$1500, the average being about \$800.
- Pesticide storage; no claims were received by the field staff person and therefore no information on costs was available. It seems that most farmers did not store large amounts of pesticides.
- Fuel storage; distance separation formulas apply to fuel storage options. For those less than 50 feet from a drilled well, among other conditions,

fuel storage must be inside a dike. The costs for these have been declining in recent years. A 300-gallon double-walled tank costs about \$1000, plus \$500 for a hand pump and hose. A 500-gallon tank is about \$1200. Such tanks are placed in dike structures costing around \$850 for a concrete structure suitable for a 500-gallon tank and about \$1200 for a steel dike structure. If the fuel tank is between 50 and 75 feet from a drilled well, among other conditions, a diked structure must be used or a sealed spill protection structure used. This could be a self-made concrete pad or steel pan structure costing from \$200 to \$500. For fuel tanks more than 76 feet from a drilled well, among other conditions, a diked structure, or a spill protection structure can be used, or the tank can be above ground on non-combustible supports and bi-weekly records kept.

- Septic systems; rates vary according to the percolation rates of the site. Low percolation rates, as on wet or heavy clay soils, require raised beds or sometimes aerobic systems which are very costly. A (normal?) tank costs \$1000. System installation on sites with high rates of percolation averages \$2800. Sites with low rates vary from \$6000 to \$10,000. Septic inspection and pumping costs about \$1000.
- Manure storage; eaves trough for barns averages \$1400. No other information was available.
- A detailed list of expenditures for planting and tillage equipment bought under the EFP is available. Again, these costs are highly variable, reflecting different sizes, design and ages of the equipment purchased;

ranging from \$792 to hire a custom no-till planter to \$71,000 to purchase a no-till planter.

#### *7.3.1.4 Ontario's Rural Water Quality Program Costs*

The GRCA delivers Ontario's Rural Water Quality Program in the Regional Municipalities of Waterloo and Wellington. It appears that, in keeping with Ontario tradition, relying on the GRCA to form collaborations with municipalities and other stakeholders, and its long expertise in program implementation, have met with great success in attracting participants to this program. The GRCA has kindly provided complete information on rates and eligibility for these programs (see Appendices). The following information is summarized from these documents.

In Waterloo, financial incentives are of two types: 1) a grant to cost-share a Project, and/or 2) an annual performance incentive for implementing a specific management practice or to cover annual operational costs. These performance incentives vary between types of projects according to the table provided below: from between 50% for livestock waste management practices, to 80% of costs for plugging unused wells. Up to 75% is available for livestock access restriction to a maximum of \$10,000.

**PROJECTS ELIGIBLE FOR FUNDING:** *Water/00,2001*

<b>Group One: Grant only</b>		grant rate (%)	maximum grant (\$)	performance incentive (\$)	groundwater or surface water area?	maximum acreage
Livestock waste management	minkhouse wastewater treatment	50	5,000	NA	S	NA
	manure storage	50	15,000	NA	S&G	NA
	clean water diversion	50	2,000	NA	S&G	NA
	livestock access restriction*	75	10,000	NA	S	NA
Farmstead	wellhead protection	50	500	NA	G	NA
	plugging unused wells	80	1,000	NA	G	NA
	fertilizer, chemical or fuel storage/handling	50	750	NA	G	NA
Erosion control structures	grassed waterways, water and sediment control basins, terraces, streambank stabilization, and drop inlets	50	10,000	NA	S	NA
<b>Group Two: Grant with performance incentives</b>						
Livestock waste management	nutrient management plans	50	500	\$200/yr	S&G	NA
Cropping practices	strip cropping	50	1,000	\$20/acre/yr	S	50
Fragile agricultural land retirement	stream buffers, fragile land retirement, field windbreaks	75	6,000	\$250/acre/yr	S&G	10
<b>Group Three: Performance incentives only</b>						
Cropping practices	residue management	NA	NA	\$20/acre/yr	S	50
	cover crops	NA	NA	\$20/acre/yr	S	50

\*livestock access restriction materials are eligible for 100% cost-share if installed by the landowner.

Waterloo RWQP Comparison of Grants Provided Per Year (updated november 14, 2001)

Year	Clean Water Diversion	Manure Storage	NMP	Milkhouse	Erosion Control	Tillage	Cover Crops	Livestock Fencing	Fuel Storage	Well Plugging	Fragile Land Retire	Total
1998	\$3,499	\$98,598	\$2,048	\$18,197	\$1,560	\$0	\$0	\$0	\$750			\$123,902
1999	\$5,679	\$201,410	\$1,739	\$20,000	\$5,128	\$7,472	\$320	\$6,081			\$3,986	\$251,815
2000	\$8,255	\$108,741	\$286	\$16,826	\$4,449	\$7,380	\$1,340	\$36,906		\$750	\$16,549	\$201,482
2001	\$16,946	\$68,063	\$1,122	\$13,327	\$217	\$9,400	\$1,140	\$80,655			\$36,488	\$227,358
Total	\$34,379	\$476,812	\$5,195	\$68,349	\$11,354	\$24,252	\$2,800	\$123,643	\$750	\$0	\$57,023	\$804,557

Waterloo RWQP Projects Completed (updated november 14, 2001)

Year	Clean Water Diversion	Manure Storage	NMP	Milkhouse	Erosion Control	Tillage	Cover Crops	Livestock Fencing	Fuel Storage	Well Plugging	Fragile Land Retire	Total
1998	4	9	9	5	1	0	0	0	1			29
1999	5	14	14	4	1	8	2	1	0		3	52
2000	6	8	5	5	5	0	1	9	0	1	9	49
2001	13	5	9	4	1	0	0	21	0	0	14	67
Total	28	36	37	18	8	8	3	31	1		26	197

Wellington Guelph RWQP Projects Completed in 2000														
	Clean Water Diversion	Manure Storage	NMP	Milkhouse	Erosion Control	Livestock Fencing	Fragile Land Retire	Fuel Storage	Well Protect	Well Plugging	Cover Crops	Strip Cropping	Tillage	Total
Number of Projects	3	7	3	3	3	8	10	1	2	4	1	1	15	61
Grant	\$6,478	\$91,537	\$807	\$13,088	\$18,133	\$32,208	\$15,429	\$575	\$788	\$1,672		\$450		\$181,164
Landowner's Contribution	\$10,425	\$129,711	\$919	\$22,069	\$11,812	\$5,650	\$6,582	\$764	\$847	\$117		\$513		\$189,410
Incentive							\$7,275				\$720	\$340	\$11,310	\$19,645
Total	\$16,904	\$221,248	\$1,726	\$35,157	\$29,945	\$37,858	\$29,286	\$1,339	\$1,635	\$1,789	\$720	\$1,303	\$11,310	\$390,219

Wellington Guelph RWQP Projects Completed in 2001 (November 14, 2001)														
	Clean Water Diversion	Manure Storage	NMP	Milkhouse	Erosion Control	Livestock Fencing	Fragile Land Retire	Fuel Storage	Well Protect	Well Plugging	Cover Crops	Strip Cropping	Tillage	Total
Number of Projects	3	10	9	1	2	1	0	0	1	0	2	0	2	31
Grant	\$9,192	\$144,737	\$2,361	\$12,346	\$9,092	\$3,413	\$0	\$0	\$500	\$0		\$0		\$181,641
Landowner's Contribution	\$17,405	\$223,911	\$3,369	\$15,664	\$10,754	\$1,138	\$0	\$0	\$4,540	\$0		\$0		\$276,781
Incentive							\$21,900				\$3,980	\$0	\$11,680	\$37,560
Total	\$26,597	\$368,648	\$5,730	\$28,011	\$19,846	\$4,551	\$21,900	\$0	\$5,040	\$0	\$3,980	\$0	\$11,680	\$495,982

A combination of grant and performance incentive is available with Wellington and Waterloo's Rural Water Quality Program. A grant rate of 50% for nutrient management plans is available to a maximum of \$500. The performance incentive is \$200 per year. Grants for strip cropping are available to a maximum of \$1000 with accompanying performance incentive of \$20/acre/year. For implementing stream buffers, fragile land retirement and field windbreaks, the grant rate is 75%, up to a maximum of \$6,000 with an accompanying performance grant of \$250/acre/year (to a maximum of 10 acres). In the same program, performance incentives of \$20/acre/year to a maximum of 50 acres are available for residue management and cover crops.

The completion of an EFP is required to be eligible for these programs and this fact has encouraged a surge in participation in the EFP program. It is perhaps noteworthy that the labour provided by the applicant, family dependents or his or her business is not an eligible cost, except for the livestock access restriction to watercourses. In this case it may be included as the participant's contribution in the cost-sharing portion. It is not clear whether the Review Committee receives remuneration for their efforts. There is a budget devoted to their activities however.

Some 130 grants were awarded between 1998 and 2000 as part of the Waterloo Rural Water Quality Project. The average grant varied considerably between eligible projects, from \$750 for fuel storage and well plugging to \$13,185 for manure storage. The average total grant per applicant for the three years was \$4440. For the year 2000 the ratio of grant to total on-farm project cost was again variable across the eligible activities; from 1.0 for performance incentives for tillage, cover crops and well plugging to .57 for fencing to .27 for producing a nutrient management plan. Overall, the total grant-to-cost

ratio was .35. This is somewhat higher than for activities under the EFP as described above.

The Waterloo program appears to have been under-subscribed since considerable surplus funds remained in their 2000 financial statement. The Wellington program was oversubscribed and all grant money was allocated by the Review Committee.

There appears to have been no attempt in the local programs above to relate incentive grants to external environmental goods and services. A standard schedule was used instead.

A number of local water quality programs in eastern Ontario have been established. The Rideau Valley Clean Water Program, launched in January 2002 appears to be similar to the other local programs. Operating within the Rideau watershed outside urban areas, eligibility also requires the completion of an EFP. Eligible on-farm projects include many of the same activities as for Wellington and Waterloo. Grant rates vary from 50% for nutrient management plans to a maximum of \$900, to 75% for fencing livestock to a maximum of \$5,000. Riparian buffers and erosion control are also eligible for 75% funding, to a maximum of \$5,000, while capping abandoned wells is eligible for 75% funding, to a maximum of \$500. The rates may be extended depending on the total amount of money available each year. This presumably depends on the success of the program to attract funding partnerships.

### **7.3.2 Estimating the Value of Lost Production**

As an alternative to estimating the intangible values of environmental benefits, or the costs of implementation, we may also try to estimate the value of production foregone

in implementing an environmental farm practice. This approach relies on a direct appeal to an individual's profit-maximizing behaviour. That people will behave in such an "economically rational" manner has always been a central assumption of the classical and neo-classical economics on which the free market economy (i.e. capitalism) is based. Such a derived value is not static. It would, of course, vary according to the market price of the good. This alone makes this method problematic for incentive program purposes. Nevertheless, we have some anecdotal evidence that suggests that full compensation for production foregone in agri-environmental programs would be expected from some farmers before enrolling in a program of environmental payments.

An inversion of the idea of compensation to farmers for lost production is used in a recent study commissioned by DUC. Brethour *et al.* (2001) of the George Morris Centre provide estimates of the savings farmers could make by retiring marginal land adjacent to water bodies. This study finds that retiring such land would cut losses incurred by planting in marginal areas. These areas would then be available for riparian buffer zones which would provide external habitat and other environmental benefits.

Brethour *et al.* were able to estimate these savings by assessing the "opportunity cost" to landowners and producers of setting aside the marginally productive agricultural land. They used real Ontario price data for corn, soybeans and winter wheat from 1995 to 2000. Using American spelling, opportunity cost is defined by Principia Cybernetica

Web [http://pespmc1.vub.ac.be/ASC/OPPORT\\_COST.html](http://pespmc1.vub.ac.be/ASC/OPPORT_COST.html), as:

...the advantage forgone as the result of the acceptance of an **alternative**. It is measured as the **benefits** that would result from the next best alternative use of the same resources that were rejected in favor of the one accepted. Opportunity cost is difficult, perhaps impossible, to measure precisely.

Brethour's *et al.*'s study analysed the variation in gross margins across typical agricultural fields in Ontario. If one assumes that farmers follow a profit-maximizing behaviour, it will be an economic advantage to retire land when the gross margin is less than the fixed cost. Specifically this was shown to occur in wet or otherwise marginal areas near streams. This approach to valuation for purposes of environmental conservation creates a proxy value for potential production which is foregone by retiring marginal land.

Brethour *et al.* deliberately did not attempt to estimate the value of public environmental benefits from retiring marginal land and establishing a riparian buffer zone. Nor was it their purpose to consider the question of direct environmental payments to farmers for the retirement of marginal land. Therefore, we see that while farmers would be able to cut their losses by retiring marginal land and returning it to a natural state and thereby possibly increasing their profit margin, they would not actually receive an income for providing environmental benefits.

A recent study conducted for Ducks Unlimited (Canada) by Brethour *et al.* (2001) of the George Morris Centre makes an empirical analysis of crop yield and profitability to predict the dollar savings that would accrue to farmers by retiring marginally profitable land and returning it to its natural state. This work makes no attempt to derive a dollar value for wider environmental benefits as a public good. The findings would be useful to the sponsoring agency in promoting the voluntary removal of land from cultivation for the purposes of inclusion in a riparian buffer zone, for example.

## **7.4 USDA Environmental Benefits Index**

Ducks Unlimited Canada (DUC) proposes the use of an Environmental Benefits Index (EBI) similar to that used by the USDA as part of the Conservation Reserve Program (CRP) (a copy of this index and the DUC proposal is appended to this report). The CRP removes land from production, especially fragile or marginal land to prevent erosion and other environmental damage. The index is part of a process of competitive contractual bidding for provision of on-farm environmental activities. Scores have been devised for six environmental factors plus a cost factor. The six are: cover practices, water quality, erosion factors, enduring benefits, air quality benefits and state or national Conservation Priority Areas. The index then is based on the expected environmental improvement in soil resources from cover, water quality, wildlife habitat and other resource concerns during the time the land is to be enrolled in the program. The sum of the scores are totalled and compared with all other applicants and grants awarded on a competitive basis. In this scheme the standardized index makes no attempt to calculate lost production values and proxy market values derived through the economic methods discussed above. The variable weights attached to activities then form the basis for establishing eligibility and selection of applicants for granting purposes. DUC believes that the use of such an index will result in a cost-effective program that achieves the greatest environmental benefits with given resources.

## **7.5 Eligibility for Incentive Programs**

Criteria for eligibility for incentive programs can be established in many ways, depending on the geographical scope of the program and its objectives. Some programs

target certain geographical areas such as watersheds, ecological regions, or municipalities. The current Rural Water Quality Programs funded by specific municipalities and delivered on a watershed basis are one example. The Rural Water Quality Program requires the completion of an EFP as part of its eligibility criteria.

Some programs aim to gradually improve the environmental outcome through universal eligibility but with voluntary participation which is hoped to instil an environmental consciousness which will become standard practice. The EFP is one such.

Other programs could have a very specific aim; to protect an endangered species, for example. The American Chestnut Restoration program is one such.

Some programs aim to promote best management practices in soil, water and nutrient management whose impacts have been well-demonstrated by trial and error or by systematic investigation and testing. The emphasis on conservation tillage of many programs is an example.

Some programs may have a single goal but which has multiple benefits. The Conservation Cover Incentive Program proposed by DUC would, if accepted, have a number of ecosystem and agri-environmental benefits while responding to the organization's mandate to provide habitat for waterfowl for conservation and for hunting purposes.

For the purposes of this report potential eligibility for incentive programs could be grouped into the following broad categories:

- Universal eligibility for all rural landowners or land managers;
- Eligibility restricted to farm owners/operators with specified criteria;
- Eligibility based on specific program goals, and;

- Eligibility targeted to specific sites, eco-regions or other geographic area.

We must distinguish between eligibility for application to a program and the actual review process which selects applicants. Eligibility criteria for many programs are available, but the actual applicant selection procedure used in each program remains unknown. In many cases this would have been a decision taken by committees assembled by the funder or delivery agency and these records are not readily available. It is likely that decision-making is confidential.

The GRCA, the delivery agent for the Rural Water Quality Program in Wellington Region selects a Review Committee to make decisions on grant applications. Because the fund was finite and oversubscribed for the year 2000, some applicants were refused because their projects were judged by the committee to address lower priority areas. As put by the program officer:

The Review Committee worked extremely hard and made some very difficult decisions. The largest challenge facing the program is to allocate the limited resources to the increasing number of eligible applications. Given the present interest in the program the Review Committee will continue to be challenged with difficult decisions.

Ryan, 2001a, p. 7

One might expect that local and regional incentive programs will have variable amounts of funding as private and municipal government funding commitments come and go. While eligibility may conform to transparent and standard criteria, it is likely that other over-subscribed programs will be subject to *ad hoc* prioritising by confidential review committees as they attempt to assess the most worthy projects. A negative impact on the good will of potential participants could be then predicted in these cases.