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AGRI-ENVIRONMENTAL STEWARDSHIP ADOPTION IN CANADA: A STATE OF KNOWLEDGE REVIEW AND ANNOTATED BIBLIOGRAPHY

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Growing Forward

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1 Preamble

Understanding Agri-Environmental Stewardship Adoption

Growing concerns surrounding the environmental repercussions of conventional agricultural practices in recent decades have led to the development and implementation of a large array of agri-environmental programs around the world. In Canada, and elsewhere, there has been heavy reliance on voluntary agri-environmental stewardship programs as the means to achieving wide-ranging environmental policy objectives (Falconer 2000; Pierce 1996; Smit and Smithers 1992). As such, within both the research community and the environmental practitioner community, considerable energy has been devoted to better understanding factors that serve to encourage and discourage farmer participation in voluntary agri-environmental programs with a view to answering the following question: How do we go about fostering the more widespread adoption of agri-environmental stewardship behaviours in the interest of ensuring long-term agricultural sustainability and community well-being? And, moreover, what policy reformulations might serve to enhance or augment participation in agri-environmental stewardship?

A large body of scholarship now exists that theorizes factors explaining the (non)adoption of agri-environmental stewardship practices and (non)participation in agri-environmental programs. In the words of Nowak (1983), there remains 'spirited debate' as to the applicability of the literature concerning the adoption of environmental conservation technologies and practices. Many theorizations are in direct contradiction with one another, in part a reflection of the complex ways in which farmer values and attitudes correspond with behaviour; in many cases, environmental attitudes and behaviours are at best weakly linked (Beedell and Rehman 1996; Guerin and Guerin 1994; Lovejoy and Napier 1986; Napier and Forster 1982). Furthermore, efforts to provide explanations for adoption behaviours have been cast as being inattentive to complexities related to the interplay between agency and structure (in a storyline reminiscent of Giddens, 1984). However, Falconer (2000, p. 380), suggests a positive trend in this regard:

> *Recent studies have attempted to redress the balance between understanding structures and understanding farmers' own personal choices. There is growing recognition of the complex interplay between external and internal factors, with a questioning of this dualism and a greater sensitivity to the different contexts in which farmers operate*.

Such is echoed in Vanclay (2004), who argues the need for agricultural extension efforts that pay heed to the inherently social nature of farming. Knowler and Bradshaw (2007), in a related vein, intimate that convergence towards a particular universal explanation for adoption is unlikely; as such they call for research that aims not for universal understanding, but rather that is meaningful in furthering local management efforts.

Environmental Farm Planning – A Novel Policy Approach

In response to calls for more sustainable and caring forms of agriculture (e.g., Hill 1985; Rowe 1990), considerable energy has been invested over the past two decades in finding means of promoting and enhancing environmental stewardship at the farm-level. In the Canadian context, environmental farm planning has emerged as an innovative approach to addressing environmental concerns at the farm-level.

The Environmental Farm Plan (EFP) program began as a pilot project in the early 1990s in province of Ontario. Its origins can be traced to *Our Farm Environmental Agenda*, a commitment made in 1992 by the Ontario Farm Environmental Coalition to facilitate the process of encouraging every farmer in the province of Ontario to conduct farming activities in an environmentally responsible way (Ontario Farm Environmental Coalition 1992). Following its successful launch in Ontario, the EFP program was expanded nationally, with funding provided initially under the Canada-Ontario Green Plan and later through Agriculture and Agri-Food Canada (AAFC) and the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) under the Agricultural Policy Framework. Current support for the EFP Program is slated to continue to March 31, 2013 through AAFC and OMAFRA under the national Growing Forward framework.

Developed for farmers by farmers, the EFP program is a voluntary environmental education and awareness program that engages farmers in a self-assessment as to environment performance. The EFP program has been applauded on a number of grounds. In addition to inviting and fostering farmer participation in devising solutions to agri-environmental problems, the EFP program has also been extolled on the merits of its bottom-up dimension (Grudens-Schuck 2000). As noted by Hilts (1997):

> *The Environmental Farm Plan effort is the most comprehensive farm planning effort in the world from an environmental perspective, and the only such program driven by the farm community itself.*

There has been considerable praise for the learning and educational outcomes associated with the EFP program, which are have not only improved environmental awareness within the farm community (van Osch 1997), but have arguably begun to narrow the 'disconnect' between the farm community and non-farming rural neighbours (Atari et al. 2009). Others have pointed to the cost-savings benefits realized in the form of additional environmental actions taken by farmers at their own expense (Klupfel 1998).

Meanwhile, the fact that the EFP framework spans both farm (production) systems and environmental concerns has met variously with praise and skepticism. Robinson (2006a, p. 869), as a voice in the latter camp, questions whether there is indeed broad support for environmental enhancements or whether only small environmental enhancements occur where it is economically fruitful; in his words, "… the 'whole farm' aspect of the programme is perhaps not fully pursued in many cases." Levels of uptake have come under scrutiny as well. At the time of writing, it is estimated that upwards of 74,000 farm families have participated in the EFP program; and, while participation varies by province, it is estimated that more than 60 per cent of farmers in some regions in Canada have become stewards under the Program (Centre for Environmental Stewardship and Conservation, 2009). Although this level of participation is encouraging, farm plan adoption nevertheless remains far from universal.

Studies have pointed to a range of barriers to more widespread uptake and participation in the program. Smithers and Furman (2003), in exploring the high drop out rate beyond certain stages in the program, point to farmer concerns for the confidentiality of the process and overarching fears of government intervention in agricultural land use. In a similar vein, Yiridoe (2000) suggests that the wider embrace of environmental farm plans is inhibited by risks of public disclosure, noting that while the EFP program itself does not authorize the release of environmental information, there are inherent disclosure risks that arise through program requirements (e.g., the assessment of on-farm risks, the need for detailed documentation and record keeping; the authoring of corrective action plans). Others cite as a barrier to participation the financial burdens associated with implementing environmental improvements (e.g., Klupfel 2000; van Osch 1997). A number of other barriers are invoked in the literature – ranging from lack of knowledge of the program (Klupfel 2000) to perceptions about the program's ability to respond to farmer needs (Smithers and Furman 2003). Robinson (2006b) calls into question the possible privileging of farmer views given that the process is based on self-assessment and peer-to-peer review, and worries that the approach may limit transparency. And, as with other environmental stewardship programs, the ability to demonstrate – in an unequivocal way – the ecological outcomes associated with the EFP Program remains a vexing challenge (e.g., Smithers and Furman 2003; Robinson 2006a; Robinson 2000b; Summers et al. 2008). Concerns for the measurability of environmental outcomes are expressed equally in the context of agri-environmental schemes elsewhere around the world (e.g., Wilson and Hart 2000; Pagiola 2008).

Despite these challenges, the EFP program continues to garner the interest of other countries seeking to improve environmental performance on agricultural lands (e.g., Knierim 2007). It remains widely cited as a success story in an evolving Canadian agricultural context, in which environmental concerns have come into much sharper focus (e.g., Plummer et al. 2007; Klupfel 2000; van Osch 1997).

Growing Faith in the Private Market – The Emerging Ecological Goods and Services Paradigm

> *A growing body of evidence has cast doubt on the assumption that inculcating an environmental ethic will lead to more sustainable land management practices, particularly if these must be undertaken by farmers at their own expense.*
>
> *(Cocklin et al., p. 200, 2006)*

While the concept of environmental stewardship exhibits a certain elusiveness of definition in both scholarly and applied schools, it has been cast widely as embracing some expression of ethical responsibility unto the land (e.g., Rowe 1990; Centre for Environmental Stewardship and Conservation 2009). Yet, over the past decade, the 'public good' nature of stewardship has been thrust into the limelight, marking a paradigmatic shift in policy circles (Pierce 1996; Dobbs and Pretty 2004). The newly-emergent perspective holds thus: given that individual landowners or 'stewards' are expected to bear the responsibility of meeting heightened standards of environmental protection through additional expenditures or foregone development opportunities, and yet society at large reaps the environmental benefits, these landowners should be remunerated by society (e.g., Gutman 2007; Van Donkersgoed 2005).

Considerable impetus behind the ecological goods and services (EG&S) paradigm has come from a farming community frustrated by heightened demands for environmental protection that fail to recognize the oftentimes significant outlays of capital – both human and financial – that are invested on the part of the farmer to deliver what is largely a public good (e.g., van Donkersgoed 2005). Indeed, the concept underpinning remuneration for ecological goods and services is recognition by the wider community of the stewardship role undertaken by those living and working on the land (Cocklin et al. 2006). Yet, by what mechanism(s) is this to be achieved? What is the willingness of society to contribute or to pay? What constitutes a moral responsibility unto the land, and what ought to be compensated for? These are some of the prickly matters at the heart of tensions between those working the land and those looking on from beyond the farm gate, whether in cities, suburbs, or rural areas.

One of the particularly resonant critiques is that the profit-maximizing assumption underpinning market-based approaches fails to account for a more intricate interplay of motivations that shape stewardship attitudes and behaviours. Nowak (1983) contends that farmers are not driven solely by economic rationality, and expresses concern at the fact that other important insights from sociological research are oftentimes ignored (e.g., insights related to kinship and ethnicity, indigenous knowledge networks, and attitude-behaviour relations). Chouinard et al. (2008) find that some farmers may be willing to make uncompensated sacrifice in support of broader social goals, emphasizing equally the heterogeneity of the farming community (in a refrain consistent with Vanclay 2004). In an exposé supportive of the notion that environmental stewardship, in many cases, is undertaken irrespective of economic incentives, Reeson and Tisdell (2008) show that care must be taken to not 'crowd out' voluntary stewardship efforts.

McCarthy (p. 777, 2005), meanwhile, pursues a line of thinking echoed elsewhere in the scholarship with his assertion that, "The institutionalization of multifunctionality demands metrics." In other words, if society at large is paying for ecological goods and services, the proof will surely have to be in the pudding that farmers are delivering on the promise of protecting ecological goods and services. For the ecological goods and services approach to gain widespread traction, the linkage between land use activity and ecological goods and services delivery will need to be demonstrated. As acknowledged by Wunder et al. (2008), however, making such correlations is enormously difficult. The issue of finite funds for agri-environment stewardship efforts also rears its head in this context. From the point of view of cost-effectiveness and greatest gains in environmental improvements, where are efforts best directed? Emerging modeling tools and geospatial concepts – such as spatial targeting – may offer help in this regard (Crossman and Bryan 2009; Yang et al. 2005). Groffman et al. (2007, 13) are optimistic in this regard, predicting that new ways of looking at landscapes and new tools for compiling, integrating, and modeling ecological data will see landscape-scale assessment of multiple ecosystem services become "normal operating procedure" for conservation agencies within the next 10 to 20 years.

In spite of the many unresolved issues, the literature intimates that the ecological goods and services paradigm may have considerable merit in enhancing agri-environmental decision making and policy development and evaluation. Programs for remunerating landowners for the provision of ecological goods and services are proliferating the world over. In Costa Rica, a nation-wide framework of payment for ecological services is supported by the state, in large part through revenues derived from a fossil fuel sales tax (Pagiola 2008). In Australia, 'conservation tenders' are used to encourage and reward the provision of EG&S by landowners through programs like Eco-Tender and BushTender (see Eigenraam et. al 2007; Stoneham et al. 2003). Meanwhile in Canada, ecological goods and services remuneration approaches and programs have been slower to develop – as reflected in the paucity of scholarly articles on EG&S-related research specific to the Canadian context. Lefebvre et al. (2005) assert in a recent assessment of the environmental sustainability of Canadian agriculture:

For the most part, farmers are not compensated for their efforts to reduce environmental risks.

(Lefebvre et al., 2005, p. 21)

The most widely-referenced Canadian example of an emerging framework for rewarding farmers for the provision of ecological goods and services is ALUS (Alternative Land Use Services). ALUS is a farmer-driven, fee-for-service approach that offers farmers annual payments for the provisioning and enhancement of ecological goods and services. Pilot projects have been undertaken in the Regional Municipality of Blanshard in Manitoba and in Norfolk County in Ontario, and a full-scale provincial program has recently been instated in Prince Edward Island. While still at the stage of early days, emerging assessments point to the potential value of the ALUS approach in enhancing the flow of ecological goods and services to society and in better recognizing and rewarding farmers for the critical role they play as environmental stewards (Canadian Institute for Environmental Law and Policy 2010; MacKenzie 2008; Tyrchniewicz and Tyrchniewicz 2007).

Future Prospects

While the viability and endurance of different policy approaches to agri-environmental stewardship continues to be debated, one thing seems evident: the complexity of socio-ecological problems demands a range of approaches. Moreover, a concerted effort is needed to more thoughtfully consider the complementarities among approaches (Cashore et al. 2007; Pattberg 2005. In the words of Clark et al. (p. 258, 2007), "…we should be wary of the 'one best way' reflex in institutional design." Achieving enhanced agri-environmental stewardship in Canada will demand ongoing governance innovation among scholars, policy makers, conservation professionals, and, importantly, the farm community.

2 Annotated References

AGcare. 2007. Caring for the Land: Our Farm Environmental Commitment. A (partial) summary of environmental initiatives undertaken by Ontario farmers over the last two decades. Prepared by EarthTramper Consulting Inc. and KD Communications. Guelph. www.caringfortheland.com

This report provides a retrospective, dating back to the mid-eighties, of some of the many farm environmental projects and programs that have been undertaken by Ontario's farmers. In doing so, the report serves to showcase the involvement and commitment of Ontario farmers to agricultural stewardship. Data for this report was collected through interviews with farmers, government agencies, farm organizations, conservation authorities, universities and others. The authors emphasize the importance of having good data and statistical information to substantiate improvements in environmental quality.

Atari, D.O.A., Yiridoe, E.K., Smale, S., and Duinker, P.N. 2009. What motivates farmers to participate in the Nova Scotia environmental farm plan program? Evidence and environmental policy implications. *Journal of Environmental Management*. 90:1269-1279.

This article, in examining farmer motivations for participating in Nova Scotia's Environmental Farm Plan program, intimates that participation reflects concerns for managing public perceptions about environmental degradation linked to agriculture not necessarily concerns for reducing potential farm environmental risks (the raison d'être for the program). The authors call for the establishment of monitoring systems and the setting of achievable benchmarks to help ensure and verify claims of environmental stewardship under the Environmental Farm Plan program.

Beedell, J.D.C., and Rehman T. 1999. Explaining farmers' conservation behaviour: why do farmers behave the way they do? *Journal of Environmental Management*. 57:165-176.

In this paper, Beedell and Rehman illustrate the application of the Theory of Planned Behaviour in studying the hedge management behaviour of Bedfordshire farmers. The fundamental assumption upon which the theory is based is that people behave rationally, in accordance with the beliefs that they hold and that a person's behaviour is a function of the information or beliefs that s(he) has. They advocate for the theory's usefulness in assessing behavioural, social, and other influences on farmers' conservation related practices and behaviour, and suggest that it provides insights that cannot be obtained from conventional statistical analyses of attitudinal data.

Brotherton, I. 1989. Farmer participation in voluntary land diversion schemes: some observations from theory. *Journal of Rural Studies*. 5(3):299-304.

Brotherton sets out a simple method for predicting the relative importance of farmer factors (primarily attitudes) and scheme particulars (primarily economics) in constraining participation in voluntary land diversion schemes in the UK. Three hypothetical schemes are used to illustrate the method. He proffers that knowledge of the extent to which attitudes and economics separately constrain participation may be helpful in devising measures to encourage increased participation in voluntary land diversion schemes.

Caldwell, W., Hilts, S. and Wilton, B. 2007. Farmland Preservation in Ontario. In Caldwell, W., Hilts, S. and Wilton, B. (eds), Farmland Preservation: Land for Future Generations, Guelph: Centre for Land and Water Stewardship, University of Guelph, 87-113.

Processes of rural to urban land conversion, in particular threats to farmland preservation in Ontario, are the topic of concern in this chapter. The authors call for public policy that ensures a predictable pattern of land use conversion, thereby preventing the premature and unnecessary urbanization of farmland. The

protection of farmland as a public interest is a central theme, as is the need for land use planning that carefully considers implications for future generations.

Caldwell, W. and Hilts, S. 2005. Farmland preservation: innovative approaches in Ontario. *Journal of Soil and Water Conservation*. 60(3):66A(4).

Caldwell and Hilts provide a sketch of some of the recent measures taken on the part of provincial government in Ontario to more aggressively address the issue of farmland loss. While in agreement that new legislation and related plans (including the Greenbelt Act and the Places to Grow Act) will radically change the rural and urban landscape in parts of the province, they remain less certain as to whether the lands protected by this legislation will remain in continuous farm production for future generations. They advance the Ontario Farmland Trust as an innovative non-government initiative that could serve to enhance farmland preservation, alongside strong provincial and local policy.

Canada's Stewardship Agenda: Implementation of Priority Actions. 2003. Prepared by the Federal-Provincial-Territorial Stewardship Working Group.

Canada's Stewardship Agenda was endorsed by Federal-Provincial-Territorial Resource Ministers in September 2002 (the implementation of which is led by the Federal-Provincial-Territorial Stewardship Working Group). The Stewardship Agenda presents goals and a series of objectives as well as four priority actions for implementation. This report documents progress vis-à-vis the four priority actions in the Stewardship Agenda, highlights a selection of successful stewardship initiatives, and provides a summary of major recommendations from two national stewardship conferences held in 2002-03. The final section of the report outlines a path forward for the activities of the Stewardship Working Group.

Canadian Institute for Environmental Law and Policy. 2010. Enhancing the Flow of Ecological Goods and Services to Society: Key Principles for the Design of Marginal and Ecologically Significant Agricultural Land Retirement Programs in Canada. ISBN # 978-1-896588-68-1.

This report presents a series of design principles deemed vital to ensuring the effective delivery of agricultural land retirement programs in Canada. Six case studies from the U.S. and Canada are evaluated. These include: the Conservation Reserve Program (U.S.); the Wetlands Reserve Program (U.S.) Greencover (Canada); the Alternative Land Use Services pilot in Blanshard, Manitoba; the Payments for Environmental Goods and Services pilot in Huron County, Ontario; and, the Total Phosphorous Management pilot in the South Nation watershed in Ontario. The author concludes that an approach invoking environmental payments for retiring marginal and ecologically significant agricultural land can serve to enhance the flow of ecological goods and services to society in a cost-effective manner.

Cary, J.W., and Wilkinson, R.L. 1997. Perceived profitability and farmers' conservation behaviour. *Journal of Agricultural Economics*. 48(1):13-21.

In a pretest-post test study, Cary and Wilkinson investigate the influence of prior perceptions about two conservation practices, and of environmental orientation, on the subsequent behaviour of farmers in two contiguous areas of south eastern Australia. A logistic regression model is developed to show the relative influence of perceptions of profitability and technical feasibility and of personal environmental concern on the choice of conservation practices. Perceived profitability is identified as the most important factor influencing the use of conservation practices. The authors maintain that, while heightened environmental concern may be a desirable prerequisite for fostering appropriate conservation behaviour, it is likely to influence only a minority of farmers. Moreover, they point to the imperative of ensuring that practices are economically profitable where there are potential productivity gains substantially internalized for individual farm properties.

Centre for Environmental Stewardship and Conservation. 2009. The State of Stewardship in Canada. Land Stewardship Centre of Canada, Edmonton.

This report presents an overview of the current direction of stewardship in Canada. It examines some of the many wide-ranging stewardship activities occurring on private and public lands across Canada. Six recommendations are put forth for consideration by the stewardship practitioner community in Canada and take account of the following: (i) the need for a common definition of stewardship; (ii) the need for measurable targets; (iii) the need for a credible economic analysis of the importance of stewardship; (iv) the need for greater integration; (v) the need for new funding from government and other sources to maintain and build capacity for stewardship; and, (vi) the need to assign a high-profile task force with the responsibility for developing the case for a National Stewardship Fund. The report is also identified as a foundational piece upon which a Stewardship Road Map for Canada will be developed.

Chouinard, H.H., Peterson, T., Wandschneider, P.R., and Ohler, A.M. 2008. Will farmers trade profits for stewardship? Heterogeneous motivations for farm practice selection. *Land Economics*. 84(1):66-82.

Chouinard et al. adopt an expanded utility framework in modeling farmer behaviour. The modeling exercise is supplemented with an empirical study of farmer behaviour. The results show that that some farmers are willing to forgo profits to undertake stewardship activities. The authors argue the heterogeneity of the farm operation population, suggesting a continuum of farmer behaviours exists – one that spans profitability and stewardly motives.

Colman, D. 1994: Ethics and externalities: agricultural stewardship and other behaviour (Presidential address). *Journal of Agricultural Economics*. 45(3):299-311

In this presidential address, Colman reflects on the ethical dimensions of agricultural stewardship. He challenges the tendency to accept – uncritically – the criterion of Pareto optimality without giving due consideration to wider social influences shaping commitment to stewardship. Colman warns against the dangers of developing policies that undermine the ethical commitment to stewardship. He holds that agricultural policy should seek to promote socially beneficial voluntary behaviour and not to encourage farmers to demand that it be rewarded in the marketplace.

Corbera, E., González Soberanis, C., and Brown, K. 2009. Institutional dimensions of payments for ecosystem services: An analysis of Mexico's carbon forestry programme. *Ecological Economics*. 68:743-761.

Corbera et al. advance a multi-dimensional framework for understanding the development and effectiveness of payments for ecosystem services (PES) schemes framed around the notions of institutional design, performance and interplay. While the framework is applied in the context of Mexico's Programme of Payments for Carbon, Biodiversity and Agro-forestry Services (PSA-CABSA), the authors argue its utility in informing the development (and evaluation) of PES schemes elsewhere. The authors also emphasize the critical role of capacity and scale issues in securing the effective and fair implementation of PES schemes.

Crossman, N.D. and Bryan, B.A. 2009. Identifying cost-effective hotspots for restoring natural capital and enhancing landscape multifunctionality. *Ecological Economics*. 68:654-668.

This paper begins by examining data requirements for identifying geographic 'hotspots' for land use change. A modeling framework integrating landscape-scale biophysical data and economic data is developed for the Lower Murray region of southeastern Australia. Crossman and Bryan conclude that directing ameliorative actions towards hotspots in agricultural landscapes will be more cost-effective at restoring natural capital and stimulating landscape multifunctionality than a random targeting approach.

They note that a more comprehensive analysis of trade-offs and the inclusion of stakeholder input into the quantification of weights would add value to the concept of cost-effective hotspots.

Davey, K.A., and Furtan, W.H. 2008. Factors that affect the adoption decision of conservation tillage in the prairie region of Canada. *Canadian Journal of Agricultural Economics*. 56:257-275.

Using a probit model, Davey and Furtan explore the question of why some farmers in the Canadian Prairies have adopted conservation tillage and why others have not. Important variables include farm size, proximity to a research station, type of soil, and weather conditions, with the latter two playing the largest role in the adoption decision. Based on the results that proximity to a research station increases adoption, the authors speculate that farmers may learn about new conservation technologies and practices through observation. As such, they call for expanding the resource base of extension services.

Dobbs, T.L. and Pretty, J. 2008. Case study of agri-environmental payments: The United Kingdom. *Ecological Economics*. 65:765-775.

This case study of UK agri-environmental schemes is based on a comprehensive review of research and evaluation studies pertaining to the Environmentally Sensitive Areas (ESA) program and the Countryside Stewardship Scheme (CSS). Dobbs and Pretty to conclude that both the ESA program and the CSS proved to be effective in enrolling many farmers in the entry-level contract tiers, however, the schemes did not generally offer sufficient economic incentives to attract high levels of enrollment in the intensive farming areas. The schemes were also found to be limited in their success in enrolling farmers in higher payment tiers, those tiers requiring more substantial changes in farming practices. The authors introduce three new agri-environmental schemes in England that replace the ESA and the CSS, concluding that they offer good prospects for further enhancing agriculture's multifunctionality.

Duff, S.N., Stonehouse, D.P., Blackburn, D.J., and Hilts, S.G. 1992. A framework for targeting soil conservation policy. *Journal of Rural Studies*. 8(4):399-410.

This paper presents a comprehensive analytical framework that identifies and relates micro and macro factors influencing the adoption and use of soil conservation measures. The authors hypothesize that economic and institutional constraints will exert the greatest influence on decisions to use land stewardship practices when problem awareness exists at the micro level. Based on this framework, a research methodology is developed to classify the farm population into relatively homogeneous sub-groups based on farmers' receptivity to the adoption and use of currently available and prospective conservation practices. It is argued that this classification would provide a basis for evaluating alternative stewardship enhancement incentives in order to obtain policy prescriptions appropriate for each receptivity group.

Duff, S.N., Stonehouse, D.P., Hilts, S.G., and Blackburn, D.J. 1991. Soil conservation behaviour and attitudes among Ontario farmers toward alternative government policy responses. *Journal of Soil and Water Conservation*. 46(3):215-219.

In this study of soil conservation behaviour and attitudes among a sample of 100 farmers in southwestern Ontario, Duff et al. note few obstacles to the adoption and use of soil conservation practices; none of those noted most were financially based. Farmers preferred voluntary policies (education, advice, grants) to encourage soil conservation even though they perceived regulatory approaches (penalties, cross-compliance, direct control) as being potentially more effective. The authors call for an approach to classifying farmers as the optimal policy mechanism for reducing land degradation from soil erosion.

Engel, S., Pagiola, S., and Wunder, S. 2008. Designing payments for environmental services in theory and practice: An overview of the issues. *Ecological Economics*. 65:663-674.

This article, adopting an environmental economics perspective, reviews the main issues arising in the design and implementation of payment for ecosystem services (PES) programs. The authors begin with a discussion of PES definition and scope, followed by a review of some of the principal dimensions and design characteristics of PES programs. They then turn to an analysis of how PES programs compare to alternative policy instruments. This is followed by a detailed examination of two critical aspects of PES programs: their effectiveness and their distributional implications. The importance of program design is emphasized, and so too is the notion that PES programs represent but one of many tools in the policy toolkit.

Environics Research Group. 2006. National Survey of Farmers and Ranchers: Ecological Goods and Services. Prepared for Wildlife Habitat Canada. Ottawa.

This Environics study examines issues surrounding the stewardship of Canadian agricultural lands in general and of ecological goods and services in particular. A total of 1,794 farmers were interviewed. The results of the survey confirm Canadian farmers' continuing interest in, and sensitivity to, the basic tenets of land stewardship. However, the results also show that many farmers are struggling to survive financially. In light of this it is argued that promotional efforts that emphasize the economic benefits of using environmentally-sound land practices will be more successful than purely altruistic appeals.

Environics Research Group. 2000. Survey of Farmers, Ranchers and Rural Landowners: Attitudes and Behaviours Regarding Land Stewardship. Prepared for Agriculture and Agri-Food Canada, Canadian Federation of Agriculture, Canadian Forest Service, Canadian Pulp and Paper Association, Wildlife Habitat Canada, Ducks Unlimited Canada, Eastern Ontario Model Forest, Federation of Ontario Naturalists, Forest Gene Conservation Association, Ontario Ministry of Natural Resources' Climate Change and Ice Storm Recovery Initiatives.

This Environics study explores attitudes and behaviours of Canadian farmers, ranchers and rural landowners vis-à-vis land use and land stewardship. The results of the study suggest that environmental issues are of significant interest and concern to farmers and that there is an openness to the importance of stewardship activities for the future health and productivity of the land. In terms of key policy implications, the research points to the need to keep the lines of communication open between those who are designing policies and programs to encourage stewardship and the landowners affected by these policies and programs.

Falconer, K. 2000. Farm-level constraints on agri-environmental scheme participation: a transactional perspective. *Journal of Rural Studies*. 16:379-394.

Falconer explores how transaction costs serve to constrain farmer participation in agri-environmental schemes in the EU. She calls for a wider conceptualization of the costs of schemes to participants, noting that the costs incurred can be form a significant constraint to participation. She makes the case for instituting agri-environmental "one-stop-shops" that would result in transaction-cost economies, reducing overhead costs and producing a more integrated, less confused approach to participation.

FAO. 2007. The State of Food and Agriculture: Paying Farmers for Environmental Services. Rome: Electronic Publishing Policy and Support Branch, FAO.

This report examines the payment for environmental services approach through the lens of managing agriculture to meet the (global) agricultural and environmental demands of the future. The report focuses on three services to which agriculture can contribute: climate change mitigation, enhanced quality and

quantity of water provision, and the preservation of biodiversity. The report also examines the potential of the payment for environmental services approach to contribute to poverty reduction. It is argued that agriculture can be an important source of improvements in the environmental services provided to humanity.

Franks, J.R., and McGloin, A. 2007. Environmental co-operatives as instruments for delivering across-farm environmental and rural policy objectives: Lessons for the UK. *Journal of Rural Studies*. 23:472-489.

This paper assesses the potential of environmental co-operatives to deliver environmental benefits and an integrated and strengthened rural economy in the UK. It is based on research into Dutch environmental cooperatives, which number roughly 125 and comprise some 10,000 members. Franks and McGloin argue that environmental cooperatives would serve as a valuable policy instrument (complementary to many existing policy instruments) to help deliver landscape-scale environmental, regional and rural policy in
the UK.

Groffman, P., Capel, P., Ritters, K., and Yang, W. 2007. Ecosystem Services in Agricultural Landscapes. In Schnepf, M. and Cox, C. (eds), Managing Agricultural Landscapes for Environmental Quality: Strengthening the Science Base, Ankeny, Iowa: Soil and Water Conservation Society, 3-16.

This book chapter explores how concepts from ecosystem services analysis, landscape ecology and adaptive management inform the development of ideas that help to answer issues of what to measure – and how – to account for environmental effects in agricultural landscapes. The authors conclude that new ways of looking at landscapes and the multiple ecosystem services they produce and new tools for compiling, integrating, and modeling environmental data will see landscape-scale assessment of multiple ecosystem services become "normal operating procedure" for conservation agencies within the next 10 to 20 years.

Grudens-Schuck, N. 2000. Conflict and engagement: an empirical study of a farmer-extension partnership in a sustainable agriculture program. *Journal of Agricultural and Environmental Ethics*. 13:79-100.

This study explores issues of theory and practice related to the formation of partnerships among stakeholders who seek to address agricultural sustainability. Adopting ethnographic research methods and a participatory action research framework, the study examines these issues in the context of the Environmental Farm Plan program. The author argues that a new form of farmer-extension partnership was crucial to the success of the Environmental Farm Plan program, noting particularly how its success was shaped by farm leaders who actively resisted old patters of extension partnering.

Guerin, L.J. and Guerin, T.F. 2004. Constraints to the adoption of innovations in agricultural research and environmental management: A review. *Australian Journal of Experimental Agriculture*. 34(4):549 -571.

This review examines constraints limiting the adoption of agricultural technologies by farmers in Australia. Guerin and Guerin identify the following as major constraints to adoption: the extent to which the farmer finds the new technology complex and difficult to comprehend; how readily observable the outcomes of an adoption are; its financial cost; the farmer's beliefs and opinions towards the technology; the farmer's level of motivation; the farmer's perception of the relevance of the new technology; and the farmer's attitudes towards risk and change. The authors emphasize that adoption is not a discrete one-time affair, but rather a social process of reflexive contemplation and re-assessment. As such, participation in stewardship programs must be understood as shaped by particular socio-cultural contexts. They conclude that Roger's (1983) classical diffusion model remains largely applicable to the extension

of innovations to the Australian farm community, noting, however, that it has been supplemented in recent times by participatory action research approaches. They call for further validation of such approaches in the Australian context.

Hajkowicz, S. and Collins, K. 2009. Measuring the benefits of environmental stewardship in rural landscapes. *Landscape and Urban Planning*. 93:93-102.

This paper examines methods for constructing and applying an environmental stewardship metric (the Tamar Sustainability Index) via a case study in the Tamar region of northern Tasmania, Australia. Hajkowicz and Collins note that while there are examples in the scientific literature of metrics being used to guide agri-environment investments, few existing systems attempt comprehensive valuation of environmental and social benefits. Moreover, fewer still attempt to capture stakeholder preferences within the valuation function. They argue the utility of their approach in providing an effective means of quantifying the benefits of environmental stewardship and guiding investment in stewardship, and call broadly for a transparent approach that explicitly identifies and weights evaluation criteria.

Hall, A. 1998. Sustainable agriculture and conservation tillage: managing the contradictions. *The Canadian Review of Sociology and Anthropology*. 35(2):221-251.

This paper examines the development of a discourse within agriculture that promotes the adoption of conservation tillage as environmentally sustainable farming. It is argued that the focus on tillage practices over other alternative solutions to redressing environmental impacts must be understood within a broader analysis of the political-economic developments in Canadian agriculture.

Hilts, S., Watkins, M. and Wilton, B. 2007. The Development of the Ontario Farmland Trust. In Caldwell, W., Hilts, S. and Wilton, B. (eds), Farmland Preservation: Land for Future Generations, Guelph: Centre for Land and Water Stewardship, University of Guelph, 283-304.

This article provides an overview of the development of the Ontario Farmland Trust in the face of escalating pressures on southern Ontario's prime farmland. Hilts et al. cast farmland trusts in a positive light, suggesting they may serve as a useful mechanism for protecting farmland.

Klupfel, Ellen J. 2000. Achievements and opportunities in promoting the Ontario farm plan (Ontario Environmental Farm Plan). *Environments*. 28(1):21-36

This article presents the results of a survey undertaken to explore the role of leaders of agricultural organizations in promoting the Ontario Environmental Farm Plan (EFP) program. The study revealed a number of areas that may be important in developing strategies to increase the uptake of the EFP. These include: issues of confidentiality; the suitability of existing promotional materials; promoting different aspects of the program; financing; mistrust and fear of government; variation in support and participation by organization type; the role of program coordinators; technical assistance; the role of personal communication in promotion; and, education of the non-farm public. Klupfel concludes that while the program has been positively received, many areas still require development and further investigation to ensure promotional success.

Knowler, D and Bradshaw, B. 2007. Farmers' adoption of conservation agriculture: a review and synthesis of recent research. *Food Policy*. 32:25-48.

Knowler and Bradshaw review the findings of 31 empirical analyses of farm-level adoption of a number of conservation practices consistent with conservation agriculture in an attempt to explain how certain variables tend to influence adoption. The primary finding of the synthesis is that there are few if any universal variables that consistently explain the adoption of conservation agriculture. The authors argue

that, given the limited prospect of identifying such variables through further research, efforts to promote conservation agriculture should be tailored to reflect the particular conditions of individual locales.

Kroeger, T., and Casey, F. 2007. An assessment of market-based approaches to providing ecosystem services on agricultural lands. *Ecological Economics*. 64: 321-332.

Kroeger and Casey suggest that while some forms of market-based approaches hold promise for cost-effectively managing some ecosystem services provided by agricultural lands, significant constraints come in the form of low-cost measurability and valuation. They argue the need for some form of government involvement in order to achieve outcomes that protect the public interest.

Lefebvre, A., Eilers, W. and Chunn, B. (eds). 2005. Environmental Sustainability of Canadian Agriculture: Agri-Environmental Indicator Report Series – Report #2. Agriculture and Agri-Food Canada, Ottawa, Ontario.

This report examines the sustainability of Canadian agriculture in the context of a suite of agri-environmental indicators that spans issues of soil quality, water quality, air quality and biodiversity. The analysis suggests that while considerable progress has been made in furthering environmental sustainability goals agricultural intensification represents an ongoing challenge to the attainment of such goals.

Lovejoy, S.B. and Napier, T.L. 1986. Conserving soil: sociological insights. *Journal of Soil and Water Conservation*. 41:304-308.

In this widely-cited article regarding the adoption of soil conservation measures, Lovejoy and Napier contend that attitudes and behaviour are not necessarily correlated. They put forward five social strategies for inducing attitude changes.

MacKenzie, B. 2008. Supporting environmental stewardship and livelihood benefits in Ontario's Greenbelt: Assessing the potential contribution of the Alternative Land Use Services program. (Master's thesis). University of Waterloo.

This study assesses the potential of the Alternative Land Use Services (ALUS) program as a mechanism for promoting agricultural viability and land stewardship in Ontario's Greenbelt. The primary research findings suggest that an ALUS program could help to strengthen the Greenbelt's role in halting urban sprawl, in preserving agricultural land, and in protecting ecological goods and services. The author concludes that while an ALUS concept could play a positive role in the Greenbelt it would need to be packaged with a suite of complementary, existing programs to be effectual.

Matthews, S., Pease, S.M., Gordon, A.M., and Williams, P.A. 1993. Landowner perceptions and the adoption of agroforestry practices in southern Ontario, Canada. *Agroforestry Systems*. 21:159-168.

In this study Matthews et al. explore the level of awareness and interest in the adoption of agroforestry systems by landowners in Wellington County, Ontario. While age, gender, farm operation and farm size were not found to be correlated with the adoption of agroforestry systems, concerns with the economic aspects of agroforestry did figure prominently among landowners. The authors conclude that the success of agroforestry programs is largely dependent on the attitudes and willingness of landowners to participate in non-traditional agricultural systems.

McCallum, C. 2003. Barriers to Participation in Agri-Environmental Programs in Ontario. Report to the Christian Farmers Federation of Ontario. Guelph.

This report summarizes the findings of investigations into barriers to farmers' participation in agri-environmental programs in Ontario. In addition to exploring the scope and type of barriers constraining farmer participation in agri-environmental programs, the report assesses the feasibility of a full or partial shift in program practice from cost-sharing incentive programs to programs that make direct environmental payments to farmers. The authors conclude that the major barrier to participation in programs, from a structural design and delivery perspective, is limited funding budgeted for them by various levels of government. As for the personal viewpoints of farmers regarding adoption, the authors conclude that they tend to be diverse and oftentimes contradictory. However, foremost among barriers appears to be mistrust and/or misunderstanding of government and delivery agencies. As for the question of a shift to making direct environmental payments, farmers expressed support for the idea while remaining skeptical as to its practicality from a political standpoint. The authors hold that there is considerable merit in the concept of direct environmental payments and its application in Ontario.

McNairn, H.E., and Mitchell, B. 1992. Locus of control and farmer orientation: effects on conservation adoption. *Journal of Agricultural and Environmental Ethics*. 4:28-43.

This study of farmers in southwestern Ontario explores factors influencing attitudes towards soil conservation. The majority of farmers in the study were found to be internally motivated and environmentally-oriented. While farmers readily adopted certain soil conservation practices, the adoption of conservation tillage was found to be low. The concept of a 'risk threshold' is invoked as a significant barrier to the adoption of conservation tillage. McNairn and Mitchell suggest that non-adoption may be more a function of perceived economic risk than lack of farmer motivation.

Ontario Farm Environmental Coalition. 1992. Our Farm Environmental Agenda. Toronto.

This report sets out a grassroots vision for farming and environmental quality in the province of Ontario, as developed by the farm community via a coalition of farm organizations and commodity groups. It represents a seminal piece in cementing the desire for farm sector leadership in policy and planning processes vis-à-vis environmental sustainability in agriculture.

Plummer, R., Spiers, A., Summer, R. and FitzGibbon, J. 2007. The contributions of stewardship to managing agro-ecosystem environments. *Journal of Sustainable Agriculture*. 31(3):55-84.

This paper explores the concepts of regulation and stewardship, examining in particular the contribution of the Ontario Environmental Farm Plan (EFP) program to environmental management in the province. Results of a survey of participants in the EFP program demonstrate that appreciable measures are being taken to manage environmental impacts from farming.

Proceedings of the Ecological Goods & Services Technical Meeting. 2009. Ottawa, Canada. April 29-30, 2009. An exploration of ecological goods and services concepts and options for agri-environmental policy. Prairie Habitat Joint Venture (Edmonton). www.phjv.ca.

This paper reviews the findings of eight pilot studies on ecological goods and services (EG&S) funded by Agriculture and Agri-Food Canada between January 2007 and March 2009. The lessons learned from these pilots (as well as invited presentations at the EG&S Technical Meeting) are framed as serving a critical role in furthering the knowledge and expertise needed to support EG&S policy development in the agri-environmental arena in Canada.

Reeson, A.F., and Tisdell, J.G. 2008. Institutions, motivations and public goods: An experimental test of motivational crowding. *Journal of Economic Behavior & Organization*. 68:273-281.

In an exposé supportive of the notion that environmental stewardship, in many cases, is undertaken irrespective of economic incentives, Reeson and Tisdell (2008) show that care must be taken to not 'crowd out' voluntary stewardship efforts. At the same time, they infer that extrinsic incentives may significantly increase the supply of public goods in situations where intrinsic motivations are low and voluntary contributions are limited.

Robinson, G. 2006a. Canada's environmental farm plans: transatlantic perspectives on agri-environmental
schemes. *The Geographical Journal*. 172(3):206-218.

In this article Robinson examines differences of approach between Ontario's Environmental Farm Plan (EFP) program and agri-environmental schemes in the EU. He notes that while approaches in the EU have tended to adopt a more top-down model which favours collectively-agreed policy structures, the EFP has embraced a bottom-up model in which farmers (and farm organizations) have played a particularly strong role in shaping agri-environmental decision making and actions on the farm. He argues that in the case of both the EFP and EU agri-environmental schemes there is variable and uneven spatial implementation, limited and time-constrained financial support, and relatively narrowly defined environmental benefits. For Robinson, the verdict remains out as to whether agri-environment schemes on both sides of the Atlantic will generate desired environmental outcomes and advance the goal of agricultural sustainability.

Robinson, G.M. 2006b. Ontario's Environmental Farm Plan: Evaluation and research agenda. *Geoforum*. 37:859-873.

This critical analysis of the operation of the Environmental Farm Plan (EFP) program in Ontario calls for further systematic research into barriers to participation, the voluntary nature of the program, financial incentives and, particularly, the resultant environmental impacts. Robinson strongly advocates for more rigorous evaluation of the EFP.

Roberts, M.J., and Lubowski, R.N. 2007. Enduring impacts of land retirement policies: evidence from the Conservation Reserve Program. *Land Economics*. 83(4):516-538.

This paper assesses the endurance of land retirement decisions through an examination of data on (actual) land-use choices following the expiration of Conservation Reserve Program (CRP) contracts between 1995 and 1997. Roberts and Lubowski find that 42 per cent of enrolled acres would not have been returned to crops within a year if the program had expired in 1997. Their results also suggest that the opportunity cost of enrolling land in the CRP is higher for newly-enrolling land as compared to re-enrolling land. As such they argue that the environmental goals of the CRP might be achieved in a more cost-effective way by offering targeted signing bonuses for first-time CRP enrollees.

Ruto, E., and Garrod, G. 2009. Investigating farmers' preferences for the design of agri-environment schemes: a choice experiment approach. *Journal of Environmental Planning and Management*. 52(5):631-647.

Ruto and Garrod adopt a choice experiment approach to investigate the role that agri-environmental scheme design can have on farmer participation. Data was gathered from a survey of farmers in 10 case study areas across the EU. The findings indicate that, in general, farmers require greater financial incentives to join schemes with longer contracts or that offer less flexibility of higher levels of paperwork. The authors differentiate between 'low resistance' adopters and 'high resistance adopters,' observing that

a large segment of the former would be wiling to accept relatively small incentive payments even in schemes offering little flexibility and high levels of additional paperwork.

Smit, B. and Smithers, J. 1992. Adoption of soil conservation practices: an empirical analysis in Ontario, Canada. *Land Degradation and Rehabilitation.* 3:1-14.

This paper presents the findings from an empirical study of the use of soil conservation practices and barriers to their adoption in southwestern Ontario. The findings show that key barriers to the adoption of soil conservation practices relate to economic pressures, the complexity and compatibility of practices, and perceptions regarding the actual need for practices. From a policy development perspective, the authors emphasize the importance of supplying information on farm-level implications of conservation measures and the need for a stable economic environment for agriculture to allow longer-term planning.

Smithers, J. and Furman, M. 2003. Environmental farm planning in Ontario: exploring participation and the endurance of change. *Land Use Policy.* 20:343-356.

Smithers and Furman explore the nature of, and reasons for, differing levels of engagement among participants in the Ontario Environmental Farm Plan (EFP) program. Findings from a survey of past participants suggest that conventional measures of the personal attributes of farmers, and of the nature of the farm business are found to offer relatively little explanatory value while the nature of farmers' past environmental management experiences and motivations are deemed to offer potential insights, where a history of activism and the existence of intrinsic environmental motivations correlate with wider participation and enduring commitment. Concerns for the confidentiality of the process and apprehensions relating to the intervention of the state in agricultural land use are identified as significant deterrents to participation, suggesting that an ongoing challenge for program managers will be to cultivate a climate of trust and confidence among participants. The authors argue that, in the final analysis, the measures of success that matter most relate to actions undertaken and to measurable improvements in the environment, not to the documentation of positive motivations and good intentions – highlighting the imperative of analyses that substantiate the environmental benefits arising from agri-environmental schemes.

Stonehouse, D. P. 1996. A targeted policy approach to inducing improved rates of conservation compliance in agriculture. *Canadian Journal of Agricultural Economics.* 44:105-119.

Stonehouse advocates for a targeted policy approach to account for differences among farms and among farmers in terms of conservation needs and effort, and as a means of enhancing the likelihood of achieving societal goals such as the more effective use of scarce public funds for conservation enhancement. In defending the premise that no one group of variables alone provides adequate explanatory power for understanding conservation behaviour, he calls for a multi-disciplinary approach to solving complex problems of resource conservation and environmental protection.

Summers, R. J., Plummer, R., and FitzGibbon, J.E. 2008. Accounting precautionary measures in agriculture through pathway analysis: the case of the Environmental Farm Plan. *International Journal of Agricultural Resources, Governance and Ecology*. 7(6):437-449.

Embracing the precautionary principle and championing the value of risk mitigation, Summers et al. argue that the evaluation of stewardship programs should be aimed at identifying risks mitigated, rather than actual changes in environmental conditions. A pathways model is developed and applied through an examination of the Environmental Farm Plan program.

Traore, N., Landry, R., and Amara, N. 1998. On-farm adoption of conservation practices: the role of farm and farmer characteristics, perceptions, and health hazards. *Land Economics*. 74(1):114-127.

In this study of the adoption of conservation practices by Quebec potato farmers, Traore et al. point to the significance of the following factors in influencing adoption: the extent to which farmers perceive environmental degradation to be a problem, their educational level, expected crop losses to pests and weeds, the perceived health effects associated with the application of farm chemicals, and the availability of adequate information on best management practices. Concerns relating to the economic and financial survival of the farm enterprise are also found to be an overriding determinant in the adoption decision-making process.

Tyrchniewicz, A. and Tyrchniewicz, E. 2007. Alternative Land Use Services (ALUS): A Preliminary Overview of Potential Cost Reductions and Financial Benefits to Canada. Winnipeg, Manitoba.

This paper presents a preliminary analysis of the potential economic benefits of the Alternative Land Use Services (ALUS) concept to Canadian farmers and society from a cost reduction perspective. The overall benefits to society are determined to be approximately $820 million/year. The authors caution that the estimates serve as early approximations of the cost reductions and potential benefits of natural capital associated with ALUS, noting the need for additional work to verify and fine-tune these estimates.

Vanclay, F. 2004. Social principles for agricultural extension to assist in the promotion of natural resource management. *Australasian Journal of Experimental Agriculture*. 44:213-222.

Vanclay argues that an understanding of the social nature of farming is imperative for agricultural extension to be effective. Such an understanding transcends an exclusive focus on agriculture as a technical issue. Based on personal reflections of over two decades of research on the social dimensions of farming, Vanclay presents twenty-seven principles deemed to be critical to the effective promotion of natural resource management in agriculture. Central among these are: awareness of farming as a social activity, recognition of the social diversity of farmers and the social drivers in agriculture, and the socio-cultural basis of adoption.

Van Kooten, G.C., Weisensel, W.P., and Chinthammit, D. 1990. Valuing trade-offs between net returns and stewardship practices: the case of soil conservation in Saskatchewan. *American Journal of Agricultural Economics*. 72(1):104-113.

In this study of farmers in Saskatchewan, Van Kooten et al. investigate the relevance of stewardship to farming practices, in particular the ability and willingness of farmers to sacrifice profits for soil quality. While farmers generally maintain that they are concerned about soil stewardship, the results of the study show that it takes a substantial concern for soil quality to motivate a change in soil conserving practices. In light of the fact that such practices typically require relatively small sacrifices in profits the authors postulate that educating farmers about the low costs associated with soil conservation may result in substantial improvements in soil losses.

Van Donkersgoed, E. 2005. Help the green farmer. *Alternatives*. 31(2):7-8.

In this article, Van Donkersgoed champions the merits of the Alternative Land Use Services (ALUS) concept in recognizing and rewarding farmers for the provision of ecological services on behalf of society. Increasing regulatory provisions are argued to be an unreasonable burden on farm families, while ALUS is endorsed as a positive alternative that will serve to bridge the current disconnect between farmer and consumer, city and countryside.

Van Es, J. 1983. The adoption/diffusion tradition applied to resource conservation: inappropriate use of existing knowledge. *The Rural Sociologist.* 3(2):76-87.

Van Es argues that the classic adoption-diffusion model is largely inappropriate for research on resource conserving behaviour given the inherent assumptions of voluntarism on the part of the farmer and individual economic gain attached to the adoption of the conservation measure in question.

Van Osch, K. 1997. An assessment of farm plans and countryside planning in Ontario. *Environments*. 25(1):15-28.

This study investigates the use of farms plans as a means to improve understanding of how to plan for agriculture in the countryside. The opinions of farmers and public agency staff were sought on: voluntary and regulatory approaches to countryside planning; the role of financial incentives in encouraging participation; barriers that prevent or delay action; monitoring activities to assess the effectiveness of programs; and, the extent to which farm planning supports sustainability goals. Inadequate coordination of technical advice is identified as a significant barrier to farm plan uptake, while results are inconclusive with regards to the role that financial incentives play in encouraging participation. The author concludes that the use of farm plans is effective in helping farmers to improve the environmental operation of their farms and the quality of the environment in the countryside.

Wilson, G.A., and Hart, K. 2000. Financial imperative or conservation concern? EU farmers' motivations for participation in voluntary agri-environmental schemes. *Environment and Planning A*. 32:2161-2185.

This study of factors influencing farmers' participation in agri-environmental schemes (AES) involved questionnaires with 1,000 farm households in nine EU countries and Switzerland. The findings highlight pronounced geographical differences in farmers' reactions toward AES. And yet, the study also highlights that much common ground exists with respect to farmers' motivations for scheme participation. Wilson and Hart emphasize that the financial imperative for scheme participation is not necessarily incompatible with an often equally important environmental concern. They argue that an appreciation for the participation/non-participation decision making process represents only a first step in assessing the effectiveness of AES. They call for a fuller examination of the complex indicators of scheme success including the effects of scheme participation on farmers' incomes, farmers' attitudes toward the environment and the way they farm, and the extent to which AES protect and enhance environmental quality.

Yang, W., Bryan, B.A., Hatton MacDonald, D., Ward, J.R., Wells, G., Crossman, N.D., and Connor, J.D. 2010. A conservation industry for sustaining natural capital and ecosystem services in agricultural landscapes. *Ecological Economics*. 69:680-689.

Yang et al. propose the concept of a 'conservation industry' to generate increased investment in conservation in agricultural landscapes. They envisage a mature conservation industry as comprising investors, producers, and service providers who produce conservation products and services exchanged via market transactions. A viable and effective conservation industry is viewed as requiring careful design and planning, and the authors are forthcoming in acknowledging that the establishment of such an industry is not without its own inherent risks. Echoing Reeson and Tisdell's (2008) storyline about the dangers of motivational crowding, the authors note that caution is warranted to ensure a conservation industry does not crowd out, discourage or jeopardize the voluntary conservation efforts of private landowners in agricultural landscapes.

Yang, W., Sheng, C. and Voroney, P. 2005. Spatial targeting of conservation tillage to improve water quality and carbon retention benefits. *Canadian Journal of Agricultural Economics*. 53:477-500.

This study extends previous research to develop a GIS-based modeling framework that examines the spatial targeting of conservation tillage to achieve both water quality and carbon retention benefits in agricultural watersheds. The modeling framework is tested empirically in the Fairchild Creek watershed in southern Ontario. Results demonstrate that targeted conservation tillage based on sediment abatement goals can also achieve comparable carbon retention benefits.

Yiridoe, E.K. 2000. Risk of public disclosure in environmental farm plan programs: characteristics and mitigating legal and policy strategies. *Journal of Agricultural and Environmental Ethics*. 13:101-120.

Yiridoe argues that the wider embrace of environmental farm plans is inhibited by risks of public disclosure, noting that while the EFP program itself does not authorize the release of environmental information there are inherent disclosure risks that arise through program requirements (e.g., the assessment of on-farm risks, the need for detailed documentation and record keeping; the authoring of corrective action plans). He calls for a more systematic assessment of the legal and policy instruments that can offer various forms of protection and help minimize such risks.

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Wunder, S., Engel, S., and Pagiola, S. 2008. Taking stock: A comparative analysis of payments for environmental services programs in developed and developing countries. *Ecological Economics*. 65:834-852.