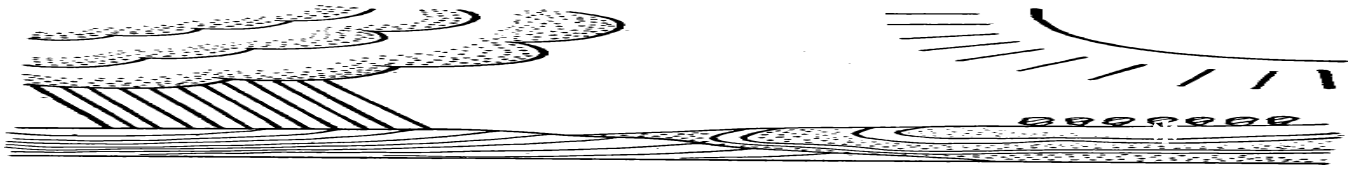

EXECUTIVE SUMMARY:

The Multiple Benefits of Agriculture Project

An Economic, Environmental & Social Analysis

November 2001

It is economically and environmentally beneficial to shift agriculture toward more diverse systems on actively farmed land—and if financial incentives motivate change, citizens are very willing to pay.

These are some of the key findings of the Multiple Benefits of Agriculture Project. This analysis, which was conducted in two Minnesota watersheds over a two-year period, concludes that the value of nonmarket goods, such as reduced soil erosion and improved wildlife habitat, merits significant changes in U.S. farm policy. This modeling study also confirms that if present land use trends continue, environmental, social and economic problems will worsen.

American agriculture produces bin-busting yields of a handful of commodities. However, this analysis shows that it can do much more for local communities and society at large. There is a growing recognition among farmers, policy makers, environmentalists and the public that agriculture can produce food and fiber while creating other, nonmarket "goods" such as environmental and social benefits, including rural prosperity.

How does society encourage agriculture to

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Key Findings*

Soil Erosion

✔ Switching from conventional tillage to conservation tillage reduced the amount of soil eroding into streams by 25 percent to 31 percent, depending on the watershed studied.

✔ Switching to an agricultural system that is more reliant on perennial plant systems reduced the amount of soil eroding into streams by 50 to 80 percent, depending on the watershed.

Water Quality

✔ In the Wells Creek study area, adoption of best management practices—100-foot grass buffers, conservation tillage on all cropland and nutrient application at recommended rates—would help meet national goals for reduction of the hypoxic zone in the Gulf of Mexico (40 percent in-stream reduction of nitrogen). In Wells Creek, there are many small tributaries, the land is hilly and significant tree and grassland cover is part of the current land use. Dairy farming is a major part of the agricultural economy.

✔ In the Chippewa River study area, however, adoption of best management practices would not produce results adequate to meet national goals for hypoxia reduction. In this case, meeting such goals would require adoption of more diverse farming systems that involve the use of perennial plant systems and natural drainage features such as wetlands. The land near the Chippewa River is relatively flat and includes significant artificial drainage. The Chippewa River study area, with its intensive tillage of corn and soybeans, is representative of the way the Corn Belt as a whole is farmed.

Financial

✔ Substantial environmental benefits could be achieved for little more, and possibly less, than what taxpayers currently pay into federal farm programs.

✔ On average, Minnesota citizens are willing to pay an additional $201 per household annually for specific and substantial public benefits that are produced under diversified land use and farming systems.

✔ The annual downstream costs of sedimentation could be cut 50 to 84 percent, depending on the watershed, by switching to a more diverse farming system that includes perennial plants and wetland habitat. Other significant "avoided costs" could reduce the need for such things as minor flood damage mitigation and trout stream habitat renovations.

Key Findings ***continued on page 2…***

Based on modeling studies in two Minnesota watershed areas.

…Key Findings *continued from page 1*

✔ Based on 2000 market prices, hay and other perennial plant enterprises are more profitable in the study areas than corn and soybeans. However, federal subsidies often make it uneconomical to raise anything other than corn and soybeans. That is a significant disincentive for diversifying farming operations. Society needs to replace those subsidies with incentives for creating public goods.

Greenhouse Gas Reductions

✔ Greenhouse gas emissions, in carbon equivalent, would be reduced as much as 36 percent in the Chippewa River watershed if more perennial plant cover were used on the working landscape.

✔ Based on a $20-per-ton "price" for storing carbon to reduce greenhouse gas emissions, the average Minnesota crop farm (318 acres) could receive $1,000 per year for using conservation tillage. Pasture and grazing systems should benefit even more because they hold even greater potential for capturing and retaining carbon in the soils.

Wildlife Benefits

✔ In the Wells Creek watershed, diversifying the agricultural system would reduce lethal fish events by more than half. A scenario where a diversified agriculture is combined with the presence of increased wetlands and other characteristics of natural landscapes would decrease lethal fish events by almost 100 percent.

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produce multiple goods beyond high yields? With financial incentives. And by calculating the value of certain goods society can better determine what incentives are needed to foster and support a farming system that will bring about these goods.

That's why the Multiple Benefits of Agriculture Project was launched. A 15-member working group used modeling to predict the environmental and social benefits that could result from changing agricultural land use practices in two Minnesota watersheds. These quantitative and qualitative public (nonmarket) benefits include improved water quality, less soil erosion, enhanced soil quality, increased wildlife habitat and social capital formation, as well as toxic chemical and greenhouse gas reductions.

What the analysis found was that significant improvements could be brought about through a combination of land use changes, ranging from individual practices (e.g. adoption of minimum tillage) to more comprehensive systems (e.g. establishment of perennial plant systems and wetlands).

This analysis shows that there is no one cookie-cutter method for bringing about positive results in all watersheds. For example, in the less row-cropped watershed studied, adoption of best management practices—100-foot grass buffers, conservation tillage on all cropland and nutrient application at recommended rates—would go a long way toward meeting national goals for reducing the contaminant runoff that contributes to the hypoxic zone in the Gulf of Mexico. However, in the more row-cropped watershed, adoption of best management practices would not be enough to meet those national goals. In this case, meeting such goals would require more diverse farming systems that involve the use of perennial plant systems.

Different types of geography, climates, soil types and even social infrastructures require a variety of strategies for bringing about public goods in different watersheds. If farmers were to adopt more crop diversity and perennial cover in the watersheds, rather than simply improving management of the dominant row crops, more environmental benefits would result. The policy recommendations that emerge from the Multiple Benefits of Agriculture analysis focus on creating incentives for farmers to use their own creativity to produce results that benefit the public while fitting local situations best.

Minnesotans are willing to provide those incentives. On average, Minnesota households would be willing to pay an additional $201 per year, per household, or a statewide total of $362 million, for significant improvements in environmental performance, according to a random statewide survey conducted by the Multiple Benefits of Agriculture Project. That shows citizens put an economic value on "goods" that may not be available for purchase in the marketplace. The Project's survey of local watershed residents shows an urgent need to develop public policy, research, education and marketing strategies to promote greater diversification of food and fiber production in ways that yield clear environmental and social benefits. Local, state and federal institutions, along with the residents they serve, must adapt if they are to provide the support needed to develop a "multiple benefits" agriculture.

Considerable environmental benefits could be achieved for no more than and possibly less than the current public costs, after transition expenses are overcome, according to an analysis of farm financial data conducted by the Project. Redirecting stewardship incentive payments would lead to environmental improvements for little or no extra cost to the taxpayer.

But redirecting payments will mean major changes in policy. Current federal agricultural policies subsidize the production of a selected set of commodities. Production of those commodities through monocultural systems has contributed to serious environmental problems. Moreover, we have experienced a significant decrease in the number of agricultural producers, inflicting major damage on rural economies. Conservation policies have attempted to mitigate environmental problems through technical assistance and cost-share programs to improve farming practices. In recent years, acreage retirement programs have become a major tool for environmental mitigation on agricultural lands. In fact, about 70 percent of

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conservation spending since 1985 has been for land retirement programs. However, these programs do not address agricultural working lands, which represent approximately half—excluding Alaska—of the privately held acreage in this country.

The results of this study clearly point to the need for new farm policies that produce benefits on working lands by rewarding real results. This will require the harnessing of imagination and creativity—the products of thought and thoughtful practice.

The Multiple Benefits of Agriculture project is recommending further development of a policy framework that differentiates between agricultural market and nonmarket public goods. The results of our Phase I research strongly suggest several key policy elements that need to be further developed (see page 4).

About the Research

The study areas were the lower Chippewa River Basin in western Minnesota and the entire Wells Creek watershed, which lies in the southeastern part of the state.

The Wells Creek watershed includes 40,172 acres in Goodhue and Wabasha counties. Sixty-one percent of the acres are cultivated. There are many small tributaries, the land is hilly and significant tree and grassland cover is part of the current land use.

The Chippewa River study area is 44,445 acres. Eighty-one percent of the acres are cultivated. The land is relatively flat and includes significant drainage.

Four scenarios were developed for this analysis:

Scenario A

The ***extension of current trends scenario*** is characterized by fewer and larger farms with increasing acreage in row crops and no significant trend toward the application of best management practices. Without incentives to control the external effects of farming, negative environmental outcomes such as erosion, nutrient runoff and habitat degradation will continue.

Scenario B

The ***adoption of best management practices (BMPs) scenario*** includes conservation tillage, 100-foot buffers along streams, and recommended nutrient application rates on all farmland.

Scenario C

The ***expanded community and economic diversity scenario*** focuses on increased agricultural diversity. In modeling different versions of this scenario, we include increased crop diversity and a shift to a five-year rotation. One model shifts pasture lands to management intensive rotational grazing systems, and introduces wetland restoration in appropriate areas. One hundred-foot buffers along streams are used.

Scenario D

The ***managed year-round cover*** scenario is characterized, when possible, by continuous plant cover on

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% Change in Environmental Damage Compared to Baseline Data

	Wells Creek Study Area					Chippewa Study Area			
Scenario	**A**	**B**	**C**	**D**		**A**	**B**	**C**	**D**
Sediment	**+4%**	**-31%**	**-56%**	**-84%**		**-9%**	**-25%**	**-35%**	**-49%**
Nitrogen	**-7%**	**-37%**	**-63%**	**-74%**		**+1%**	**-17%**	**-51%**	**-62%**
Lethal fish events/year	**+10%**	**-57%**	**-72%**	**-98%**		**+2%**	**0**	**0**	**-10%**
Water runoff	**+1%**	**-3%**	**-24%**	**-35%**		**0**	**-1%**	**-21%**	**-34%**
Downstream cleanup costs from sediment	**+4%**	**-31%**	**-56%**	**-84%**		**-9%**	**-25%**	**-35%**	**-49%**

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working farms. Common land uses in this scenario include, management-intensive rotational grazing, cover cropping and land managed for hunting preserves. One focus is to increase rotational grazing acres by 15 percent to 20 percent (and to increase cattle numbers by the same amount). Prairie restorations are also included in this scenario. Expanded (300-foot) buffers along streams are used.

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Using the Agricultural Drainage and Pesticide Transport (ADAPT) model and the four citizen-shaped land use scenarios, researchers were able to model "what if" scenarios. The ADAPT model was used to predict in-stream environmental benefits, including impacts on fish for each scenario. Potential wildlife effects and greenhouse gas emissions were calculated based on reviews of other scientific literature. Social scientists calculated social and farm economic impacts. Economists estimated nonmarket economic values for environmental benefits by calculating avoided costs and by performing a contingent valuation survey of Minnesota citizens.

The Multiple Benefits of Agriculture Team

A multidisciplinary research team guided the Multiple Benefits of Agriculture Project. Farmers, rural residents, academics, and nonprofit and government staff served on the Project's steering committee. The University of Minnesota's Department of Applied Economics provided the biophysical modeling and developed productivity and profit estimates. The University of Minnesota's Department of Fisheries and Wildlife conducted biological modeling, including estimates of fish and wildlife benefits. Bemidji State University provided the expertise to conduct a contingent valuation survey to assess the real economic value of improved environmental outcomes from farms. The Minnesota Department of Natural Resources provided technical expertise on fish and wildlife benefits. Minnesota State University-Mankato provided the GIS, or mapping services. The Institute for Agriculture and Trade Policy assisted with scenario development and gathered data on avoided costs. Researchers associated with Iowa State University and the Minnesota Institute for Sustainable Agriculture conducted the sociological analysis. Land Stewardship Project directed the research project. In addition to this project team, several additional researchers and consultants contributed to this work.

Key Policy Recommendations

☛ **Pay farmers for public environmental and social benefits from their farms, including those resulting from ongoing and newly adopted practices and farming systems.**

☛ **Provide incentives to farmers through programs that graduate payments according to increasing levels of stewardship on working lands.** This recommendation recognizes that during the first years of transition, it is very difficult to adopt and maintain more diverse farming systems.

☛ **Move toward paying on the basis of environmental results, not simply the installation of practices.** This will account for differences in the interplay between conservation practices and farming systems based on ecology, topography, climate and other site-specific factors. Our analysis shows that the effects of best management practices (BMPs) or changes in farming systems depend on ecology, topography and climate.

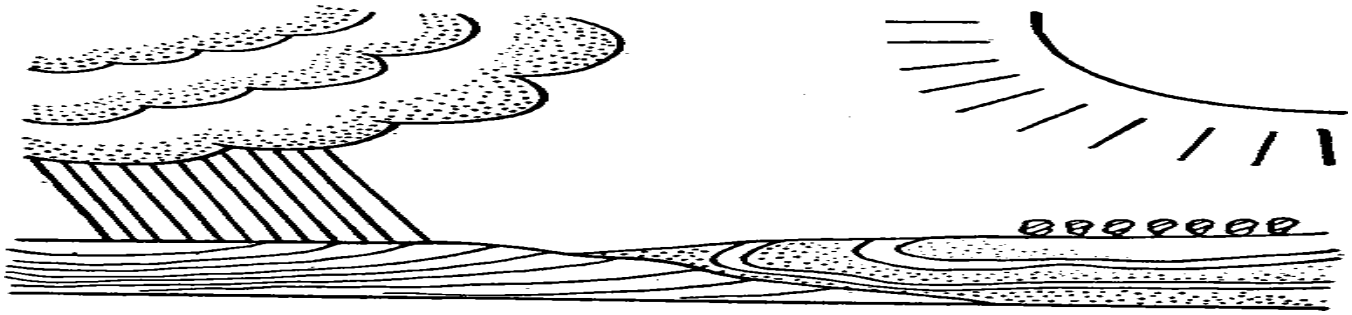
☛ **Create and expand new markets for crops used in diversified farming systems through rural development and marketing program funding.**

☛ **Redirect research, education, extension and conservation technical assistance to more effectively promote stewardship, integrated farming systems and diversified marketing.** Institutions need to change along with farmers to more effectively promote stewardship and diversified marketing.

☛ **Create conditions for fair market prices and fair access to markets.** Low market prices are threatening to eliminate an entire generation of innovative farmers who care about the land and their communities. We need policies that will keep that base of farmers in business while they make the transition to more diverse production systems.

☛ **Develop a process for national and local goal-setting and public involvement.** For example, the Land Management Contract (LMC) developed in France rewards farmers for the production of social and environmental benefits that are not fully compensated for through the market. Citizens help set local goals in the context of the national policy. Farmers then propose a LMC to meet those goals.

This is a **Land Stewardship Project** publication. To view the entire Multiple Benefits of Agriculture report, log onto www.landstewardshipproject.org. For information on purchasing a paper copy of the report, call 651-653-0618.



The Multiple Benefits of Agriculture Project

An Economic, Environmental & Social Analysis

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