Staff Paper

LINKAGES BETWEEN AGRICULTURAL MARKETING AND ENVIRONMENTAL POLICIES

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I. Introduction

There is a growing consensus in the United States and throughout the world that stronger measures should be taken to protect the environment. This consensus appears to persist despite the current economic recession and increased public demand for governmental measures to improve economic growth. Indeed, there is some evidence that americans support both economic growth and environmental protection, recognize there may be conflicts between economic and environmental goals, and desire policies that would achieve both goals simultaneously (Willits and Crider, 1991). The objective of crafting policies which simultaneously increase economic growth and environmental protection was developed during the Clinton-Gore presidential campaign and may be expected to be an important policy objective of the new administration.

The desirability of finding complementarities and reducing conflicts between economic growth and environmental protection policies is becoming increasing apparent in the agricultural sector of the economy. Presently, there is a great deal of polarity between farm and food groups who seek to enhance the economic viability and competitiveness of U.S. agriculture and environmental groups who are becoming increasingly vocal about the effect of agricultural production on the environment. To satisfy both groups, compatible policies must be chosen.

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[1]The author is a Professor in the Department of Agricultural Economics at Michigan State University. Special thanks are due to Scott Swinton who provided helpful comments on the framework and assistance on graphics.

Yet, the compatibility of existing agricultural and environmental policies is being increasingly questioned by agricultural economists (Phipps and Reichelderfer, 1988; Reichelderfer, 1990; Runge, Munson, Lotterman, and Creason, 1990; Creason and Runge, 1990; Phipps, 1991; Just and Bockstael, 1991; Carlson, Cochran, Marra, and Zilberman, 1992).

The objective of this paper is to examine potential conflicts and complementarities between agricultural and food marketing policy and environmental policy. A central argument of the paper is that these conflicts and complementarities primarily occur because of the effects of agricultural and food marketing policy on farm behavior. While the marketing process itself may generate some external effects on the environment, these are not addressed. Rather, the paper examines the impacts of marketing policy on farm level production decisions which, in turn, have environmental consequences.

The paper is primarily conceptual since research on links between agricultural and environmental policies is just beginning. The first section presents a framework for understanding the links between environmental policy and agricultural and food marketing policy. The next section looks at particular types of environmental impacts and how they are affected by production decisions and public policies. The third section examines potential conflicts and complementarities between the objectives of agricultural and food marketing policy and environmental policy objectives. Suggestions are made for ways that agricultural and food marketing policies could be altered to help agriculture better achieve both economic and environmental objectives simultaneously.

II. Linkages Between Agriculture and the Environment

To examine how agricultural and food marketing policy may or may not affect the

environment, linkages between the food system and the environment need to be identified. Since there are many steps between the production of commodities and their ultimate consumption, there are many potential linkages. For example, it is possible to identify environmental issues specifically linked to the retail, food processing, commodity storage and distribution, and farm levels of the food system. However, this paper concentrates on the farm level because it is likely that the key environmental issues occur there, and because agricultural and food marketing policies are principally directed to assisting farmers in marketing the commodities they produce. These policies affect farmers' production decisions, and, thus, have environmental impacts at the farm level.

A growing literature has identified many links between agricultural, environmental, and resource policy (Reichelderfer, 1990; Creason and Runge, 1991; Just and Bockstael, 1991). Figure 1 summarizes some of the major ideas from this literature. Public policies, markets, and the physical environment of agriculture are viewed as sending signals which impact producers' decisions. Agricultural producers' decisions, in turn, are viewed as affecting environmental and economic outcomes experienced by agriculture. These environmental and economic outcomes, in turn, affect the public policies, markets, and physical environment in which agriculture is embedded. Thus, agricultural and food marketing policies interact with other policies, markets, and the physical environment to affect agricultural production decisions which ultimately have environmental and economic consequences.

There are a broad array of policies that affect agricultural producers' decisions, including: (1) monetary policies that affect interest rates and exchange rates, (2) fiscal policies that affect the value of capital investments through changes in tax treatment of capital assets, (3)

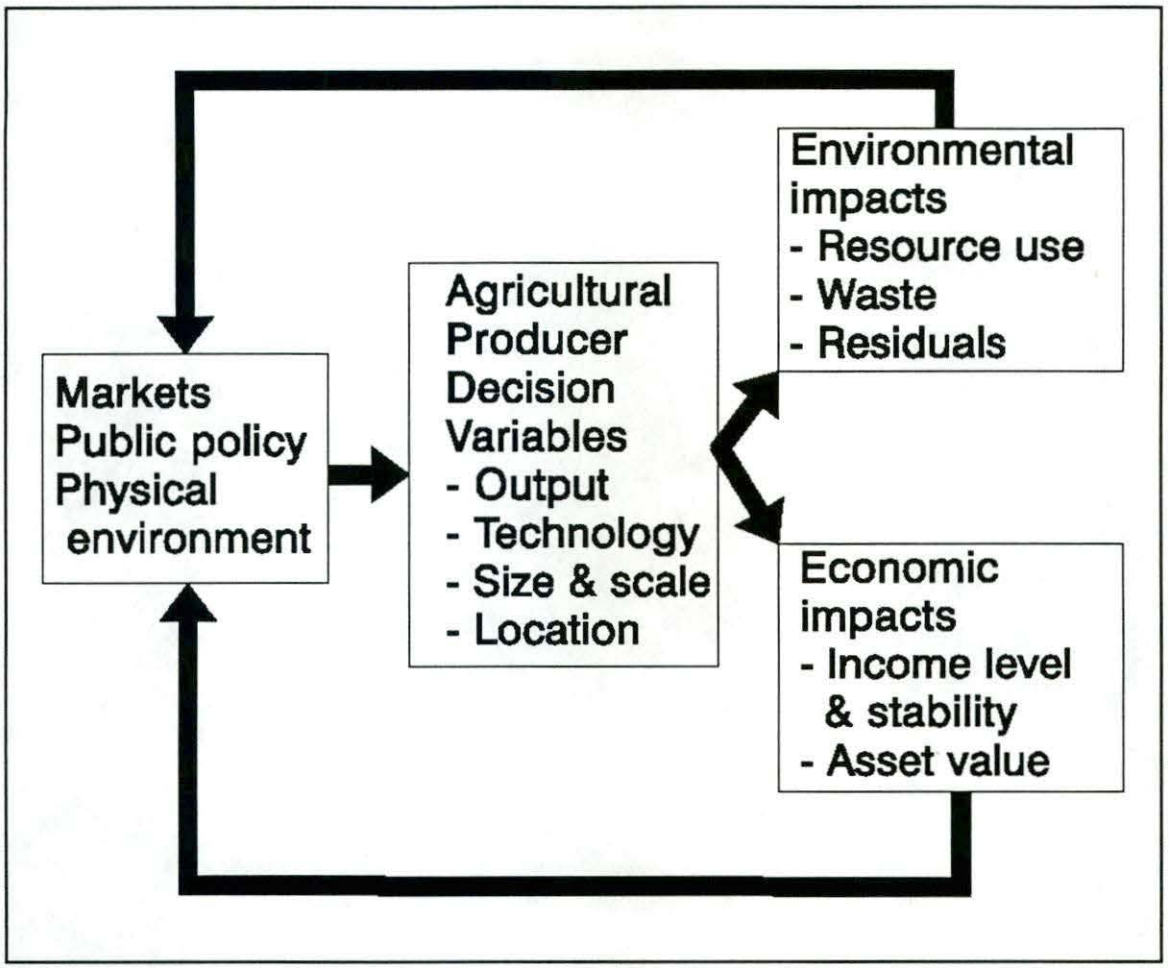

Figure 1: Linkages Between Agricultural Policies and Environmental Quality

agricultural policies designed to increase and stabilize net farm income, (4) recommendations by Extension and private consultants which affect knowledge of production methods and technological choice, (5) resource policies which affect prices and use of natural resource inputs such as irrigation water, land, and energy, and (6) environmental policies which restrict or discourage use of agricultural chemicals and other inputs (Creason and Runge, 1991; Just and Bockstael, 1991; Reichelderfer, 1990). Market signals include prices of different types and qualities of outputs and inputs, which, of course, affect and are affected by public policies. Signals from the physical environment include climate, rainfall, pest pressures, soil fertility, and

plant and animal biological requirements and yields. Changes in signals from the physical environment affect both markets and policies. Interactions among public policies, markets, and the physical environment produce a complex array of signals affecting producers' short and long run decisions on what and how much to produce, how to produce it, and where.

Farmers have long been viewed as stewards of the land. Ultimately, production decisions made by many individual farmers determine: (1) the amount and type of commodities produced, (2) the technology used to produce them, (3) the size and scale of operations, and (4) the location and distribution of production (see Figure 1). Changes in each of these variables affect the environment by affecting level and location of: (1) natural resource extraction, (2) waste disposal, (3) emissions of residuals, and (4) the production of environmental amenities and disamenities at the farm level. For example, the farm sector is the largest user of water and land resources, generates wastes from livestock facilities, emits residuals of soil and agrichemicals into water, and affects environmental amenities such as wildlife habitats. The size and distribution of these environmental outcomes can vary significantly depending on what commodity is produced, how much is produced, what technology is used to produce it, the vulnerability of the environment in which it is produced, and the concentration of production (Reichelderfer, 1990). Environmental impacts of agricultural production have a feedback effect because they affect the present and future physical environment of agriculture and other sectors, and, hence, demands for environmental protection.

Agricultural producers' decisions collectively also determine the net income stream received by farmers and the value of the assets they own, such as land and equipment. These economic outcomes have profound effects on public policy especially because these market

outcomes trigger the level and distribution of benefits from government programs such as commodity price supports.

The framework described in figure 1 is a closed system. Obviously, this is a simplification that is inaccurate. Other sectors of the economy not directly linked to agriculture also impact the environment and the economy. Their actions may affect public policies, markets, and the physical environment of agriculture, and, thus, affect producers' decisions. However, the remaining discussion will mainly focus on the direct linkages to agriculture and ignore these additional interactions with other economic sectors.

The framework illustrates the complexity of the system in which agriculture operates, and, thus, the difficulty of deriving testable hypotheses about the impacts of agricultural and food marketing policies on the environment. The next section provides further detail about the major environmental impacts of agriculture that are likely to be of concern, then we will return to the question of how agricultural and food marketing policies may influence environmental quality.

III. Environmental Impacts and Agricultural Production

Agricultural producers decisions affect the physical environment in which agriculture is embedded by using natural resources, generating wastes, emitting residuals into environmental media, and producing environmental amenities and disamenities. This section looks at some of the major environmental impacts currently at issue and how they may be affected by public policies that influence agricultural producers' decisions.

Natural Resource Use

The farm sector is one of the largest users of soil and water among all sectors of the

economy. It is also a major user of energy. When use of these resources exceeds natural regeneration rates, user costs rise. User costs reflect the opportunity cost of using a resource today rather than saving it for future use, and they are additional to the cost of resource extraction. The problem of rising user costs is greater in some geographical areas than in others. For example, the west faces high user costs for irrigation water because water is extracted from western aquifers at a much faster rate than it is replenished. Water prices generally do not reflect full marginal extraction costs or user costs, so water use is generally thought to very inefficient (Howitt, 1991). In addition, water use is boosted by the favorable tax treatment given to irrigation equipment (Creason and Runge, 1991).

Similarly, soils in some areas of the nation erode more quickly than they are regenerated, thus creating user costs from declining soil fertility. Land prices are generally believed to reflect marginal user costs to farmers, but not the external costs of water pollution from soil runoff. It has also been argued that true user costs are not reflected in land prices because intergenerational equity demands that the benefits of future soil fertility should be discounted at a much lower rate than markets would dictate. Thus, the current level of soil conservation is generally believed to be inefficient due to off-site water pollution and intergenerational equity.

The level of agricultural output clearly affects resource use. More output means more water and soil will be used, and, since water markets and levels of soil conservation are inefficient, policies encouraging increased agricultural output will exacerbate those inefficiencies. Since the rate of input use creates user costs only if use rates exceed regeneration rates, and because water and soil use versus regeneration rates vary by location, these inefficiencies will vary by location of agricultural production. Thus, policies which encourage greater agricultural

output or the location of agricultural production in arid or highly erodible locations create greater inefficiencies.

Agricultural production is also affected by the way natural resources are utilized by other economic sectors. Nonagricultural activities increasingly compete for water, land, and energy. Thus, agricultural policy interacts with resource use policies directed to other economic sectors.

Waste Generation

Generation of wastes from agriculture--particularly animal waste--is becoming an increasingly recognized problem. Large scale dairy farms, feedlots, and containment facilities for swine, poultry, and veal generate animal waste in excess of the absorptive capacity of the soil surrounding these facilities. Depending on the soil type and disposal methods, large amounts of animal waste can cause nitrate contamination of groundwater. Large quantities of animal waste may also contaminate surface water with bacteria and nitrates due to run-off.

The amount and distribution of livestock waste generated by agricultural production depends on agricultural producers' decisions about the type of agricultural commodities to produce, the level of output, the type of technology used in production, the scale of individual operations, and the location of that production. As with natural resource use, the problems created vary by region. For example, the capacity of the environment to absorb and assimilate wastes varies by region. Unlike natural resource use, however, the scale of individual operations, combined with technology choice, is important in determining the extent of the problems created. Thus, policies which encourage livestock production in large-scale confinement facilities, as opposed to more dispersed production methods, exacerbate the waste disposal problem. Similarly, policies which encourage this type of production in areas with less

capacity to absorb these wastes also add to the problem. However, there is the potential for recycling these wastes into useful products if appropriate economic incentives are developed. Agricultural marketing policy could be one such tool for facilitating the recycling task.

Hazardous waste can also be generated by agricultural production. Cleaning and disposal of containers of pesticides and animal drugs generates hazardous waste that requires special handling. Fuel storage and use can cause water pollution. The type of commodities produced, the level of output, the type of technology used, and the location of agricultural production all affect the amount and distribution of hazardous waste generated by agricultural production. For example, crops requiring more chemical use generate larger amounts of hazardous waste (see Reichelderfer, 1990 for a list of crops which are chemical intensive). Consequently, policies which favor the production of those crops or technologies which are chemical intensive exacerbate the problem.

Residuals Generation

Residuals of fertilizers and pesticides applied to crops may contaminate groundwater and surface water, and thus negatively affect drinking water and aquatic life. The extent of these problems depends on the type of commodity produced, the amount produced, and the region of production. For example, some commodities such as corn and cotton are more chemical intensive than others (Reichelderfer, 1990). Furthermore, some regions have greater pest pressures which encourage more intensive chemical use. Some regions also have more porous soils or rainfall, thus affecting the likelihood of leaching and runoff. Thus, policies which affect producers' decisions to produce certain types of commodities, increase their output, or to locate in environmentally sensitive areas will affect the amount and deposition of residuals generated

by agricultural production.

Soil erosion may pollute surface water, reducing fish populations and recreational uses. Unlike the effect of soil erosion on fertility, offsite impacts of soil erosion are not reflected in land prices, so inefficient levels of soil erosion are likely to occur. The extent of the erosion problem depends on the type of commodity grown, type of soil, the technology used, and climatic conditions. Policies which encourage production of commodities in areas with highly erodible soil or encourage the use of technologies which increase erosion will exacerbate the problem (Reichelderfer, 1990).

Agricultural production is also affected by the generation of residuals produced by other sectors of the economy. Global warming, climate change, ozone pollution, and acid rain could be potential problems for agriculture (Segerson, 1991). These problems will vary by region, and could shift the comparative advantage for some kinds of agriculture in some regions. Thus, these problems have the potential to affect agricultural production decisions, and ultimately, the policies which are used to improve coordination in the food system.

Amenities and Disamenities

Agricultural land use can create amenities or disamenities depending on the type and location of agricultural production. Some forms of agriculture, such as fruit production, provide substantial amenities for tourists, including recreation and scenic areas. Fieldcrops can provide habitats for some wildlife such as geese and deer. However, the conversion of woodlands, wetlands, and grasslands also destroys the habitats of other valuable wildlife. Conversion of forests to agricultural land can also negatively affect genetic diversity and carbon storage. Agricultural production that is land-intensive is most likely to create these disamenities.

Environmental amenities such as wildlife refuges, genetic diversity, and carbon storage that agriculture could provide are likely to be underproduced due to market failures. That is, these amenities will be produced only to the extent that they provide a return to agricultural producers above costs. Policies that encourage increased agricultural output or that encourage production on environmentally sensitive lands discourage production of environmental amenities.

Conflicts Among Environmental Objectives

There can be conflicts between mitigating the different types of environmental impacts of agriculture. For example, restricting conversion of land to agricultural use may save wildlife habitats, but it can also lead to more chemically intensive agriculture. Similarly, agricultural technologies that reduce soil loss, such as no-till, require more herbicide use. Focusing on only one policy objective at a time can lead to unintended consequences, so policy design must take such possibilities into account.

IV. Potential Conflicts and Complementarities Between Agricultural and Food Marketing Policy and Environmental Policy

Government policies on agricultural and food marketing were designed to increase and stabilize commodity prices, reduce farmers' costs of commodity marketing, and correct market failures. Most marketing orders facilitate price stabilization by smoothing the flow of commodities to market (Armbruster and Jesse, 1983; Babb, et al., 1983). Antitrust exemptions for agricultural marketing cooperatives permit farmers to collectively bargain output prices, although undue price enhancement is prohibited (Harris, et al., 1983). Cooperatives also enable farmers to reduce their marketing costs through capture of scale economies and provision of certain public goods. Advertising, research, and promotion programs also reduce farmers'

marketing costs by providing public goods, overcoming free rider problems, and capturing scale economies (Ward, et al., 1983). Grades and standards and price reporting reduce the transaction costs associated with marketing farm commodities (Nichols, et al., 1983 and Henderson, et al., 1983). A variety of trade practice regulations address market failures and farm equity issues (Knutson, et al., 1983). Food safety policies improve public confidence in the safety of the food supply and protect consumers (Sporleder, et al., 1983; van Ravenswaay, 1988).

Because there are so many different agricultural and food marketing programs, it is impossible to generalize about the impacts these policies might have on producer decisions and, thus, on environmental quality. Consequently, this section develops illustrative examples of how current agricultural and food marketing policies may affect producers' decisions, and, thus, produce conflicts and complementarities with achieving environmental goals. The section also develops examples of how these policies and programs could be modified to achieve both economic and environmental objectives. These examples are intended to stimulate the development of policy alternatives which help agriculture to achieve environmental and economic goals simultaneously.

Marketing Policies Affecting Amount and Type of Output

Generic advertising and export market development programs are designed to expand the demand for commodities and, therefore, to increase output. These programs potentially conflict with environmental goals, particularly where such programs encourage expanded output of commodities that are potentially more harmful to the environment or that use scarce natural resources. For example, there are both generic advertising and export market development programs for cotton, a commodity whose production is more erosive and chemically intensive

than most other crops (Reichelderfer, 1990). There are also promotion programs for a variety of fruits and vegetables that require large amounts of water, but are grown in arid areas. However, promotion and market development programs are also in place for commodities that are less erosive or chemically intensive, for example wheat.

Although there seem to be undeniable tradeoffs between economic and environmental goals when it comes to promotion and market development programs, these programs could be used to simultaneously achieve both goals. An example is the development of markets for commodity uses which are potentially environmentally friendly such as substitutes for non-renewable energy sources and biodegradable plastics. Another example is incorporating environmental objectives within current marketing programs, such a water and soil conservation goals.

Marketing orders for dairy increase prices received by producers without restricting total production and, thus, expand output of dairy products. This increased output also means increased livestock wastes from dairy operations. While this is another example of conflict between economic and environmental goals, marketing programs could be used to deal with the livestock disposal problem. For example, dairy farms could use cooperatives to acquire the equipment to process these wastes and to develop a marketing program for the recycled product.

Amenities are underproduced and disamenities are overproduced by agriculture because of market failure. That is, it is difficult to collect payment from those who ultimately enjoy amenities such as wildlife, genetic diversity, or carbon storage. Yet one can imagine such a market created. For example, the Nature Conservancy buys environmentally sensitive land throughout the world using money from donations. A marketing order for production of

amenities could be created with shares purchased by groups like the Nature Conservancy.

Policies Affecting Technology Choice

Some marketing orders, such as the one for peanuts, restrict output by reducing acres planted. While reduced land in production is compatible with some environmental goals such as reduction of soil erosion and conversion of woodlands to agricultural land, such restrictions also encourage more intensive use of agrichemicals to boost yield per acre. Thus, such policies have both positive and negative environmental consequences.

Grades and standards for agricultural commodities may also encourage the use of chemicals in agriculture because higher grades require high cosmetic quality while commanding a higher price (Reichelderfer). While the grades and standards set by the government may be responsible for this outcome, it is also likely that standards set by food processors and the fresh market meet or exceed the grades and standards set by government. In either case, there is missing information about another aspect of quality, and that is the amount of chemical residues on the product. Consequently, the market does not reward producers who provide a product with high cosmetic quality while minimizing chemical use. To do so, a special marketing program would have to be developed such as that run by NutriClean (van Ravenswaay, 1989).

Promotion programs could be used to boost consumer demand for commodities that have been produced so as to conserve soil, minimize water pollution, and reduce chemical use. Examples of such programs exist in Canada, Germany and Japan where labels have been developed to promote "green" products (OECD, 1991). There is increasing evidence that a sizeable segment of consumers may be willing to pay extra for such labels (van Ravenswaay, 1992).

Marketing orders provide an institutional mechanism for ensuring that producers meet certain standards of environmental stewardship. Examples already exist in dairy where cooperatives can assess stiff penalties on producers who do not comply with certain management practices regarding the use of animal drugs. Cooperatives can also play a useful role by increasing the availability and decreasing the costs of the agricultural production technologies that are environmental friendly. For example, cooperatives could help producers develop and monitor water, soil, and energy conservation programs. They could also provide greater access to and reduce the costs of using alternatives to chemical inputs such as biological pest controls.

Policies Affecting Size and Scale of Operations

It is difficult to assess what impact, if any, marketing programs might have on the size and scale of farm operations because economies of scale depend on the development of technology, not on market demand and marketing costs. Marketing programs, particularly cooperatives, would appear to favor the survival of smaller scale operations by enabling such operations to capture some of the economies of scale that a larger operation would enjoy. Moreover, as discussed previously, cooperatives may help smaller producers reduce the costs of meeting increasingly tough environmental regulations.

Policies Affecting Location of Agricultural Production

Promotion and export development programs have an impact on the location of agricultural production because they can expand the commodity demand. Since this encourages the expansion of output, more land is likely to be brought into production, thus resulting in the possible conversion of wetlands, woodlands, and grasslands. Since marketing orders generally pertain to commodities not under price supports, they are not affected by the recently adopted

sodbuster, swampbuster, and conservation provisions of the 1985 farm bill. However, as Reichelderfer (1990) points out, these provisions are only effective when market prices are low because penalties for converting land are limited to the loss of deficiency payments--a penalty that is only important when prices are low.

As discussed previously, however, some marketing programs could provide the tools for agriculture to address environmental problems. Since marketing orders are developed to encompass particular commodities and geographical areas, they may be better suited for addressing environmental problems that vary by commodity and geographical area than blanket policies adopted at the federal level.

V. Conclusions

Following the growing literature examining the linkages between agricultural policy and environmental policy, a framework was developed for examining the impact of agricultural and food marketing policies on environmental quality. Marketing policies affect producer decisions, which in turn, affect the economic and environmental outcomes experienced in the agricultural sector. Thus, there are potential conflicts and complementarities between agricultural policies and environmental policies.

The paper examined some of the key environmental issues facing agriculture and how agricultural and food marketing policies may most likely affect these issues. This was done by examining how marketing policies affect producer decisions, how these decisions would, in turn, most likely affect the intensity of natural resource use, the discharge of wastes, the emission of chemical residuals, and the preservation of environmental amenities. Some suggestions were made for developing agricultural and marketing policies which could achieve environmental and

economic goals for agriculture.

There is increasing need to identify policies which can simultaneously achieve both economic and environmental policy goals. A more environmentally friendly agriculture is technically feasible, but current public policy does not always encourage--and sometimes discourages--this outcome. Some of the problem comes from conflicts between environmental policy, monetary policy, fiscal policy, and resource policies, but some of the problem also comes from agricultural policies.

Marketing policies are probably not the primary agricultural policies that exacerbate conflicts between economic and environmental goals, but they do contribute to the problem. More importantly though, agricultural and food marketing policies hold the potential for helping agriculture to simultaneously achieve both economic and environmental goals. Hopefully, the ideas is this paper will encourage others to think of ways to fulfill this potential.

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