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GATT and the Environment:

Policy Research Needs

by

Courtney Harold

and

C. Ford Runge

DEPARTMENT OF AGRICULTURAL AND APPLIED ECONOMICS

UNIVERSITY OF MINNESOTA

COLLEGE OF AGRICULTURE

ST. PAUL, MINNESOTA 55108

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GATT and the Environment:

Policy Research Needs*

Courtney Harold

and

C. Ford Runge**

Center for International Food and Agricultural Policy

Department of Agricultural and Applied Economics

University of Minnesota

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**Respectively, Graduate Research Assistant and Professor, Department of Agricultural and Applied Economics, University of Minnesota. Runge is co-organizer of the Study Group on Trade and Environment at the Council on Foreign Relations in New York. Research support from the U.S. Department of Agriculture National Needs Fellowship Program and the Northwest Area Foundation is gratefully acknowledged.

This paper is a brief review of current problems in which trade and environmental issues intersect. After a statement of these problems, it focuses on some recent empirical research and future research needs of special relevance to agricultural economists.

In the General Agreement on Tariffs and Trade (GATT), environmental issues have been particularly salient in the last several years, prompting special reports (GATT; Anderson and Blackhurst), and a rejuvenated GATT working group on the subject (see Pearson; OTA). The Organization for Economic Cooperation and Development (OECD) has formed a joint committee on trade and environment, and has commissioned a variety of sector papers, including one on agriculture (Runge). The International Agricultural Trade Research Consortium (IATRC) has also initiated work in the area.

What are the Issues?

Three main issues dominate the trade/environment debate. The first is the potential environmental impact of trade liberalization, both in the regional context of NAFTA and in the global trade talks in GATT. The second is the possible use of environmental measures as nontariff barriers to trade. The third is the relationship between trade agreements under NAFTA and GATT and the variety of international agreements affecting the environment, such as the Montreal Protocol agreement to protect atmospheric ozone.

First is the concern that trade liberalization, whether in NAFTA or GATT, will lead to increased levels of environmental damages. There are at least three aspects of this concern, which has been expressed strongly by a variety of environmental groups and members of Congress. Simply by raising the scale of economic activity, more open trade may lead to levels of investment

and consumption that put additional pressure on scarce natural resources, and increase levels of industrial pollution. Some also argue that differences in environmental standards, especially between North and South, will create "pollution havens" for firms and industries seeking less regulatory oversight. Finally, the proposed harmonization of environmental standards is argued to lead to a "lowest common denominator," in which higher levels of environmental protection are sacrificed in the name of competitiveness.

In contrast to the environmental community's concern over the impacts of more liberal trade, those most directly involved in trade negotiations tend to focus on a second issue: the potential for protectionism disguised as environmental protection. In North/North trade relations, this can occur when a country or trading bloc protects internal markets in the name of environmental health or safety, such as the European Community's (EC) decision to ban the import of beef from cattle treated with certain growth hormones. In North/South trade relations, it can occur when higher levels of environmental standards are used to bar market access to goods and services produced under lower levels of regulation in the South. The fundamental issue concerns the ability to distinguish legitimate environmental measures, which may well distort trade, from those which are not only trade distorting but have little basis from an environmental standpoint. Developing such criteria involves complex legal, scientific and institutional issues.

The third issue is a hybrid of the first two. In the last decade, a variety of new multilateral agreements have been negotiated in response to global environmental challenges such as ozone depletion, species extinction, protection of Antarctica, and international management of the oceans. The Rio Conference on Environment and Development, held in June, 1992, resulted in a broad new mandate for environmental action, Agenda 21, together with the creation of a new

U.N. Commission on Sustainable Development. Some of these agreements call on their signatories to refrain from trade in certain goods or processes. In the recently completed NAFTA negotiations, for example, a trinational commission on environment was created with dispute settlement authority apparently independent of GATT law. How are these accords to be balanced with existing or new trade obligations under GATT? Should they be exempted from national treatment and/or non-discrimination requirements? What body of international law, and which international institutions, should exercise authority over the intersection between multilateral environmental and trade policy?

These issues play out along two different axes: the first is trade relations in the North, especially between the United States, the European Community and Japan. In some respects, the high income countries of the North are increasingly alike in placing relatively high value on environmental quality. But these economies are also locked in a high stakes game of competition for global markets, and their governments face domestic pressures to loosen regulatory oversight.

The second axis is the gap between environmental regulations in the North and South. This gap is clearly much wider, accentuating problems of harmonization and concerns over "pollution havens" and competitiveness. The NAFTA negotiations reflect these differences in microcosm, with Mexico attempting rapidly to upgrade its environmental regulations in order to satisfy fears in the U.S. and Canada. From the perspective of the North, these fears include lower costs of environmental compliance by competitors in the South; movement of firms and industries into these low-regulation areas; the import of goods (such as fruits and vegetables) tainted by treatments banned in the North for environmental reasons; and the use of production methods in the South (such as tuna fishing with nets that also kill dolphins) objectionable to environmental

interests. Yet for many in the South, the environmental regulations adopted in the North, even if desirable, may be unaffordable. In addition, many developing countries suspect the North of using its higher standards to discriminate against the products and processes of the South primarily for trade rather than environmental reasons.

These issues pose special challenges for agriculture in research and public policy. While the second and third issues will be a long-term focus of GATT and government activity, it is the first issue that is currently in the spotlight. What are the likely environmental impacts of trade liberalization under GATT, especially in agriculture? The empirical base in this area is thin, and trade/environment interactions are poorly understood, and only recently have been subjected to study.

Agriculture: The Theoretical and Empirical Base

Since almost all agricultural trade policies emanate from domestic price manipulation (Johnson), the same domestic policies in the name of which trade is distorted also appear responsible for a large share of the environmental damages in agriculture (Runge). Of course, even if reforms which reduced producer subsidies were undertaken, high commodity prices arising from the market could lead to environmental stress on land and water resources. While domestic and trade policy reforms are not likely to be sufficient to address a variety of environmental problems in agriculture, they are nonetheless necessary if these market failures are to be confronted. Such measures would appear to work in the same direction as more targeted environmental interventions, but the evidence in support of this view has yet to be convincingly marshalled.

In light of the many assertions that agricultural trade liberalization will benefit the environment,[1] empirical examination of these effects was undertaken in a cross-country study of fertilizer use and the potential impacts of trade liberalization by the first author (Harold). She tested the basic empirical relationship between the intensity of agricultural production, as measured by fertilizer use per hectare, and the level of producer subsidies, which is at the heart of claims that reductions in these subsidies will lead to environmental improvements. While only a beginning, its basic results support the general claim of environmental improvements from reduced producer subsidies.

The study focused on achieving a modest decrease in the level of agricultural support in countries with highly protected agricultural sectors. The aggregate level of support was measured using Producer Subsidy Equivalent (PSE), an indicator of the value of the transfers from domestic consumers and taxpayers to producers resulting from a given set of agricultural policies, at a point in time. Although the PSE does not provide an exact measure of the level of protection provided by government intervention, nor does it indicate the impact of government policies on production or trade, both the U.S. Department of Agriculture (Webb, Lopez and Penn) and the OECD have estimated PSEs for a large number of countries.

Explanation of Variables. Data were collected over six years for forty countries in the model. The dependent variable (FCONS) is total fertilizer use for nitrogen, phosphorous and potassium fertilizer per hectare of arable land and permanent cropland. Permanent pasture and grazing lands are not included.

The general equation used to calculate PSEs was somewhat different from the aggregate PSEs calculated by OECD and ERS. Livestock products are excluded, to better capture

agricultural policy distortions on fertilizer use, since livestock production does not use fertilizer directly. The livestock industry obviously influences the demand for feed crops, which leads to more demand for fertilizer, but the use of fertilizer for feed crops is captured in the adapted PSE.

While the demand for fertilizer depends in part on its own demand in the previous period and on the expected price of a crop in the next period, a consistent fertilizer price series (or even a good price proxy from other variables) was not available. The expected PSE for the following year could also affect fertilizer use, but this variable was not considered.

Other factors that might be expected to influence the use of fertilizer are: the per capita gross domestic product (PCGDP) and the producer prices of wheat, corn and rice (PPWHEAT, PPCORN, PPRICE, respectively). Per capita GDP is expected to affect fertilizer consumption positively, since richer countries can purchase more fertilizer. A quadratic specification was suggested by Tobey and Cook, based on an Income Transition Hypothesis of an inverted u-shaped income curve with respect to demands for environmental services (World Bank). Theory implies that the coefficient on GDP should be positive and the square of GDP should be negative, as aggregate fertilizer use increases to a maximum and then declines as environmental concerns begin to constrain its use.

Results of regression analysis. The model estimated is a pooled cross-section time series:

$$FCONS = \mu_{it} + \mu_1 PSE_{it} + \mu_2 PCGDP_{it} + \mu_3 PCGDP2 + \mu_4 PPCORN_{it} + \mu_5 PPRICE_{it} + \mu_6 PPWHEAT_{it} + e_{it}, \quad i=1...40,\ t=1...6$$

The error term is assumed to be independently and identically distributed, with zero mean and constant variance. Table 1 summarizes the results. Descriptive statistics, covariance and correlation matrices and regression output are available from the authors. The model has a

constant slope coefficient and intercepts that vary over countries and time. The estimated coefficient on PSE, 15.4, is significantly different from zero at the 0.01 level. A one unit increase in the producer subsidy equivalent across all countries would lead to a 15.4 kilogram per hectare per year increase in commercial fertilizer use. Thus, the intensity of fertilizer use would decline if trade liberalization occurred, provided a drop in the PSE were to accompany the liberalization.

To put this in perspective, consider the impact on fertilizer use in the Netherlands, the country with the highest rate of fertilizer use per hectare in the data set. In the Netherlands on average from 1982 to 1987, commercial fertilizer applications were 765.5 kilograms per hectare per year. If the PSE in the Netherlands (approximately 39 percent for that time period) dropped by one point, then the model predicts that fertilizer would show a negligible decrease. However, if the PSE dropped by 15 points, a plausible level if the GATT negotiations are successful, fertilizer would decrease by 231 kilograms per hectare per year. Currently the Netherlands has problems with excess fertilizer use. A drop to 534.5 kilograms/hectare/year is not enough to eliminate environmental damages, since the crop needs on arable land are only 160 (180) kilograms per hectare per year for clay (sand) (Dietz). However, in countries where fertilizer is being used only marginally in "excess", the resulting drop in use may reduce pollution significantly. This example illustrates that the drop in fertilizer consumption per hectare could be substantial, depending on the amount of the PSE change.

PCGDP and $PCGDP^2$ are both significant at the 0.1 level and consistent with the Income Transformation Hypothesis. Per capita gross domestic product in a country affects fertilizer intensity positively to a certain level of per capita GDP (to $13,287 on average for all countries), and negatively thereafter.

Corn and rice commodity prices are statistically significant at the 0.05 level, but they showed negative coefficients (the producer price of wheat was not significant). The higher the producer price of corn and rice, the lower the fertilizer intensity. This conflicts with the notion that higher producer support prices cause more intensive fertilizer use. There could be a missing variable that biases the results in this specification, causing a negative sign, or there could be problems with the price data themselves.

To examine the major linkage of interest, FCONS is regressed on PSE alone. The coefficient on PSE is significant 0.01) and is only slightly different from that in the original model (14.74). This smaller model helps to buttress the conclusion that there is a strong relationship between agricultural support, as measured by the PSE, and fertilizer use, regardless of price and country development levels.

Future Research Issues in Agricultural Economics

Clearly, studies such as reported here require replication, expansion, and improvement. Continuing to focus on fertilizer, whether trade liberalization benefits the environment depends on specific linkages: (1) trade liberalization leads to a drop in producer subsidies in countries with heavily subsidized agricultural sectors (the same countries that use fertilizer and other potential pollutants intensively); (2) a drop in subsidies causes producers in these countries to produce less; (3) this is achieved by decreasing the intensity of non-land inputs; since fertilizer is an important input, if production decreases, the use of fertilizer should also decrease; (4) since fertilizer contributes to degradation of the environment, a drop in its use would benefit the environment. There is a critical need to examine each of these linkages in order to further the policy debate.

With respect to the first linkages, the "Dunkel draft" reform proposal will allow countries to meet required reductions in agricultural support in many ways; the PSE measurement includes anything from machinery and fertilizer subsidies to crop payments to producers. Different approaches can be more or less targeted to reduce intensity of production.

With respect to the second linkage, subsidy decreases could lead to a drop, a shift or an increase in production. Among the possible consequences: (1) a producer could shift production from one crop to another; (2) production could shift from one country (or a group of countries) to others; (3) land could be sold to other agricultural producers; or (4) land could be sold for non-agricultural purposes. Each effect has implications for fertilizer use. The expected net effect of these four changes, which is what is estimated by most trade models, is that aggregate agricultural production will decline, and with it input use, establishing the third linkage. This depends in part upon the elasticity of substitution between inputs. For land and fertilizer, Binswanger estimates the partial elasticity of substitution between fertilizer and land to be 2.98: land is a substitute for fertilizer (Binswanger). The only empirical evidence that fertilizer use might fall with trade liberalization comes from Abler and Shortle for the EC. The Abler and Shortle model estimates the change in production and fertilizer use by the elimination of commodity programs in the U.S. and the EC. They estimate a –7.3 percent medium term decrease in chemical use in the EC but a 6 percent increase in the U.S. This provides only mixed support for the contention that falling subsidies cause fertilizer use to drop.

Finally, whether a decrease in fertilizer use leads to an improvement in the environment is also in need of more careful research. While it is widely agreed that agriculture contributes to environmental pollution, some researchers remain tentative about the link between fertilizer use and

the environment (e.g., Dubgaard; Taylor and Frohberg; Duffy, et al.). Part of the uncertainty can be attributed to the time it takes for farm chemicals to reach groundwater. Some researchers estimate it takes 25 years or more, so the impacts of the post-war rapid growth in farm chemical use may just now be beginning to emerge. While trade liberalization may reduce the aggregate use of fertilizer, the intensity of use is a better indicator of "excessive" applications with harmful environmental impacts. This should be the focus of future research. Because trade reform policies are not primarily aimed at environmental targets, trade liberalization per se is not a sufficient response to environmental problems in agriculture (Anderson; Runge). Agreement on trade targets and instruments does not imply that necessary environmental regulatory actions in agriculture will be undertaken.

Notes

1. See Anderson (1992); Koopmans (1987); and Runge (1992).

Table 1. Panel data linear regression problem

Dependent variable: FCONS = commercial fertilizer use per hectare

Explanation of Ind. Variables		Significant at 95th percentile	Coefficient	Standard Error
PSE	Producer subsidy equivalent	yes	15.36	7.28
PCGDP	Per capita GDP	yes	0.029	0.0098
PCGDP2	Per capita GDP squared	yes	–0.000001	0.0000
PPCORN	Producer price for corn	yes	–0.0933	0.0374
PPRICE	Producer price for rice	yes	–0.0456	0.0227
PPWHEAT	Producer price for wheat	no	0.0595	0.0334

R^2 = .992 No. of observations = 240
Adjusted R^2 = .9908 Degrees of freedom = 239

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