

**Green Box Criteria:
A Theoretical
Assessment**

Economic & Policy Analysis Directorate
Policy Branch

January 2000

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Agriculture and Agri-Food Canada

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Acronyms

AAFC	Agriculture and Agri-Food Canada
CWB	Canadian Wheat Board
EU	European Union
GATT	General Agreement on Tariffs and Trade
MC	Marginal cost
MR	Marginal revenue
NISA	Net Income Stabilization Account
OECD	Organization for Economic Cooperation and Development
PPP	Polluter Pays Principle
WGTA	Western Grain Transportation Act
WGTPP	Western Grain Transition Payments Program
WTO	World Trade Organization

Preface

This report is part of the Trade Research Series that Agriculture and Agri-Food Canada is undertaking to support discussions in connection with multilateral and bilateral trade negotiations. The purpose of the series is to create an inventory of research that will make it easier for stakeholders to identify concerns, issues and opportunities associated with such discussions. The research is for the most part directed to areas in which little or no information has been circulated rather than to areas in which a broad base of literature already exists. More information on the Trade Research Series is available on the AAFC website at www.agr.ca/policy/epad, or by contacting Brian Paddock, Director, Policy Analysis Division, Policy Branch (e-mail: Paddobr.em.agr.ca, phone: (613) 759-7439).

The report is the first of two reports undertaken by the Policy Branch of AAFC concerning WTO “green box” criteria and production neutrality. This first report provides a non-technical discussion on whether green box criteria is sufficient to ensure the production neutrality of different kinds of direct payment programs. The second report is of a more technical nature, and examines different payment programs in Canada, the U.S. and the EU for their production neutrality. Preliminary results from these reports were presented at the International Agricultural Trade Research Consortium Annual Meetings in St. Petersburg, Florida, December 1998.

Abstract

This paper examines the World Trade Organization's Agreement on Agriculture criteria for domestic programs which are exempt from reduction commitment under Annex 2 of the Agreement. The standard against which these criteria are judged is production neutrality. Two economic rationales are identified for government intervention in agriculture: income redistribution and correction of market failures. When the government's objective is to redistribute income, the appropriate measure is a transfer where the recipients can not affect the size of the payout by changing their behaviour. This method of transfer is consistent with the criteria for decoupled payments in Annex 2 of the Agreement on Agriculture. When the government's objective is to deal with market failures, it is more problematic to find an appropriate measure. From the perspective of economic theory, the first best method is to deal with the market failure at the source of the problem. Since this approach is rarely practical, second best measures must be sought. Appropriate disciplines for these second best measures should allow farmers minimal ability for discretionary action, except in following the direction of market signals. The paper examines how well Annex 2 criteria deal with government programs to correct for market failures and suggests areas where these criteria might be tightened to provide less incentive for inducing production.

Introduction

The completion of the Uruguay Round addressed three issues of government intervention in agriculture: domestic support, export subsidies, and market access. The inclusion of domestic support was a recognition that domestic programs could adversely affect trade (OECD Ministerial Declaration 1987). Paragraph 1 of Annex 2 of the Agreement on Agriculture recognizes that not all forms of domestic support are trade distorting and allows measures, deemed to have “no, or at most minimal, trade-distorting effects or effects on production”, to be exempt from domestic support reduction commitments. The Annex 2 exemption is based on criteria under the headings of general services (research, inspection, extension and training, marketing and promotion, and infrastructure), public stock holding for food security, domestic food aid, and direct payments to producers in the form of decoupled income support, income insurance and safety net programs, structural adjustment assistance, regional assistance and environmental aids. The due restraint provisions (Article 13), known as the Peace Clause, state that green box policies are not actionable for countervailing duties and other GATT challenges. This Peace Clause is valid only during the implementation period.

To be eligible to be categorized in the exempt or “green box” classification, support measures must meet two basic criteria: they must be government funded (including government revenue forgone) and the support must not have the effect of providing price support to producers. In addition to these basic criteria, specific criteria apply for the different forms of direct payments.

This paper examines the issue of whether “green box” criteria with respect to direct payment programs are sufficient to ensure the production and trade neutrality of these programs. It provides an overview of how each type of program could affect production decisions and ultimately trade¹. The assessment begins by examining the rationale for government intervention in agriculture in Section 2. This rationale is the justification for the existence of a green box. The theoretical economic criteria necessary for direct payments to be neutral are

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1. Since all programs which support market price are excluded from the green box, the effect of direct payment programs, which qualify for the green box, on consumption will be minimal. As a result any impact these “green box” direct payment programs have on production will be approximately equal to their effect on trade flows.

discussed in Section 3. The next three sections analyse the potential production impact of different types of direct payment programs: Section 4 looks at decoupled support, Section 5 looks at safety net programs and disaster relief, and Section 6 looks at structural adjustment assistance, regional development, and environmental aids.

Rationale for Intervention in Agriculture

Economic theory provides two rationales for government intervention in agriculture: correction of market failures and income redistribution. Market failures arise because of transactions costs, information asymmetries, non-allocation of property rights, and missing or imperfect markets.¹ Redistribution of income between groups in society is generally done for reasons of equity rather than for economic efficiency. Improvements in economic efficiency occur as long as the costs of implementing the policy do not outweigh the benefits of resource reallocation.

Agriculture is primarily a land based biological activity susceptible to the effects of natural phenomena. It has unique features which lead to market fluctuations. Lags and rigidities in the production process propagate shocks creating cyclical behaviour in both production and prices. Demand for most agricultural commodities is not very responsive to changes in prices or incomes, so that changes in supply cause large fluctuations in prices.^{2 3} As a result the effect on incomes can be dramatic. Among other things, income instability affects investment decisions⁴, and risk averse producers' output levels are lower than they would be in the absence of risk. The market failure in this case is a missing market which would allow pro-

1. Examples of such failures include public goods, positive and negative externalities, increasing returns to scale leading to monopoly behaviour, and risk and uncertainty combined with the absence of contingency markets
2. Whether producers or consumers are worse or better off as a result of price fluctuations is an empirical question which depends on whether the source of the shock comes from the demand or the supply side (see Waugh (1944), Oi (1961), and Turnovsky (1974 and 1976)).
3. A typical argument for government intervention to stabilize prices is that unstable prices generate cobweb effects on output (especially for the livestock sector), generate adverse consumer reaction when prices escalate, and could possibly cause a severe downturn in agriculture if farmers over-react to temporary high prices. This type of behaviour is inefficient because there are large adjustment costs in moving from high to low levels of production. This justification for intervention assumes producers base their price expectations on recent prices. It does not hold, however, if producers base their price expectations on all relevant information available and do not make systematic errors in their projections.
4. Johnson (1947) argued that unstable prices lead to capital rationing. The decision to invest depends on the discounted stream of expected profits and expenditures. The investment decision should not be affected if farmers form their price expectations in a rational manner. However, Dixit and Pindyck (1994) stress the irreversibility of most investment decisions, and the ongoing uncertainty of the economic environment. This new investment theory recognizes the option value of waiting for better information and may provide a justification for the argument for capital rationing and under investment in agriculture.

ducers to spread the risks associated with agricultural production. A complete set of futures and risk markets are required for economic efficiency (that is providing an allocation of resources such that it is impossible to make anyone better off without making someone else worse off).

Another distinguishing feature of agriculture is that because of the inelastic nature of both supply and demand, persistent technological improvements over time cause real commodity prices to decline. This implies producers have to continually reduce costs either through economies of scale, adoption of new technologies, or more efficient use of inputs to avoid erosion of their net income. This impacts on the structure of agriculture and the number and sizes of farms, and thereby affects rural communities particularly those where the local economy is primarily dependant on agriculture. As a result governments often feel obligated to redistribute income to agriculture.

Economic Criteria for Neutral Payments

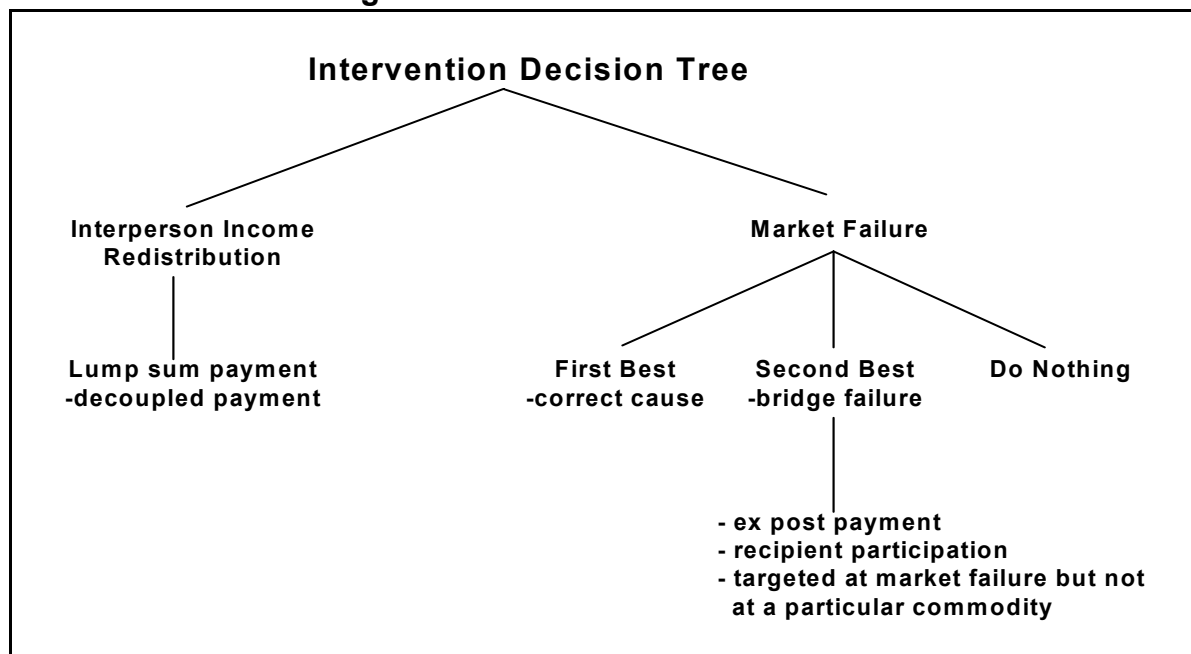
If governments wish to intervene to re-distribute income or correct for market failures then they should choose an efficient method of intervention. The idea of the green box is to encourage governments to choose a method of intervention that minimizes distortions to production and trade.

Welfare economics suggests that the most efficient way to redistribute income, among individuals, is to provide lump sum transfers (taxes). A lump sum transfer is one where the recipient can not affect the size of the transfer (tax) by changing his behaviour in any manner. If a government's primary objective is to redistribute income from the rest of society to agriculture, then it should use lump sum transfers. If a government's primary objective is to correct for market failures then the first best method is to correct for the underlying cause of the market failure. Depending upon the type of market failure at issue, the government's role might be to reduce transactions costs, make information available to eliminate information asymmetries, allocate property rights or otherwise create the conditions necessary for the missing market to operate. Practically, however, it is often not always possible for governments to correct for the market failure at source. When this is the case the government has to search for a second best solution which typically involves bridging the market failure by creating an artificial market (e.g. government provision of crop insurance). However, not all instances of missing markets necessarily imply a distortion or an inefficient allocation of resources and when this is the case, or when the distortions are minor, the appropriate action for the government may be to do nothing.

An often cited example of missing markets, in agriculture, involves contingency markets. Development of contingency markets allows for the inter-temporal redistribution of income between good and bad times. Missing contingency markets represent a potential market failure, but the act of redistributing income across time often involves a redistribution of income among individuals. For this reason the redistribution of income towards agriculture often becomes confused with correction of market failures associated with the inter-temporal distribution of income. This confusion hides the appropriate policy response. If the government's primary motive is to redistribute income to agriculture the appropriate tool is a lump sum transfer; if the government's primary motive is to redistribute income, for each individual, across time the appropriate response is to facilitate the development of insurance markets.

Figure 1 presents a hierarchy of decision rules for government intervention in agriculture. Typically government interventions create the incentive for individual agents to change their behaviour to take advantage of the intervention. The best intervention is that which minimizes the amount of true discretionary power left to the individual agents. However, governments are faced with limited information about individual behaviour and the transactions' cost of enforcing a measure may be prohibitive. There are some rules of thumb which can be used to minimise the chance that individual agents will change their behaviour, to take advantage of the government intervention, and as a result distort markets. If the intervention takes place after the individual has made the production decision the chance for distortion is greatly minimized. The payment base for the program should not be subject to influence by the producer and therefore should probably be based on a fixed historic criteria such as historic production. If the intervention is not targeted at one specific sector there is less chance for distortion as market considerations should still determine the allocation of resources among sectors. If individuals are partially responsible for financing the program there should be less incentive for them to change their behaviour in order to increase the size of the government payment.

Figure 1: Intervention Decision Tree



Decoupled Income Support

Direct payments, used for decoupled income support are exempt from reduction commitments, in the WTO Agreement on Agriculture, if they meet the basic “green box” criteria plus the following specific criteria:

- (i) Eligibility for such payments shall be determined by clearly-defined criteria such as income, status as a producer or landowner, factor use or production level in a defined or fixed base period.
- (ii) The amount of such payments in any given year shall not be related to, or based on, the type or volume of production (including livestock units) undertaken by the producer in any year after the base period.
- (iii) The amount of such payments in any given year shall not be related to, or based on, prices, domestic or international, applying to any production undertaken in any year after the base period.
- (iv) The amount of such payments in any given year shall not be related to, or based on, the factors of production employed in any year after the base period.
- (v) No production shall be required in order to receive such payments.
(Source: Agreement on Agriculture Annex 2, paragraph 6).

The basis for these criteria is the theoretical concept of a lump sum transfer. Lump sum transfers do not distort an economy’s resource allocation because they do not alter agents’ incentives. Whereas lump sum transfers are often mentioned in the economics literature, actual pure examples may not exist. The act of raising revenues is distortionary and has a cost for the economy.¹ Even if revenues could be raised without cost, the fact that leisure can not be taxed creates a situation where the agent’s behaviour is changed in some manner as a result of the transfer. This change in behaviour causes an inefficient reallocation of resources within the economy.

1. Empirical evidence (Fullerton 1991) puts the marginal cost of raising an extra dollar of tax revenue at about \$1.3. See Moschini and Sckokai (1994) or Chambers (1995) for a discussion of the interaction of distortionary taxation with transfers to farmers.

Some agriculture support programs try to approximate a lump sum transfer by tying support to a historically fixed variable such as past production. These transfers are often compensation payments with the size of the payment related to the income loss incurred. The idea is that since the direct payments are based on a past, fixed base period, farmers cannot affect payment size through current behaviour, and as result their current production decisions will only be based on market considerations.² This is the rationale behind compensation programs such as the “production flexibility contract payments” under the United States Federal Agriculture Improvement and Reform Act and Canada’s WGTTP which compensated for the discontinuation of the subsidies under the WGTA.³

The neutrality of decoupled payments can be illustrated by a simple optimization problem for a representative producer who maximizes profits. The producer’s profits are calculated as the difference between revenues ($P \cdot Q$) and total costs $C(Q)$ plus an unit subsidy, s , which is based on past production for a base period:

$$(1) \quad \text{Max}_Q \pi = P_t \cdot Q_t - C(Q_t) + s \cdot (Q_{\text{base period}})$$

Profits are maximized when production is allocated such that marginal revenue (MR) is equated to marginal cost (MC).

$$(2) \quad \text{MR} - \text{MC} = P - \partial C / \partial Q = 0$$

Because the subsidy, s , depends on past production ($Q_{\text{base period}}$) it does not enter into the marginal decision. In fact any subsidy which does not directly affect the optimality condition, that marginal revenue equals marginal cost, will be neutral.⁴

The property of the producer’s optimization problem, shown above, which accommodated the neutrality of a fixed direct payment does not hold for more sophisticated optimization models which account for risk preferences. With a risk averse producer the direct payment can produce a wealth effect which is analogous to the income effect in the consumer’s optimization problem. Pope and Just (1991), Sandmo (1971) and Hennessy (1998) demonstrate that this wealth effect will affect production decisions.

In addition to the exception to neutrality induced by the wealth effect for a risk averse producer, there are situations where the direct payment can indirectly affect the decisions, of risk neutral producers, at the margin. Consider a producer who faces a constrained optimization

2. A similar idea is that support will be mostly decoupled when the quantity of production receiving support is substantially less than the total quantity produced at world prices. This method of support is often termed a “Producer Entitlement Guarantee Scheme” (Blandford, de Gorter, and Harvey 1988). This approach does not require support to be based on a fixed historic benchmark. The program can be thought of as supply management for government support where support is tied to levels of production well below the level of production at world prices. Producers could trade their entitlements to government support.

3. The difference between WGTTP compensation and the contract payments is that WGTA reform is complete while many expect that the contract payments will continue after the 2002 US Farm Bill.

4. For example in a single product case a subsidy based on the difference between total revenue and total cost (i.e. $s \cdot [P_t \cdot Q_t - C(Q_t)]$) produces optimal marginal conditions that are the same as the case with no subsidy:

$$P \cdot (1+s) = \partial C / \partial Q \cdot (1+s) \quad P = \partial C / \partial Q$$

problem. A direct payment may reduce the constraints limiting this farmer's production potential and as a consequence lead him to increase production. Three examples of this behaviour are discussed below.

The first example occurs with increasing returns to scale. Increasing returns to scale implies that at each level of output, marginal cost is less than average cost. Institutional constraints on production may restrict profit maximizing behaviour (i.e., equating marginal revenue to marginal cost), and if the producer is forced to produce where price equals marginal cost he will lose money so the best the producer may be able to do is produce where average revenue equals average cost. In this case a fixed direct payment will increase average revenue such that the payment can lower average cost and increase the level of production.

The second instance where payments based on past performance could affect current decisions is in the context of behavioural theories of the firm. Instead of assuming profit maximizing behaviour by the firms these theories assume "satisficing" behaviour. Under this assumption the objective of the firm is not to maximize profits but to achieve certain organizational goals such as production goals, sales goals, market share goals and inventory goals. The interaction of these goals through the bargaining and coalition making process of the organization determines resource allocation. This allocation within the firm reflects only gross comparisons of the marginal advantages of alternatives. Rules of thumb for evaluating alternatives provide constraints on resource allocation. Any alternative that satisfies the constraints and secures suitably powerful support within the organization is likely to be adopted. (Cyert and March 1963). In this context direct payments loosen constraints and encourage continuation of the status quo and possibly increasing production.

The third instance where direct payments based on past performance could affect current decisions is if the producer faces debt constraints. It is helpful to view a farmer's behaviour in the context of a household production/consumption model. In this framework the interactions between consumption and production raise questions as to whether a direct payment is decoupled from production. Producer decisions are based on a greater range of considerations than simply maximizing profits and include household preferences and farm financial structure. Phimister [1995] developed a household production/consumption model where debt is a constraining factor. In the absence of a debt constraint the farmer/householder optimizes in a recursive fashion. He first maximizes profits to determine output and income, and then he maximizes utility to allocate his life time consumption given a life time budget constraint. Compensation through a lump sum payment does not affect his profit maximizing decision for output, it just creates a pure wealth effect which induces consumption.⁵ If, however, the farmer/householder does face a debt constraint then the optimization of production and consumption occur simultaneously. The debt constraint affects the householder's allocation of consumption across time so that its subjective rate of interest (the rate at which the household prefers present to future consumption) exceeds the market rate of interest. Since the householder's subjective rate of interest is higher, with a debt constraint than without, this implies the opportunity cost of capital is higher as well. Relaxing the debt constraint reduces the household's subjective interest rate and the opportunity cost of acquiring capital,

5. For a risk averse producer/householder the wealth effect would affect production as well.

which allows more funds to be allocated to future production. The payment which was neutral in the non-debt constrained case leads to increased future production in the debt constrained case.

While increasing returns to scale or behavioural theories of the firm are likely only applicable to large scale multiple enterprise farms, if they are applicable to agriculture at all, many producers do face debt constraints. Furthermore, Roberts (1997) argues that given a farmer's specialized skills, and the absence of perfect capital and information markets, significant amounts of the fixed direct payments are likely to be invested in the farm even if there are no debt constraints.

The examples, that have been provided to show that fixed direct payments are not production neutral, are not an exhaustive list. Any situation in which a direct payment would relax a production constraint could potentially lead to increased production.

Government Financial Participation in Income Insurance and Safety-net Programs

Government participation in safety nets is exempt from reduction commitments if the payments meet the basic criteria above plus the following criteria:

- (i) Eligibility for such payments shall be determined by an income loss, taking into account only income derived from agriculture, which exceeds 30 per cent of average gross income or the equivalent in net income terms (excluding any payments from the same or similar schemes) in the preceding three-year period or a three-year average based on the preceding five-year period, excluding the highest and the lowest entry. Any producer meeting this condition shall be eligible to receive the payments.
- (ii) The amount of such payments shall compensate for less than 70 per cent of the producer's loss in the year the producer becomes eligible to receive this assistance.
- (iii) The amount of any such payments shall relate solely to income; it shall not relate to the type or volume of production (including livestock units) undertaken by the producer; or to the prices, domestic or international, applying to such production; or to the factors of production employed.
- (iv) Where a producer receives in the same year payments under this paragraph and paragraph 8 (relief from natural disasters), the total payments shall be less than 100 per cent of the producer's loss.

(Source: Agreement on Agriculture Annex 2, paragraph 7)

The rationale for income insurance and safety net programs is a hybrid of the rationales described in Figure 1. On the one hand the rationale originates because of a market failure: the lack of contingency markets allowing the producer to deal with production and price risk. The other rationale for these programs is to redistribute income to the farm sector¹. This mix of policy objectives makes it difficult to develop criteria for neutral programs because of the very different nature to the objectives. Government programs which either create missing markets (crop insurance) or attempt to bridge income between periods (stabilization pro-

1. An additional element of income redistribution involves the redistribution of income across time rather than across individuals.

grams) also involve a transfer of public funds to the sector and on the basis of this transfer, alone, the program should be decoupled. However, lump sum transfers will not create the right incentives to correct for a market failure. So unlike the criteria for decoupled payments the basis for these four criteria cannot be traced back to a theoretical economic concept. These criteria implicitly recognize that this type of support is potentially distorting and place strict limits on the amount of support that can be provided.

Production neutral methods of correcting for market failures are not straightforward because the correction it is deliberately designed to alter is the producer's behaviour with respect to market signals. Recall that the first best method of correcting for market failure is to facilitate the establishment of the missing markets. If this is not possible, the second best method is to bridge the market failure but this does not remove the underlying distortion. Safety net programs attempt to bridge the missing risk market through income stabilization. Most stabilization mechanisms attempt to average the effects of good and bad times by shifting money from periods of plenty to periods of relative scarcity. Having the producer respond to intertemporally averaged prices (or net returns) may not necessarily induce increased production, but it may reduce the flexibility necessary to respond to emerging changes in economic conditions. Most safety nets, however, only cut the bottom off a cycle and do not make a compensating adjustment to the top. Those schemes which compensate for bad times but do not tax the good times, raise average income, and induce additional production.

The income safety net criteria require that payments relate only to income and not to production or price. This stipulation improves program neutrality. Prices and quantities tend to move in opposite directions. As a result stabilizing income requires smaller transfers, and comes closer to the objective of smoothing producers income over time². Smoothing income over time can also be thought of as smoothing consumption over time. There are other ways for households to smooth their consumption over time such as saving in good times and dissaving in bad times. Programs such as Canada's NISA assist the producer to save for a rainy day. The criteria of Annex 2 were not written with a program such as NISA in mind. The production effects of NISA are explored in a companion paper (see Rude [1999]).

Income instability can be defined as excessive or unexpected departures from the normal "trend" of income growth³. (For this reason the trigger mechanism of most stabilization mechanisms use a moving average of prices or net returns.) It is well established that risk averse farmers will produce less in the presence of risk. Producers can either reduce risk or cope with it. Reduction of risk involves diversification and adopting of new technology, risk reducing inputs and managerial devices (information) to reduce risk. Coping with risk involves sharing and shifting of financial and production risk⁴. Shifting and sharing risk involves finding someone else for whom the bearing of risk is less costly. Risk can be spread through cooperation, leasing equipment, joint purchases of inputs and marketing of product,

2. Although income stabilization is typically thought of as attempting to correct for market failures there is an element of income redistribution involved if only the troughs are cut and not the income peaks.
3. Gardner (1978 p. 279) suggests that income instability should be "based on deviations around the best-fitting monotonic (no turning points), continuously differentiable (no corners or gaps) function through the time series data, perhaps the mean squared logarithmic deviation."
4. Within risk sharing arrangements such as alliances and joint ventures there will also be performance and relational risk. Contracts can be written which mitigate one but not both types of risks (see Das and Teng [1996]).

corporate ownership where risks and profits are shared among a large number of shareholders, marketing management strategies, hedging, and insurance. It is not evident that the gains from risk sharing are smaller in agriculture than in other industries in which insurance markets have emerged. Nevertheless, it may be difficult to transfer risks to others without blunting the incentives of farmers to act efficiently.

So why aren't private contingency markets being developed which will help risk averse producers cope with income instability? And where the private markets do develop, why don't farmers take advantage of the market? We will discuss the answers to these questions in the context of private insurance contracts, but the discussion could apply equally well to other market risk management instruments. The problem is an asymmetry of information between insurers and those insured. These information asymmetries give rise to two problems: moral hazard and adverse selection. If the risk sharing scheme affects the incentives of the farmer, say for example to use less risk reducing inputs, the problem is described as moral hazard. Moral hazard is a problem because those who purchase insurance alter their behaviour, without the knowledge of the insurer, and thereby increase the possibility that they will collect an indemnity. Moral hazard increases the cost of indemnities. If the agent sharing the risk can not distinguish between risk types of those insured the problem is adverse selection. In this situation it is difficult for the insurer to set premiums which will assure adequate participation and financial viability. For the insurance contract to be financially viable over time revenues from premiums must at least equal the costs of indemnities. There must be adequate participation in the program to diversify risks (and the risks must be independent). Adverse selection decreases participation in the contract because low risk types do not want to buy insurance that is priced for high risk types (or even averaged insurance premiums). Either moral hazard or adverse selection can stymie the development of insurance markets or they can result in highly priced premiums which farmers find too expensive to pay.

Although adverse selection and moral hazard are problems that are encountered in all insurance markets, there are unique features to agriculture which further stymie the development of insurance markets. Consider grain and oilseed producers. Prices that they receive for their different crops are positively correlated across crops and the prices are correlated from one year to the next by carry over. As a consequence, their price risks are not independently distributed. Also yield risks, which are due to weather vagaries, such as drought, may affect large numbers of producers at the same time. For these reasons actuarially fair insurance premiums often tend to be prohibitively expensive or the coverage is too limited for effective markets to develop.

If government could provide the missing information that resulted in adverse selection and moral hazard in the first place, then private insurance markets would develop that would allow the shifting of risks and efficient production decisions to be made.

In some cases government provided insurance may create an insurance market where none existed, but this insurance does not necessarily eliminate the problems. Pooled insurance premiums and subsidized premiums can provide the wrong incentives to producers.

So far we have not mentioned crop insurance as a risk management instrument. Most of the comments from above which apply for income safety nets also apply to crop insurance. The economics literature is somewhat ambiguous about the effects of crop insurance on output. A sufficient condition for output to increase arises out of the effect of moral hazard on input use [Ramaswami (1993) and Horowitz and Lichtenberg (1993)]. If the producer is risk averse and the inputs, although they increase expected output, increase the variability of output by increasing the probability of low yields, then crop insurance will create an incentive for producers to use more inputs and output will increase. If the inputs are risk reducing inputs, such as most pesticides, then because of moral hazard the producer will use less of the input and decrease expected output. Theoretical models of moral hazard in crop insurance support the conclusion that the direction of the moral hazard effect on input use, output, and expected indemnities is ambiguous unless strong assumptions are made about risk preferences and input risk properties. Crop insurance also may encourage producers to move risky marginal land into production and the crop mix may be biased towards production of more risky crops. Empirical evidence of the effect of insurance on input use is mixed. Horowitz and Lichtenberg (1993) and Knight and Coble (1997) conclude that crop insurance increases the use of fertilizer and pesticides. Smith and Goodwin (1996) conclude that fertilizer expenditures will decrease with crop insurance. Price Waterhouse (1994) concludes that for Canada cropping decisions are based on a broad number of factors including market conditions and other programs which overwhelm the effects of crop insurance.

Annex 2 is silent on crop insurance except for payments for relief of natural disasters. The criteria for these payments are:

- (i) Eligibility for such payments shall arise only following a formal recognition by government authorities that a natural or like disaster (including disease outbreaks, pest infestations, nuclear accidents, and war on the territory of the Member concerned) has occurred or is occurring; and shall be determined by a production loss which exceeds 30 per cent of the average of production in the preceding three-year period or a three year average based on the preceding five-year period, excluding the highest and the lowest entry.
- (ii) Payments made following a disaster shall be applied only in respect of losses of income, livestock (including payments in connection with the veterinary treatment of animals), land or other production factors due to the natural disaster in question.
- (iii) Payments shall compensate for not more than the total cost of replacing such losses and shall not require or specify the type or quantity of future production.
- (iv) Payments made during a disaster shall not exceed the level required to prevent or alleviate further loss as defined in criterion (ii) above.
- (v) Where a producer receives the same year payments under this paragraph and under paragraph 7 (income insurance and income safety-net programs), the total of such payments shall be less than 100 per cent of the producers total loss. (Source: Agreement on Agriculture Annex 2, paragraph 8)

With disaster relief programs the size of the payments are based on the effects of unknown events rather than a fixed historic base. Farmers engage in *ex ante* decisions that have to be made prior to the realization of net returns. If government interventions, to stabilize income or to relieve disasters, are to be effective they have to match the contingency. This means that to be neutral the precise parameters of the program can not be anticipated *ex ante* and subsequently be manipulated by producer behaviour to effect the payment size.

may not be desirable. For these reasons it will be extremely difficult to develop green box criteria for payments under environmental programs. Therefore, a monitoring mechanism which requires that the government proposing an environmental measure, to provide an explanation of what the market failure is, how the program corrects for the market failure and its impact on output, might be useful.

Structural Adjustment, Regional Development and Other Transfers

Structure refers to the composition of the productive capacity of the economy, that is to labour, capital, and natural resources and their allocation among sectors in the economy. Economies are constantly in the process of adjusting to changing conditions of demand and supply and the consequences of technological change. Structural adjustment is a dynamic process which reallocates resources in the economy so growth can occur.

Structural adjustment is also a consequence of domestic and international policy reform. To be optimal the adjustments that follow policy reform need efficiently functioning factor markets. However, impediments to efficiency often occur when the true cost and benefits associated with economic activities are not perfectly known by the individuals during the adjustment process. Imperfect knowledge can hinder adjustments that are necessary to improve resource allocation in the economy and may create hardships during the transition period.

Government policies of assistance for structural adjustment include macroeconomic economy-wide measures such as fiscal, monetary and exchange rate policies, policies that relate directly to the primary factors of production, and agriculture specific policies such as research and extension, and direct payments. The “green box” allows structural adjustment assistance for producer retirement programs, resource retirement programs, and investment aids if they meet certain criteria. The resource and producer retirement programs are direct payment programs. The same criteria should be used as for other direct payment programs where the funds are taxpayer financed. Payments need to be either fixed or tied to a variable which is outside the farmer’s control. For efficiency in correcting the factor market impediments, the assistance should be targeted as closely to the distortion as possible. Factor market retirement programs can be fashioned with clearly designed criteria that ensure retirement. The “green box” requires that investment aids shall “not be based on prices... applying to any production undertaken in any year after the base period”, “shall not mandate... the agricultural products to be produced”, and “shall be limited to the amount required to compensate for the structural disadvantage”. Limiting the structural assistance to the amount required to compensate for the structural disadvantage is an area of potential abuse despite the require-

ment that eligibility be linked to clearly defined criteria. The notion of structural disadvantage is not well defined and attempts to correct for the disadvantage can lead to interventions which artificially distort comparative advantage.

The WTO Agreement on Subsidies and Countervailing Measures states that regional aids are non-actionable provided that they are not limited to specific enterprises or industries within the region. The region has to be specified as disadvantaged on the basis of objective criteria such as per capita GDP and unemployment. The “green box” of the Agreement on Agriculture allows assistance that is specific to agriculture providing that the payments are not tied to current or expected production, prices, and that the assistance is generally available to producers within the region. The green box criteria state that “where related to production factors, payments shall be made at a degressive rate above a threshold level of the factor concerned”. Payments meeting this provision could potentially have a positive affect on production¹. Therefore one must question why the Agreement on Agriculture provides an exception to the broader Agreement on Subsidies and Countervailing Measures. One purpose of the Uruguay Round was to begin to eliminate the special status of Agriculture in the WTO.

Payments under environmental programmes are allowed provided that the payments are “part of a clearly defined government environmental or conservation program and are dependent on the fulfilment of specific conditions under the government programme, including production methods or inputs”. Furthermore “(t)he amount of payment shall be limited to the extra costs or loss of income involved in complying with the government programme”. These criteria implicitly assume that the most appropriate mechanisms to deal with environmental externalities is through direct intervention (e.g. regulation) and that the only allowable subsidies are those to assist producers with compliance with the regulations. However direct intervention (through restrictions on activities or direct provision of the goods) is not the only available instrument to correct for externalities; governments can also choose to intervene indirectly (by affecting prices and thereby affecting the incentives of the individual agents). The usual approach to address environmental problems is to use a mixture of indirect economic instruments (market based instruments), regulations, and provision of information. A mixture of regulations and economic instruments with precise targeting is more likely to produce efficient results. One of the most appropriate means of addressing environmental externalities is through a charge or tax based on an evaluation of the damage caused by the polluter. This is an application of the polluter-pays-principle which was endorsed by the OECD member countries in 1974. Taxing negative environmental externalities is not a problem under the Agreement on Agriculture, but providing subsidies to encourage the generation of positive environmental externalities would be a problem.

Environmental problems are one of the clearest examples of a market failure that a government may face. Given the problems of disentangling effects on production of instruments intended to correct for market failures, this should be an area of concern in defining neutral criteria. The fact that the payments cannot exceed the extra costs of complying with the government program implies that environmental aids will not have much of a positive effect on production. Monitoring, however, will be necessary to ensure that payments do not

1. Given the disadvantaged character of the regions the effect on production will almost certainly be minimal.

exceed the incremental costs of the environmental program. The development of effective monitoring devices is not a trivial issue and the Agreement on Agriculture does not provide any guidance for developing these devices.

Recommendations for Green Box Reform

Some general principles should be followed in the design of green box criteria. First, the criteria should consider if the original rationale for the program is primarily for income redistribution or for correcting a market failure. If the objective is to re-distribute income then a decoupled direct payment should be used. If the objective is to correct for a market failure then the government proposing the instrument should be required to provide an explanation of what the market failure is, why private markets will not provide a solution, and how the program corrects for the market failure. Given that the program can be justified on the basis of attempting to correct for a market failure, the next question to ask is whether a farmer can anticipate the program payment prior to making his production decision. If the farmer can anticipate the payment then he can cultivate the payment mechanism by adjusting his production decisions and the program will not be neutral. In those instances where it can not be determined whether the producer can anticipate the program payment or not, additional criteria should be applied. The criteria might include limits on support and requirement for targeting the support to individual need.

Reform of Decoupled Income Support

Given the potential for decoupled payments to affect production the first question to ask is should the criteria be changed? If yes, the next question is how? For the most part decoupled payments are production neutral and although there are exceptions to this neutrality, reforming the criteria to close these loopholes may not be practical. The problem is that each exception is tailored to the circumstance of an individual type of producer. Writing new rules for green box criteria for decoupled payments would amount to writing a rule for each possible exception.

There are some things that can be cleaned up around the edges of the current criteria. The compensation payments provided under both the United States Federal Agriculture Improvement and Reform Act (production flexibility contract payments) and the reform of the EU Common Agricultural Policy are both transitional and scheduled to be reviewed. However, farmers may anticipate a second round of payments. The parameters upon which future payments may be based (e.g. base yields) can be manipulated today in expectation of a bigger pay-out tomorrow. Thus current producer reactions could affect how future programs

are developed and thereby affect the payouts the farmer will receive in future programs. To prevent this from happening there should be a requirement that programs which are extended have to use the initial base period as a point of reference.

Given that there are a number of avenues where decoupled payments may distort production decisions, and although individually the effects of each of these avenues may be minimal, in combination the effects associated with exceptionally large transfers may very well distort production decisions. So limits on both the annual amounts and perhaps even the duration support, through decoupled payments, should be introduced. The limits in support could be adjusted to producer need and criteria such as means tests might be applied.

Income Insurance and Income Safety Net Programs

The general requirements for a good income safety net policy are that the market failure be identified, that the program be targeted at the market failure, that it be transparent in terms of having easily identifiable objectives, that the costs, benefits and beneficiaries be identified, that producers not be able to manipulate the payouts, and that the program be flexible enough to respond to a diversity of situations. The criteria for a safety net program must be designed to allow changes in market signals to be transmitted to producers and they must not blunt the incentives of the farmers. Any sort of program which pools risks gives a signal which is averaged, while the appropriate signal for producers are marginal signals.

While the first best solution is to address the market failure by facilitating the creation of missing markets, second best solutions are the norm and these solutions often require trade-offs between effective safety nets and production neutrality. The crucial element in the design of safety net measures is the trigger mechanism. The mechanism is triggered when actual farm income falls below a threshold which is determined by baseline income. It is important that the baseline be a moving average which reflects long term trends in income which in turn reflects market signals. The more years used in calculating the baseline, the more it will reflect a long term trend. However, a longer trigger mechanism blunts short term changes in market signals. The definition of income used for the baseline is also important. The income sources should not extend beyond agriculture, but should be broadly based to avoid specific commodity coverage. The geographic coverage is problematic and there is a trade-off in design. Too narrow a regional coverage can lead to product specificity, while too broad a geographic coverage may not be effective for stabilizing individual farmer's income. The choice of income concept includes gross revenue, gross value added, and net income. Net income comes closest to the economic situation that the farmer faces. While it is desirable that the safety net measure be targeted at the individual there are trade offs between triggers that operate at the farm level and the sector level. Sector level programs are less subject to manipulation and moral hazard. With an individualised trigger the individual may have less incentive to adopt risk management strategies.

So how can the current Annex 2 criteria (paragraph 7) for income safety nets be changed to be more effective? The first question is: are all government assisted risk management instruments covered under paragraph 7 of Annex 2? The answer is no. Attempts by government to facilitate risk sharing among individuals, through setting up alliances for example, would not be covered but such an arrangement is unlikely to affect production. Government programs which defray part of the premium to purchase market based risk instruments, such as an option, are also not covered but again this program should not affect production decisions if the premium is priced by the market.¹ Programs which encourage savings in order to smooth the individual household's intertemporal consumption, such as NISA, are not considered in paragraph 7. As there are a plethora of ways that government can participate in the management of risk and each should be customized to the characteristics of individual facing the risk. One blanket set of criteria can not be established for Annex 2 domestic support reduction exemptions.

Government instruments to reduce risk can be viewed as proxies for private instruments: target prices and deficiency payments can be viewed as providing farmers with hedges against down-side price risk; government financed crop insurance mimics private insurance; loan rates can be viewed as put options; and NISA can be viewed as an instrument which promotes saving for a rainy day. The effectiveness of government sponsored risk instruments should be viewed in the context of their effectiveness relative to the equivalent private market instrument and the incentives the government instruments provide to producers. The closer the government instrument comes to mimicking the private instrument the less likely that production will be induced. An empirical method of enforcing this criterion is to calculate private market equivalent prices for the government instrument. For example, option prices can be calculated for government programs (for example see Wilson [1995] who calculates the option value of CWB initial price guarantees) and these values can be compared to private market instruments to judge the potential distortionary effect of the program.

Since self insurance is one method of reducing moral hazard it is preferable that income safety nets have a component of self insurance where the individual participates. Programs which are designed to fit the circumstances of individual producers will be more likely to correct for market failures and less likely to induce production.

Reform of Other Green Box Criteria

The need for reform of other green box criteria is probably of less urgency than reforming the criteria for decoupled payments or income safety nets. Those adjustment assistance payments which provide compensation should be judged by the same criteria as decoupled payments. Those adjustment assistance payments which encourage movement of resources should be conditional upon the resource leaving agriculture. For structural adjustment payments the payments should be limited in duration of time. Disciplines on regional assistance programs should fall under the Agreement on Subsidies and Countervailing Measures.

1. The problem of moral hazard may remain.

The current Annex 2 criteria for permissible environmental support only covers those aids which assist the farmer for the extra cost/foregone revenue from complying with a clearly-defined government environmental or conservation programme. This criterion implicitly assumes that direct intervention is the only appropriate way for the government to deal with environmental externalities. However, less direct methods including taxes may provide the producer with the incentive which will correct for environmental externalities. While the domestic support disciplines do not discipline taxation they would apply to environmental subsidies. If the environmental externality is positive, the appropriate mechanism to internalize the externality may involve a subsidy. Clearly there is scope for abuse in the application of environmental subsidies such that output is induced. The role of the green box is to prevent this. The choice of the best instrument depends on the circumstances surrounding the environmental externality. The appropriate instrument must be targeted directly at the externality generator and not at associated activities. Measurement becomes one of the most important determinants in the choice of policy instrument. Adequate measurement requires both defining and valuing the external activity. The costs of the corrective mechanism may outweigh the benefits from the change in the level of the externality. If this is the case no action should be taken to correct for the externality. Furthermore the method chosen for correcting an externality can create additional externalities and for this reason corrective action may not be desirable. For these reasons it will be extremely difficult to develop green box criteria for payments under environmental programs. Therefore, a monitoring mechanism which requires that the government proposing an environmental measure, to provide an explanation of what the market failure is, how the program corrects for the market failure and its impact on output, might be useful.

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