4. A scientific approach

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An Economic Perspective on Phytosanitary Policy

Introduction

The protection of plant health is an important issue in many countries over the world. Plant health issues play an important role in the WTO negotiations as individual countries are allowed to introduce trade barriers in order to protect their domestic agriculture against the introduction of plant diseases. Although the risk of a catastrophe due to introduction and spread of new plant diseases is generally very low, the economic and environmental impacts can be extremely large if a pest does occur (Knowler and Barbier, 2000). OTA (1993) estimated the cumulative damage costs from alien species in the US to be about $100 billion, for a selected group of pests over 85 years; for all introduced pests (some 50,000 species), the costs were estimated at $123 billion per year (Pimentel et al., 1999).

Moreover, the risk of introducing quarantine organisms is rising due to: (1) world trade in increasing volumes, with higher speed and over longer distances of, (2) population mobility and tourism; (3) increase in information, communication, technology and wealth in developed countries creating a demand for exotic plants and plant materials (e.g. fruits); (4) habitat fragmentation that may increase vulnerability; and (5) an increasing number of firms operating at a world scale, or more generally, the globalisation of the world economy (Shogren, 1999).

In most western countries, national plant health services have been assigned the task of safeguarding the national plant health situation. Under EU legislation, national plant health services are required to inhibit the spread and introduction of harmful organisms (PPS, 2003) not known to occur in the EU (A1 organisms) or known to occur in the EU (A2 organisms) or harmful organisms that are not known in certain protected areas (B organisms). The traditional set of measures available to plant health services consists of import and export inspections and a system of monitoring of plant production and production of propagation materials.

In the current system (EU directive 2000/29), all import and export consignments from non-EU countries have to be inspected in order to ensure that they are free of harmful organisms. However, the increasing risks of introducing quarantine organisms tends to reduce the effectiveness of the traditional tools of plant protection services such as import and export inspections. Moreover, the system is costly to trade companies in terms of the costs and time needed for inspections; these costs deteriorate the competitive position of companies operating in world markets. The need for cost savings is particularly evident given the continuing liberalisation of world markets in agriculture. Yet another problem of the import inspections as foreseen under EU directive 2000/29 is that the system tends to overload national plant health services. This is because the labour input required for the inspection system tends to exceed the available capacity.

The overall purpose of this paper is to provide an economic analysis of the current phytosanitary policy and to identify interesting alternatives for the future. However, the paper first discusses the underlying economic rationale for having a phytosanitary policy. This followed by a discussion of the current activities aimed at safeguarding plant health and a discussion of a number of alternatives for the current phytosanitary policy.

Why is there A Need For Phytosanitary Policy?

This section discusses two factors that explain the need for phytosanitary policy. These factors are the public good characteristics of plant health and the presence of asymmetric information in trade of plant materials. The plant health situation of a country may be defined in terms of the fytosanitary status of a country or e.g. the risk of introducing quarantine organisms (A1, A2 or B) in the production chain.

2.1 Public Good Characteristics of Plant Health

Public Goods are a special type of positive externality, having two distinguishing characteristics (Baumol and Oates, 1988): its consumption does not reduce the availability for others (nonrivalness) and no one can be excluded from its consumption (non-excludable).

Nonrivalness of a good implies that its use by e.g. a producer of plant products does not impose any limitation on its use by any other producers. Clearly, this condition is satisfied for plant health, since the availability of sound plant health provides benefits that are nonrival, i.e. their use by one agent does not limit the availability to others. Such benefits include access to export markets, lower costs of prevention, abatement and monitoring associated with plant diseases. Nonexcludability means that preventing others from sharing in the benefits of a good's consumption is not possible (or prohibitively costly). In terms of plant health, non-excludability refers to the extent to which agents can be excluded from the benefits of sound plant health, i.e. whether individual or groups of plant producers can be forced to accept a lower level of plant health than any other group.

Although some goods can be characterised as either pure public goods or pure private goods, many goods (including plant health) cannot be classified in the one-dimensional scheme of pure private or pure public goods. Figure 1 provides a classification scheme (see Romstad, 2002) in the dimensions of nonrivalness and non-exludability and shows how plant health should be positioned in either dimension.

Pure private goods are characterised by high degrees of rivalness and excludability and are located in the upper left of the box. By contrast, pure public goods are located in the lower right of the box with low degrees of both rivalness and excludability. The crucial dimension for efficient market allocation appears to be the degree of excludability, i.e. the more excludable the good is, the more likely the market provides an efficient allocation. Rivalness is not a crucial dimension since goods with low degrees of rivalness may still be allocated efficiently by the market. An example of a good with a low degree of excludability but with an efficient market allocation is the category of club goods (e.g. cable TV). A key-characteristic of club goods is that the benefits are (partially) excludable (Cornes and Sandler, 1996) by e.g. imposing fees or requiring club membership for full access to the benefits provided by the club. The upper right part of Figure 1 represents goods that are freely accessible but highly rival such as sea fisheries, natural resources (forests). Market allocation is generally inefficient here, as it results in situations of overexploitation (e.g. extinction or degradation) of the resource.
Benefits of plant health are, to some extent excludable (see below) and generally has a low degree of rivalness. Therefore, plant health is located in the lower part of the box in Figure 1. Rivalness is low in plant health, because 'using' plant health does not reduce its availability to others. For example, a low incidence of plant diseases in a particular region is a benefit that, if used by a particular farmer does not reduce the availability to other farmers in the same region. Excludability of plant health ranges from lower to higher levels. Plant health is partly located in the private domain of individual farmers. This holds for a particular farmer who maintains a rigorous pest management regime and generally has lower damage due to pests and diseases than neighbouring farmers. Other benefits, such as the phytosanitary benefits from refraining from imports from countries with a high prevalence of quarantine organisms are less excludable, since its positive impact on plant health is available to other actors in the sector.
The public good aspect of plant health has various appearances in practice. The first is that producers that pursue high-risk activities do not directly account for the potential risks they pose on society and other producers. The potential economic damage for other producers and society of a catastrophe may be tremendous as it may include loss of export markets and production of a much broader range of products than those produced by the high-risk agent. Second, plant producers generally differ in terms of phytosanitary standards that are required for their end products. Producers of plant propagation materials have to satisfy more strict regulations concerning plant health than other growers have. Under EU legislation, the prevalence of quarantine organisms with the A2 and B-status has far reaching consequences for producers of seeds and propagation materials; for producers of consumables, the consequences aremore modest (PPS, 2003). Without any intervention through government regulation, producers of seeds and propagation would face highly negative consequences of the lower phytosanitary standards maintained by producers of consumables. A third appearance of the public good aspect of plant health is closely related to the issues before, i.e. that the plant health status may depend on the poorest performance within a sample of actors. This public good aspect is more generally referred to as 'the weakest link' (Cornes and Sandler, 1996) and implies that the performance of a single producer may determine the level of security for the whole sector. An importer of plant materials from a high-risk country may introduce a quarantine disease into the plant production chain and as such affect the phytosanitary status of a country.

2.2 Asymmetric information

Standard economic models assume that all actors in a market (buyers and sellers) are perfectly informed about the product characteristics, such as risks and prices. The situation where buyers and sellers do not have access to the same information about risks and prices is more generally referred to as asymmetric information. The consequences of information asymmetry are known from the economics literature. Akerlof (1970) demonstrates that asymmetric information results in a tendency for sellers to supply risky products (Akerloff, 1970). In the absence of any intervention, the market for the less risky products may totally collapse resulting in a situation of market failure.
The problem of asymmetric information is also evident in the market for plant materials. Information about the fytosanitary quality of the plant product is generally available for sellers. Plant producers (sellers) may infer knowledge about the health status of their products (which are a function of the quality of the soil, geographical area, production techniques, monitoring procedures and quarantine and pest control measures adopted). As such, plant producers know the fytosanitary history of their products at the moment of delivery. Similarly importers of plant materials have more information about the country of origin and fytosanitary conditions during the production and transportation of the plants. For buyers in the market, the fytosanitary history of the product is not directly observable.

Information asymmetry is not equally problematic for all types of goods. In terms of information, goods can be classified into one of three types: search goods, experience goods and post-experience goods (Boardman et al., 1996). Search goods have characteristics that buyers can learn about, prior to the purchase, by examining the good for relevant external sources. Experience goods are goods about which consumers can obtain full knowledge after purchasing and experiencing them. Post-experience goods refer to products about which consumers can fully learn only after a period of time.
Evidence shows that plant health features of plant materials have in many cases, characteristics of a post-experience good (MAFF, 2000), i.e. non-native organisms may not become established and develop into pests until well after their introduction. Clearly, for post-experience goods like plant health, information asymmetry may persist for a long period of time (Boardman et al., 1996) and the need for regulation through phytosanitary policy is more evident.

3. Public Sector Activities

In order to protect plant health, regulation is required; a task that has been assigned to plant protection services in most western countries. Frequently used instruments are provision of information, eradication programmes and command and control options. The Nairn et al. (1996) Review of Australian quarantine indicated that organisations other than government would not choose to provide these services on a commercial basis, or only at a higher price. Also, some services provided by the government cannot be undertaken by other organisations, as they fall under international rule.
Examples of provision of information by the public sector are services from research and extension. Important elements of many research programmes related to plant health include improved diagnostics and development of more cost-efficient eradication and control programmes for quarantine diseases. Extension activities are undertaken by various government institutions such as the plant protection service and experimental research farms. Extension includes the spread of information through newsletters, presentations and provision of information through Internet. Research and extension can be seen as activities that contribute to a reduction of information asymmetry. Better diagnostic methods allow for faster detection of quarantine diseases; they also reduce the time-lag associated with the post-experience good character of plant and plant materials. Extension increases the awareness among stakeholders about fytosanitary risks.
Eradication and prevention programmes are public sector actions that directly increase the supply of plant health. Under EU-legislation, national plant protection services are authorised to eradicate and prevent the spread of pests and diseases that fall within the class of quarantine organisms. The eradication and prevention programmes usually provide damage compensation to inflicted producers; the underlying rationale being that a quarantine disease is a problem for the sector rather than an individual producer. Moreover, compensation is expected to provide an incentive for producers to report quarantine pests and diseases. Eradication and prevention programmes aim at improving or maintaining plant health directly. The asymmetric information aspect is also obvious, i.e. damage compensation bridges the information asymmetry between inflicted producers and other actors in the chain. Reporting the pest or disease in return for compensation decreases the likelihood that quarantine organisms spread through the plant production chain.
Command and control regulations are well-known examples of intervention mechanisms in the market for plant health. They include import inspections, trade regulation, seed certification and monitoring within chains. An inherent weakness of the command and control regulation is that it does not give an incentive to firms to go beyond the minimum requirements set by the regulation (Sunstein, 1990). Another criticism of command and control is the high cost and difficulty of enforcement (Braithwaite and Makkai, 1994). More generally, also, command and control regulation is found to be vulnerable to political manipulation and increasing administrative complexity, whereas a strict regulation in a competitive environment may increase resistance among stakeholders (Gunningham and Grabosky, 1998).

4. New Opportunities for Phytosanitary Policy

Many western countries are faced with increasing risks of quarantine organisms for their production and exports of plants and plant materials, due to increasing trade flows and internationalisation of firms. Several developments related to globalisation of the world (economy) reduce the effectiveness traditional public sector activities towards reducing fytonsanitary risks. Also, capacity for import inspections may become a limiting factor for plant health services and businesses are increasingly aware of costs related to inspections. These developments require a reconsideration of the current policy towards plant health.

Self regulation

Self-regulation is considered an important, yet often unacknowledged component of many regulatory regimes and is expected to play a more prominent role in many western economies in the near future (Gunningham and

Grabosky, 1998). Self-regulation is a process whereby an organized group regulates the behaviour of its members (OECD, 1994). It can be categorized in terms of the degree of government involvement: (i) pure self regulation, without any form of intervention, (ii) mandated self-regulation, involving direct involvement by the state, whereby it requires business to establish controls over its own behaviour, but leaves the details and enforcement to the business itself and (iii) mandatory self-regulation involving businesses themselves being responsible for some of the rules and their enforcement, but with the over-riding regulatory specifications mandated by the government.

In the regulation of plant health, several possibilities exist for self-regulation. These possibilities are categorised as (1) certification, (2) insurance and (3) direct regulation by chain partners.

Certification is a means of self-regulation that is increasingly applied by various industries. A well-known example of self-regulation within the European food industry is Eurep-gap, which gives detailed specifications for the production within primary agriculture for animal welfare and environment. More recently, the Dutch hornamental industry introduced the certification system 'Phytomark/Eigenverklaring' for Dutch companies importing ornamentals (Stichting Erkenningen Tuinbouw, 2002). This voluntary scheme required trading companies to import only from foreign companies that comply with strict phytosanitary rules. In exchange, the companies could insure against the risk of being liable for damage to producers in the Netherlands. However, the interest for Phytomark was very low, mainly because the advantages for the participating firms were very small. In 2003, it was decided to discontinue Phytomark.

Insurance against the economic consequences of outbreaks of quarantine diseases on individual firms is another example of self regulation. Phytopol was an insurance scheme that was available for firms that subscribed to Phytomark. A further example is the insurance against economic damage from brownrot and ring rot in the Netherlands (i.e. potatopol). This insurance is available for potato producers in the Netherlands that satisfy a number of phytosanitary requirements (e.g. hygiene etc.).

A final example of self-regulation of plant health is direct regulation by chain partners. Trading companies can impose a number of phytosanitary requirements directly to primary producers and face price cuts to those producers that reject the requirements. An example is a trading company in seed potatoes in the Netherlands that proposed a 10% price cut for seed potatoes that have been irrigated with surface water (which is seen as one of the major sources of spreading potato brownrot). The Netherlands holds a very strong position in the markets of seed potatoes and potato brownrot is a seen as a major threat for this export position.

Chain risk analysis

Firms in the plant production sector are nowadays part of global production chains. As a result, catastrophic phytosanitary events in early parts of the production chain may have large consequences for chain partners in other parts of the world. This feature of plant production provides an excellent opportunity for a chain-oriented approach to monitoring phytosanitary risks in plant production chains. Two different potential uses of chain risk analysis are elaborated below, i.e. Hazard Analysis of Critical Control Points (HACCP), reduced checks and the combination of quality and phytosanitary inspections.

HACCP based on quantitative risk analysis (Corlett, 1998; Mortimore and Wallace, 1998) can be used to establish procedures for a sound phytosanitary control in plant production chains. The HACCP method has been frequently applied in the food production chain in order to ensure production of save food (Unnevehr and Jensen, 1996), but the method is also applicable to the phytosanitary control problem at hand. A complete HACCP usually involves seven principles (NACMCF, 1992): (a) assess the hazard, list the steps in the process where significant hazards can occur and describe prevention measures; (b) determine critical control points in the process; (c) establish critical limits for each CCP; (d) establish procedures to monitor each CCP; (e) establish corrective actions to be taken when monitoring indicates a deviation from the CCP limits; (f) establish record keeping for the HACCP system; (g) establish procedures to ensure that the HACCP system is working correctly. The highly relevant outcome of a HACCP analysis for phytosanitary risks in plant production chains could be an overview of critical control points that have to be monitored in order to ensure a sound plant health situation. Such an overview of critical control points can be helpful to national plant health services.

A second potential use of chain risk analysis lies in the establishment of a system of reduced checks based on a risk analysis of trade flows from individual countries. Results of import inspections in the past can be used to determine the fraction of consignments from each country that have to be inspected upon import in the EU. The result of such a risk analysis is an inspection regime for each individual trade flow (by type of plant and country of origin). A special case of the system of reduced checks would be a list of countries (acknowledged third countries) for which no inspections have to take place upon import in the EU, e.g. conditional on a valid export certificate from the country of origin. Advantages of such a system of reduced checks as described here are obvious, i.e. savings in terms of time and money needed for performing the inspections. Furthermore, the system of reduced checks decreases the labour requirements by Plant Protection services.

A third opportunity with a chain-oriented approach towards monitoring plant health is the potential for combining product quality and phytosanitary inspections. In the current situation, phytosanitary inspections and quality inspections of final consumer products are usually the responsibility of different public organisations. Phytosanitary inspections and quality inspections are usually performed by different agents. Combination of these inspections offers a potential for efficiency gains, both in terms of money and time. The optimal control points for these combined inspections could be determined using a HACCP type of approach. An obstacle for the combination of phytosanitary and quality inspections could be the difference in the dynamics of quality diseases and plant diseases, with the latter having far reaching economic consequences in the long-run for the earlier stages of the plant production chain.

Conclusions

Several factors, particularly those related to the globalisation contribute to increasing risks of introducing harmful organisms in the EU. These increasing risks reduce the effectiveness of traditional tools of national plant health services in safeguarding plant health.

Plant health has public good characteristics and therefore requires the input from public sector organisations. Furthermore, the market for plant products is characterised by asymmetric information, largely because of the incubation time of diseases. The public good characteristics and the presence of information asymmetry require sound regulation by government agencies, e.g. through inspections and monitoring of the production of plant materials.

The trends in the introduction of risks of plant diseases require adjustments of the current phytosanitary policy. Alternatives are self regulation and chain risk analysis.