Unilateral Environmental Regulations and the Implications for International Commodity-Related Environmental Agreements

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Summary

Unilateral measures by individual countries to internalize environmental externalities may be hampered by a loss of competitiveness leading to a loss of market share and a loss of export

earnings. International Commodity-Related Environmental Agreements (ICREA) would aim not to stabilize prices but to deal with commodity-specific environmental issues in relation to international trade. Through negotiated full cost prices, ICREAs would internalize the costs associated with the introduction of clean technologies, commodity diversification, and sustainable management practices. The costs would be finally borne by the consumers of the services rendered by the commodities.

ICREAs do not yet exist and may not be generaliszable to all commodities produced by developing countries. Malaysia's unilateral attempts to control pollution from the production of palm oil, for example, were quite successful. The industry continued to expand despite having to incur additional costs in the form of pollution abatement. The costs are passed backwards onto the resource owners instead of forward onto consumers. Even then, impacts were relatively small compared to the total value of the output. International agreements for palm oil may more appropriately take the form of technology cooperation and sharing of the benefits of research and development.Introduction

Unilateral measures designed to maintain and restore the quality of the environment vary. In some countries, strict pollution control legislation has been enacted, coupled with the administrative machinery designed to enforce compliance. In others, particularly the developing countries, pollution control has been outweighed by other economic and social priorities. In lower income countries, the demand for increases in production, employment and income receives higher priority than the demand for increases in environmental quality. Restrictions on the use of inputs in favour of environmental quality can raise private costs of production and reduce international competitiveness. Countries which are more `open' will tend to be affected more by the imposition of environmental controls because their terms of trade and balance of payments are more closely related to levels of income and general welfare.

As experiences of developed countries demonstrate, policies that successfully protect the environment and foster sustainable economic growth often require producers, governments and consumers to modify their behaviour in ways that can involve short-term economic sacrifices in order to achieve more desirable long-term gains. Firms must devote their capital resources to install new equipment, to modify older technologies, or to change production processes to reduce harmful emissions. Similarly, farmers who shift to more environmentally-friendly practices may find their earning capacity curtailed, at least in the short term. In developing countries, where the demands for rapid economic growth are compelling and where the ability of producers to pay for environmentally-friendly methods of production may be limited, it will be difficult for governments to impose environmental policies that appear to constrain economic opportunities unduly. It is important to identify and characterize an environmental problem before deciding on a policy instrument. Instrumentas should provide an acceptable level of environmental protection while minimizing cost and any economic disincentive effects.

It is generally accepted that the environment is a collective good which is to be protected by public policies. Several alternative strategies available to the government for internalizing the various externalities that produce environmental problems include regulation (and/or prohibition), fiscal measures (including various kinds of taxes and subsidies) and government provision of environmental services. These strategies pose clear alternatives for the main thrust of government environmental policy.

Governments intervene in the operation of an economy through the provision of subsidies, setting price and quality controls, and the regulation of sectoral activities. Many interventions have detrimental side- effects on the environment because they fail to internalize the full costs of resource exploitation and use. Many studies have shown that a wide array of agricultural subsidies had not taken environmental objectives into account (OECD, 1989). These included production incentives

(e.g., subsidies for wheat production) income support subsidies (e.g., direct payments to farmers), set-aside programmes (e.g., taking land out of production to reduce surpluses) and subsidies for production diversification (quota systems). As a result of a programme to subsidize the use of fertilizer, hundreds of small farmers are applying excessive amounts of fertilizer to their holdings. What is not absorbed by the crops or volatilized to the atmosphere eventually reaches the local water body. There it creates algal blooms, which eventually die and decompose, reducing the supply of oxygen available to fish. For local farmers to maintain the same level of productivity with reduced fertilizer applications, they would need to spend additional time and money testing the nutrient status of the soil and applying fertilizer more frequently and only as needed. Correcting such "public policy failures" can be a high pay-off area due to the possibility of simultaneously improving both environmental performance and overall economic efficiency. It is anticipated that an international agreement such as an International Commodity-Related Environmental Agreement (ICREA) is a viable incentive for governments to pursue sound environmental policies without fearing serious economic losses. Unilateral attempts by individual countries to internalize environmental externalities would be penalized by a loss of competitiveness leading to a loss of market share and a loss of export earnings.

During recent years, there has been growing recognition that pollution damage costs should be internalized. Getting the price right is probably the most important factor in an effective pursuit of sustainable development. Unless prices for raw materials and products properly reflect social costs, and unless prices can be assigned to air, water and land resources that presently serve as free inputs and cost- free receptacles for the waste products of society, resources will be used inefficiently and environmental pollution will likely to increase. Unfortunately, the price of many natural resources has historically been set too low to reflect their full cost. Further, the social costs associated with consuming and possibly exhausting the resource are usually ignored in setting prices. The concept of full cost pricing should prevail for all types of use with the price set to at least cover the supporting costs of the services: capital investment, operation and maintenance and environmental costs.

Agenda 21 provides a guide to all countries on the possible strategies and action plans available for achieving sustainable development. Much of the actions still have to be dependent on the initiatives of each country. International Agreements and Conventions need not always be viewed negatively as trade barriers. They should be considered as new challenges so that new visions and strategies can be formulated. It is important that the public and private sectors as well as private citizens should reinforce each other to ensure that industry will be able to meet environmental excellence standards. The industry should seek opportunities from international agreements rather than consider them as threats.

Meanwhile, governments will continue to work at the international level to remove any unjustified eco- labelling intended to raise trade barriers.

ICREAs provide a possible instrument for correcting international commodity under- pricing. This paper first reviews the basic concept of ICREAs and the several forms theymay take to promote the use of production technologies which make production more sustainable. It then examines the case of unilateral environmental regulation for Malaysian palm oil.

The Concept of ICREA

New commodity pricing arrangements that reflect the costs and benefits of environmental protection are essential to promoting sustainable development. In this regard, international trade can become a primary vehicle for the internalization of environmental costs. Through negotiated full cost prices, ICREAs internalize the costs associated with the introduction of clean technologies, commodity

diversification, and sustainable management practices. The costs are then borne by the beneficiaries of the services rendered by the commodities. Revenues could be administered by each ICREA secretariat. ICREAs are not oriented at price stabilization, but are solely created to deal with commodity-specific environmental issues in relation to international trade (Kox and Linnemann, 1993). The underlying objectives of ICREAs in the order of importance are as follows (Kox, 1994):

1. internalize environmental externalities in the price of exported commodities, so that the ultimate consumers in the long term pay the full resource costs;

2. promote eco-friendly production methods for a specific primary export commodity;

3. support governments of exporting developing countries in creating ecological policies for the export sector;

4. contribute to export diversification programmes in developing countries where natural preconditions

are not fit for producing the commodity in an environmentally sound way, but where a lack of alternative foreign exchange sources would otherwise impede participation.

Forms of ICREA

Depending on the market and production conditions for the commodity, an ICREA may take several forms, all of which are intended to promote the use of technologies for sustainable production. Type-A involves standard-setting without financial transfers; Type-B involves financial transfers that enables governments of exporting countries to create and enforce environmental policies related to the commodity. Other types of ICREAs would combine elements of the two types such as a standard-setting with preferential access to foreign markets.

Type-A

A standard-setting ICREA applies common standards with regard to production technology and ecological impacts by signatory producers. Participation of importing countries is not necessary except that it could facilitate sanctions for non-compliance. With a Type-A ICREA, the majority of important producer countries must participate in order to form an international producers' cartel to establish common ecological norms or technology-related standards. Common international standards may be established for production technology, product standards, performance standards and emission standards with regard to a particular commodity. Common ambient standards could not possibly be established because different countries have different resource endowments, levels of pollution, waste and absorptive capacities, systems of production, labour and capital intensities and levels of development and also because of governments' reluctance to give up their policy discretion. Harmonization of standards may be very difficult to negotiate because of the international diversity in resource endowments and policy preferences.

Type-B

This type of ICREA is more flexible than the standard-setting Type-A. It involves intergovernmental agreement to internalize environmental costs of a specific primary commodity which are internationally traded. Countries have greater flexibility in determining their environmental targets and implement measures in relation to their environmental impacts, technological options, environmental policy, national conditions and priorities. This type of ICREA involves financial transfers from a fund which is fed by an import levy charged at border-crossing in importing countries and administered by an ICREA Secretariat. Governments of producing countries can draw

on this fund to strengthen their institutional capacity to implement policies and programmes conducive to sustainable development and to make producers switch to environmentally sound techniques.

There are two justifications on the need for such an ICREA fund. The first is that, for sustainable production and eco-friendlier technology to be adopted at the international level, actions need to be taken in producing countries which would not be undertaken unilaterally. The source contributing to the fund will depend on who the beneficiaries are when internalization of externalities is the crucial issue. Thus, the fund can be viewed as rents or resource consumption allowance (by analogy with the capital consumption allowance or depreciation) from using the environmental media in the production of the specific commodity. If it is a purely financial- technical issue, sources may not matter because financing may come in the form of contributions from Official Development Assistance (ODA), the Global Environmental Facility (GEF), UNEP programmes and/or private sector financing mechanisms.

The second justification for the fund is that the domestic demand for capital exceeds the supply in many commodity producing countries and the country needs to borrow from abroad. Such borrowings may be undertaken in pursuit of sustainability objectives. In order to avoid borrowings a country must use resource rents to finance economic diversification into activities that are ecologically friendlier and which are relatively more dependent on labour and human- made capital. These activities sustain the economy as the environmental quality dwindles. Operational issues pertaining to Type-B ICREA are not dealt here but are discussed in Kox (1994).

Compatibility of ICREAs With GATT/WTO

The main international institution governing trade is the General Agreement on Tariffs and Trade (GATT) which came into being in the late 1940s. Its purpose is to set out rules and procedures to be followed by nations in their international trade relationships. It is especially aimed at reducing trade barriers, to constrain nations from imposing tariffs and quotas on imports or subsidies on exports, and in general to move toward conditions of free trade. One section of the GATT agreement prohibits what are called nontariff barriers (NTB), such as excessive inspection requirements, excessive product specifications, and the like. But there are exceptions to the rules: for example, under article XXb and XXg, governments are allowed to set restrictions in order to achieve the protection of human, animal or plant life or health, and the conserving of natural resources, respectively.

GATT Contracting Parties completed the Uruguay Round of negotiations after seven years on December 15, 1993 with a package of agreements on terms and conditions for liberalization of international trades. The package was signed at the Marrakesh ministerial meeting on April 15, 1994. The meeting also decided to establish a Committee on Trade and Environment within the jurisdiction of the new World Trade Organization (WTO). Many experts are expecting the agenda for the next round of GATT/WTO negotiations to be the integration of trade and the environment or the "Green Round". The primary focus of the work programme would be the promotion of sustainable development. This would include the adoption of international policies, measures and instruments to reduce the pressures and burdens on the planet's ecological capacity caused by overconsumption of the North and the creation of ecological space and the assurance of resource availability for the sustainable development and poverty alleviation of the South. Two core issues have been identified. First, what are the effects of environmental regulation on trade policy; secondly, what will be the effects of trade liberalization on the environment? In fact the "Green Round" has already been launched informally. Several expert meetings of GATT have identified the following possible issues for future negotiation:

a. The use of trade measures in multilateral environmental agreements and their possible

incompatibility with GATT Articles. For example, both the 1987 Montreal Protocol (on Substances that Deplete the Ozone Layer) and the 1989 Basel Convention (on the Control of the Transboundary Movements of Hazardous Wastes and their Disposal) have trade restrictions which contravene the liberal trade principles of GATT.

b. The transparency of national environmental regulation. Developed countries always want to impose more environmental requirements in developing countries both in terms of enforcement and economic instruments such as the imposition of additional environmental regulations and the removal of subsidies for fuels. In this regard, it is possible that they will also propagate a universal set of environmental regulations for all countries so as to ensure that the manufacturers will internalize the environmental cost. Therefore, there will also be a need to ensure all national environmental regulations to be transparent.

c. The trade effects of so-called eco-packaging and eco-labelling. The developing countries are very concerned with actions taken by many developed countries in legislating regulations to restrict or ban imports of goods from developing countries through eco- labelling. The developing countries consider such moves contravene the spirit of GATT.

The two types of ICREA, Type-A (standard setting) and Type-B (financial transfer) can be designed to be compatible with GATT rules. For Type-A, exporting countries should be free to apply on a voluntary basis standards for process and production methods (PPMs) and eco- labelling in the context of international agreement provided that neither will discriminate against non-parties to the agreement. Type-A will not be compatible with existing GATT rules if mandatory PPM standards and eco-labelling are unilaterally imposed by importing countries.

Type-B ICREAs can be made to be consistent with the GATT system of trade rules in several aspects (Kox, 1994):

(a) Import levies to finance the ICREA fund
Import tariffs would not be created as trade barriers to protect domestic producers. For several primary products exported from tropical countries, the commodity does not compete with a similar commodity in the importing countries. Moreover, import tariffs would be created only in the context of an international agreement in which exporting countries participate voluntarily. Revenues from import tariffs would be fed into an ICREA fund and would be channeled back to the exporting countries to finance their environmental programmes. However, in the case of palm oil, it has 16 other competitors in the world oils and fats market, the main rival being soybean. Thus, import tariffs for the sake of ICREA fund would likely be seen by exporting countries as trade barriers.

(b) Applicability of GATT waivers

Exceptions to GATT rules on nontariff barriers allow governments to take measures which deviate from the general provisions of the agreement. Besides exemptions XXb and XXg in which ICREA should qualify, waiver XXh allows trade-related measures under an intergovernmental commodity agreement. This exemption could also be relevant for ICREAs provided that there is broad country participation to the agreement.

(c) Trade sanctions against free riders

Trade sanctions will be avoided as far as possible. Instead, participation and compliance by exporting countries can be stimulated through positive incentives of financial transfer and technology cooperation.

(d) Freedom of countries to apply national environmental policies
ICREA of Type-B does not prescribe the formulation of a country's national environmental policy measures. Countries have sovereign discretion in determining their environmental targets and in implementing measures in relation to the environmental impacts of commodity production, technological options and national priorities.

Practically, everyone would agree that there is no incompatibility between trade and environmental protection. In fact, few of the more than 150 international agreements on environment had been identified as having trade provisions. Trade and market access of developing countries can be expanded to enable them to meet their basic needs as well as achieve environmental protection. While environmental costs have impacts on global competitiveness, assignment of costs should move from the `polluter pays' to the `buyer pays' principle so that product prices reflect the `internalization' of environmental costs. Adoption of a process for cost internalization to be agreed and coordinated multilaterally through ICREA would avoid adverse impacts and help build `peace between trade and environment'. Adherence to multilateral principles on the use of such agreements for environmental purposes is therefore essential. Incentive-based mechanisms to encourage developing countries to internalize environmental costs such as by facilitating transfer of environmentally sound technologies and finance to encourage countries to adopt and implement higher standards are also needed. The rationale is that the importing countries have been the main beneficiaries of past and present trade have the `cushion' to absorb adjustments. The exporting countries, being mainly impoverished, cannot afford to bear more burdens, especially since they are already enduring debt payments and structural adjustments.

A major reason why environmental policies and standards of OECD countries were perceived to be potential barriers to trade of developing countries was that in formulating them, the characteristics of productions or production processes used in developing countries were generally ignored. Aware of these issues, the exporting countries should be in a position to act positively to the challenges in the negotiation process with a carefully negotiated mandate. In terms of the mandate, exporting countries should be promised expanded market access and thus increased export earnings for their commodities. In return, they would agree to bring into an ICREA system the requirements for ecologically sound production proportionate to their natural resource endowments, levels of pollution, waste and absorptive capacities, systems of production, labour and capital intensities and levels of development.

The Standards Code

The Standards Code, which emerged from the Tokyo Round negotiations in April 1979, included a major international effort to provide a framework of principles for managing problems arising from product standards that affect trade. This effort produced a Code of Conduct for Preventing Technical Barriers to Trade. The Standards Code was extended and amended under the Uruguay Round to include environmental objectives.

Environmental product standards can impair market access for exporters. The product standards may act as trade barriers to exporters who must comply with a variety of standards in different export markets. In fact, environmentally related product standards merge into the longstanding trade issues of health and sanitary standards, and can be analysed as one type of nontariff barrier (NTB). Sovereign countries have the right to establish health and sanitary standards for products through Article XX of the GATT, and this right extends to imported goods. Such standards must meet two tests: first, their purpose is to contribute to a legitimate domestic objective, such as conservation of natural resources, the protection of health or safety, essential security, environmental or consumer interests; and, second, product standards must be applied equally to domestically produced products as well as to imports.

The U. S. Toxic Substances Control Act, and similar legislation in other countries illustrate the serious potential of environmental standards as nontariff barriers. Although there is little evidence that environmentally related product standards have been used as disguised trade barriers, countries (especially developing countries) are concerned about market access. Trade barriers have often laid the groundwork for competitive imperfection. Whether by intent or not, many regulatory product standards have the effective result of restricting freedom of entry and the free flow of goods. Even if not used as covert trade barriers, product standards can impair market access by fragmenting markets, increasing production costs and requiring testing and verification procedures that discourage imports.

However, probably the greatest amount of competitive imperfection stems from product differentiation, either real or assumed, from various kinds of services offered with the product. The great majority of food by the time it reaches the consumer has been differentiated by brands and packaging. Differentiation techniques are becoming more important among importing countries. The objective of most differentiation is to remove the emphasis from price and to associate product labels with the buying urge. Eco-labels are used to inform consumers that the products are more environmentally-friendly produced than others in the same category. Eco- labels give the product a higher status than the general product standards if consumers are willing to pay a higher price for the labelled product. To the extent that eco- labels contribute to higher prices, these could be actively promoted and strengthened within ICREAs. With eco- labels, a product could receive preferential treatment by importing countries, complementary to the product standards in the Type-A ICREAs. However, ICREAs based on trade preferences will pose problems due to the possible violation of the Most Favoured Nation (MFN) treatment in GATT rules.

Interest in eco-labelling and international product standards is increasing in developing countries, including Malaysia. The Malaysian Government has set up a Malaysian Accreditation Council (MAC) to accredit registrars to operate the ISO 9000 quality system for manufacturers. The MAC, formed in March 1994, came under the aegis of the Ministry of Science, Technology and the Environment. The MAC would give private and commercial registrars the opportunity to be recognized by the government. Besides accrediting private and commercial registrars, it would hand out ISO 9001/2 quality system certificates and register and keep track of other accreditation schemes. The MAC would also be able to harmonize with the accreditation bodies in other countries as it would be part of an international network of accreditation bodies. Among the members of MAC are the Ministry of International Trade and Industry, the Rubber Research Institute of Malaysia, the Health Ministry, the Standards and Industrial Research Institute of Malaysia, the Federation of Malaysian Manufacturers and the National Cocoa Council. The establishment of MAC would also safeguard the interests of genuine companies which wanted their products certified. It would also safeguard the ISO 9000 standard as well as protect the quality of Malaysian-produced goods.

The Malaysian Palm Oil Situation

During 1975-85, production of crude palm oil (CPO) in Malaysia rose from 1.3 to 4.1 million tonnes (Table 1). This expansion strengthened the industry as the world's largest producer and exporter in 1980s and made it the country's second largest earner of foreign exchange by 1984. In 1989, oil palm (Elaeis guineensis) covered about one-third of the country's cultivated area amounting to 1.95 million hectares, surpassing rubber hectarage for the first time. Export earnings from palm oil and related products continue to increase despite less favourable prices due to higher export volume. Currently, the palm oil industry maintains its position as the third largest export earner of the country after petroleum and timber. Contribution of palm oil to the GDP has increased from 4.3% in 1980 to 8.4% in 1989. The industry also provides a source of livelihood to about 200,000 rural families in Government land schemes and individual smallholdings and employment to some 120,000

workers on estates. Additionally, a substantial number is employed in ancillary supporting industries in trading, milling, processing and manufacturing. In global terms, palm oil has become the second most important vegetable oil after soyabean oil in the world's oils and fats complex since 1982. Palm oil accounted for about 13.6% of the world production of oils and fats in 1989. With the continuing expansion of oil palm principally in Malaysia and Indonesia, palm oil would have to strive for further increases in market share from the level of 30.7% currently attained. Palm oil has the ability to do so given its versatility in a variety of food and non-food applications, its good nutritional quality and its competitive cost of production vis-a-vis other vegetable oils. Unfortunately, market distortions are still rampant in the world oils and fats trade, thus Malaysia has to contend with discriminatory tariff structures in certain markets as well as with extraordinarily large production and export subsidies of oils and oilseeds accorded by rich industrial countries i.e. the United States of America (US) and the European Community (EC). Based on its performance, the palm oil industry is expected to continue to contribute significantly to the overall Malaysian economy in the 1990s.

World Oils & Fats Situation

World production of 16 major oils and fats is currently rising by 2-3% a year, which is less than the average growth of 3.2% a year between 1985-88. Consumption continues to grow by 3-3.5% a year resulting in a reduction of closing stocks. This growth is still lower than the average consumption growth of 4.5% per annum during the period of 1985-1988.

Of the global production of 16 major oils and fats, the major share is taken up by soyabean oil with an output of 19.8% of world production in 1989; palm oil was next at 13.6%, followed by rapeseed oil at 10.4%, sunflower oil at 10%, tallow at 8.7% and butter at 8.3%. In the case of coconut oil and palm kernel oil, their production amounted to 3.7% and 1.7% respectively.

World supply of vegetable oils in 1990s saw a significantly expansion in the production of palm products, principally from Malaysia and Indonesia, and to a smaller extent rapeseed, sunflower, groundnut and cottonseed oils. After the drought in 1988, the US oilseed crop recovered while the crop output from Canada and EC continued to grow. In the case of India, favourable weather conditions for two consecutive seasons have resulted in a substantial increase in oilseed production, mainly of groundnut, rapeseed and sunflowerseed.

Of world exports of major oils and fats, palm oil is the largest traded oil, accounting for 30.7% of world export in 1989. This was followed by soyabean oil at 15.1%, tallow 11.2% and rapeseed oil 7.6%. With regard to coconut oil and palm kernel oil, their share of world oils and fats trade amounted to 5.2% and 3.6% respectively. Of significance is that palm oil has managed to increase its market share of world export from 10% in the 1960s to 16% in the 1970s and to 30.7% in 1989.

Malaysia is the world's largest net exporter of palm oil accounting for 68.3% of world export, followed by Indonesia at 13.9%, Papua New Guinea at 1.6% and Cote d'Ivoire at 0.96% in 1989. This excludes export from Singapore of 724,000 tonnes which is treated as re-export.

World consumption of oilseeds, vegetable oils and meals has risen in the past years in line with increases in world population, rises in per capita income and expansion of animal protein production programmes in some countries, especially in the Soviet Union (USSR). Over the years, there has been a conscious switch from animal oils and fats to vegetable oils on coconut of health. Global demand for different vegetable oils, oilseeds and its derivative products hinges on supply, price differentials, uses and consumer preferences. In this context, palm oil is well placed to satisfy consumer needs on the basis of competitive prices and quality.

With the recent shift towards a greater usage of vegetables oils, world consumption of the major

vegetable oils including soyabean oil, palm oil, rapeseed oil and sunflower oil continues to increase. In contrast, world consumption of fish oil and animal fats declined by 0.3 million tonnes to 20.1 million tonnes in 1989. Overall, world consumption of 16 major oils and fats continue to increase with soyabean oil at 20.3% of total world oils and fats consumed constituded the largest components, followed by palm oil with 13.3%, rapeseed oil with 10.3% and sunflower oil with 9.7%. The average consumption growth of total world oils and fats during 1985-89 was 4.2%, with consumption of vegetable oils growing at 5.3% and animal fats at 1.4% over the period.

Per capita consumption of oils and fats ranged from 4 kg per annum in Bangladesh to 39.6 kg per annum in the USA. Malaysia has a per capita consumption of 17 kg, higher than Indonesia's 12 kg per annum. The populous markets of the People Republic of China (P.R. China) and India both have per capita consumption of 7.7 kg and 7.3 kg per annum respectively. There are prospects for per capita consumption to be increased in many countries especially those in the Third World. In many countries, per capita consumption is still below the average per capita of 13 kg per annum as recommended by the World Health Organization as the minimum intake consonant with a healthy and balanced diet.

Pollution Control in the Palm Oil Industry

In Malaysia, the crude palm oil (CPO) industry was the worst source of water pollution. Pollution caused by the organic wastes from CPO mills was equivalent to pollution generated by a population of more than 10 million people (nearly as large as the entire population) in 1975 (Table 2). Effluent control in the palm oil industry is effected through a system of licensing within the Environmental Quality (Prescribed Premises) (Crude Palm Oil) Regulations 1977 (Amendment 1982). Under the licensing procedure, appropriate conditions, mainly effluent standards, are attached to each license. In addition to the standards, effluent-related license fees are levied on the BOD load discharged. The imposition of effluent-related fees as well as incentives through waiver of fees for research have expedited research in palm oil mill effluent treatment technology. Pollution control from the palm oil mills is encouraging, as these mills have been constructively receptive to the regulations and have progressed satisfactorily towards meeting the more stringent standard of 100 mg/l BOD.

The approach in controlling pollution from palm oil mills is largely based on the best practicable means concept with provisions for gradual integration with river basin management concept. The centrally planned pollution control regulations enforced on the industry will likely be far from a least-cost way of achieving water quality goals. The installation of in-plant measures would limit the discharge of effluents from mills to a certain extent but not necessarily eliminate the total effluents discharged into the rivers. It is usual to find situations where the water quality of some rivers continue to deteriorate despite the fact that effluents from mills are complying with discharge standards. Such situations arise because the total effluent loads discharged into the receiving waters exceed the levels that the river can assimilate. A more efficient and sustainable approach requires the establishment of national water quality criteria and standards. This would form an integral part of the concept of river basin management.

Environmental Quality (Prescribed Premises) (Crude Palm Oil) Regulations Section 51 of the EQA confers power upon the Minister to make regulations for the purpose of carrying into effect the provisions of the EQA. The regulation making power is exercisable after consultation with the Environmental Quality Council. A number of committees comprising representatives from relevant government agencies and the industry were appointed to develop and recommend appropriate standards for the palm oil effluents. These standards were "not only environmentally sound but also sensible within the framework of economic feasibility and available technology" (Ong, Maheswaran and Ma, 1987). The DOE took almost two years of preparatory and consultations before the standards were incorporated into the Environmental Quality (Prescribed Premises)(Crude Palm Oil)

Regulations, 1977 (Amendment 1982) which was announced on July 7, 1977.

Effluent control in the palm oil industry is effected through a system of licensing and applications of effluent discharge standards. Under the licensing procedure, conditions, mainly effluent standards, are attached to each license. The regulation allowed one year for the mills to install treatment facilities and then to comply with the four stages of allowable discharge limits into a watercourse (Table 3). The first stage of standards took effect on July 1, 1978. During the first year palm oil mills were required to reduce the effluent characteristics, taking BOD concentration as the key parameter, from 25,000 mg/l untreated effluent to 5,000 mg/l in 1978/79 and to 500 mg/l by 1981. These BOD limits were further reduced to 250 mg/l in 1982 and finally to 100 mg/l in 1984. In addition to the standards, effluent-related license fees are levied on the BOD load discharged. Dischargers were required to pay RM100 per tonne for BOD loads exceeding the legal standard and RM10 per tonne of BOD for loads equal to or less than the standard. Each discharger also paid a non-refundable RM100 annual license- processing fee.

The regulations leave the palm oil mills the option of discharging the effluents onto land subject to a fee of RM50 per 1,000 tonnes instead of into a watercourse. The amount of effluent-related fees computed for land disposal and watercourse discharge were equivalent for the standards set during the first generation. For example, a 100,000 tonnes of BOD load with a concentration of 5,000 mg/l standard of the first generation discharged into a watercourse would require the mill to pay RM5,000 (0.005 x 100,000 x RM10) effluent-related fees. If the mill were to dispose the effluents onto land the effluent- related fees were also RM5,000 (100,000 x RM0.05) regardless of the BOD concentration.

During the later generations of standards, however, effluent-related fees for watercourse discharge were substantially lower than those for land disposal. For example, a 100,000 tonnes of BOD load with a concentration of 100 mg/l standard of 1984 discharged into a watercourse would require the mill to pay effluent-related fees of RM100 (0.0001 x 100,000 x RM10) subject to a minimum of RM150 specified in the regulation compared to RM5,000 (100,000 x RM0.05) for land disposal. Thus, the regulation seemed to create an incentive for watercourse discharge over land disposal for palm oil mill effluents.

High effluent-related fees and the waiver of fees for research on effluent disposal or treatment as provided for in the regulation expedited research with remarkable breakthroughs in the treatment technology. Mills which succeeded in developing technologies to reduce BOD were rewarded by being charged lower effluent-related license fees. The legislation empowers the Director General to waive partially or completely effluent-related fees payable if he "is satisfied that research on effluent disposal or treatment of a kind or scale that is likely to benefit the cause of environmental protection is being or to be carried out at any prescribed premises..." In determining the extent of the waiver the authority considers the quantity and quality characteristics of effluent discharged or to be discharged that is involved in the research. Palm oil mills are required to report the total effluent discharge, its composition and the method of disposal every three months, in addition to the annual application for an operating license.

Performance of the Regulations

Pollution control in the palm oil industry has been considered far from satisfactory in terms of compliance. The problems are attributed to improper management of treatment systems and the use of under-sized systems while expanding milling capacity. In 1991, out of 112 mills monitored 75 percent were found to comply with the discharge standards for BOD of 100 mg/l (Table 4). The implementation of the regulations to control pollution from the palm oil mills are encouraging, as these mills have been constructively receptive to the regulations and have progressed satisfactorily

towards meeting the desirable target of 100 mg/l BOD.

The industry did incur additional costs due to the implementation of the regulation. Capital costs accounted for most of the costs associated with treatment systems. However, relative to the industry's total production costs, treatment costs were low: only 0.2% in 1983 (Chooi, 1984). Due to the nature of the world market structure for fats and oils, the increased costs of production were unable to be shifted onto the consumers. Instead, two-thirds to three- fourths of the costs were shifted upstream and ultimately borne by oil palm growers, who had no outlet for palm oil fruits aside from sales to the palm oil mills (Khalid, 1991; Khalid and Braden 1993). The regulations caused prices of fresh fruit bunches (FFB) to be much lower than they would have been otherwise due to the oligopsonistic nature of the market. Thus, environmental protection need not necessarily impair the overall competitiveness of the industry in the open economy and the industry continued to expand even when the regulations were more stringent.

Enforcement of the Regulation

During the initial years of the enforcement of the regulation the palm oil industry regarded effluent treatment as an additional cost of production. Compliance with the discharge standard of 5,000 mg/l BOD was not mandatory during the first year of implementation both to allow sufficient lead time for the building and commissioning of treatment systems and for further development of relevant treatment technology. Many mills chose to pay the fees rather than treat their effluent to meet the standard. Out of 130 mills, 46% paid license fees of more than RM10,000; 7% paid more than RM100,000 and a total of RM3.5 million were collected (Table 5). A 67.8% reduction in BOD load discharged was recorded.

During the second year of enforcement it was mandatory for mills to reduce their BOD discharge to 2,000 mg/l and the license fee was levied at the rate of RM10 per tonne of BOD. None of the mills paid more than RM10,000 in effluent-related fees during the year and a percentage reduction of BOD load discharged was recorded at 84.7%. A progressive reduction in the total BOD load discharged were recorded as more stringent BOD standards were implemented. In just two years of mandatory enforcement the total BOD load discharged had achieved a 94.2% reduction despite increases in the number of CPO mills from 131 to 147 and in the amount of CPO output from 1.8 to 2.6 million tonnes (Table 6). It appeared, then, that the motivation to comply with the standard was not the fee, but rather the risk of being shut down for violating the mandatory standard. The standard deserved most of the credit for the industry's rapid reduction in the aggregate BOD load discharged.

The industry's efforts to develop even better treatment technologies were given a boost in 1980 when the government established the Palm Oil Research Institute of Malaysia (PORIM). A survey conducted by PORIM and the Rubber Research Institute of Malaysia in 1980-81 found that 90% of the 40 mills surveyed were discharging palm oil mill effluents (POME) with a BOD concentration below the fourth- generation standard (500 mg/l), and that 40% were discharging POME with a BOD concentration below 100 mg/l. These findings and other evidence of ongoing improvements in treatment technology led the DOE to announce the fifth- and sixth- generation BOD standards that called for even lower BOD levels (refer Table 3). In concession to the industry, the DOE eliminated the standards on COD, total solids, and organic nitrogen, which the survey revealed had proved difficult for the industry to meet. By the end of 1982, 80% of the 185 palm oil mills were complying with the fifth-generation standard (250 mg/l).

Resource Recovery

The industry's ability to reduce its BOD discharge has been facilitated by not only improvements in

treatment technology, but also by the development of various commercial by- products made from POME. As early as 1977, a Danish company saw a market opportunity and began marketing to mills a process to convert separator sludge into animal feed (Jorgenson, 1977). By 1982 ten large pig and poultry farms were using palm oil meal in their feed mixes. Mills that discharged POME onto land found that it had a fertilizing effect. This enabled many plantations to eliminate their purchases of fertilizers, which saved one company an estimated RM390,000 per year. In 1982, three mills with tank digesters were recovering methane, 60- 70% of the gases generated during anaerobic digestion, and using it to generate electricity for mill use. One analysis found that the payback period for the investment required to build an integrated fertilizer/biogas recovery system was 3.1 years (Quah, et. al., 1982). In 1984, 4 mills found uses for all their POME and consequently had zero discharge (Maheswaran, 1984).

Lessons from the Malaysian Experience

Malaysia's experience with the regulation in the palm oil industry offers several lessons for pollution control efforts.

1. Pollution reduction and industrial expansion can occur simultaneously. The fact that an industry is economically important is not grounds for being reluctant to address its pollution problems. One reason for success in merging environmental and industry objectives was the development of effective and relatively inexpensive technology. Industry was able to develop numerous by-products from the effluent. Another reason was the industry's ability to shift the costs associated with pollution control onto the suppliers of the raw materials.

2. Effluent charges were not responsible for most of the reduction in BOD discharge. During the first year of implementation, standards were not mandatory and firms chose to pay effluent charges. After the first year of implementation, the motivation to comply with the standard was not the effluent charge, but rather the risk of being shut down for violating the mandatory standard. The effluent charges were seen as a means of reinforcing a system of uniform standards.

3. Effluent charges offer abatement cost savings compared to uniform standards but the savings can be small. The magnitude of potential savings depends on the degree of variation in the marginal abatement costs across pollution sources. The greater the variation, the greater the scope for efficiency gains through a reallocation of resources for abatement.

4. The industry can be worse off under an effluent charge than a uniform standard. The sum of effluent charges and abatement costs under the former can exceed the abatement costs under the latter. From a social perspective, effluent charges are still better: the objective is not to minimize industry's costs, but to minimize society's. The effluent charges can be interpreted as potential compensation to the victims of pollution. Even if such compensation is not directly paid out, the revenue from effluent charges benefits society if it is used to fund monitoring, enforcement, and clean-up activities. The higher costs understandably make effluent charges less attractive to industry.

5. Effluent charges can result in local pollution problems. The simulation results indicate that some mills would discharge effluent with a BOD concentration well above historical standards if faced with only an effluent charge. Although it is possible to design a cost-effective system of "ambient charges" which vary across pollution sources and are linked to local ambient conditions, such a system is information-intensive, difficult to administer, and in essence not much different from a system of firm- specific effluent standards, which offers an environmental agency greater certainty about pollution abatement.

6. Malaysia's experience with environmental regulation in the crude palm oil industry offers no lessons about the determination of optimal pollution levels. The effluent charges and standards were not chosen by comparing marginal abatement costs and marginal abatement benefits. Information on the value of environmental benefits is limited in Malaysia.

Research and Development

Research and Development (R&D) efforts undertaken by both the public and private sectors have contributed significantly to the impressive development of the Malaysian palm oil industry. PORIM is intensifying R&D activities on palm oil to enhance the industry's resilience in the wake of strong challenges faced by the Malaysian palm oil sector. These efforts are reinforced by complementary R&D activities undertaken by the major plantation companies. R&D activities of PORIM include the development of new uses for palm oil products. Such efforts have helped to increase utilization and will continue to create a greater demand for the expanding supply of palm oil.

In terms of increasing productivity, PORIM has concentrated on improving oil palm yield through breeding and selection research. High yielding palms with better oil quality have been identified and elite planting material is being propagated to the industry. There are good prospects for increasing yields from elite palms to a much higher level than currently obtained. Efforts to clone selected elite palms for vegetative propagation through tissue culture are continuing.

Other areas of improving production efficiency include better fertilizer application, the use of locally available urea as a substitute for the more expensive and imported ammonium sulphate and the control of pests and diseases through biological control and other means. In this regard, while weevils have been successfully introduced to assist pollination, barn owls are being propagated as biological control agents rodents.

In order to overcome labour shortage in harvesting and collection of FFB in the plantation sector, PORIM continues to carry out trials on prototype harvesting machines, FFB cutters and infield transporters produced by local and foreign machine manufacturers.

R&D efforts on utilizing oil palm by-products have proven successful. Production of pulp and paper from oil palm fronds, pulping of oil palm trunk, production of blockboard from oil palm lumber, utilization of oil palm empty fruit bunches for the production of roof tiles and conversion of oil palm trunks into furniture have been shown feasible. Some of these are being commercialized through pilot plant studies and small scale production evaluations with the help of private sector companies.

In line with the country's efforts to promote resource-based industries under the IMP, increased R&D efforts have been targeted on the use of palm oil as substitute raw materials for consumer end-products in the food and non-food sectors. In food uses, PORIM has actively provided services to local industries and end-users of palm oil overseas. Various shortening and margarine blends had been formulated for local refiners. Provision of technical services overseas includes commissioning of margarine plants with palm- based formulations and product development for a number of consuming countries. Palm butter oil blends were also successfully formulated for biscuit making. Formulations of blends for spray-dried milk powders such as coffee creamers and infant formula have also been undertaken. Coffee whitener based on hydrogenated palm kernel oil is now being successfully produced on a commercial basis.

In the area of non-food applications, R&D has been undertaken to extend applications to include palm- based metallic soap in rubber processing, palm-based epoxy acrylated coating and palm-based calcium soaps as animal feed supplement for ruminants. In candle making, incorporating palm fatty acid in the paraffin wax formulation helps to increase the strength and burning life of candles.

Research on palm- based surfactants, especially sulphonated methyl esters, would provide a potential substitute for petroleum- based surfactant.

A new refined and deodorized palm oil has been produced for evaluation. This new product contains relatively high contents of vitamin A and E (carotene and toco-pherol respectively) and will enhance palm oil as a nutritious oil.

PORIM has intensified its nutrition research on palm oil. To-date, PORIM supports 49 projects on a worldwide basis with the primary aim of providing greater scientific evidence on the beneficial and nutritional properties of palm oil. These research projects are being carried out by established and reputable universities/institutions in the US, UK, the Netherlands, India, Pakistan, Australia, Republic of Korea and Malaysia. Repeated experiments in animal and humans show that palm oil feeding does not raise the level of blood cholesterol. In fact, evidence indicates that palm oil, being a balanced oil, behaves more like an unsaturated oil in its effect in lowering blood cholesterol. The presence of anti-oxidants contributes to this positive result.

In order to improve productivity, efficiency and quality apart from reducing milling and processing costs, PORIM initiated the Certificate of Competency of Mills Scheme in 1985. This has contributed towards quality enhancement of CPO and efficiency of mill operation.

The control of effluent discharge by the palm oil industry is important to minimize pollution. In this connection, research activities have centred on the treatment of palm oil mill effluent (POME). As a result, POME, both raw and treated, as well as empty fruit bunches containing high plant nutrients is being recycled for usage as fertilizer resulting in significant savings in fertilizer cost. For this purpose, a guideline for effluent application has been drawn up. This includes making use of heat and electricity generated from biogas as an energy source in several palm oil mills.

Conclusion

Malaysia's ability to compete for increasing market shares for its palm oil has resulted in the rapid expansion of its palm oil production. Indeed, its palm oil production has grown very rapidly over the years, particularly in the 1970s and 1980s. However, in the future, owing to the constraints posed by the availability of suitable land as well as labour, increases in palm oil production are anticipated to slow down. Therefore, the industry should undertake efforts to consolidate and strive for further improvements so as to achieve greater efficiency and to bring about cost reductions apart from strengthening the competitive position of Malaysian palm oil in the world oils and fats market.

The Malaysia's palm oil industry has also made positive contribution to the country's resource-based industrialization through the setting up of palm oil-based industries. In this connection, the potential for the further development in the oleo-chemicals sector is very good. Production of Vitamin E from palm fatty acid distillate (PFAD) has been identified to have the potential for commercialization and efforts in this direction are being made. In addition, extraction of Vitamin A is also being studied as a substitute for synthetic materials currently utilized.

The present developments would further enhance awareness about the nutritional quality of palm oil and the product standards, thereby improving its acceptability among users. Besides its technical advantages and versatility, palm oil would be able to compete fairly on the basis of its health and nutritional attributes. With the support of science and technology, the prospects for Malaysian palm oil would be strengthened in the years ahead.

In spite of the fact that the industry grew even while it was facing stringent environmental regulations, the regulations did impose costs on the industry. By 1984, mills spent RM100 million to

construct and operate treatment systems. Both refined and crude palm oils are sold in an extremely competitive world market for fats and oils. This prevented the industry from passing the costs of treating the effluents onto the consumers. Instead, most of the costs were ultimately borne by oil palm growers, who have no outlet for the fresh fruit bunches (FFBs) aside from sales to crude palm oil (CPO) mills. The regulations made FFB prices lower than they would have been otherwise. Although the effects of the regulations on FFB prices was discernable through economic analysis, it was not obvious in the marketplace. One wonders how could an ICREA for palm oil be operationalize when at the present stage of development only Malaysian producers internalize their environmental costs. Yet, these costs of internalization has been rather small to cause severe economic impact on the producers. Moreover, ICREAs are temporary measures that once the full cost pricing has been established, market forces will determine the equilibrium. Thus, with the experiences of Malaysian palm oil producers other possible areas of cooperation with other producers are possible. These include technology cooperation, policy cooperation, research and development and institutional strengthening for palm oil-specific commodity built within the general strategies and actions for regional cooperation within ASEAN which are summarized as follows:

FOCAL POINTS FOR ASEAN ENVIRONMENTAL COOPERATION Technology Cooperation

Strategy: Develop a system for the promotion of environmentally sound technologies.

Actions: Establish linkages with existing clearing houses on environmentally sound technologies. Establish mechanisms that identify end users of R & D results and encourage the participation of private sector.

Strengthen linkage and coordination with other ASEAN committees such as the Committee on Science and Technology (COST) doing related R & D work on the environment.

Support the promotion of indigenous technology or technologies that have been adapted to regional needs.

Policy Cooperation

Strategy: Promote government-private sector interactions that lead towards the development of policies that mutually support the thrust of each sector.

Actions: Initiate studies on development of environmental and trade policies which are supportive to the principles of sustainable development.

Establish mechanisms that encourage government and private sector to adopt appropriate environmental standards backed up by sufficient economic incentives.

Set up government-private sector information linkages/networks to include information on technology, expertise and facilities for environmental management.

Research and Development

Strategy: Strengthen the knowledge and information data base on environmental matters.

Actions: Pursue the establishment of basic environmental quality standards leading to the setting up of harmonized quality standards in the region.

Identify centers of excellence for R & D and eventually build them as focal points of environmental networks.

Establish a mechanism for the preparation of periodic reports on the state of the region's environment.
Institutional Strengthening

Strategy: Strengthen institutional and legal capacities to implement international agreements on environment.

Actions: Undertake a comparative study on the institutional structure and legislation for environmental management.

Establish capacities to support regional efforts to implement international agreements and participate effectively in negotiation of new or revised agreements.

Enhance collaboration with international bodies overseeing the implementation of international agreements and cooperation.

REFERENCES

Chooi, C.F., 1984. "Ponding System for Palm Oil Mill Effluent Treatment." In Proceedings of the Workshop on Review of Palm Oil Mill Effluent Technology vis-a-vis Department of Environment Standard (PORIM Workshop Proceedings No. 9). Palm Oil Research Institute of Malaysia, Bandar Baru Bangi, Malaysia.

Department of Environment, Malaysia. Environmental Quality Report 1981-84

Department of Environment, Malaysia. Environmental Quality Report 1991

IMF, International Financial Statistics, Various issues.

Khalid, A.R., 1991. "Internalisation of Externalities: Who Bears the Cost of Pollution Control?" The Environmentalist 11(1):19-25.

Khalid A.R. and W. Mustaffa W.A., 1992. "The External Benefits of Environmental Regulation: Resource Recovery and the Utilization of Palm Oil Mill Effluents." The Environmentalist 12(4):277-285.

Khalid, A.R. and J.B. Braden, 1993. "Welfare Effects of Environmental Regulation in an Open Economy: The Case of Malaysian Palm Oil." Journal of Agricultural Economics 44(1):25-37.

Khalid, A.R., 1993. "The Economics of Pollution Control: Does Malaysia Need Regulatory Reform?" NETTLAP 6, November, p. 135-172. United Nations Environment Programme.

Khalid, A.R., 1994. The Standard-cum-Charge Approach in Environmental Policy: The Malaysian Experience in Applying Economic Instruments to Environmental Policies in OECD and Dynamic Non-Member Economies. ISBN 92-64-14212-6, OECD, Paris, p. 59-82.

Kox, H. L. M. and Linnemann, H. (1993). International Commodity-Related Environmental Agreements as Instruments for Promoting Sustainable Production of Primary Export Commodities, Paper presented at International Expert Meeting on Strategies for Sustainable Resource Management and Resource Use, Noordwijk, 3-4 June.

Kox, H. L. M. (1994). The International Commodity-Related Environmental Agreement: Background and Design. Unpublished Report on ICREA Research Project. Faculty of Economics and

Econometrics, Free University, Amsterdam, June.

Ma Ah Ngan, C.S. Chow, C.K. John, Ahmad Ibrahim, and Zaid Isa, 1982. "Palm Oil Mill Effluent Treatment - A Survey" in Proceedings of Regional Workshop on Palm Oil Mill Technology and Effluent Treatment (PORIM Workshop Proceedings No. 4), Palm Oil Research Institute of Malaysia.

A. Maheswaran and Godwin Singam, 1977. "Pollution Control in the Palm Oil Industry - Promulgations of Regulations." Planter 53: 470-476.

A. Maheswaran, 1984. "Legislative measures in the control of palm oil mill effluent discharge" in Proceedings of the Workshop on Review of Palm Oil Mill Effluent Technology vis-a-vis Department of Environment Standard (PORIM Workshop Proceedings, No. 9), Palm Oil Research Institute of Malaysia.

Malaysia, Department of Statistics. Oil Palm, Coconut, Tea and Cocoa Statistics Handbook, Various issues.

Malaysia, Ministry of Agriculture (1992). The National of Agriculture Policy (1992-2020).

Malaysia, Ministry of Primary Industries. Statistics on Primary Commodities, Various Issues.

Augustine S.H. Ong, A. Maheswaran, and Ma Ah Ngan, 1987. "Malaysia" in Environmental Management in Southeast Asia, edited by Chia Lin Sien, Singapore: National University of Singapore Press.

S.K. Quah, K.H. Lim. D. Gillies, B.J. Wood, and J. Kanagaratnam, 1982. "Sime Darby POME Treatment and Land Application Systems" in Proceedings of Regional Workshop on Palm Oil Mill Technology and Effluent Treatment (PORIM Workshop Proceedings, No. 4), Palm Oil Research Institute of Malaysia.

Vincent, J.R. 1993. "Malaysia's Palm Oil Effluent Charges." Paper presented at HIID Environmental Economics Workshop Technical Case, Harvard, June 15.

ENDNOTES:

1.Hereinafter referred to as EQR (CPO).

2.BOD concentration is the intensity of the biochemical oxygen demand of effluent, measured by reference to the BOD of a standard unit of volume of the effluent, such as a litre; thus effluent is said to have a BOD concentration of, say, 5,000 mg/l, if its oxygen-consuming potential is such that one litre of it will, according to laboratory test, utilize, during a period of three days and at a temperature of 30 degrees Centigrade, 5,000 mg of oxygen in the process of its biochemical oxidation. Dilution of the effluent is prohibited, whether raw or treated at any time or point after it is produced at any prescribed premises without prior written authorization of the Director General.

3. op. cit.

4.Regulations 17(1), 17(2) of Environmental Quality (Prescribed Premises)Crude Palm Oil) Regulations, 1977.

5. This section concludes the findings by Khalid 1993.

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