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# PRESIDENTIAL ADDRESS

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The intellectual challenge now facing our agricultural economics profession is indeed very great. Providing food to a growing world population requiring sufficient and also reliable supplies of adequate and diverse products remains a challenging task for agriculture; this problem is somewhat masked in many developed countries, in view of their need to control growing supplies in face of sluggish demands. The problems raised by these contrasting situations are extremely diverse. They are complex and interdependent. It is on this last point that we are invited to reflect during this conference. As you know our theme is: 'Agriculture and Governments in an Interdependent World'.

It would be very presumptuous to try to discuss this theme in all its breadth within the scope of one paper, even a Presidential Address, when we are going to devote seven days of discussions, plenary papers, and parallel sessions to this theme. And this does not include the contributed papers, discussion groups and posters which may also touch, directly or indirectly, on topics related to our main theme. Yet, some sort of introduction may be useful. Perhaps, as President, I may discuss several aspects of our main theme, since no-one else during this conference will have the chance to do so. Choosing this approach, in spite of the risk of being excessively superficial, seems to me to be warranted because it will permit me to touch on the international state of our profession and the agenda we face, that is, subjects traditionally viewed as befitting a Presidential Address.

An interdependent world! What do we mean by that? Is there anything new conveyed by this expression? Many analysts have long ago observed that the tremendous technological progress in communication and transportation and the ensuing growth in the use of modern means of communication have transformed the world into a 'village'. The already old expression 'the jet-set society' reflects a related idea. In addition, interdependence is not a new concept for economists. On the contrary, the main contribution of economic theory is that it provides us with intellectual tools to handle economic interdependencies. The concept of economic equilibrium, partial or general, is designed to help us capture the eventual result of the behaviour of numerous, interdependent, economic agents.

But, if the nature of interdependencies and the concept are not new, the magnitude and the complexity of the problems which have emerged for agriculture in the world have probably reached levels approaching or perhaps exceeding those of the late 1920s and early 1930s that culminated in worldwide depression and war. Progress in communication and transportation has had an impact on markets and on non-market interdependencies. Generally speaking, agricultural commodity and capital markets have become more competitive.

National governments' attempts to control and manage their economies are more and more constrained by the evolution of these international markets which respond to long term economic forces and to other governments' actions. Because of these interdependencies public authorities feel the need to co-ordinate their actions; but the absence of a world government or of effective disciplines controlling the behaviour of each and every national government renders such co-ordination very difficult, both for agricultural market interventions and for macroeconomic policies.

Technological and ecological interdependencies are also very strong; they also raise major problems of policy co-ordination in the absence of a world government. All of these lead to serious questions regarding our ability, as a profession, to throw useful light on the most pressing issues or our time affecting agriculture. In this address I would like to briefly review these interdependencies and then to draw some implications from that reflection for our profession, and more particularly for the bulk of our activities during this conference.

## MACROECONOMIC INTERDEPENDENCIES

First, let us emphasize the uniqueness of the current situation due to the magnitude of the existing macroeconomic imbalances in the world's economy; it will then be possible to discuss the major consequences for agriculture of these imbalances and of their correction, whatever way these corrections will occur. Finally, reviewing the main economic linkages generally at play may help us systematically to take macroeconomic interdependencies into account in our agricultural economics work.

### *The uniqueness of the current situation*

In a recent article, Bergsten (1987) eloquently expressed the dramatic nature of existing macroeconomic imbalances: 'The unprecedented international imbalances of the first half of the 1980s have fundamentally altered the structure of the world economy. The United States, the creator of the postwar economic system and home of the world's key currency, has become the largest debtor nation ever known to mankind – and its red ink will continue to flow at least into the 1990s: Japan, widely viewed as a developing country only a generation ago, has become by far the largest creditor – and its massive build up of foreign assets will continue expanding rapidly, as far ahead as one can predict . . . The forces set in train by these historic changes will dominate the course of global economic events for the next five to ten years and may go far to influence world politics as well'.

Because of a long series of trade deficits compensated by massive inflows of financial capital, the net indebtedness of United States can be predicted to exceed half a trillion dollars by the end of the 1980s. Bergsten estimated that the United States would have, after servicing its debt, to improve the rest of its yearly current account balance by about US\$200 billion, the bulk of this having to come from trade in manufactured products. At the same time, Japan would have to accept

a US\$100 billion decline in its annual trade balance. Such changes require major domestic readjustments in the United States and in Japan, as well in Western Europe and many other countries. Thus, for instance, the United States would have to run a trade surplus, which would require producing more than it spends, save a higher proportion of its income, cut its budget deficit dramatically or reduce private investment, which would of course be much less desirable. It should be pointed out that such changes represent dramatic reversals of long established past patterns of behaviour. The requirements for Japan are no less formidable: reduce its growth rate, its propensity to save, expand domestic demand and re-tool its productive apparatus to cater much more to a new, expanding domestic market. As already evidenced in recent years, Germany will be submitted to the same type of political pressure to adjust its macroeconomic policies as Japan. If these adjustments take place, the consequences for other countries will be considerable.

Bergsten further argues that 'the issue is not whether the United States and other countries will adjust to the realities of global interdependence. Though countries cling jealously to absolute nominal sovereignty, real economic sovereignty has long since eroded substantially . . . . Policies must be internationally compatible to be sustainable, and to avoid levying huge costs on all parties.'

Of course, a major difficulty stems from the political obstacles to macroeconomic policy co-ordination. In their Plaza agreement of 1985, the G5 financial authorities<sup>2</sup> recognized that the totally unmanaged flexibility of exchange rates had failed as much as the lack of flexibility of fixed exchange rates, inherited from Bretton Woods, had failed in the early 1970s. This was a clear recognition that joint action was needed. But in the same article quoted above, Bergsten argued that policy adjustments following the Plaza agreement had gone only halfway to what was needed. Whether or not the economic policy makers will have the foresight, the courage, or even the possibility to adjust sufficiently macroeconomic policies in a concerted manner, or to mutually impose upon themselves a new set of international monetary rules, remains to be seen. There is no doubt however that the current imbalances reflect major macroeconomic interdependencies which, in any case, will have dramatic consequences for agriculture.

### *Consequences for agriculture*

Trade deficits lead to protectionist pressures. So do major and rapid shifts in comparative advantages brought about by major shifts in exchange rates. Industries and activities which are no longer competitive on world markets argue that they face unfair competition and clamour for protection. Whether or not such requests are legitimate or not is a moot point; what matters for our purposes is that this is an economic cause of a very strong political pressure. And this, of course, has repercussions for agriculture both within the affected country and outside.

In many developing countries the service of the external debt will require an increase of export earnings. For many of them, particularly in Africa, the prospects for exports of industrial raw materials and manufactured goods are

bleak. This means that agricultural exports must increase. At the same time rapid demographic growth imposes the need to increase domestic food production, even if complete food self-sufficiency is not aimed for. In these conditions, managing the balance between export and subsistence crops and keeping total agricultural production growing will represent a tremendous challenge in many of these countries.

G.E. Schuh has been one of the first members of our profession to call our attention to the impact of changes in macroeconomic conditions on agriculture. After a first paper on the role of the exchange rate (Schuh, 1974) he wrote a more comprehensive article in 1976; since then macroeconomic changes have been even more dramatic. But his original analysis remains a useful guide to the impact of the current macroeconomic situation on agriculture, even if it was mainly couched in terms suitable for agriculture exporters.

The main economic influence of macroeconomic changes on agriculture is exerted through the exchange rate. Agricultural products are generally tradable. They are not much differentiated and, as such, the export demand faced by the agricultural producers of a given country is usually price-elastic, which means that its export demand is very sensitive to exchange rate variations.

Since most prices of agricultural commodities on world markets are expressed in dollars, variations in the exchange rate of the dollar are extremely important for agriculture in many countries. A further depreciation of the dollar, which is likely considering the existing macroeconomic imbalances discussed in the previous section, will have adverse effects on agricultural producers in countries whose currency is not strictly linked to the dollar. Admittedly, this impact is not automatic: it relies on the existence of a positive transmission elasticity of domestic prices relative to world market prices but we assume that this is a very general situation.

Of course, much would be changed if the dollar were replaced by the yen as the key international currency. International prices of agricultural commodities would then be expressed in an appreciating yen instead of a depreciating dollar. Such a development should not be viewed as totally unrealistic. After all, the dollar replaced sterling as the international currency when economic agents refused to hold sterling assets which were depreciating because of the UK balance of payment deficits. The same could happen to the dollar. At this stage, such a development is unlikely. Bergsten speaks of a bipolar financial system; he does not believe that the total substitution of the yen for the dollar is likely.

Specific consequences for agriculture of macroeconomic adjustments are brought about by intersectoral linkages. For instance, if Japan were to undertake the macroeconomic policy referred to above, a tremendous increase in land prices could be expected. Some observers argue that the current level of protection on rice leads to high land prices, which are one of the major obstacles to a boost in aggregate consumption, 'modern' consumption patterns requiring much more space for houses, recreation, automobiles, and so on, than is available in the islands of Japan. But the argument can be given a different angle. An increase in domestic aggregate consumption would raise the price of land and this would further erode the international competitiveness of Japanese agriculture, thereby increasing the political pressure for border protection. As a result

international trade negotiations about agriculture, particularly in GATT, would be further complicated.

### *The main economic linkages*

More generally, it is useful to conduct a systematic review of the economic phenomena usually at play in the relationship between macroeconomic changes and the situation of agriculture. As already indicated, the main influence is exerted through the exchange rate. An overvalued exchange rate acts as a tax on exports and a subsidy on imports. Tradables are discriminated against, relative to non-tradables. The reverse is true if the exchange rate is undervalued. Of course, these impacts can be amplified or compensated by border measures, as reflected in the concept of the effective rate of protection. But, for the purpose of analysis, let us remember that exchange rate variations tend to lead to changes in relative domestic prices.

Briefly summarized, the main factors influencing the exchange rates are those which influence the financial flows between a country and the outside world. This link is direct when the value of the currency is free to float. In the more general case where public authorities intervene, the influence of financial flows (capital movements) remains very strong because they are taken into account by public authorities in their decisions to devalue or to 'peg' their currencies . . . . As emphasized by Schuh (1985), the development of capital movements, that is, financial flows not directly related to trade flows, has been spectacular in the last 10 to 15 years. In recent years, total international financing declined (from 347 billion ECUs in 1985 to 250 in 1987) (Gilibert *et al.*, 1988). Yet it remains true that capital movements largely dominate trade flows in determining the exchange rate of a currency. Of course the former are influenced by the latter and, in the long run, changes in purchasing power parity probably remain a major determinant of exchange rate variations.

Through interest rates, monetary policies influence international capital movements. Interest rates also constitute a primary instrument available to public authorities to check inflation, which of course affects the purchasing power of the domestic currency. These interactions reflect the well-known existence of macroeconomic interdependencies at the domestic level, which are themselves closely interrelated with the international interdependencies discussed so far.

To take such interdependencies fully into account would require a full-fledged macroeconomic model. It would be beyond the scope of this paper to present even the main features of such a model here. As agricultural economists, let us only remember that such an intellectual framework is necessary if we want to fulfil our professional goal, namely to interpret the main determinants of the economic problems faced by agriculture.

## SPECIFIC MARKET INTERDEPENDENCIES

Admittedly, the influence of macroeconomic changes on agriculture is often

transmitted through market mechanisms. It was pointed out above that the main influence was exerted through the exchange rate, which affects, and in return is influenced by, relative prices and the general price level. In this section, we want to focus on interdependencies through specific markets where farmers operate directly: the markets where they sell agricultural goods and the markets for their main factors of production, namely, land, labour and capital.

### *Agricultural commodity markets*

Interdependencies among domestic agricultural commodity markets through international linkages have grown in recent decades. This is reflected in the mere fact that international trade represents a growing share of total world production. Even if that share remains relatively small, there is no doubt that the price of cereals on world markets has a pervasive influence on many domestic markets. These include the markets for cereals, for cereal substitutes in production (such as oilseed crops and sugar beet) and in consumption (such as other livestock feeds), as well as for livestock products, because the latter often depend on cereals as an input in their production.

The interrelationships among world prices and domestic agricultural policies are also very close. For many products (cereals, oilseeds, dairy products, poultry meat, pork, beef, sugar, and so on) prices on world markets today result from direct government interventions as well as long term trends in supply and demand. Such interventions are the general rule in developed countries, as illustrated by the positive nominal rates of protection of many agricultural products in most of these countries (Anderson and Hayami, 1986). Because government interventions are widespread and massive, they have a major impact on world prices. Thus, when the United States lowered its Loan Rates by 25 per cent after the passing of the 1985 Food Security Act, world prices of the corresponding products declined significantly. Today, the subsidy war between the United States and the European Community is such that prices paid by importers have recently represented less than one half, and often only on third, of the price received by the American or the European producer.

Conversely, this extreme situation is the source of considerable pressure on domestic agricultural policies. For several years the budget of the European Community has been under serious strain because of the decline in the world prices of agricultural commodities, spendings for agricultural market policies representing 60 to 70 per cent of the total EC budget. Under this pressure, a reform of the Common Agricultural Policy was adopted in February 1988 and measures have been decided which limit the growth of public spending for agricultural market policies. These will clearly lead to lower guarantee price levels and to some measures to check the growth of production. The budget pressure is perhaps less strong in the United States, where the 1985 Food Security Act can be interpreted as a compromise between the desires to safeguard farm incomes and to regain world market shares, somewhat sacrificing on the desire to limit budget expenditures: Loan Rates (intervention prices) were reduced but Target Prices much less. The latter are received by farmers who agree to participate in government programmes, the difference between the Target Price

and the market price, which varies closely with the Loan Rate, is supported by the Federal Budget. Since 1985, the corresponding agricultural payments have become very visible and have been subjected to political pressures. This may lead to policy reform in the future. But in this respect much will probably depend on whether or not progress is made in the current GATT negotiations on agricultural trade. Before discussing these, it is necessary to take into account the impact of low world prices on other countries, particularly developing countries.

Various studies have been made to estimate the impact of a possible liberalization of agricultural trade, that is of a drastic decline in government intervention on agricultural markets. Assuming a positive elasticity of supply, they all conclude that there would be an increase in world prices of most agricultural commodities. The impact on the welfare of developing countries depends heavily on whether or not their present policies discriminate against agriculture, as many do. It also depends on whether or not the particular country is a net importer or a net exporter of agricultural products. For the former, consumers suffer a loss. Thus there is no doubt that the current situation provides them with at least a term of trade gain. But the most important impact may be the long-run effect of low world prices on the development of domestic agriculture. In many developing countries, particularly in Africa, growth of agriculture is a necessary ingredient of any sustainable development strategy. The present situation is not conducive to agricultural growth since imported foodstuffs supplied to large urban centres, benefiting from the subsidy war among developed countries, cost much less than domestic products, penalized in addition by limited transportation facilities. Policy makers, under pressure from urban areas, as evidenced in Senegal in the spring of 1988 for instance, are tempted to take advantage of this cheap food, thereby sacrificing the potential contribution of agriculture to long-term growth.

Developing countries in which agriculture provides a significant share of their exports, such as Argentina for instance, lose on all counts. The domestic macroeconomic consequences can be such that the depressed price situation on agricultural world markets is a catastrophe.

Thus, it should not come as a surprise that several of these countries want to put pressure on developed countries, particularly on the United States and the European Community, so that they stop dumping their excess agricultural production on world markets. It is in this perspective that the 'group of Cairns' was created. Made up of 13 developed and developing countries<sup>3</sup>, organized at the initiative of Australia which hosted the first meeting in the city of Cairns, the group's specific objective is to fight the use of unfair trade practices, such as export subsidies, in the field of agriculture.

The creation of the Cairns group may reveal, and at the same time promote, a very significant change in the domain of agricultural trade negotiations. Because of powerful historical reasons, agriculture has until now been exempted from many GATT disciplines. Earlier attempts to liberalize agricultural trade in previous rounds of multilateral trade negotiations (MTNs) failed. The main reason for this situation is the refusal by most developed countries to place their domestic agricultural policies on the negotiating table. Yet in the field of agriculture, domestic and international trade policies are closely interrelated and it is not possible to negotiate seriously on the latter without discussing the former.



In recent years a major change may have occurred in this respect. Several statements at the highest political level at meetings among developed country leaders, such as the Tokyo and Venice G7 summits or an OECD Ministerial meeting in the spring of 1987, have indicated a commitment to co-ordinate agricultural policies in order to avoid the most damaging trade consequences and conflicts resulting from these policies. The action has now moved to the Committee on Agriculture of GATT, where a new round of MTNs was launched at a meeting in Punta del Este (Uruguay) in September 1986. At the time of writing, it is not at all clear whether or not these negotiations will succeed. There is no doubt, however, that, whether they fail or succeed, the impact on world markets and on the interdependencies resulting from these markets will be considerable.

### *Labour, land, and capital markets*

Conditions on the land and labour markets have a direct influence on the evolution of farm structures. Thus, in a sense, these markets reflect the consequences of the evolution of agriculture, including the consequences of the growing interdependencies which have been discussed so far. At the same time, the land, capital and labour markets are the vehicles through which other interdependencies affecting agriculture are expressed. This results from the mere fact that labour and land are also used as inputs by non-agricultural activities. Thus these markets reflect intersectoral linkages. In this respect, the most important phenomenon affecting the evolution of agriculture in many regions of the world is the migration of labour out of agriculture and rural areas. Even when migration is quantitatively compensated for by demographic growth, its impact is often very significant because different segments of the population are not equally involved in the migration process. Classically, migrants are predominantly young, male and relatively better educated than those who stay.

In addition, many migrants keep ties with members of their families remaining in the village. These ties can take very diverse forms, depending on the original family organization and on migration patterns. Generally speaking however, labour outmigration increases the number of households relying on multiple economic activities, that is, not solely on agriculture, for their livelihood. In many cases, some migrants go abroad. This creates strong interdependencies. For instance, the oil boom in the Arab Gulf, which was obviously related to the general world economic situation, had significant repercussions on villages and, as a result, on agriculture in many regions of countries stretching at least from India to Morocco.

In spite of early recognition in farm management work of the linkages between farm and family (see for instance Ramaratnam, 1981), and of relatively recent theoretical progress on the 'new household economics', all the implications for agriculture of the existence of numerous, multiple activity households have not been fully derived. On the theoretical front, the teachings of Becker (1981) have to be combined with those of Chayanov (1924). But in addition many analyses of the revolution of agriculture should take more into account the effect of the rising value of time (Schultz, 1972) for at least some members of the

farm family. Indeed, such a phenomenon implies that in very remote areas agricultural growth may be favoured, and in some places hampered, by the new set of economic relationships between villages and faraway urban centres resulting from labour migration. Accordingly, in the hills of Nepal, our research team has shown that farmers had very little economic incentive to invest their cash earnings in agriculture. Techniques and infrastructure development are such that the average and marginal productivities of labour used in agriculture are very low (Bergeret, 1986). In such a case, migration does not lead to agricultural development. By contrast, in Southern Tunisia remittances of migrants have helped to finance a remarkable growth in tractor purchases, leading to greater volumes of production but also to unwanted soil erosion. These examples are only given here to illustrate the numerous possible ramifications of labour market interdependencies. The impact on intensive fruit and vegetable farming in developed country agriculture, such as in California or in Southern France, is another example of such a ramification.

Although land values may be related to exchange rate variations, the evolution of the land market is more often than not the result of the evolution of agriculture. Thus farm land prices plummeted in the United States and in Western Europe in the late 1970s and early 1980s as a result of farm income losses resulting from stagnating world market prices while inflation rates were high. In many places, land prices are not only influenced by farm returns but also by expectations of urbanization. The area covered by such expectations is much greater than the area which will actually be urbanized in the next ten to twenty years. In such cases, the land market may indeed be a very powerful vehicle of interdependencies affecting agriculture.

Of course, the land market is also an important vehicle in the case of deep changes in economic policies. Thus for instance, it was recently decided in China that rights to operate farm land could be sold from one family to another, in the framework of the 'household responsibility system'. In such a case, the 'land market' reflects a shift in policy and this may have very significant consequences for agriculture.

Changes in farm structure, characterized by an evolution of the land-labour ratio, affect and, conversely, are influenced by changes in capital markets, as illustrated by the recent financial difficulties of agriculture in many countries, at both micro and macroeconomic levels. For instance, sharp shifts in interest and inflation rates, caused by the macroeconomic imbalances discussed above, have led to serious problems for many farmers in developed countries. The external debt crisis facing many developing countries has had serious and multifaceted consequences for agriculture in these countries. The issues raised by these phenomena are so important that this constitutes one of the main themes of our conference.

## TECHNOLOGICAL INTERDEPENDENCIES

Progress in communications has led to an acceleration in the circulation of new knowledge. Scientific advances can be diffused much more rapidly than in the past. This is the source of new interdependencies with multiple ramifications.

We shall first explore here some consequences of these phenomena for technical change in agriculture, a traditional area of concern for agricultural economists. Technical changes are often embodied in new inputs. Past investments in those inputs by farmers and in Research and Development activities by input supplying firms create a momentum for technical change, which is not easy to check once it is started. This explains many current problems in developed countries. At the same time, technical change in the agriculture of developing countries is often disappointing, even though, there is no doubt that the diffusion of technical innovations in world agriculture has accelerated, as illustrated for instance by the phenomena associated with the 'green revolution' in many countries of Asia and Latin America. The main cause of this acceleration is probably the ease of diffusion of new knowledge. But we know that many other conditions are required for the creation of appropriate innovations and their adoption. Technical innovations are very seldom directly transferable from developed to developing countries. To be adopted they must be adapted to the specific ecological, economic, social, cultural conditions of agriculture. Many of these conditions are, at least to some degree, location-specific. Thus, if the new high-yielding varieties, which led to the green revolution, were developed on the basis of fairly well-known genetic knowledge, they still required the efforts of researchers at what was to become CIMMYT and IRRI to be broadly adapted to tropical conditions. In addition, they were only suited for specific situations in the Tropics, those which could benefit from good water control.

Since then, conscious international efforts have been made to generalize this model by the creation in the 1970s of the International Agricultural Research Centres and of the Consultative Group on International Agricultural Research (CGIAR). This new international system has been able to avoid many of the bureaucratic and ideological difficulties encountered by other international organizations. With its numerous contacts and collaborations in both developed and developing countries, the CGIAR embodies a new set of interdependencies of importance for agriculture.

For effective and speedy technical change in agriculture, other important ingredients are needed: an effective National Agricultural Research System relating well to the CGIAR network, a good agricultural education and extension system, and of course a favourable economic environment in terms of prices and input availability at the farmers' level. Unfortunately, these conditions are not easy to satisfy. Finally, a major obstacle to fast development induced by rapid technical change, of the type encountered in such countries as Pakistan and India during the green revolution', is the lack of technological breakthroughs equivalent to the new high-yielding varieties of wheat and rice which were available in the 1970s.

In addition, one must wonder whether or not developing countries are well equipped to take advantages of rapid scientific progress. Biotechnologies, often developed by private companies, may hold prospects of spectacular progresses in yields or in efficiency. *A priori*, nothing limits the application of biotechnologies to developed countries' agriculture. But specific economic and organizational conditions must be satisfied for developing countries to take advantages of advanced technologies. If they are not met the technological gap between developed and developing countries' agricultures will widen, thus further

shifting comparative advantage to the benefit of the former at the expense of the latter.

This 'natural' evolution may be strengthened by policy actions, if the recent development of political pressures by US commodity lobbies is successful. These aim at cutting US support to international development agencies, so that they stop supporting projects in developing countries leading to a growth of agricultural production competing directly with US products. So far, this movement does not exist in Europe. But the current crisis on international markets is so severe – and it will probably worsen – that such pressures may become very strong, perhaps threatening the generally wide consensus among national governments that the development of developing countries should be encouraged.

## ENVIRONMENTAL ISSUES

Ecology, which studies 'the interrelations between plants, animals and their complete environments', to borrow the expression used by the Encyclopaedia Britannica, is indeed a science of interdependencies. The increasing concern for the environment in recent decades results from a growing awareness of these ecological interdependencies and of the dangers faced by human societies, and even the whole of mankind, if the dire consequences for the environment of some human actions are ignored. Many misunderstandings and controversies result from the dual origin, both subjective and objective, of these concerns.

A major contribution of economics to the analysis and clarification of environmental issues rests on the paradigm of the tragedy of the Commons. Briefly summarized, the problem is formulated as follows: in a village, the commonly held and utilized land tends to be degraded because it is over-utilized and under-maintained. Unless some common social organization is established to police the use of the 'Commons', individual households have no incentive to individually maintain or improve it since others will be able to, and surely will, reap the benefits. In Olson's terminology, collective action to maintain resources is hampered by a 'free rider' problem. Alternatively formulated, the problem arises because private costs and benefits (to individuals) differ from social costs and benefits (to society as a whole) because of externalities (Lerner, 1944 and Jessua, 1968). As a result, the aggregate behaviour of individuals differs from the social optimum. This justifies either measures designed to internalize costs and benefits or, when this is not feasible, regulations to control resource use.

The relevance of these concepts and hypotheses can be illustrated using the example of current controversies about the conservation of tropical rain forests.<sup>4</sup> These controversies are sometimes very bitter; they reflect deep divergencies of values and they have entailed acrimonious public statements and the exercise of strong political pressure. In such a situation, the first role of agricultural economists, together with other professionals, should be to contribute to a clarification of the debates.

The issues at stake illustrate a set of interdependencies, which are both important and difficult to sort out. At the risk of over-simplification, the issues may be summarized as follows: deforestation is being caused by economic

pressures, migration from over-populated surrounding areas being facilitated by the choice of development strategies, such as the opening of new areas through infrastructural development spurred on by the desire to exploit timber, oil, or other mineral resources.

The ecological consequences of deforestation may not be completely established. Yet there are sufficient indications that they may be so damaging as to generate serious concerns. In this respect, three important issues may be mentioned here. First, about one half of the precipitation is recycled via evapotranspiration in the Amazon Basin compared with a global average of 12 per cent. If the forest disappears, less water will be recycled through evapotranspiration and the whole hydrological cycle will be profoundly modified. In addition, burning the forest may significantly increase the total amount of carbon dioxide in the atmosphere and thus increase global warming (the famous 'greenhouse effect'). Finally, deforestation may lead to 'irreversible loss of unknown and unevaluated genetic and cultural diversity' since humid tropical forests contain 40 to 50 per cent of all the earth's species and unique human cultures, which have knowledge of that diversity.

The public debate has been stirred mainly by concerns expressed outside of the region, particularly in North America. Beyond the ethical issues raised by such a geographic distribution of the actors involved in the policy debate, this situation illustrates yet another set of interdependencies besides those that were discussed so far. The 'tragedy of the Commons' paradigm suggests that deciding whether or not the negative potential effects of the destruction of the tropical rain forests are to be avoided and how this should be done is fraught with considerable difficulties in the absence of a world government. Simply stated, mankind may be lacking the necessary institutions to regulate and solve problems of this magnitude, involving deep conflicts of interests and of values. The channels to provide adequate, or even minimum, compensation to the losers have not yet been invented and it is not sure that they will be. Yet any policy scenario or any policy choice implies large numbers of potential losers who could be very significantly affected by the outcome.

## CONCLUSION

We live indeed in a more and more interdependent world which means a challenging, but perhaps eventually a better co-ordinated world. The first responsibility of agricultural economists is to understand better the economic situation and problems of agriculture at all levels: farm, local, regional, national and even worldwide. Few of us have a responsibility at the world level but the interdependencies, which were just discussed and which constitute the essential themes of our work during this conference, are such that this level cannot be ignored by any one of us.

For that purpose economic theory is a very useful and even indispensable tool. This means that, as I urged at the end of our meeting in Malaga three years ago, we should not hesitate to be 'full-fledged economists'. This is the reason why, several times in this paper, the theoretical basis of some of our problems has been presented. Admittedly, the presentation was not original; yet it was made to remind everyone of our professional identity as economists.

But, in spite of its potentially unique contribution, economic theory may be falling short of the task to be accomplished. How to elucidate policy options at the international level? Are international general equilibrium models the answer? Are they feasible? At which level of aggregation? Is a positive analysis of existing national conflicts of interests sufficient? If not, which normative model can be used as a reference? Is the concept of global world social welfare adequate and operational?

At the same time, let us not forget that ours is an association of applied economists. As stated in our constitution, our first purpose is 'to foster the application of the science of agricultural economics in the improvement of the economic and social conditions of rural people and their associated communities'. In this perspective, we must also keep in mind the limitations of economic theory. Two related considerations point out these limitations: first, many of the problems tackled by agricultural economists require multidisciplinary investigations (Johnson, 1986) and second, the basic concepts and some of the fundamental hypotheses of economic theory rely on hazy definitions, the ambiguity often reflecting fundamental intellectual problems. One result of these considerations is that our knowledge and our understanding of the interdependencies discussed in this paper are both comprehensive and inadequate. Let us keep in mind that we should remain intellectually humble.

Such a mental attitude should help us to benefit most from the unique opportunity of learning from one another. Some bring to this conference high professional and technical skills; others have unique experiences which do not perfectly fit into even the best *a priori* framework, be it a reference theory or the organizing principles of our programme during this conference. Let us make the best of these differences. Our diversity is probably our greatest asset. Let us use it collectively to face up to the tremendous challenge posed to our profession by the existence of problems requiring a world solution, such as those which result from macroeconomic imbalances, or the crises on world agricultural commodity markets, or the existence of multiple technological and ecological interdependencies, where there is no world government and the institutions for sorting out the confusions and solving the conflicts at the world level seem totally inadequate.

In such a situation, we shall do well to abide by the precepts formulated by our founding President at the first International Conference of Agricultural Economists held in England 59 years ago:

Friendship; Tolerance; Gravity.  
Humour; Thought; Play.  
Mix well and use freely while you are here.

*L.K. Elmhirst, 26 August 1929*

## NOTES

<sup>1</sup>The very useful comments of Glenn Johnson, John Lynam and Ed Schuh in the preparation of this paper are gratefully acknowledged.

<sup>2</sup>G5: meeting of representatives of the five major 'Western' economies (Britain, France, Germany, Japan and the United States).

<sup>3</sup>Argentina, Australia, Brazil, Canada, Chile, Colombia, Hungary, Indonesia, Malaysia, New

Zealand, Philippines, Thailand and Uruguay.

\*Much of the information on this topic is taken from an unpublished paper by John Lynam.

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