

# CEPAL Review

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## The environmental dimension in agricultural development in Latin America

*Nicolo Gligo\**

The general propositions on the relation between development and environment which are formulated in other articles appearing in the present issue of the *Review* acquire particular relevance in the light of trends in the Latin American agricultural sector over the last few decades. The peculiar dynamics of the style prevailing in the sector, which is conditioned by and at the same time influences the global development pattern, has produced effects on the environment among which the most outstanding are over-utilization of the soil and its consequent deterioration, and loss of resources, particularly on account of the rapid rate of deforestation.

The core of the article consists in a more detailed examination of this thesis, analysing the specific causes responsible for the current environmental situation in agriculture. Thus, the author highlights the repercussion of certain economic factors on the sector—such as the infrastructure available, demand for products and inputs and their prices, credit and marketing—, changes in the structure of land tenure and the ways in which technology is adopted, generated and disseminated.

In face of this situation, the author stresses the need to take into consideration the magnitude of the ecological cost that the continuance of the current trends in agricultural development would imply, and the importance of formulating other options whereby the necessary expansion of supply can be appropriately combined with a minimum deterioration of the environment.

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## I

### Agricultural development in Latin America and its physical environment\*

"Yon learned gentleman says that I must plant trees on this slope instead of ploughing it, and that I have to think of future generations, but begging his pardon, I think he's making a bit of a mistake, because if I don't grow food for my family there won't be any future generations."

Peasant farmer from the Commune of Navidad, Chile.

If the output currently obtained from agricultural resources is compared with what could be obtained with potential alternative uses, the resulting balance would conjure up a very optimistic picture of the future.

But the Latin American countries are facing, in greater or in lesser degree, serious problems in the development of their respective agricultural sectors. The situation is complex, and reveals increasing difficulties, since despite the significant changes that have taken place, especially in connexion with the striking growth achieved in recent decades, no solution has been found for endemic problems such as those deriving from low income levels, unemployment, the population exodus, rural marginality and, in particular, the deterioration of the physical environment.

The emergence of a new development style after the Second World War has constituted the framework for the changes in the sector. This new style has had repercussions on the prevailing patterns of capital accumulation, the structure of land tenure and income distribution, and modifications in relations of dependence are observable, alongside changes in cultural patterns, values, attitudes. These changes in agriculture have taken place as a function of the global changes in society. As Enrique Iglesias says, "... it is not possible to speak of the social situation of agriculture without referring to the problems of the econo-

\*The author wishes to thank Osvaldo Sunkel for his comments.

my as a whole, since the problem of agriculture in isolation does not exist, just as the problem of the 'social situation of agriculture' does not exist in isolation". And he adds that in a new development style the complex role of agriculture becomes increasingly important, but this role in its turn determines the limitations of global analyses.<sup>1</sup>

In the scenario created by the new development style, agriculture is of noteworthy dimensions, and in addition old problems have been aggravated and new ones have emerged. Latin American agriculture is still of fundamental importance in the development of the region; in 1977 it generated 44.2% of total foreign exchange and its share in the gross domestic product amounted to 11.7%.<sup>2</sup> The product is much bigger than it was 25 years ago; between 1950 and 1975 its average growth rate was 3.5%, with the result that it is 2.5 times larger.<sup>3</sup>

This growth was accompanied by significant changes in structures and internal social relations. These changes were influenced by the different policies making for technical and entrepreneurial modernization, as well as by diverse land reform processes in degrees of depth that vary both as regards transformations of land tenure systems and in respect of spatial coverage and the growing penetration and predominance of capitalist patterns. Nevertheless, despite these changes, income disparities have persisted and in many areas rural poverty has actually increased.<sup>4</sup>

The most salient characteristics of the style—in particular, structural heterogeneity—are also in evidence in agriculture: areas of inten-

sive capitalist agriculture contrast with large marginal and sub-marginal deteriorated areas, and the concentration of investment in the former is counterpoised by its scantiness in the latter.

In the areas of intensive agriculture and in those where the agricultural frontier is being extended, one of the features observable is the steadily increasing activity of the transnational corporations, which have had a marked influence on the adaptation of the structures of production, not only in relation to output itself, but through their importance in the fields of marketing, agroindustries and international markets. Accordingly, international market trends and the introduction of changes in consumption habits, as well as domestic demand, have also influenced the reorientation of the structure of production.

Together with the modernization of the entrepreneurial sector and the penetration of the transnational corporations, the last 30 years have witnessed a notable incorporation of technological innovations, which have helped to raise land and labour productivity.

But over and above these well-known characteristics of Latin American agriculture, an aspect that must be considered is the series of environmental problems which the agricultural development style has left in its wake, since *pari passu* with growth resources have deteriorated or been destroyed. Over-utilization of the soil has accelerated to a marked extent; the destruction of a percentage of the natural wealth of the various ecosystems as a result of the extension of the agricultural frontier has been partly responsible for the loss of some of the production potential and has wiped out future resource possibilities.

Consequently, Latin American agriculture is facing a tricky situation; and everything seems to suggest that unless significant structural changes are effected or technology takes great strides forward, this situation will be likely to grow worse in the forthcoming years. All evaluations indicate that the environmental problems of agriculture are becoming more and more serious, since to the difficulties inherent in the specialization of the ecosystem must be added the loss of resources occurring year by year.

<sup>1</sup>Enrique V. Iglesias, "The ambivalence of Latin American agriculture", *CEPAL Review*, Santiago, Chile, second half of 1978, pp. 7-17.

<sup>2</sup>CEPAL, *Statistical Yearbook for Latin America 1978* (Spanish-English), United Nations Publication, Sales No.: 79.II.G.3, p. 72.

<sup>3</sup>CEPAL/FAO Joint Agriculture Division, *Veinticinco años en la agricultura de América Latina: rasgos principales, 1950-1975*, Cuadernos de la CEPAL, No. 21, Santiago, Chile, 1978, p. 9, table 1.

<sup>4</sup>Latin American Institute for Economic and Social Planning (ILPES), *La pobreza crítica en América Latina. Ensayo sobre diagnóstico, explicación y políticas*, Vol. 1, p. 3. (Reference taken from Aníbal Pinto "Styles of development in Latin America", *CEPAL Review*, first semester 1976.)

Deforestation has gathered catastrophic speed (between 1976 and 1980, in Latin America and the Caribbean, it averaged 4 127 000 hectares per annum).<sup>5</sup> Over-utilization of the soil has resulted in increased erosion and the sedimentation of watercourses. (For example, in Mexico 8% of the soil is completely eroded and 43% is undergoing accelerated erosion.)<sup>6</sup>

In addition to these problems, mention must be made of the historical deficiencies of irrigation systems and customs which have created serious salinization problems (in Argentina it was calculated in 1969 that 20% of the irrigated land was affected; by 1974, owing to unfavourable weather conditions, the figure had risen to 40%).<sup>7</sup> And the problem has arisen not only in irrigated land but also in many places where the soil is waterlogged because of poor drainage. In 1964, according to the FAO/UNESCO *Soil map of the world*, there were 1 965 000 hectares of salinized soils in Central America and 129 163 000 hectares in South America.<sup>8</sup>

The modernization of rural areas has influenced the ways and degrees in which ecosystems are artificialized. The penetration of land tenure systems in which the aim is to maximize production over the short term, regardless of the deterioration caused by over-utilization of resources, has led to the creation of agrosystems of dubious stability where copious energy inputs are a permanent necessity. Thus the disruption of trophic levels and the consequent lack of stability for want of natural controls have necessitated increasing applications of pesti-

cides — a necessity which has had very bad effects on human populations,<sup>9</sup> either because they have had to ingest pesticides in amounts exceeding the tolerable limit or as a result of the recrudescence of tropical diseases, principally malaria, owing to the genetic resistance acquired by the vectors.<sup>10</sup>

But the pollution of the rural sector has not been the work of agriculture alone; urban processes too have had all sorts of repercussions in consequence of the effluents discharged and of infection from sewage water.<sup>11</sup> In addition to the impact of urban activity, the rural sector — in particular agriculture — has suffered the effects of mining and of industries established in the countryside or of those which, although urban, discharge their effluents in rural areas.

Lastly, it is worth while pausing to consider the advance of the desertification process. Albeit the various indicators measure it in different ways and although studies have not been able to differentiate clearly between the incidence of anthropic activity and that of natural phenomena, it can safely be described as increasingly serious.<sup>12</sup>

<sup>9</sup>See José S. Villalobos Revilla, "Aspectos nocivos de los insecticidas organoclorados sobre el hombre y el medio ambiente en México", in *Memoria - I Reunión nacional sobre problemas de contaminación ambiental*, Vol. II, op. cit.

<sup>10</sup>UNEP, *Estudio de las consecuencias ambientales y económicas del uso de plaguicidas en la producción de algodón en Centroamérica y Guatemala*, September 1975; and FAO, FAO/UNEP co-operative global programme on the development and application of integrated agricultural pest control, *Consulta regional de expertos sobre medio ambiente y desarrollo*, RLAT 801/76/315, Bogotá, Colombia, July 1976.

<sup>11</sup>Several inland metropolitan cities in Latin America discharge their sewage water in agricultural areas. For example, in Venezuela, in a survey of 8 districts near Caracas, 77% of the area was found to be irrigated with highly polluted waters. See Nelson Geigel Lope-Bello, *La experiencia venezolana en protección ambiental*, in CEPAL, Division of Natural Resources and Environment, "Información de medio ambiente en América Latina: Venezuela", Santiago, Chile, 1974. (On typed cards in CLADES.)

<sup>12</sup>For example, Mario Peralta asserts that 50% of Chilean territory is in process of desertification. See Mario Peralta, "Procesos y áreas de desertificación en Chile continental. Mapa preliminar", *Ciencias Forestales*, Santiago, Chile, September 1978, Vol. I, No. 1, pp. 41-44. For further details on this subject see United Nations, *Report of the United Nations Conference on Desertification*, A/Conf.74/36, Nairobi, August-September 1977.

<sup>5</sup>Sergio Salcedo and José Ignacio Leyton, "El sector forestal latinoamericano y sus interrelaciones con el medio ambiente", in Osvaldo Sunkel and Nicolo Gligo (compilers), *Estilos de desarrollo y medio ambiente en América Latina*, Mexico, Lecturas, Fondo de Cultura Económica, 1980, 2 vols.

<sup>6</sup>Nicolás Aguilera Herrera, "Problemas de contaminación salina-sódica de suelos", *Memoria - I Reunión nacional sobre problemas de contaminación ambiental*, Vol. II, Mexico, January 1973.

<sup>7</sup>CEPAL, Division of Natural Resources and Environment, "Información de medio ambiente en América Latina: Argentina", Santiago, Chile, 1974. (On typed cards in CLADES.)

<sup>8</sup>FAO/UNESCO, *Soil map of the world*, Paris, UNESCO, 1964.

## II

### Basic causes of the environmental situation of agriculture

Agricultural development is conditioned by global development and in turn is a basic factor in overall development trends. Such questions as intersectoral relations, income flows and balance, the role of agriculture in the generation of foreign exchange, the relation of agricultural prices to overall price levels or the rate of return on capital in agriculture as compared with the corresponding rate in other sectors of the economy, have repercussions on global behaviour patterns and, therefore, on the short- and long-term use of agricultural resources. The influence of the aforesaid global framework in conjunction with the sector's own strategies have shaped the special features of the agricultural development style. Migration has had a marked effect on this development style, and therefore, on the man/land ratio; in addition, it has exerted pressure for the use of specific resources and has conditioned the pace and manner of the extension of the agricultural frontier.

#### 1. *The dynamics of the prevailing style*

The aim of most of the Latin American countries' development strategies has been to modernize their agriculture by promoting more re-investment of the surpluses generated in the sector itself and encouraging investment of capital from other sectors or from abroad.<sup>13</sup> Within the agricultural sector, the dominant groups have been the channel for a major proportion of investment in infrastructure, the result of which has been a global concentration in keeping with the prevailing development style. And it is in areas with comparative advantages, many of which produce for export, that the above-mentioned phenomena and processes are concentrated.

<sup>13</sup>Modernization must not be confused with technological and scientific progress; for the purposes of the present analysis modernization is understood to mean the capital-technology drive characteristic of the development style.

The great differences in rates of return, one of the chronic problems of Latin American farming, have been aggravated by the prevailing style: on the one hand, there are farms with comparative advantages which are run for growing export crops and are capable of generating surpluses; on the other hand, there are the farms producing for domestic consumption, which show low rates of return and are practically incapable of generating surpluses; and alongside these, clusters of *minifundios* engaged in subsistence farming. To these must be added a range of farms in situations combining these features: some that have assimilated specific aspects of the prevailing style through their incorporation in national or transnational associations or consortia; others, in contrast, undergoing partition and incorporation into the subsistence economy.

The State, which has played an essential role in the development of agriculture, has accentuated these differences through its price, credit and input policies. Furthermore, the technological model has been adapted almost automatically to the branches of production of the areas with comparative advantages, because of the demand they create, because of the importance of the generation of foreign exchange and because of the 'induction' effect of the transnational corporations which handle technologies and offer 'packages' of these. The model for the generation, adoption and dissemination of technologies has been projected on to the 'modernization' of agriculture, making it more dependent on the use of technological inputs and promoting its specialization in terms of the international market and of the domestic markets. The irruption of this 'modernization' drive during the post-war years was so vigorous that it implied an important qualitative change in methods of production and in social relations within Latin American agriculture.

The introduction of agricultural machinery was linked to the possibility of displacement of

manpower. Population growth was reflected in a constant increase in the labour supply, and, on the other hand, there was also a constant increase in labour productivity. The rigidity of demand for labour in Latin American agriculture, combined with the special characteristics of seasonality, have resulted in an extremely high level of unemployment.<sup>14</sup>

The disruption of the structural complementarity between the latifundia and the *minifundios*—formerly a predominant complex in Latin America—aggravated the employment situation and consequently influenced emigration and over-utilization of resources. The one-time latifundia (or great landed estates), by adopting capital-intensive technologies and mechanizing their operations, have come to offer the peasant sector far fewer chances of supplementary work. And to this have been added the successive partitions which caused the *minifundios* (or tiny properties) to proliferate.

Consequently, the peasant population found itself compelled to take measures to survive. It had to try to optimize its subsistence production, whether for the market or for its own consumption. Accordingly, a considerable percentage has emigrated to the urban centres, creating a number of problems to which sufficient study has been devoted; and others have moved out to virgin land. Both spontaneous and directed settlement processes have thus increased, with the consequent destructive effect on natural resources, reinforced by the large-scale public and private enterprises. The pace of this deterioration has speeded up remarkably, inasmuch as the population exodus has progressively expanded in volume and, furthermore, many countries have fostered settlement either directly or through the construction of access roads.

But the basic cause of the environmental situation of agriculture must be sought in the

economic rationality of the enterprises that have entered the agricultural sector. Demand and steady prices for specific crops and export items have cleared the way for capital to flow into agriculture with the object of maximizing its rates of return.<sup>15</sup> This capital made for the 'modernization' of traditional latifundia and, to a lesser degree, of medium-sized farms; year by year, moreover, it has gradually brought large tracts into use for crop farming or livestock production in areas where the agricultural frontier is being pushed forward.

When long-term conservation of a resource is not a matter of concern to them, enterprises are not interested in carrying out ecological feasibility analyses but only in maximizing the rate of return on capital. Having such great freedom of movement to enter and leave the agricultural sector at the dictates of circumstance, they have even been able to treat natural resources that are renewable as though they were not. In these conditions, processes that have apparently led to the modernization and specialization of the ecosystem involve serious negative effects on environment. Single-crop farming, even though undertaken with the help of the well-known 'packages of technology', has affected the soil of Latin America with a variety of ills, such as loss of edaphic structure, exhaustion, erosion, low-threshold compaction, etc.

It is in agricultural frontier areas that the inconsistency between economic and ecological feasibility is most apparent, since there the enterprises have had at their disposal the production of untouched ecosystems which have accumulated nutrients for decades and even centuries. They can 'harvest', especially in areas subject to very little control, the whole of the production that the ecosystem has accumulated over the long term until its climax is reached. This 'harvesting' takes widely varying forms: for instance, the indiscriminate cutting-down of forests without a thought for rational management, the utilization of nutrients

<sup>14</sup>The Regional Employment Programme for Latin America and the Caribbean (Programa Regional de Empleo para América Latina y el Caribe - PREALC) estimates that the "unemployment equivalent" ranges from 20% to 40% of the economically active rural population. See PREALC-ILO, *El problema del empleo en América Latina y el Caribe: situación, perspectivas y políticas*, Santiago, Chile, PREALC, 1975.

<sup>15</sup>For example, about 11% of the land where censuses have been taken in the Federal State of Amazonas belongs to 433 enterprises, and totals approximately 11 million hectares. See "Panorama Económico/80", in *O Globo*, Rio de Janeiro, 30 June 1980.

through ash as a function of felling and burning-off practices, the exploitation of the original nutritive capacity, the use of the available supply of forage as stock-farming advances, etc.

## 2. *The incidence of economic factors*

The various economic factors directly influence the use and behaviour of resources; their repercussions, however, are not always of the same kind, especially if an attempt is made to analyse the marked differences between the capitalist enterprises that aim at maximizing the rate of return on capital and the peasant economies, whose primary objectives are subsistence and reproduction. The existence of diverse responses has determined, in its turn, technologies that differ from one another and/or are utilized with varying degrees of intensity.

The factors that merit special analysis are the endowment of infrastructure, demand and prices for agricultural products and inputs, agricultural credit and marketing.

The various ecological regions of Latin America and the different levels of development have influenced the formation of a heterogeneous mosaic of infrastructures, which have conditioned the use of the soil. Exceptionally well-endowed areas contrast with others that have no infrastructure at all. High degrees of infrastructure endowment are found almost exclusively in the neighbourhood of large cities, in areas with excellent climatic conditions, such as the humid pampa, and in irrigated valleys in semi-arid regions.

Irrigation works have significantly increased during the last few decades, for between 1947 and 1974 the area of irrigated land was enlarged by 50%.<sup>16</sup> But irrigation was not always introduced where the soil was most suitable and a series of environmental problems have arisen in consequence.<sup>17</sup> Moreover,

irrigation has entailed more intensive agriculture and has led to 'modernization', determining a high degree of artificialization. This in turn has had repercussions in the shape of changes in crop structure and in agricultural income, apart from its environmental effects.

Alongside irrigation, access roads are possibly the forms of infrastructure that have exerted most influence on the transformation of agriculture; their construction has been closely linked to the extension of the agricultural frontier. Investment in road works has not only encouraged settlement, but, by facilitating the access of products to the market, have influenced the change in production structures in areas already farmed.

Agroindustries have had a marked influence on the use of the soil because of the purchasing power they generate and the package of technology and inputs they provide, and also because they avert risks of perishability. Generally, too, in Latin America, agroindustries have permitted the concentration of surpluses in the hands of their owners. This fact has affected the profitability of the farms from which the surplus has been obtained, and, consequently, has influenced soil use practices and systems.

It is seldom recalled that there has been a correlation between the absence of infrastructure and the non-existence of agricultural experimental stations. Investment in research infrastructure has generally bypassed the less accessible areas. Cases in point are afforded by the small number of experimental stations in the humid tropical areas of the Amazon basin or in the semi-arid Chaco. The result of this lack has been ignorance of the ecosystems which has prevented recommendation of the most appropriate transformation technologies and of how they should be managed.

The history of Latin America is directly linked to the cycles of several agricultural products. The expansion of many areas has been due to the familiar coffee, sugar and cotton cycles; demand for tannin determined the quebracho exploitation cycle. These processes, in their turn, evolved in accordance with demand and with the price obtained in world markets. In

<sup>16</sup> See CEPAL, *Veinticinco años en la agricultura latinoamericana*, op. cit., annex, table 19.

<sup>17</sup> For a study of these environmental problems in greater depth, see Carlos J. Grassi, "El regadío, su influencia en el ambiente físico y resultados que derivan de su manejo", in *Conservación del medio ambiente físico y desarrollo*, Guatemala, ICAITI/NAS, 1971, pp. 145-157.



these cases the advancement of the agricultural frontier was motivated.

Both short-term fluctuations and long-term cycles are of significance in relation to the environment. The study of environmental effects is commonly confined to policies directly bearing on the use of resources or the wastes obtained in production processes. But importance also attaches to analysis of the repercussions of changes in demand and in the prices of products and inputs, and, in particular, the price/input ratio. Fixing the price of a specific product has often caused overutilization of the soil to such an extent that the existing protective legislation on resource conservation has been invalidated. In contrast, low prices have left large areas unproductive or have discouraged efficient land use, causing, for example, a switch-over from crops to extensive stock-farming. Changes in the price/input ratio, such that the relative importance of the cost of inputs has increased, have meant that consumption of these has declined. And this, on several occasions, has given rise to serious disequilibrium problems in highly artificialized systems where additives are a permanent necessity.

In recent times the implications of international demand with respect to land use have acquired special characteristics in consequence of the pressure to produce certain items. This has led to the cultivation of specific products beyond the utilization capacity of the soil, a process intensified by the narrower range of crops that can be grown in recently incorporated areas.<sup>18</sup> Cases in point are afforded by the habilitation of soils for cotton—and coffee—growing.

Another factor that has been of special importance is agricultural credit, since it has exercised direct influence in various ways. In the first place, the shortage and concentration of such credit has been partly to blame for the low productivity of much land and labour. Secondly, farmers have lost on their profits because they have been exploited by moneylen-

ders.<sup>19</sup> Thirdly, credit has played a key role in encouraging the use of highly productive inputs, a point which is of basic significance for the analysis of repercussions on the physical environment. Moreover, the limited saving capacity and low marginal propensity to save in rural areas has generally meant that investment has depended entirely on credits from other sectors, which has unquestionably affected the use of inputs.

The limitations imposed by the scanty supply of agricultural credit have been aggravated by its concentration in terms both of farm size and of branches of production.<sup>20</sup> The evolution of the use of credit must be to some extent held accountable for the polarization of agriculture in Latin America. This polarization is of basic importance in the subsistence economy sectors, since the deterioration of their situation has forced them to try to survive at the expense of conservation of the environment.

The relation between prices and credits has played a significant part in the specialization of international production, and, therefore, in the use of resources. As a result of their incorporation into the world market the dependent countries have been caught up in a credit spiral that has its source in the dominant countries.<sup>21</sup>

Credits have also motivated types and systems of land use with the consequent influence on creativeness and deterioration. State credit lines, supervised credits and input credits have helped to determine both crops or branches of production and the technologies applied. The absence of operational credits has

<sup>18</sup> Dale W. Adams, "Agricultural credit in Latin America: A critical review of external funding policy", in *American Journal of Agricultural Economics*, Vol. 53, No. 2, May 1977, pp. 163-172.

<sup>20</sup> Illustrative of this problem is the high concentration of credit in four branches of production, in El Salvador, which between 1961 and 1975 received from 80 to 90% of commercial agricultural credit. See Gerald E. Karush, "Plantations, population and poverty: the roots of the demographic crisis in El Salvador", in *Studies in comparative international development*, Vol. XIII, No. 3, New Jersey, 1978, pp. 59-79 (p. 67).

<sup>21</sup> See Ursula Oswald and Jorge Serrano, "El cooperativismo agrario en México: implantador del capitalismo estatal dependiente", in *Revista mexicana de sociología*, Year XI, Vol. XL, Special Issue, Mexico, 1978, pp. 273-284 (p. 283).

<sup>18</sup> See Brian A. Thomson, "The periphery and the environment: three case studies in Argentina and Brazil (1870-1970)", in *International Social Science Journal*, Vol. XXX, (1978), No. 3, Paris, UNESCO, pp. 494-535.

been partly responsible—as could not be otherwise—for the impossibility of satisfactory marketing, apart from the inability to obtain inputs.

A certain amount of agricultural production is customarily allotted to farm consumption and the rest is marketed. Although in relative terms the importance of farm consumption has been dwindling, in absolute terms it is still considerable. Through the marketing process sizeable surpluses generated in the sector have been appropriated. In the Latin American countries the process in question has to be conducted through markets which have a strong propensity to price instability and in which a great deal of speculation goes on, especially in areas populated by small farmers; moreover, surpluses are manifestly channelled into the hands of moneylenders; and, lastly, in subsistence agriculture a vicious circle is created inasmuch as low prices make it necessary to sell larger volumes and that in turn brings down prices still farther.<sup>22</sup>

The factual conditions of marketing have influenced the destination of the middlemen's surplus. In Latin America a considerable proportion of income is appropriated through the high marketing margins over producer prices. And part of this surplus is transferred to other sectors of the economy. A change in this situation would have permitted higher rates of return per farm, and, therefore, would result in greater rationality in the use of resources, but such changes would adversely affect power groups that reap the benefit of the surpluses.

### 3. *Evolution and influence of changes in the structure of land tenure*

The need to change the structure of land tenure in order to create new patterns is reflected in the agricultural development strategies of the Latin American countries that have pursued direct and indirect policies relating to structural modifications. The objectives pursued have ranged from reforms attempting to conso-

lidate ownership of the land and water to revolutionary changes whereby not only has land been distributed but a new structure has been introduced, as a basis for global transformations of the society concerned.

The aim of the present study is not only to analyse the evolution of the structure of land tenure in Latin America over the last few decades but to point out that this structure was a factor conditioning the depth and penetration of the development style, by which, in its turn, it was modified. Consequently, it is necessary to examine some of the relevant aspects of the modifications undergone.

Few changes have taken place in recent decades in the concentration of land and in income, except in Bolivia, Chile, Cuba and Peru.<sup>23</sup> Generally speaking, there are more properties and a larger area is farmed, but that has not made any difference to the traditional indicators of concentration of land tenure. Obviously, this unequal distribution has resulted in the maintenance of the existing levels of rural poverty.<sup>24</sup>

The pressure for land exerted by peasant groups combined with the introduction of modern techniques, has intensified the atomization of *minifundios* so that an extreme type has emerged. In Ecuador, Brazil, Colombia and Venezuela, progress in distribution has been related with the extension of the agricultural frontier; in Argentina, Uruguay and Paraguay no significant changes in land distribution have taken place;<sup>25</sup> nor have the Central American and Caribbean countries witnessed any major transformations of the structure of land tenure.<sup>26</sup>

<sup>23</sup> United Nations, *Progress in Land Reform*, Sixth report, New York, FAO/ILO (ST/ESA/32), 1977.

<sup>24</sup> Sociedad Interamericana de Planificación, *Reformas urbanas y agrarias en América Latina*, Bogotá, Sociedad Colombiana de Planificación (SCP), 1978.

<sup>25</sup> For further details see the data on Panama and Argentina given in CEPAL, *Las transformaciones rurales en América Latina: ¿Desarrollo social o marginación? Cuadernos de la CEPAL*, Santiago, Chile, 1979, table 33; and Théodore Vander Pluijm, "Analyse de la réforme agraire au Venezuela", in *Réforme Agraire, colonisation et coopératives agricoles*, Rome, FAO, 1972, No. 2, pp. 1-22.

<sup>26</sup> See Permanent Secretariat of the General Treaty on Central American Economic Integration (SIECA), *Perspectiva para el desarrollo y la integración de la agricultura*

<sup>22</sup> See J.C. Abbot, "The role of marketing in the growth of agricultural production and trade in less developed countries", in *FAO Studies in Agricultural Economics and Statistics, 1952-1977*, Rome, FAO, 1978, pp. 323-329.

While the concentration of land tenure has not been substantially modified, in contrast both in production practices and in technical and social relations considerable changes do appear to have taken place.

Global changes in societies have also been reflected in *the development of capitalism in rural areas*.<sup>27</sup> This process of capitalist expansion is not a new phenomenon in agriculture, but has grown up along with industrial development; what has been different about it during the past few years is the accommodation of production patterns and of the capitalist-oriented segment to a form of dependent capitalism.

In Latin America there is a striking increase in capitalist patterns which exist alongside other traditional modes of production, or influence their disruption. As it penetrates more deeply, the capitalist style is gradually coming to dominate the basic factors of development and conditions the behaviour of other sectors—such as, for example, the peasant economies—to serve its own interests. The disintegration of smallholdings is normally a process that accompanies capitalist development. It is influenced both by competition from commercial agricultural enterprises, and by the role of commercial capital, as well as by that of credit and moneylending.<sup>28</sup>

Furthermore, adaptations of the capitalist patterns themselves have taken place. In this context the changes have been brought about mainly on the basis of consortia with greater agility than the traditional investors of capital in agriculture. National interests in other sec-

tors, of which the most representative have been commerce and agroindustry, have also entered the field. It has thus been possible to consolidate vertical structures, comprising everything from the production processes to the export of the manufactured product.

But in addition to national interests, transnational interests too have burst in upon the agricultural sector. In Central America and the Caribbean, where foreign interests have always been present, their incorporation has in many cases started from the base, i.e., from ownership of the land. This phenomenon, although existing in South America, has been less frequent here, since the transnationals have avoided conflicts and have not directed their activity towards ownership of land but into marketing and industrialization processes. Thus there have been many cases of vertical integration, often on a basis of monopolistic relations, leaving producers in control only of the land itself, and, moreover, subject to the contingencies of social conflicts with the wage-earning sector or to the limitations imposed by climate upon agriculture.

Again, a notable effect of the conditioning of peasant economies has been increased specialization on account of market demand and a loss of certain characteristics of stability. Many cultivation practices that were 'rational' for the size of peasant farms have been ousted under the influence of technical assistance programmes drawn up in the interests of the predominant style.

Consequently, a change has taken place in the prevailing post-war scenario characterized by the presence and influence of the *latifundia-minifundios* complex. Capitalist development has helped to monetarize the peasant economy to an even greater extent, and this has made for increased use of the land and has driven squatting and tenant farming into retreat.<sup>29</sup>

Alongside the changes in land tenure new systems and categories have been introduced, most of them of an associational or community character, and having their origin in agrarian

en Centroamérica, Guatemala, FAO, May 1974, 2 Vols.; and Gerald E. Karush, "Plantations, Populations and Poverty: the roots of the demographic crisis in El Salvador", *op. cit.*

<sup>27</sup> For further detail see Rubens Brandão Lopes Juarez, "El desarrollo capitalista y la estructura agraria en Brasil", in *Estudios sociales centroamericanos*, San José, Costa Rica, Year VI, No. 17, May-August 1977, pp. 175-186; and Antonio Martín del Campo, "Algunas ideas sobre la estructura agraria mexicana: una visión no tradicional", in *Estudios rurales latinoamericanos*, Bogotá, Vol. 1, No. 2, May-August 1978, pp. 59-70.

<sup>28</sup> See Alfredo Molano, "Capitalismo y agricultura: un modelo hipotético sobre las relaciones de producción y circulación", in *Estudios rurales latinoamericanos*, Vol. 1, No. 3, Bogotá, September-December 1978, pp. 34-67.

<sup>29</sup> Sociedad Interamericana de Planificación, *Reformas urbanas y agrarias en América Latina*, *op. cit.*, table IV-3, (56).

reform processes. Although the existence of these systems does not seem compatible with the great majority of development models, it can generally be attributed to political pressures, to the selection of viable alternatives in difficult ecological conditions, to pilot plans for technical, social and political research, or to the unreliability of the State in respect of providing pragmatic answers to development problems. What does seem obvious is that the area of such solutions, is very unlikely to become significant.<sup>30</sup>

In short, quantitative changes in the structure of land tenure have been only partial, as can be seen from the persistence of disequilibria. Unquestionably, traditional patterns, especially those pertaining to the peasant economy, have clashed with the expansion of capitalism in agriculture. The greatest modifications in recent decades have consisted in changes in the systems and forms of land tenure, by virtue of which this expansion has been stepped up.

#### 4. *The relation between the model for adoption, generation and dissemination of technology and the environment*

The introduction of more up-to-date techniques has been the main factor in the growth of Latin American agriculture; nevertheless, progress has been relatively slight if certain areas in the region are compared with others in the central countries where ecological conditions are similar. The most common and simplistic hypotheses advanced to account for this fact are economic and structural conditions (especially those linked to the rates of return on investment) and the low cultural level of farmers. But without disregarding the importance of these aspects, the explanation must be sought in the articulation or the disjointedness of the overall process of generation, adoption and dissemination of new know-how.

The possible technical innovations have

been linked to the influence of the hegemonic groups, identifiable with the technological process itself. In agriculture, these influential hegemonic groups comprise, in the first place, the social groups that appropriate the surplus directly produced by the land; secondly, the groups that have appropriated the surplus in the course of the vertical processes which have their origin in the marketing of agricultural products; and, lastly, groups concerned in the appropriation of the surplus deriving from the sale of new technologies and of the inputs advocated by these. Consequently, it is feasible to deduce that the activities of these three groups have extended far beyond each country's frontiers.

In the supply of agricultural technology the State has played a paramount role, owing to the small size and large number of agricultural enterprises and to the difficulties proper to biological research, especially if the powerful influence of fluctuating weather conditions is taken into account. This is why the State supply has depended in Latin America, to a greater or lesser degree, on demand, on the way in which pressure is exerted by the production sectors, and on the guiding principles imposed by the technological model adopted. The correspondence between demand and supply has undoubtedly been linked to the types of relationship between the hegemonic groups and the characteristics of the State. For example, in most of the Central American countries, the predominant interest of the medium and large-scale landowners have created a private and highly specific system of generation and transfer of technologies.

The tendency to 'import' institutional models for the generation and transfer of technology is linked to the images formed in connexion with what is defined as 'suitable agricultural technology' originating in the agricultural development models of the central countries. Thus, an image of 'suitable technology' exists that is usually applied in the context of an institutional model similar to that which creates the technology.<sup>31</sup>

<sup>30</sup> See José Emilio G. Araujo and Hugo Fernández, "Experiencias latinoamericanas en empresas asociativas y la modernización de la empresa agrícola", *Revista Desarrollo Rural de las Américas*, San José, Costa Rica, Inter-American Institute for Agricultural Sciences (Instituto Interamericano de Ciencias Agrícolas - IICA), Vol. IX, No. 3, September-December 1977, pp. 87-96 (p. 90).

<sup>31</sup> For further detail, see: (1) Francisco R. Sagasti and Mauricio C. Guerrero, *El desarrollo científico y tecno-*

Agricultural extension services have benefited a limited number of farmers, and have generally been addressed to those operating on a large scale. But this situation is not homogeneous throughout the region, since in every country the position is influenced by the structure of production; for if there are small farmers growing crops for export or producing commodities similar to the products of the larger enterprises, they do directly or indirectly benefit from rural extension programmes. But generally speaking, the technical expert in extension services is not in the habit of concerning himself with traditional peasant technologies.<sup>32</sup>

A critique of the models of generation, adoption and dissemination of technology might be interpreted as a negative analysis of individual and institutional efforts in the direction of scientific and technological progress. Unquestionably, in all the countries there is a plentiful stock of technological know-how which is the product of institutional research or individual enterprise; but the main objection to the agencies concerned relates to their practice of introducing innovations in the light of technocratic criteria, without properly taking into consideration the sociopolitical framework.<sup>33</sup>

The importance attached to the 'green revolution' in the transformation of Latin American agriculture necessitates a special analysis

of this process. The concepts set forth in the preceding paragraph make it possible to understand the real significance of the changes concerned. The so-called 'green revolution' has notably increased agricultural productivity in vast sectors of the world, and Latin America has been no exception; what is more, the experimental source of the 'revolution' was centred in Mexico. The countries of the region have adopted many technological innovations and have expanded their production beyond all expectations. But since the beginning of the present decade the increase in yields has taken a downward turn, and a number of problems that limit growth have begun to make their appearance.<sup>34</sup>

Projections went wrong because of their technocratic character, since they did not take into account the factors conditioning the new development style, and, furthermore they failed to consider its spatial insertion in areas with serious social problems.

Subsequently to its 'genetic birth' the green revolution was associated with two basic factors: water and energy. Its evolution, within each country's structural limitations, was closely linked to irrigation works and to the 'packages of technology' which included energy inputs.<sup>35</sup>

The remarkable initial 'impact' of the new species and improved varieties displaced those formerly used; a displacement which began in the more fertile soils, since these permitted the exploitation of the whole of the genetic potential. This had a multiplier effect on the image of the 'impact' of the green revolution, inasmuch as the new varieties found an environment which enabled them to realize their potential to an almost unlimited extent. The impulse given to irrigation works as a rural development strategy contributed to the consolidation of noteworthy changes. The expansion of production, therefore, was due not only to increased pro-

*lógico de América Latina*, Buenos Aires, IDB/INTAL, 1974, p. 200; (2) Víctor Urquidí and Alejandro Nadel, "Algunas observaciones acerca de la teoría económica y el cambio técnico", in *El Trimestre Económico*, Mexico, Vol. XLVI(2), No. 183, pp. 211-234; (3) Aldo Ferrer, *Tecnología y política económica en América Latina*, Buenos Aires, Editorial Paidós, 1974; (4) Amílcar O. Herrera, "Tecnologías científicas y tradicionales en los países en desarrollo", in *Comercio Exterior*, Mexico, Vol. 28, No. 12, December 1978, pp. 1462-1476.

<sup>32</sup> See Antonio García, "El nuevo problema agrario de América Central", in *Comercio Exterior*, Vol. 28, No. 6, June 1978, pp. 733-737; and Richard Perrin and Don Winkelmann, "Impediments to technical progress on small versus large farms", in *American Journal of Agriculture Economics*, Vol. 58, No. 5, December 1976, pp. 888-894.

<sup>33</sup> Julio Bolvitnick, "Estrategia de desarrollo rural, economía campesina e innovaciones tecnológicas en México", in *Comercio Exterior*, Vol. 26, No. 7, pp. 813-826; and Edmundo Castal, "Los sistemas de producción y la planificación de la investigación agrícola", in *Desarrollo Rural en las Américas*, Vol. VII, No. 1, January-April 1975, pp. 57-65.

<sup>34</sup> Lester Brown, *Seeds of Change, the Green Revolution and Development in the 1970s*, London, Pall Mall Press, 1975, p. 3.

<sup>35</sup> John C. Keene, "A Review of Governmental Policies and Techniques for Keeping Farmers Farming", in *Natural Resources Journal*, Albuquerque, New Mexico, U.S.A., Vol. 19, No. 1, January 1979, pp. 119-144.

ductivity but also to the bringing of many dry-soil areas under irrigation.

The subsequent cultivation of areas with fewer favourable attributes highlighted the importance of the packages of technology, which had passed unnoticed at first.

Evaluation of the effects of the revolution confirms the thesis of its contribution to social polarization.<sup>36</sup> As a general rule existing technical and cultural condition have not been such that the new technologies have spread to the lower-income sectors. The application and utilization of genetic advances have formed part of a package of technology to which hitherto the peasant farmer has not had access. Excessive artificialization of the ecosystem, on the one hand, and crop specialization on the other, are two factors that have reduced the peasant farmer's chances of survival.

Furthermore, the brilliant expectations raised by genetic innovations made for "the indiscriminate incorporation of new techniques in regions where the land was not suitable for them, which on many occasions signified worse erosion, a subsequent decrease in yields, desertification, etc."<sup>37</sup>

The 'green revolution', therefore, must be regarded as an important technological change, but as such it has been exploited in the interests of groups or enterprises. Its effects on development, and more specifically on the physical environment, have not borne out the expectations of the technical experts.<sup>38</sup>

As a result, the technological changes originating in the 'green revolution' and characteristic of the current development style have transformed the ecosystems into agrosystems, whose special features call for analysis. Generally speaking, it may be asserted that the

agrosystems introduced in Latin America have not maximized ecological conditions. The expansion of such crops as cotton, wheat and, more recently, soya bean has been due to market demand. Obviously, if ecological conditions are only partly taken into account, the possibilities of success have also depended upon the degree of adaptability of the crop and the energy inputs required to compensate for adaptive limitations. The crops introduced generally have such attributes as early maturity, biomass increments, resistance to pests and diseases, but they lack, for example, functional vegetation structures created by adaptive strategies, such as foliar pilosity, succulence and thominess, which are genetic features of the autochthonous flora that enable them to maximize the ecological supply.

The technological model of the development style has favoured maximum artificialization of the ecosystem, and specialization determined by economic factors. It is important to establish that agricultural progress is based on the artificialization of ecosystems; the objection is not to the process in itself but to the form of artificialization which results from application of the current development style. Generally speaking, in Latin America there are no instances of planned artificialization of the ecosystem which are not strongly influenced by the technological model created in the central countries, and essentially in the United States. Endogenous and 'traditional' technologies are often discarded without study of the possibilities of continued use of them after their modification in the light of today's scientific know-how.

In addition to the effects already mentioned, the current form of artificialization of the ecosystem has not weighed the possibility of changes in the man/land ratio but has subordinated it to technical decisions whose objective is to maximize the productivity of the land; this has helped to make the problems deriving from the rural labour supply more serious still.

Again, the technology used has not given priority to the recycling of materials; only a few agricultural techniques have incorporated this practice in piecemeal fashion (green manure, ploughing-in of stubble, etc.), but no global approaches have been adopted in physio-

<sup>36</sup> Alain de Janvry, "The political economy of rural development in Latin America: an interpretation", in *American Journal of Agricultural Economics*, Vol. 57, No. 3, August 1975, pp. 490-499; and Barbara Tuchman, "The green revolution and the distribution of agricultural income in Mexico", in *World Development*, Washington, D.C., Vol. 4, No. 1, 1976, pp. 17-24.

<sup>37</sup> Leading article: "Alimentación, crisis agrícola y economía campesina", in *Revista de Comercio Exterior*, Vol. 28, No. 6, 1978.

<sup>38</sup> Clifton R. Wharton, "The Green Revolution, Cornucopia or Pandora's Box?", in *Foreign Affairs*, No. 47, April 1969, pp. 464-476.

graphical units such as catchment basins or subcatchment areas, or in groups of farms run on similar lines.

The energy problem has also altered owing to the form and degree of artificialization. The commodities produced have determined the amount of energy inputs required, besides conditioning the continuity of their application, since stability has been affected. Artificial pest and disease control and lack of

stability have hampered the biological self-control which, in circumstances of less interference, natural flora and fauna exercise.

Lastly, the fact that artificialization has been reflected in continuous contributions of supplementary energy has created an indifferent attitude towards maximum utilization of the energy generated by the ecosystem itself, with the consequent waste of resources and neglect of non-conventional sources of energy.

### III

## Queries as to the future of Latin American agriculture and its environment

The fact that the growth rate of the agricultural sector has declined in the various Latin American countries, and in some of them has even been negative, has cast a cloud on the optimistic projections formulated in the 1950s and 1960s.

What still holds good, however, is the factual identification of a potential in the region so vast that it is probably the largest reserve of its kind in world agriculture. But given the current style of development, a number of pessimistic queries arise with respect to future growth and the conservation of resources. Furthermore, it must be clearly perceived that the path favoured by the development style is not the only way, since by the mere fact of choosing it other more viable options are rejected, many of which have to be definitively ruled out because they would entail reversibility of the changes in the ecosystems.

Analysis of the factors which have affected the growth of agriculture hitherto shows that, during the last two decades, the proportion of this growth that is due to more intensive use of the various factors of land already brought under agriculture has been steadily outstripping the share contributed by extension of the agricultural frontier.

The occupation of virgin ground for farming purposes still affords plenty of potential in Latin America; but analysis based on the size of the area should not be allowed to mislead us,

since the productivity of the new land, situated in the humid and sub-humid tropics, is far lower than that of land in the temperate zones. In most such cases, the substantial yields obtained during the early years are no more than an ecosystemic reaping of many years of cumulative production which is discharged into the soil through the practices of felling and burning-off the vegetation.

The conservation of these new areas is complicate by farming technology. It is not that ecotechniques for the humid and the sub-humid tropics are unknown. Although there is a wide field for research and many experiments are under way whose definitive results are still awaited, the existing stock of technology is sufficient for tackling the establishment of a sound agriculture, with minimum detrimental effects on the environment. If these techniques are not applied, it is because they involve higher private costs or because with them the ecosystemic harvest cannot be maximized. The prevailing style of development indisputably favours the application of detrimental techniques, so that the problem of resource conservation will apparently get worse and worse, even though research is concurrently conducted on other more appropriate techniques.

A problem which is very difficult to appreciate and to the quantification of which there are obstacles, is the real ecological cost of the incorporation of land into agriculture on the

basis of the farming systems that are preponderant in the prevailing development style. Public opinion, economic planners, and politicians, all find it very hard to realize the cost incurred through 'potential diminishment'; they tend to see only the direct results of the new productive activities, which in most cases are highly satisfactory owing to the 'ecosystemic harvest'. The ecological cost is therefore obscured by the impact of the expansion of production.

When this topic is discussed in Latin America, the foregoing criterion is often confused with the ultra-conservative positions that postulate the freezing of agricultural frontiers. Nothing could be more mistaken; the question raised here relates to the magnitude of the ecological cost of incorporating new land and farming it more intensively, given the present characteristics of Latin American agricultural development in the context of the systems and technologies of the style now in vogue, as compared with the ecological cost in the case of an alternative style. It is feasible to assume that an alternative style, in artificializing the ecosystems, will involve an ecological cost, but if the long-term objectives of this style take into account resource conservation, the impact on the environment produced by the incorporation of new land and/or more intensive methods of farming is unquestionably bound to be minimized.

The issue is complicated still further if it is considered how little is known of the potential ceiling (or rather, the range) of the ecosystems of the region and the target-images of agriculture entertained by the Latin American planners and technical experts themselves.

Limited knowledge of the many potential ways of utilizing ecosystems and ignorance of the specificities of the nature of each prevent due importance from being attributed to the questionnaire on the ecological cost. For example, if nothing is known of the specific quality and aptitude of the soil in given areas of the Upper Amazon Basin, it will hardly be possible to judge of 'what would have been produced' if erosion had not taken place.

The other factor that masks the magnitude of the ecological cost is the current target-

image of the future of agriculture for the Latin American countries, based as it is on highly artificialized and specialized agrosystems. It has already been said that the model for the generation and adoption of technology which aims at maximizing the rate of return on capital by artificializing ecosystems to the utmost possible extent has bypassed systems of farming, with their corresponding technologies, which not only may represent options that seek to maximize the use of other factors of production, such as labour, but may make it possible to obtain a bigger physical output over the medium and long term, while conserving resources or minimizing the impact on the environment. These are systems in which the object is to take advantage of the specific characters of ecosystems by subjecting them to a degree of artificialization which transforms them not entirely but only in part, so as to make the most of natural conditioning factors and elements of stability. A case in point is terrace cultivation in tropical areas, which utilizes the shade afforded by the treetops, the water retention capacity of the forest and the nutrient content of the vegetable substances that are incorporated into the soil. Consequently, what the development style dismisses is the option of combining highly artificialized agrosystems with multicrop farming and with ecotechniques, exploiting not only the main crop but other products of the ecosystem dealt with, such as firewood, protein from the fauna, etc.

The fact that the form and degree of artificialization of agriculture is called in question must not be understood to mean that the changes brought about in ecosystems subject to a high degree of intervention should be reversed. Such systems must continue to be highly artificialized, even if the assignment of more importance to biological technologies is advocated. For example, ecosystems exploited since the last century, such as those of Cuba and Jamaica, must base their agricultural development on agro-chemistry, irrigation, genetics, territorial specialization and even mechanization. Here the emphasis must not be placed on the degree of artificialization but on the technical and economic feasibility of its long-term maintenance. Accordingly, the ob-



jection to artificialization is directed against technological dependence and the modification and alteration of the ecosystem based on world market demand and on the appropriation of the surpluses generated by the very advocates of the technological changes introduced. Evaluation of the changes in Latin American agriculture must help to prevent a recurrence of the situation in the new areas that are being incorporated and the land newly brought under irrigation, as likewise in specific areas on which squatting has already taken place and which are beginning to be more intensively cultivated.

Another query as to the future of Latin American agriculture stems from the energy crisis. Its negative effects on agriculture are varied, as a result of the existing social and technological heterogeneity, given the obvious contrasts between areas of increasingly intensive cultivation and marginal areas, and between capitalist sectors using capital-intensive techniques and peasant-farmer sectors. In the first place, despite the wide technological gap that on an average divides Latin American agriculture from that of the developed countries as far as the rate of utilization of energy inputs is concerned, capitalist farms in areas of intensive agriculture show indicators similar to those of the central countries, so that presumably they may have reached—or are on the eve of reaching—a stage at which the increase in yields per additional unit of energy inputs will begin to decline. If the cost of energy is rising and the price relation between agricultural products (especially food) and energy is unfavourable to the former, it is not difficult to forecast that increases in land productivity in areas of intensive agriculture will be less than in the past decade.

Peasant-economy sectors, as they do not make intensive use of energy, will not be so hard hit by the energy crisis, but they will feel the repercussions of the worsening of the adverse situation in the large towns. Urban marginality conditions will not be remedied over the short term, since costs will follow a rising trend, mainly under the influence of the energy crisis. If the conditions in question

actually grow worse, the flow of migration from the rural areas to the town will have to be checked, with the consequent repercussions on pressure for the scanty land resources possessed by the peasant farmer.

It is possibly the extensive agriculture and livestock production sector, as being the most closely linked with the functionality of an ecosystem, that offers the greatest possibilities of technological options different from those advocated by the predominant development styles; but the question that arises here is whether these options can be turned to account, in view of their contradictions with the style of development aforesaid.

For any virgin land that may be brought under agriculture in the future, too, technological options should be chosen in which the rising cost of energy does not have the same impact as it has had up to now, and here again the new options come up against the difficulty of their viability within the predominant development style.

Lastly, another point of which mention must be made is the increasing competition and loss of agricultural resources for which non-agricultural activities are responsible. Urbanization annually swallows up large quantities of land excellently fitted for agriculture, since almost all the larger towns have grown up in very fertile areas. Although industry and mining do not directly utilize very large tracts of land, they do subject considerable areas to pollution of every kind. Yet more serious future problems are foreseen, owing to the expansion of these activities and, above all, to the forms of industrial redeployment which seek to locate the industries that cause most pollution in the Latin American countries. It is conceivable, given the conflicts and problems that will arise, that the system will attempt to resolve them by means of anti-pollution policies or policies for the application of decontamination measures, but there can be no doubt that before these policies are applied in the context of the current development style, a very high—and in many areas irreversible—ecological cost will have been paid.