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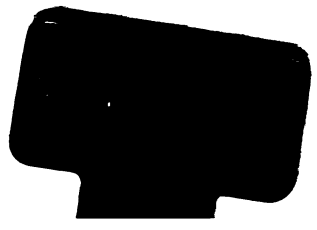


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**TECHNOLOGY GENERATION AND TRANSFER
FOR THE CARIBBEAN REGION:
A STRATEGIC STATEMENT**

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IICA OFFICE SURINAME**



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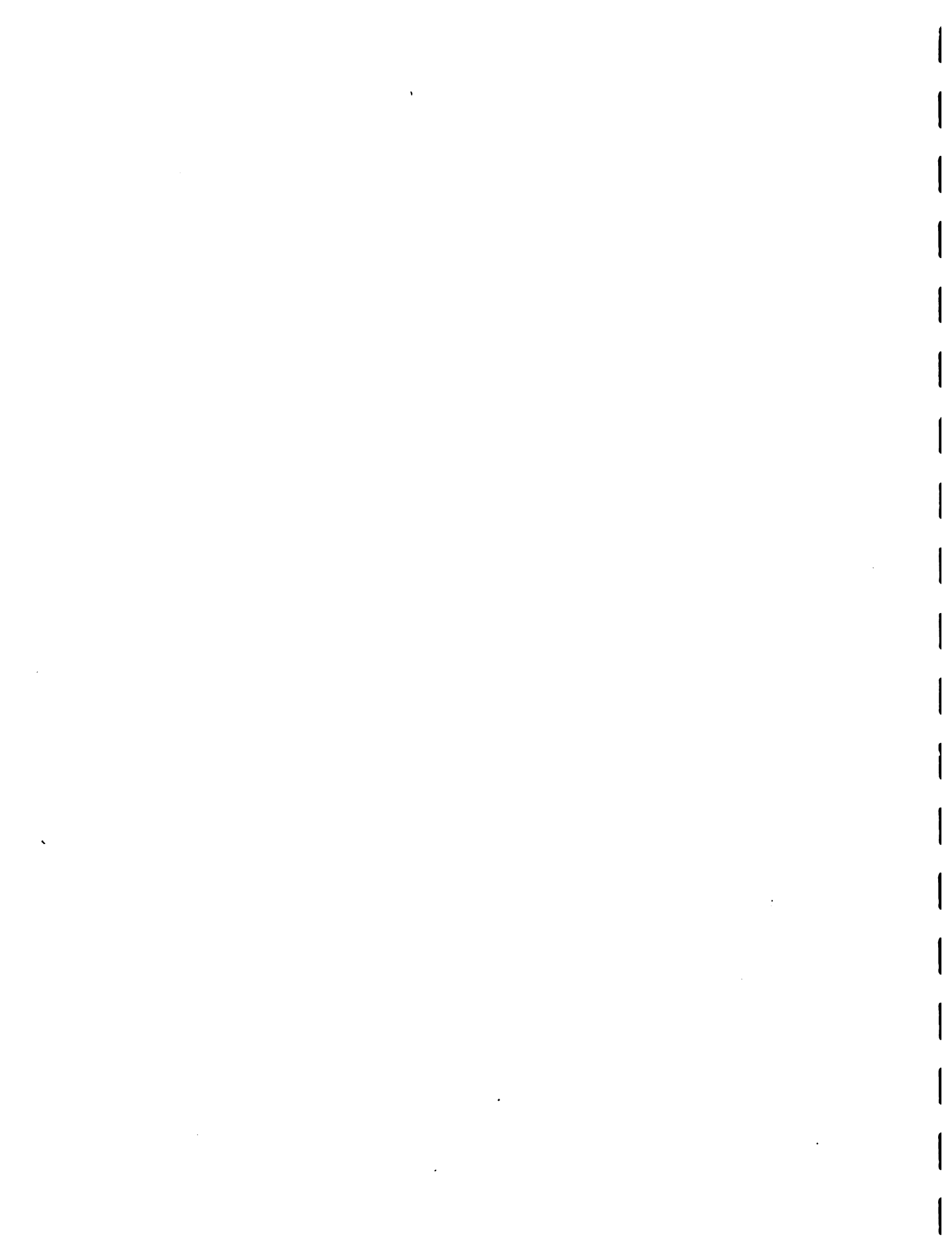
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CONCEPT



1. CONCEPT

1.1 Historical Analysis of the Agricultural Sector of the Latin American and Caribbean Countries.

The Reflections of a Comprehensive Analysis of the Agricultural History of the Caribbean Countries should be understood in the approach of the knowledge of the historical process of the colonial period from the Latin-American Countries. Despite this, there have remained areas and groups of countries with different stages and levels of the economic development process, and groups of countries with homogeneous and heterogeneous characteristics. Ever since the Industrial Revolution, the relationship of the European countries towards the Latin-American and Caribbean countries increased drastically. The intensification of the world market had its origin and generation in the improvement of the technology.

The changes, promoted by the colonial countries, on the world tropic agricultural market, considerably affected the domestic economy and the political picture of each of the Latin American and Caribbean Countries. The game of power among the colonial countries sometimes brought radical transformations in the agricultural production structure.



An examination in depth of the history of the agricultural production shows us, that the Latin-American and Caribbean Countries were in a position to support and supply and to respond to the needs of the colonial countries. This was the cause of the introduction of the sugar-cane plantations in the Caribbean area by some colonial countries, as a result of the inaccessibility to the sugar-crop market of Brazil. Since the discovery of the New World, the Latin American and Caribbean countries have been supplying the developed countries with raw materials and agricultural commodities.

At the same time, the plantation systems and the enclave economy (the Mining Sector) were functioning as a banker of the regional economy.

During the Second Great War the strong ties between the agricultural world market and the industrialized countries, were broken, and the historical conditions of trade liberization allowed the freedom of supply of raw materials and agricultural commodities. It also brought fruitful benefits for the regional countries, increased the foreign exchange reserves of most of these countries, while it brought a real development for the industrial sector.



In the period between the post-war and the beginning of the 60 decade, which was historically marked at the end by import substitutions of final consumer goods, one of the great efforts on the Latin American and Caribbean Countries, was to intensify the industrialization process.

The principal constraints of the industrialization process was that the developed countries intended to repeat the experience of the development countries, within an economic production structure of different historical conditions:

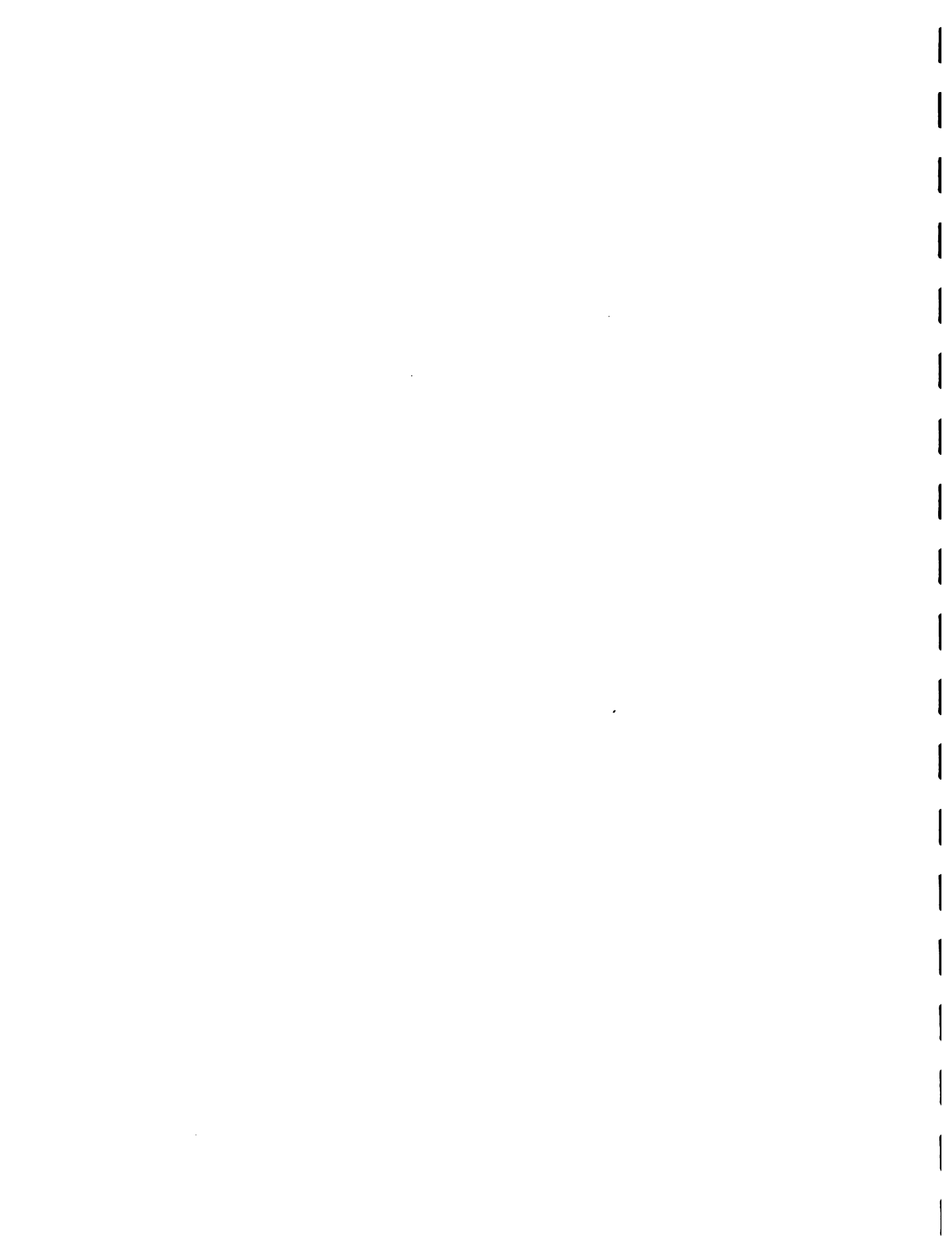
To establish this decision, it was necessary to import capital goods for the implementation of the industrial sector, to pay high salaries for international technical assistance and to purchase industrial technological packages. To accelerate the economic development process, the countries of the region had two (2) alternatives: The first consisted of prepared development plans and programs, which contained great infra-structure projects and great durable goods industry projects, to be presented to international financing organizations in order to obtain loans, and the second alternative was to increase the volume of the export of raw materials and agricultural products to finance the industrialization process.



The role played by the Agricultural Sector for the implementation of the Economic Development Process, was fundamental.

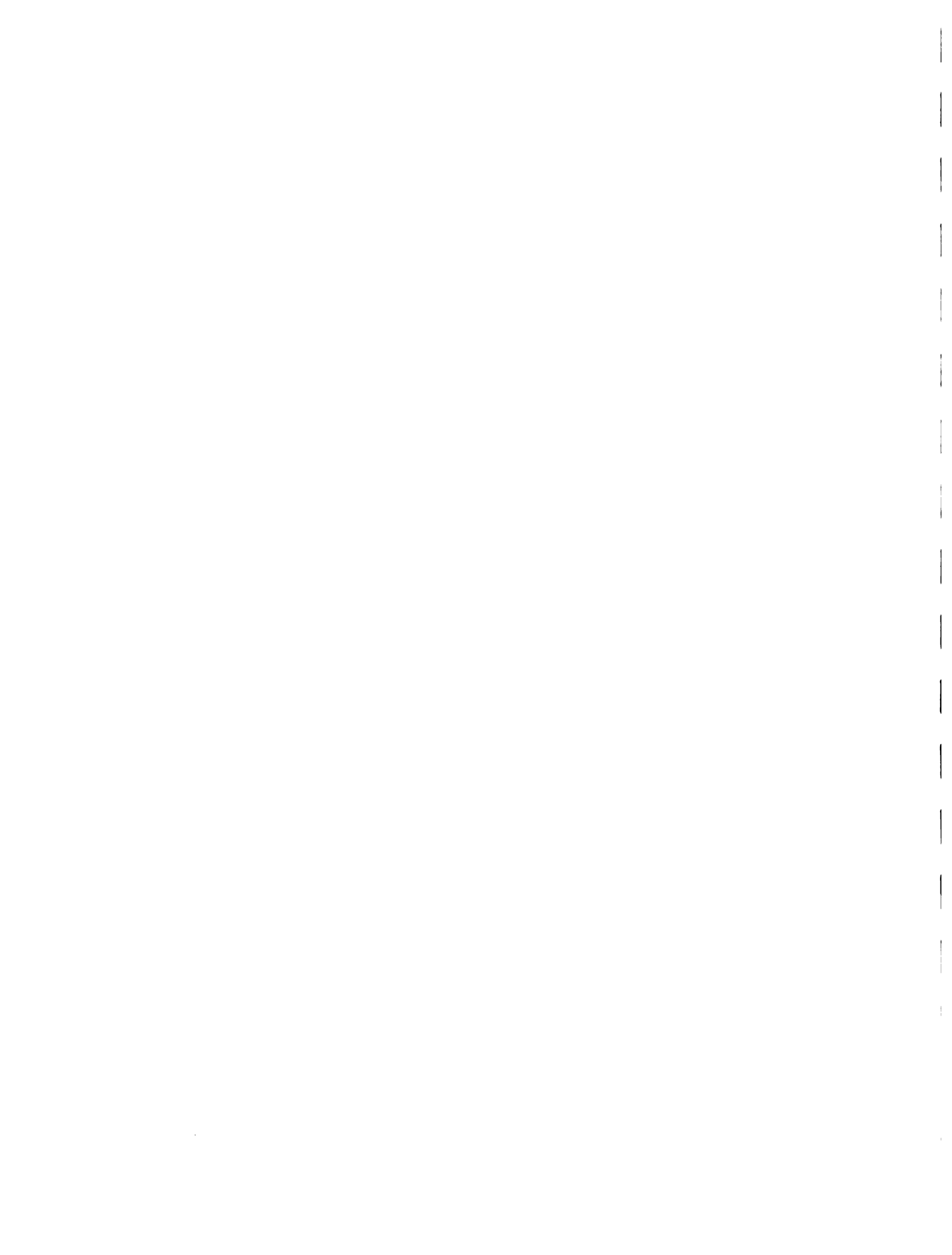
First of all, for the approach of the economic policies of the development process, the agricultural sector was divided in three (3) areas: The first, The Export Agricultural Sector responsible for the generation of foreign exchange, the transfer of resources for services and the industrial sector, and the transfer of income for the industrial sectors, through the purchase of industrial sector products. The second, the Agricultural Sector, attached to the Agro-Industry; responsible for the acceleration of the import substitution process, for the creation of new dietary habits and for the transfer of income for the industrial sector, through the purchase of agroindustrial products; The third, the Foodstuff Agricultural Sector, responsible for maintaining the low level of wages in the industrial urban complex, the transfer of income to the industrial urban complex through low foodstuff prices.

In spite of being the less dynamic sector of the economic structure, the Agricultural Sector in the Latin-American and Caribbean countries has played a major role in the economic development process.



However, the Agricultural Sector continued to put into action three important functions in the economic structure: The first, a complementary function to generate foreign currency through the export of raw materials and agricultural products to transfer resources and to give support to the industrialization process via fiscal and economic policies.

The second, a complementary function to increase the exchange relationships among the primary sector and other sectors to transfer the income to give support to the industrialization process via the purchase of industrial goods and services; And the third, to carry out a secondary function within the economic structure, because the decision on the Agricultural Policies and Agricultural Economy is planned and implemented in favor of the Industrial Sector. The Agriculture Sector has been penalized several times and in different ways, because the exchange relationship among the primary sector and other sectors is basically extremely unfavorable to the Agricultural Sector and because it is the less dynamic sector of the production structure.

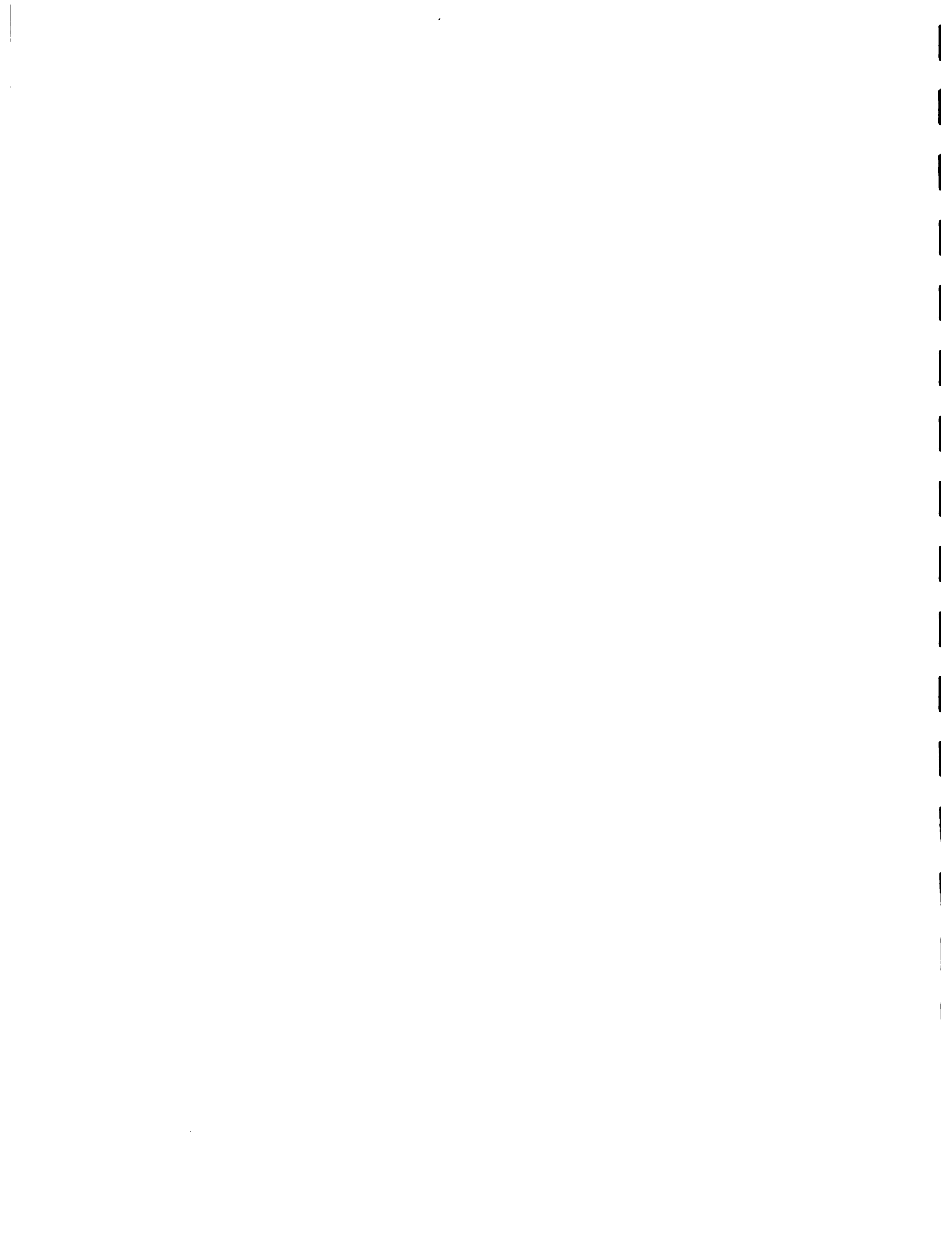


The exogenous objectives, goals and strategies of the economic development theory prevailed on most of the plans, programs and projects of the Latin-American and Caribbean countries, which in this period had just copied and implemented economic systems from the developed countries to implant, reproduce, and expand an unbalanced production structure on their distinct cultural and social structure.

But, the needs from the industrialized countries for raw materials and agricultural products from developing countries have continued.

It was not only an internal interest from the developing countries to require resources, income and products from the agricultural sector, but principally because of the generation of foreign exchange which existed along with the great interest from the industrialized countries, the Agricultural Sector of the Latin American and Caribbean countries had to be modernized, in order to drastically reduce the costs of production of the raw materials and agricultural commodities. At this precise historical period the private sector had no resources to allocate to the development of the Agricultural Sector, because it was strongly engaged in the new stage of the development of the industrial sector. For this reason the State⁽¹⁾ of most Latin American and Caribbean countries assumed new functions with the alliance agreement from the civil society, to implement and manage the economic development process.

1. Political society.



The new role which was taken over by the regional states and which was supported by the internal industrial sector's interest and the needs and priorities requested by the industrialized countries, gave the opportunity to the State to plan and direct the economic production structure within a desired framework of the powerful economic structure. On the other hand, the state - at this point of time - was establishing its presence in the production sector.

The historical conditions of the world economy were favorable. It was now only necessary to implement the plans, programs and projects, which were allowed to take over from economic production structure of the Latin American and Caribbean countries.

The major and main priorities were the development of the Agricultural Sector. The economic policies and policy measures which were implemented, promoted what was possibly called the Agricultural Revolution. The history of the Agricultural Revolution was marked by the origin and implementation of the technology. The dependent economic structure on the Latin-American and Caribbean Countries, put the responsibility of the organization and the investment of the agricultural research of the Latin-American and Caribbean Countries in the hands of the State at the end of the 50's decade and the early 60's decade. The access of technological innovation packages brought a deep change in the agricultural production structure.



At this point in time the transformation introduced a disorganized and disintegrated cultural and social structure in the rural communities.

The immense supply of international technical cooperation assistance, financial support, agricultural infrastructure, international extension services and the transfer of technological packages, launched exogenous consumption and behaviour patterns and completely affected and altered the rural life, the production forms, the modes of thinking and essential existence.

At the same period aid food programs were initiated, which in some areas created new diet habits and other areas discouraged the local production. The access to technological transfer packages of introduced a joint action of the technical cooperation assistance and financial support by long term loans, but also established a great paternalism and created a total dependence on the foreign agricultural inputs. The agricultural revolution brought an extraordinary performance for the sector, but the benefits accrued to other sectors. This means, that the agricultural sector created a growth multiplier effect in the rest of the economy. Basically, the incomes generated by this sector, were transferred through the investments and savings, and were allocated to the more dynamic sectors of the economy.



The introduction of the capital intensiveness in the agricultural sector produced a paradox in the decapitalization of the sector, because significant amounts of resources went into the industrial and financing sectors during the same time, to maintain the purchasing power of the Agricultural Sector.

In the first stage of the Agricultural Revolution⁽¹⁾, heavy investments were made by the State in the agricultural infrastructure. To reduce the impact of a diminished the capacity to import capital goods, the State was forced to introduce new policy measures, to support the export agricultural sector and the agroindustrial sector, by the introduction of technological transfer packages and financial support, to accelerate the application of foreign agricultural inputs. The result was the increase of the agricultural production and the accentuated growth in the physical export. On the other hand, the productivity improved notably and the quality of the agricultural products made important progress during that time, as a result of the introduction of technological transfer packages, which were just promoting the beginning of the intensification of the migration process to the industrial urban complex and the reduction of job opportunities supply from the agricultural sector.

1. From the postwar to the beginning of the 60's decade



The plantation system and the enclave economy were considerably affected by the introduction of technological packages. On this moment, the raw material and agricultural commodity prices went dramatically down on external level, while the prices for foreign agricultural inputs were maintained and began to affect the balance of payment.

As a result, the balance of payment was affected and consequently the balance of trade was also affected and from this moment the deterioration of the economic structure of the Latin American and Caribbean countries began.

Two main causes which determined important changes by the time the second stage of the Agricultural Revolution⁽²⁾ appeared, were: First of all the decrease of foreign exchange, generated by the agriculture, as a result of the severe fall of the prices of raw materials and agricultural commodities on the world market, and secondly the expansion and diversification of the industrial sector, which was necessary to intensify the increase of capital goods. The solution was to accelerate the foreign loans, in order to give support to the industrial sector and to recover the growth of the agricultural performance, as the Agricultural Revolution inserted intense and large quality changes in the agricultural structure.

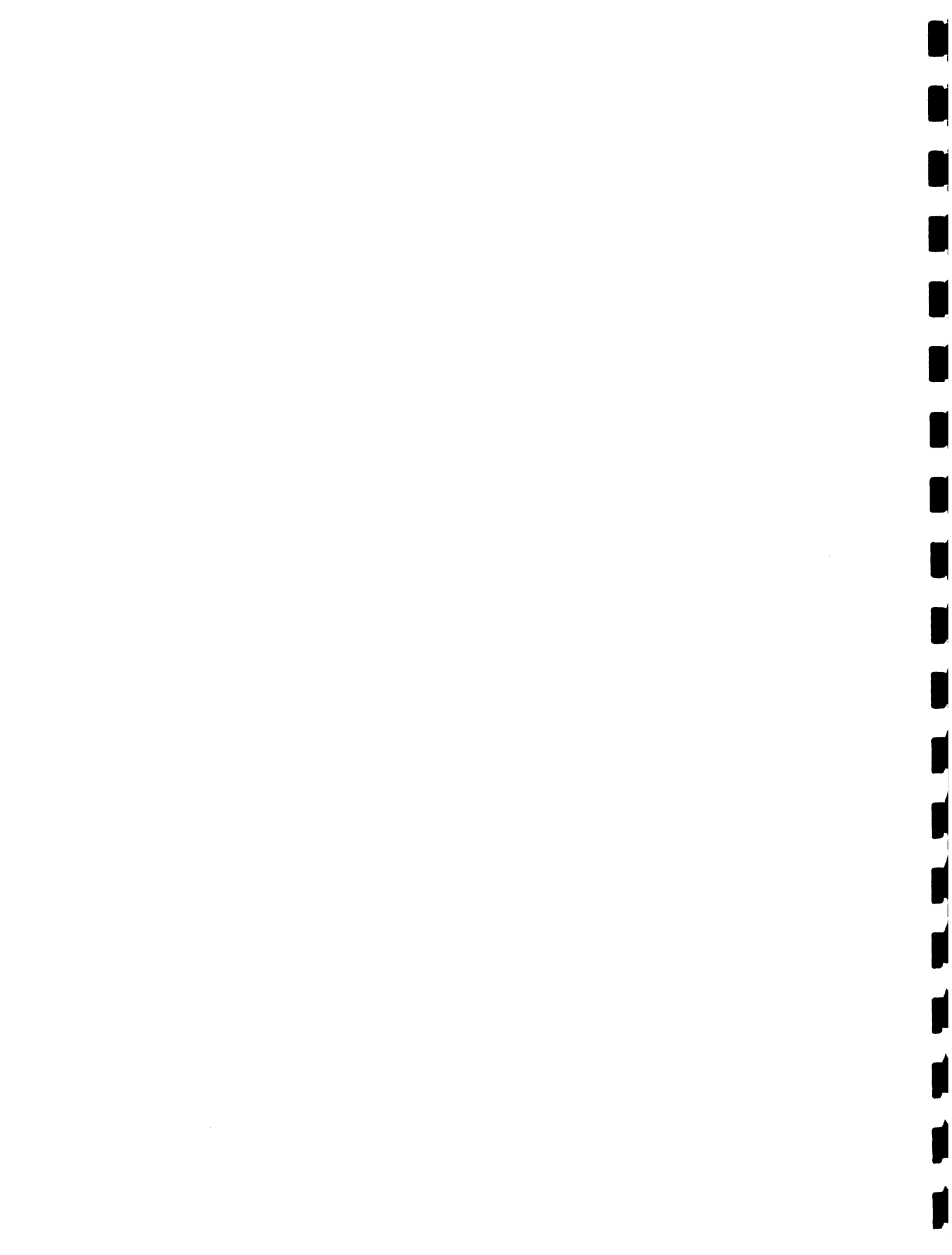
2. From the beginning of the 60 decade to the petroleum crisis in 1973, promoted by the Arab Countries.



Significant modifications then appeared in the agricultural education system; in the agricultural financing system research institutions were created and agricultural extension services were implemented at national and regional levels. The objectives were to increase the production and productivity again and to put the agricultural diversification into effect.

The strategy to increase the physical volume of agricultural products and raw materials, was to enlarge the agricultural frontier through fiscal subsidized incentives for the private sector, to introduce advanced technology and to promote internal protectionist measures, internal subsidized policies and agricultural price controls.

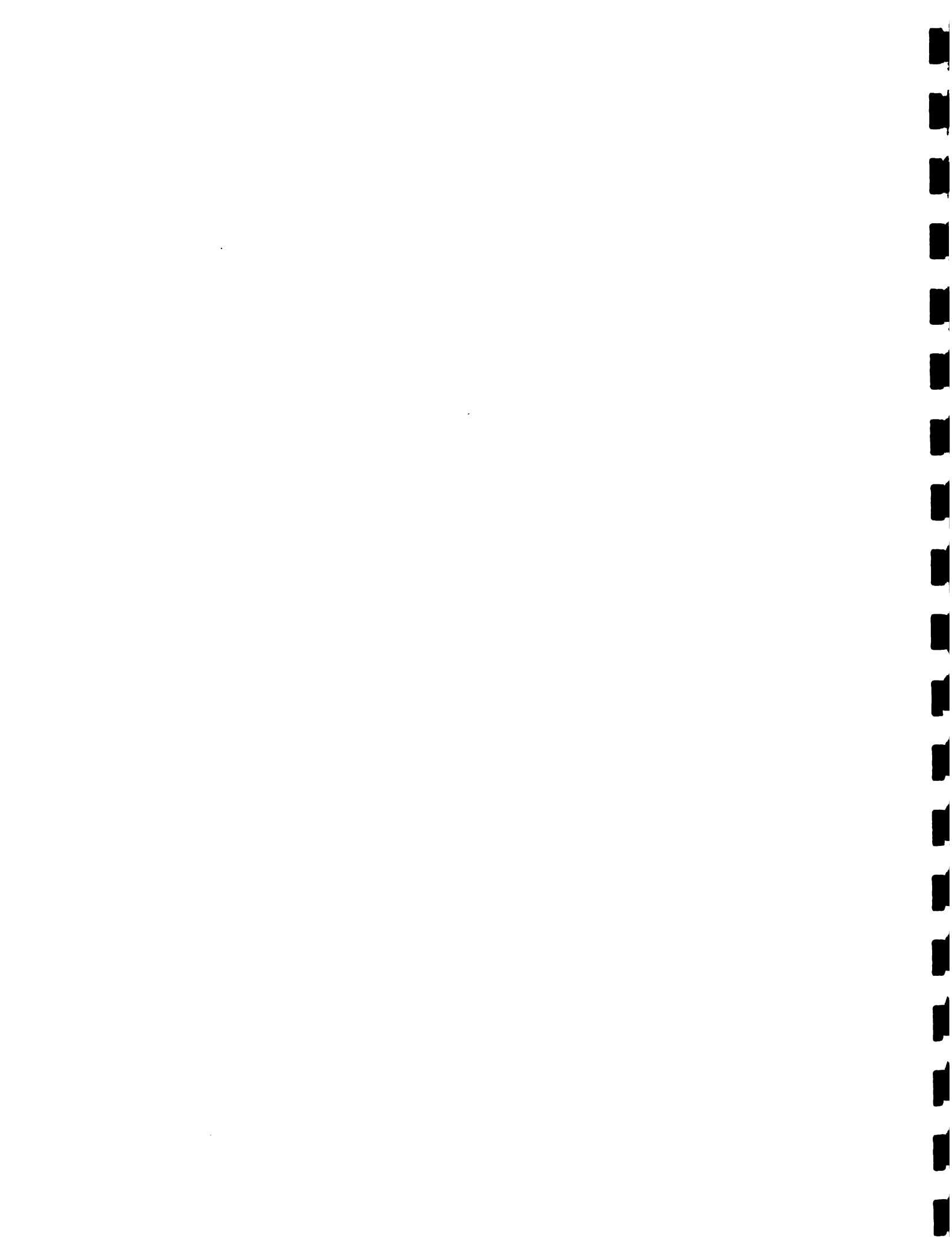
The strategies had two objectives to support the Export Agricultural Sector via protectionist measures to maintain the competitiveness of prices in the world market. The State implemented the foodstuff price control to retain the low level of wages for an indirect support of the industrial sector and to continue to support the process of import substitution to decrease the amount of import products. The State implemented the agricultural subsidized policies to support the agroindustries, in order to produce some products for the world market.



However, as a result of the internal and external needs and priorities it was necessary to introduce corrections, adjustments and changes in the agricultural structure, and as a result of this, the third stage of the Agricultural Revolution⁽³⁾ appeared in the Latin-American and Caribbean countries.

The main external reason was the diminishing of the purchasing power of regional countries, motivated by the sharp fall of the raw material and agricultural commodity prices on the World Market, which reduced the purchase capacity, to import agricultural inputs on which most countries on the world market were depending of the world market. By the petroleum crisis, since 1973, energy prices were sharply increasing, with a particular jump at the OPEC II decisions in 1979. As a result, the agricultural production costs rose extremely and brought shortcomings and limitations to the economic development process. On the internal level, the extreme expansion of the internal and external debts - incurred by the State - and the acute domestic inflation process, were the cause of the deterioration and severely hindered efforts for the agricultural development.

3. From the petroleum crisis until today.



In the post-petroleum crisis period, the agricultural sector and the State from the Region, were called upon to play a larger and more intensive role, as a result of their characteristics, which meant on one side, the generation of foreign exchange and on the other side, modernization of the service sector, while a new role in the production sector was enlarged and assumed by the State.

First of all new State enterprises, organisms and institutions were created and the state took upon itself, the functioning of the job-opportunity supply, as a result of the reduction of job-offering from the agricultural sector, caused by the technological revolution in the agricultural sector, to an extent which was much higher than the industrial sector could absorb.

In practice the agricultural production structure had no capability to use advanced technology in the field of genetic, chemical and mechanical foreign agricultural inputs and to absorb the agricultural technological packages at the same level as the industrialized countries. However, the very large progress, obtained by the agricultural sector of the Latin American and Caribbean Countries, did not get the space for their agricultural products on the International Market despite the competitive prices. During the last two and a half decades, trade protectionist measures had been implemented by the industrialized countries through additional import taxes, animal health and plant protection barriers have been making the trade relationship and export of agricultural products more difficult year by year.



The Latin American and Caribbean Countries also had the amount of Foodstuff imports grown from the industrialized countries, which had the lowest agricultural cost of production, and in some cases with heavy subsidized costs, although all of them had no comparative advantages to face the competition of the Region Countries. This is the specific case with the wheat and milk products. From their very large agricultural stocks food aid donations and food aid programs were derived, which caused a big damage to the agricultural development production of Latin America and Caribbean countries.

Nowadays, huge international grain and milk products stocks have been accumulated, basically as a result of the protectionist measures of the agricultural producers of the industrialized countries.

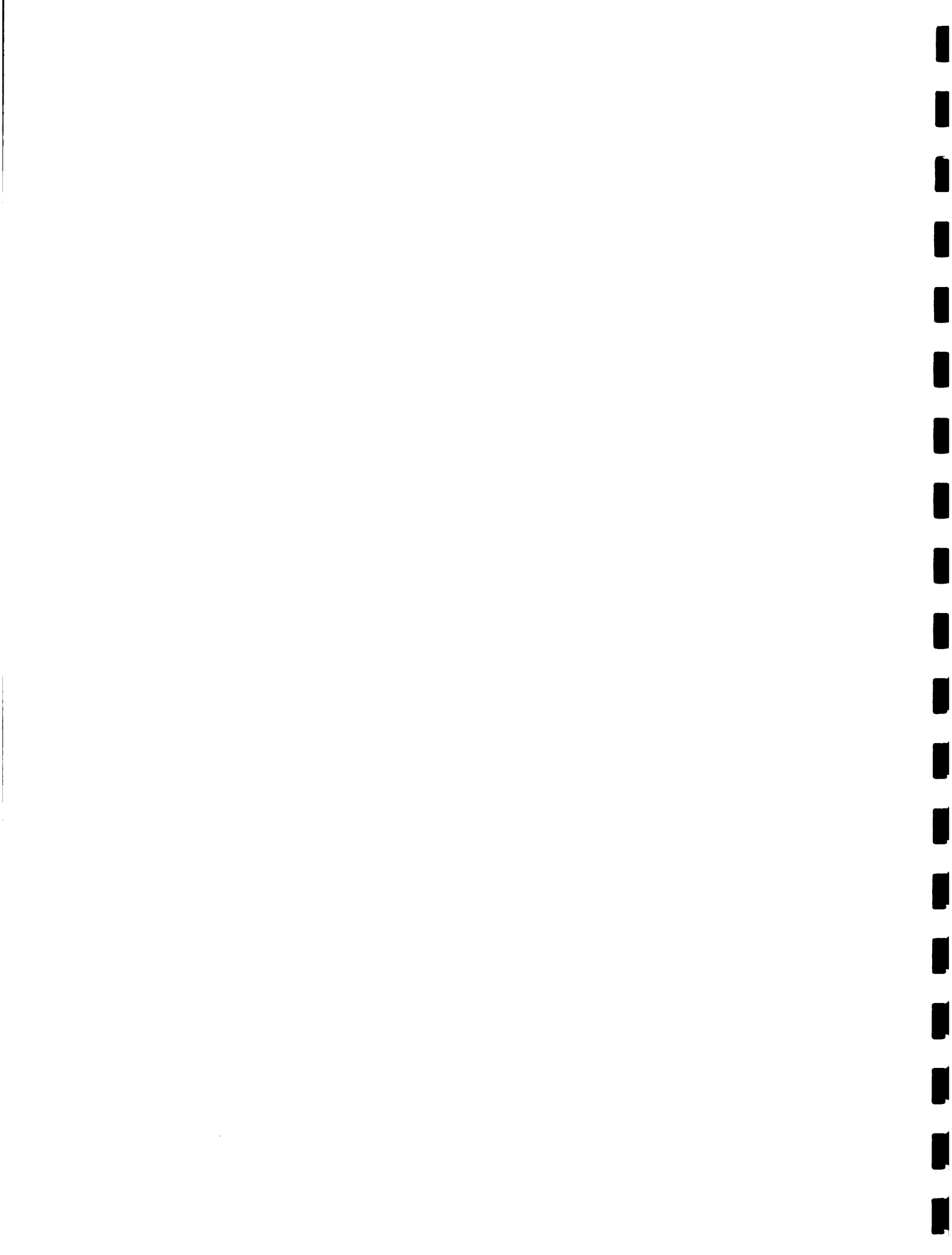
In the same period the performance of the industrial sector of the region got the maturity to carry out a strong dependence from the transnational companies which had control in the Region of chemical/pharmaceutical/agricultural inputs and maintained captive markets. Despite this, some agroindustries became successful on the World Market, but the developed countries introduced protectionist barriers for the industrial products. These protectionist measures reduced the growth of employment opportunities in the countries of the Region and sometimes imposed unemployment. More than in the past the restrictions against the developing countries on the World Market have risen nowadays.



The domestic protectionism for a few industries with advanced technology in the Region has been forced by industrialized countries with relation to measures which involved most of the agricultural and industrial products, exported by the regional countries.

The performance reflected by negative growth rates of the economies of Latin American and Caribbean Countries strongly forced the reduction of the Public Budget in the investments and services for the agricultural and industrial sectors and decreased the participation of the Gross Domestic Product from the state enterprises.

Over the past 30 years the qualitative technological changes have revolutionized the agricultural production structure and have made increasingly important contributions to the economic development process. However, the specific characteristics of the domestic agricultural growth took place and were guided by the reflections of the external needs and restrictions while they were primordially displayed through the amplification and diversification of the industrial productive capacity. The agricultural development process was strongly tied to the planification of the industrial growth. The agricultural planning and the industrial priorities were focused on the economic approach, based on the external trade conditions rather than the requirements and priorities of the small farmers and the peasant economy.



Nevertheless, most of the foodstuffs have been produced by the small holders and peasant economy in the Latin American and Caribbean Countries. The small farmers have paid the highest prices to support the economic development process.

During the last three decades the shortcomings and limitations of Latin American and Caribbean countries have been multiplying. The economic crisis increased the amount of the foreign debt accumulation, the capital goods; the agro-chemical/genetic/pharmaceutical/mechanical inputs from transnational companies and the external indebtedness; the trade protectionist barriers; the volume of food imports and the large scale of external technological transfer packages, which as a result have increased the agricultural production costs and prices for the Latin American and Caribbean countries, while the countries of the Northern Hemisphere and some countries of Asia - our main markets with the utilization of advanced technology - have pushed costs and prices down. On the other hand the income generated by agricultural sector has been reduced. But the more important fact that has a big effect on the negative rates of economic development process in the Latin American and Caribbean countries has been basically that the debt service payments have absorbed year by year an increasing percentage of the total export value of goods and services.



The economic policies had put pressure on the agricultural sector to increase production and productivity and on the agricultural diversification products, in practice, to earn more and more foreign exchange.

Today, more than ever, this critical situation makes it more crucial. The new stage of the Agricultural Revolution has just begun to be generated on the third stage period. At this point in time it is so important to redefine a new role to the agricultural sector through the plan of action supported by Latin American and Caribbean Countries.



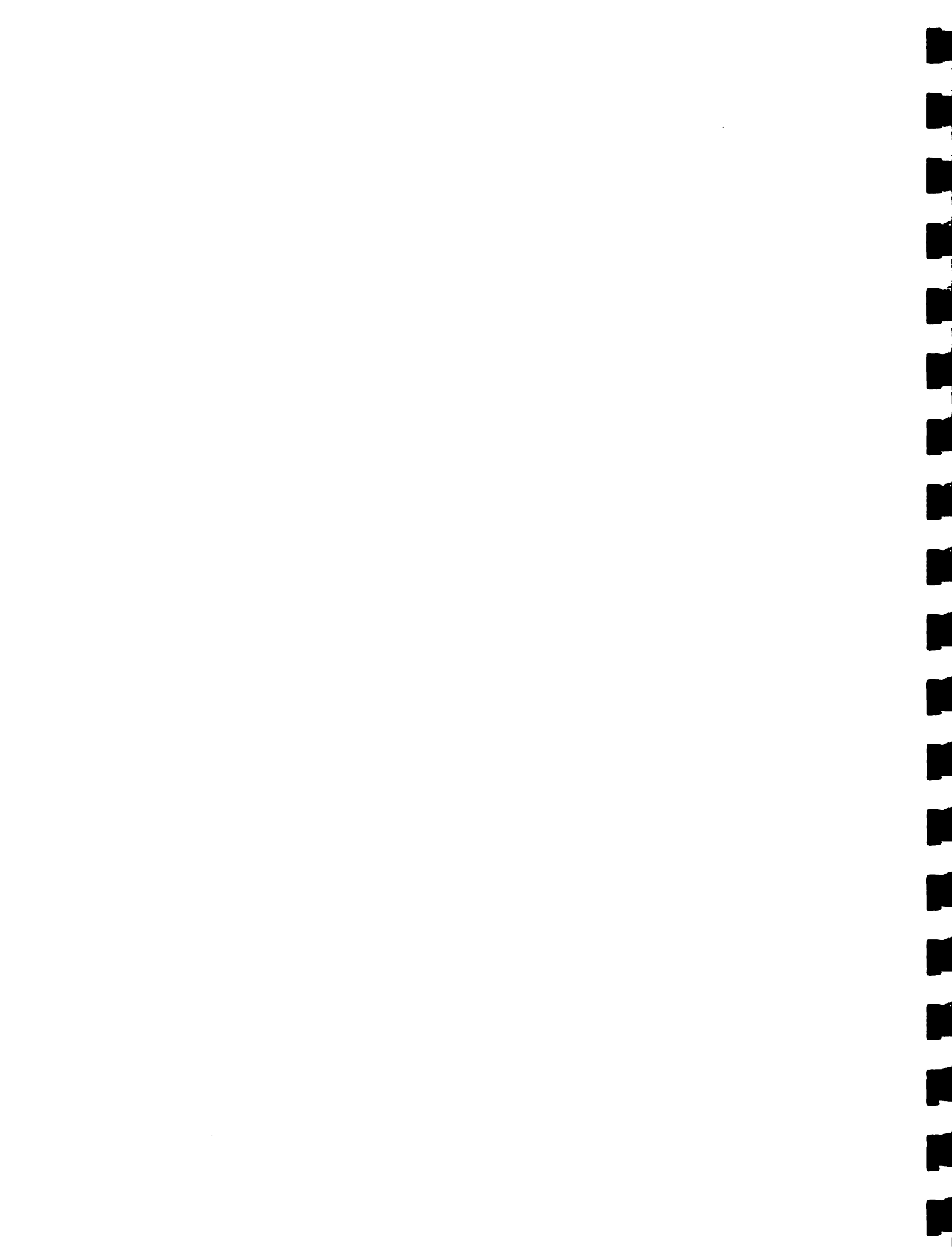
1.2 Technology Generation and Transfer in the Latin American and Caribbean Countries.

The introduction of agricultural technology in the Latin American and Caribbean Countries was clearly marked by two stages: the first, the transfer of technological packages since the postwar until the middle of the 70's decade and the second the big efforts of the regional countries to implement the appropriate technology generation since the middle of the 80's decade up to today. The first stage received substantial contributions in financial support and technical assistance from the industrialized countries, principally in organizing and creating national institutions of research. The decision to modernize and to diversify the agricultural sector came from abroad and was based on the interest which was necessary to drastically reduce the cost of production for raw materials and agricultural commodities. The technology has deeply revolutionized the agricultural production structure, but at the same time it multiplied the international dependence on the agricultural inputs, it increased the marginalization of rural communities and the rural poverty became acute in the Region.



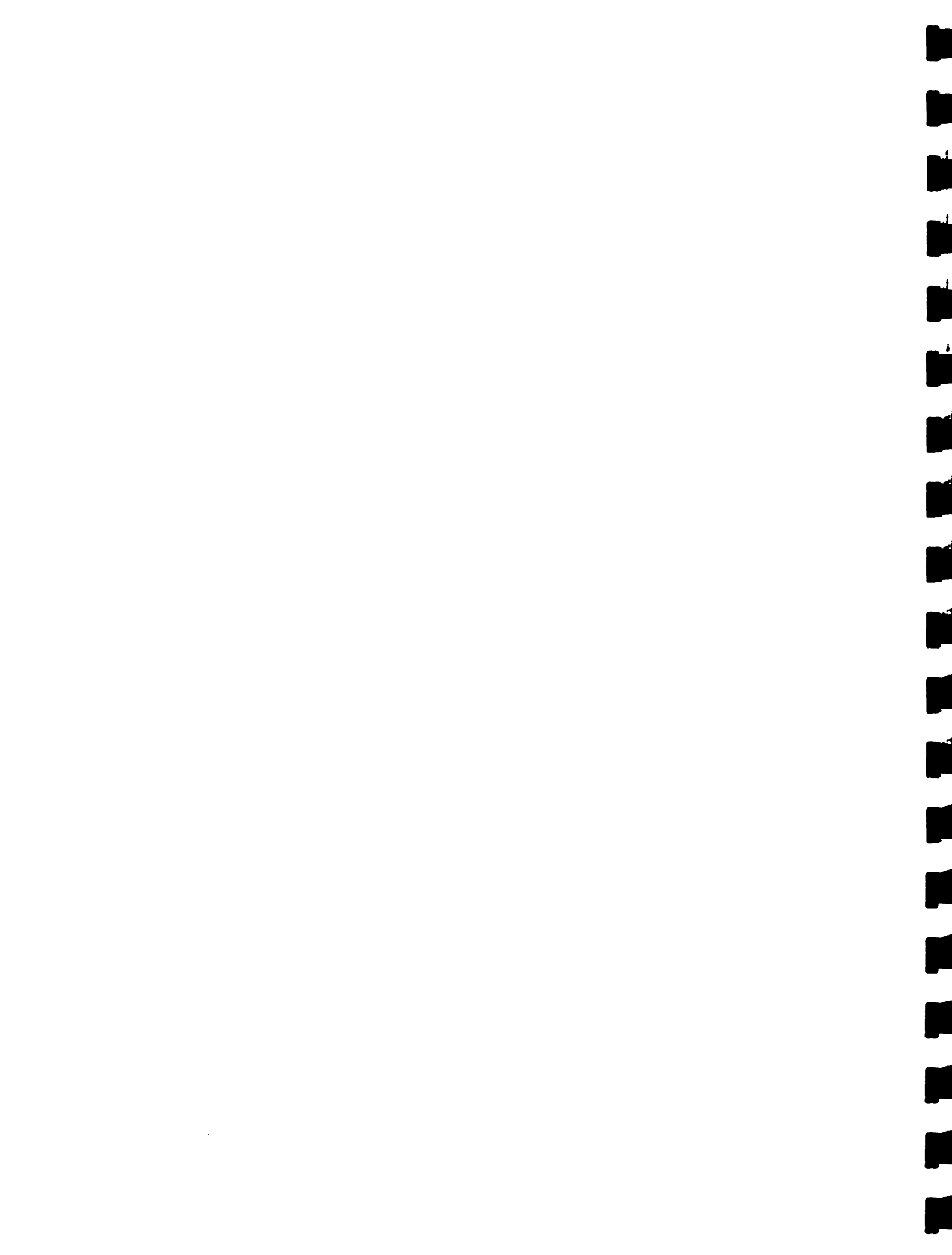
An example of the limitations and constraints of the introduction of the technology was widespread use of the agrochemicals which created its own contradiction in terms of pest and diseases resistances. It also sharply raised the level of the rural unemployment. In the first stage the significant efforts were made to introduce technological transfer packages and promoted, in the process of this development, the control by the chemical and pharmaceutical industry subsidiaries of transnational companies. This internationalization of the domestic agricultural market implemented economic adjustments and implied extremely high social costs and also promoted the homogeneity of the agricultural production and the uniformity of the consumption patterns. The benefits of the production and productivity growth were appropriated by the industrialized countries.

The second stage, which has been characterized by the generation of appropriate technology, faced shortcomings and limitations to support the agricultural development. The accumulation of technological packages in the previous stage disaggregated and produced a cross-section in the agricultural production structure. The foreign consumption and diet patterns were introduced in the Latin-American and Caribbean societies. Our structure of consumption was abruptly broken and many regional consumption habits were replaced, while many plant species were gradually disappearing.



The motivations of the integration and internationalization of the international agricultural market was defined by the implementation of programs and projects which incorporated the proposals of the world economy. For instance the programs of horizontal technology transfer financing by international organizations, confirmed this tendency, principally the grains and artificial pasture technology. The worse part of this accumulation process was that through regional integration the smaller countries were entirely dependent on and tied to these technological transfer packages from the large countries of the region, which passed on the decisions of the international economy on international level.

The agricultural research was orientated to the export of agricultural products and a little effort was made to generate technology for the small farmers systems. For this reason the Agricultural Foodstuff Sector was assumed to implement the appropriate technology at its own expens. Within this approach the framework of the agricultural production structure pressures contributed and penalized the small farmers and the peasant economy through the concentrated process of land and income, and expelled the smallholders to marginal areas of production.



The small farmers and the peasant economy, instead of introducing laboursaving technologies, maintained the competitiveness of the prices and qualities of their raw materials and agricultural commodities through the increase of the hours of work and the intensity of work, but at the same time they should force to bring into practice some advanced technological inputs. The large application of the laboursaving technology in the agricultural production structure of the Latin-American and Caribbean countries promoted and increased the seasonal agricultural labour force and the proletarianization process in the agricultural sector. Profound quality changes were implemented in the peasant economy and the small farmers systems by the introduction of capital intensive goods and services, through the strong linkages of the internationalization of the domestic agricultural market.

The ideological speech printed programs and projects in the plans to underline that the technology would bring the improvement of the standard of living, but in reality the standard of living deteriorated for the rural communities. The vigorous capitalization process in the agricultural sector reduced for a significant part in the non-monetary component of the peasant economy and small farmers incomes.



At the beginning of the introduction of technological transfer packages, which were to change the production and quality of the Agricultural Sector, tied to the Agroindustrial commodities, successfully got the external market. Therefore the appropriate technology generation in the region became important for a few specific agricultural products. Some of the small farmers production and the peasant economy was introduced in this specific agricultural production.

The low rate of return of investments on research into the small farms systems blocked the smallholders, producers and the peasant economy for participating entirely in the agricultural capital intensive system. Nowadays the international pressure appears for the implementation of integrated regional cooperation in research.

This case confirmed the tendency for the increase of participation of the internal private sector in the appropriate technology generation process, principally because the opportunities to get a high rate of return on the agricultural investments increased. From this analysis we can infer that there are adjustments in the international division of labour and of the world economy as a result of the empty spaces within the economic structure by the State which in the past should have passed these on to the private sector.



The historical role played by the State in the past, within the development process, should be modified. This means that in the near future the agricultural sector will relatively quickly change its role, if one considers the new role of the private sector in the economic production structure.

The competitiveness of the interest on the agricultural world market, for one side, shows a very clear picture of the linkage, the trends and the constraints of the development of the agricultural sector and on the other side it puts the opportunities of the primary sector from the Latin-American and Caribbean countries into disadvantage. The implementation of the technology transfer packages has been an accelerated process. The appropriate technology generation process has just begun to gain momentum. Under the internal and external conditions and within the competitiveness of some raw materials and agricultural commodities from the Region, the confrontation of the domestic production structures with the importance of the new forms of technology will be increased. This is the case of the biotechnology, which will offer a great potential of technological alternatives of laboursaving and landsaving and will assume an important role on the agricultural production structure in the future.



The transfer of technological packages has not created sufficient capabilities, because the benefits have been appropriated by the industrialized countries. However, the technology generation will be retained on the national economy for some of the benefits. The technological transfer packages have given priorities for increasing raw materials and foodstuff production and productivity.

The development of the agricultural sector has reflected a considerable enlargement of its share in the total of resources and income within the economic growth.

This emphasis has resulted in a significant growth in the physical volume of the agricultural products, but at the same time the increase of the bulk of the preharvest, harvest and postharvest of agricultural products, was losing basically as a result of the harvest and proharvest system, transportation, storage, the processing system, packing, etc.. The preharvest system was principally affected by plant pests and diseases. But the development of the agrochemical and mechanical technology grown considerably, but they remained in the hands of the transnational companies. This restricted and, once again, made the possibility for an autonomous development of the agrochemical and mechanical technology generation in the Latin-American and Caribbean countries more difficult.

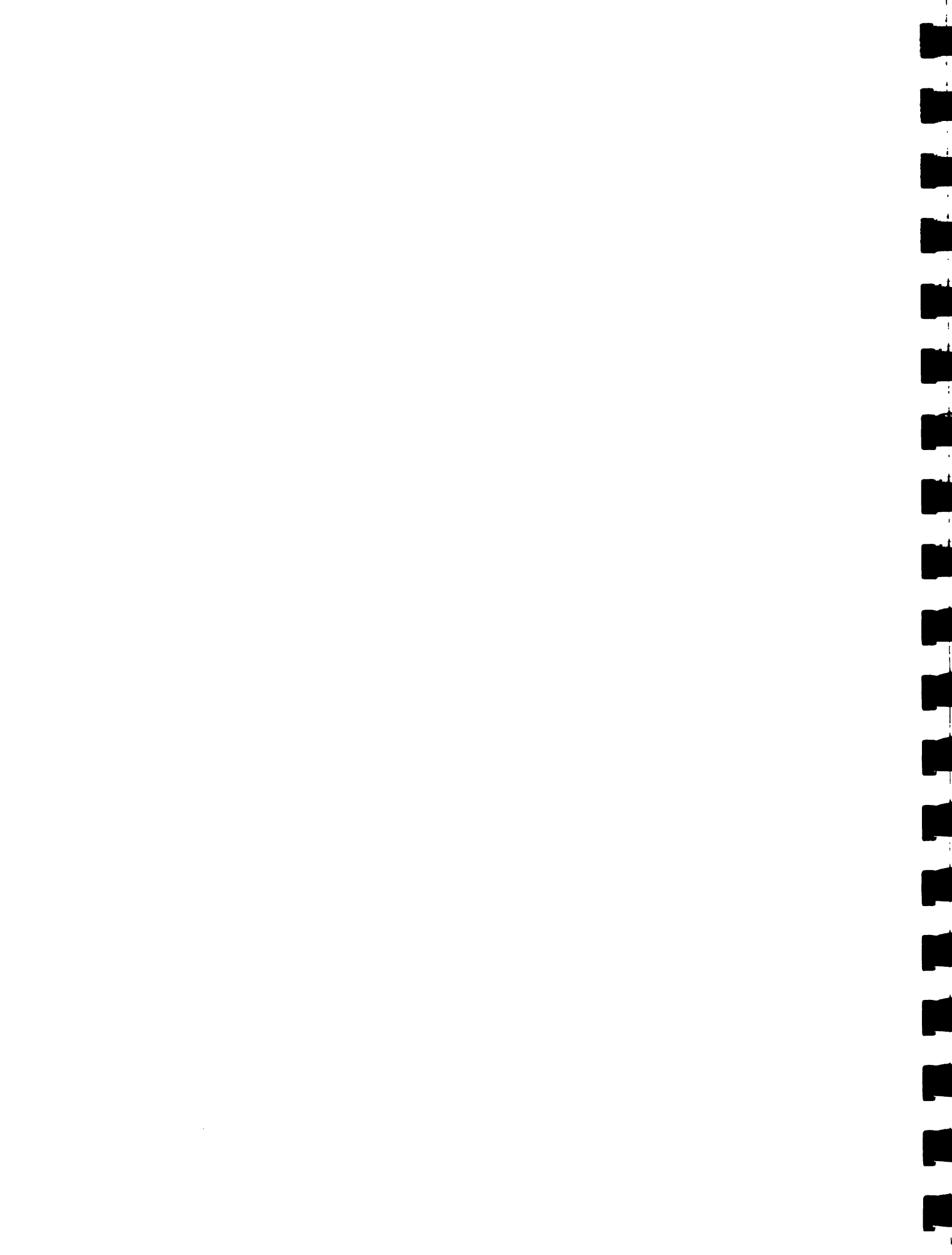


Year by year the amount of the preharvest, harvest and postharvest product losses were increasing and the political society and the civil society should always assume and absorb the social and economic damages.

The analysis of the role, played by the technology and generation transfer, should be considered in relation to the agricultural production structure. The economic structure presents competitiveness and no harmoniousness. The research is an integrated part of the productivity system. Today it is impossible to talk about the agricultural inputs, without the corresponding genetic, mechanical, agrochemical and pharmaceutical technology.

The technology is completely embodied in the capital goods. The technology has been the driving force of the qualitative changes in the agricultural production structure and brought a significant growth of the production and productivity for the Region, but the benefits were appropriated by the industrialized countries.

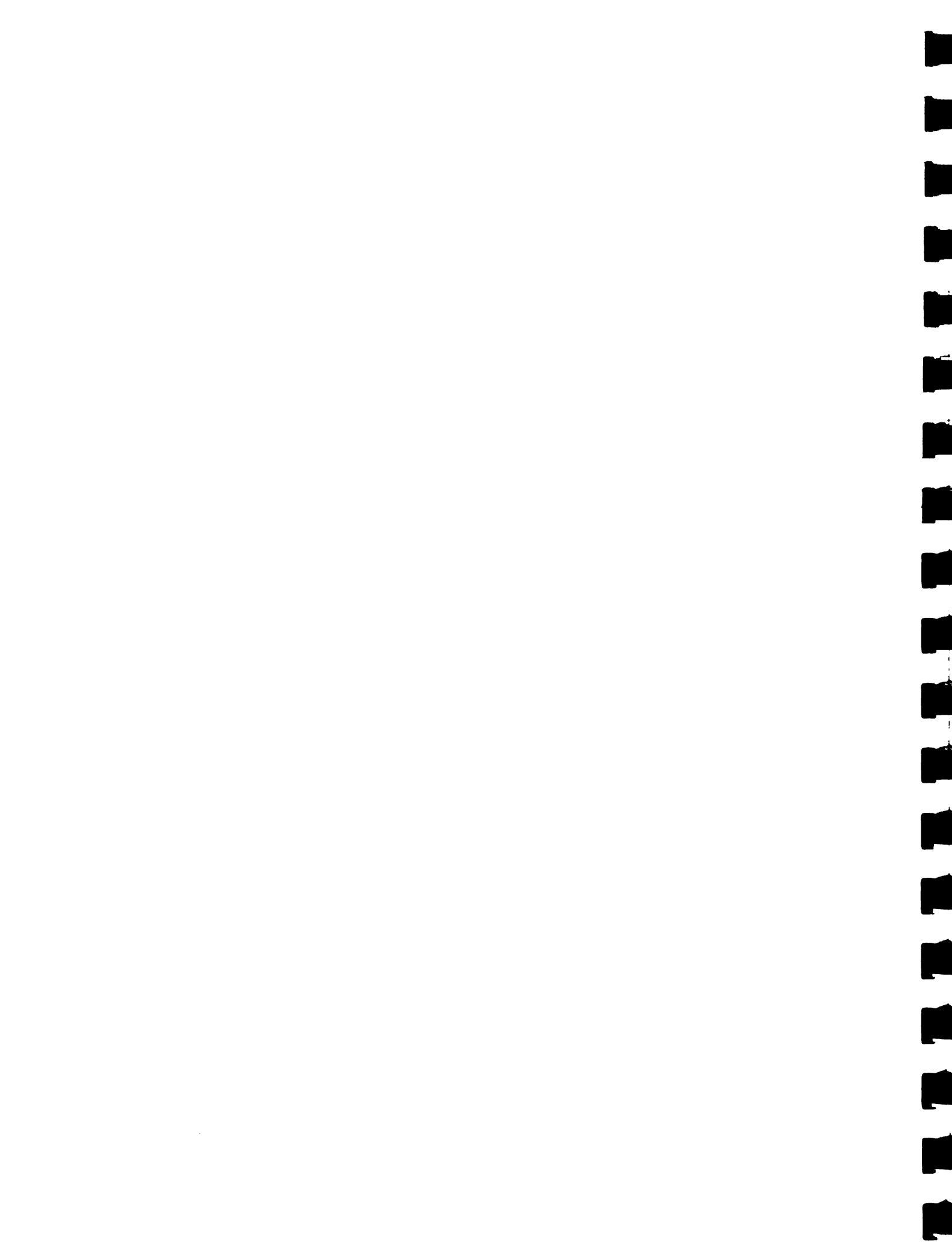
The combination of production factors, land, labour force, capital and technology have given rice every year. The integration has been continuously increasing and the complementarity function has grown more quickly than the substitutive function. The use of one necessarily implies the other.



The correlation among the production factors has become complex, sophisticated and unaccessible for the agricultural production structure of the Latin-American and Caribbean countries. For instance some hybrid crop varieties have a very high correlation with fertilizers, herbicides, pesticides and agricultural practices. But at the same time, the introduction of the agrochemical technology has created pests and diseases resistances in plants. On the other hand, some industrialized patterns of the mechanical technology are not applicable in the agricultural production structure of most of the countries of Latin America and the Caribbean.

The needs created by the foreign economic behaviour, surrounding the technology, do not correspond with the needs and priorities of different cultural and social realities which exist in the Latin-American and Caribbean countries.

The scarcity of resources do not follow the incredible waste in the application of agrochemical inputs applied in the agricultural production. Nowadays the industrialized countries have just created import barriers for agricultural products which used agrochemical inputs. The agricultural technological policies have clearly penalized the peasant economy and the small farmers system. The economic policies have been against the interest and needs of the rural communities.



The domination has not been defined, neither has it been explicit in the ideological speech of the dominant class. However, on one side it has been clearly implemented in the proposals of the economic structure, on the other hand it can be inferred from the behaviours of appraisal of the production system which has considered the shortcomings of the agricultural production structure as result of the defect of the Latin American and Caribbean Countries, but in reality most of them are consequently defined by the industrialized countries of the needs and restrictions. The implementation of the advanced technology will continue, and it is impossible to change the speed of this process. However, the Latin American and Caribbean countries should adopt technological alternatives for the peasant economy and small farmers systems.

They should make better use of available plants, vegetables and varieties which exist in the Region and they should introduce genetic technology for these specific regional plans.

To implement this technological system, a correspondent mechanical technology which has been adopted for soil, climate and environment conditions of the region should be followed, as well as to complement this technological system for the development of biological and ecological control research and bio-energy research.



1.3 Reflections on a Proposal for Technology Generation and Transfer for the Caribbean Countries.

In the colonial period the economic production structure of the Caribbean countries was based on the plantation system and in some cases on the mining sector, (both very important economic activities), and for many of the countries such situations have continued. During the Second Great War the tourism sector in the Region gained a large tourist flow, as a result of the inaccessibility of European, Asian and African countries. From this period, up to today, a significant number of resources has been allocated to tourism development in the Caribbean countries. From this point in time until today the tourism sector has got a significant growth.

Today it is possible to define the industry of tourism in the Region as an enclave industry; this means that it has strong ties to the world economy, but weak linkages with the domestic economy. The small size of the countries, principally the Windward and the Leeward Islands ^{1/}, and also Barbados, have been marked by shortages of land, accompanied by an increase of population density.

^{1/} Windward Islands: Martinique; St. Lucia; St. Vincent and Grenadines; and Grenada.

Leeward Islands: Virgin Islands; Antigua and Barbuda; St. Kitts and St. Nevis; Montserrat; Guadelope; Dominica; St. Martin; St. Estatius, etc.



The medium-size countries such as Jamaica, the Dominican Republic and Haiti, have implemented other alternatives, but have faced the same problems, as a result of the similarity of their economic production structure. It is possible to include Jamaica in this group, but then the importance of its bauxite sector should be clarified. The exceptions on the medium-size countries are Trinidad & Tobago, where the main sector of the economy is the petroleum industry, and Haiti which has a very large domestic market.

The large-size countries in the Region are Guyana and Suriname, which based their economy on the bauxite sector, the sugar cane - and rice plantations, and Cuba which has a different economic system. The ethnic composition of the population of Trinidad and Tobago, Guyana and Suriname, has made it difficult for the integration and the implementation of national programs and projects. The variety of social and economic structures in the region and in a significant number of states, which have not yet got their independence, will delay the economic integration from the countries of the region.

These factors can be added to two other factors, which are: first of all, the strategic location in terms of geo-political and commercial international development and maritime movements, and secondly the laterally political independence of the Caribbean countries, marked and defined by the characteristics of the economic structure for the Region.



On one side the very strong ties of the captive agricultural markets, the foreign mining trade and the political linkages with the previous colonial status of the Northern Hemisphere countries and on the other hand the small scale of production and the small size of the economy blocked and limited the development of the agricultural sector of countries of the Region.

The tourism industry which should be functioning as with a link in a chain, to promote the economic integration of the small countries of the Region, has contributed to accelerate the foreign behaviour and consumption patterns and all foreign currency, generated by the tourism, has been allocated for strengthening the sector, while most of the resources have not returned to the Region. The property of the tourism complex industry is based outside the Region; more precisely: in the industrialized countries.

Hoteliers, Airline companies, shipping companies, tourism agencies, financing agencies, commodity wholesale companies, tourist packages promotions, food supply companies, etc., are subsidiary companies in the development countries. The concept of leisure and entertainment comes from the industrialized countries, to be implemented in the tourism complex industry; subsequently the behaviour and consumption patterns reproduced in the Caribbean Area are models from the developing society.



Man tried to implement some of the domestic production structure in the Caribbean area, for instance the strong linkage between the tourism sector and the local agricultural sector, but a lot of constraints have been existing in carrying out this proposal. First of all, the tourism sector in the Region carries out its activities in a short period, called 'high season', that is from December 15 to April 15. During the agricultural production in the program, the sector faced this limitation of seasonality of the agricultural commodities. Secondly, the sophisticated requirements demanded from foreign tourists and the strong ties between the hotel complexes and the associated companies outside of the Region, have made any alternative of final consumer goods difficult. Year by year there has been an important increase of the volume and of the value of the agricultural commodity imports by the Caribbean Area. The local agricultural production has played a very limited role. The enclave economy of the tourism sector in the Caribbean area, tremendously increased the cost of living. First of all, a significant percentage of the best areas of the land, many of the beaches have now become under the control property of the foreign companies. Secondly, most of it has been bought by foreign people, for the construction of houses and for the introduction of the condominium system. Thirdly, the national tourism sector has a weak linkage with the international tourism complex in each country of the Region, because they are completely independent.



The chain of the international tourism complex has only physical location in the area, because the behaviour patterns, the systems and the economic linkage have come from abroad. The tourists do not leave the hotel complexes as this system is a part of the foreign social and economic structure.

The main difference between the enclave economy of the tourism industry of the Caribbean countries and the enclave economy of the developing countries, principally the mining sector, is, that in this system national enterprises retain a part of the number of resources, while in the Caribbean countries most resources are generated by the tourism flow, which are appropriated by the international companies of the Region and which pay only the salaries to the national people. An example of this can be found in the period '82/'83, when the complete tourist flow of Grenada was redirected to other countries in the Region. There is no significant opportunity for the small countries which have strong ties with the tourism complex industry, to direct this offer in order to achieve economic development, without looking for other ways. That means that the Governments of the Region have to redefine the principals of the concept of tourism and development, while some of the economic policies based on the tourism industry, have supported a real national economic development process for this sector.



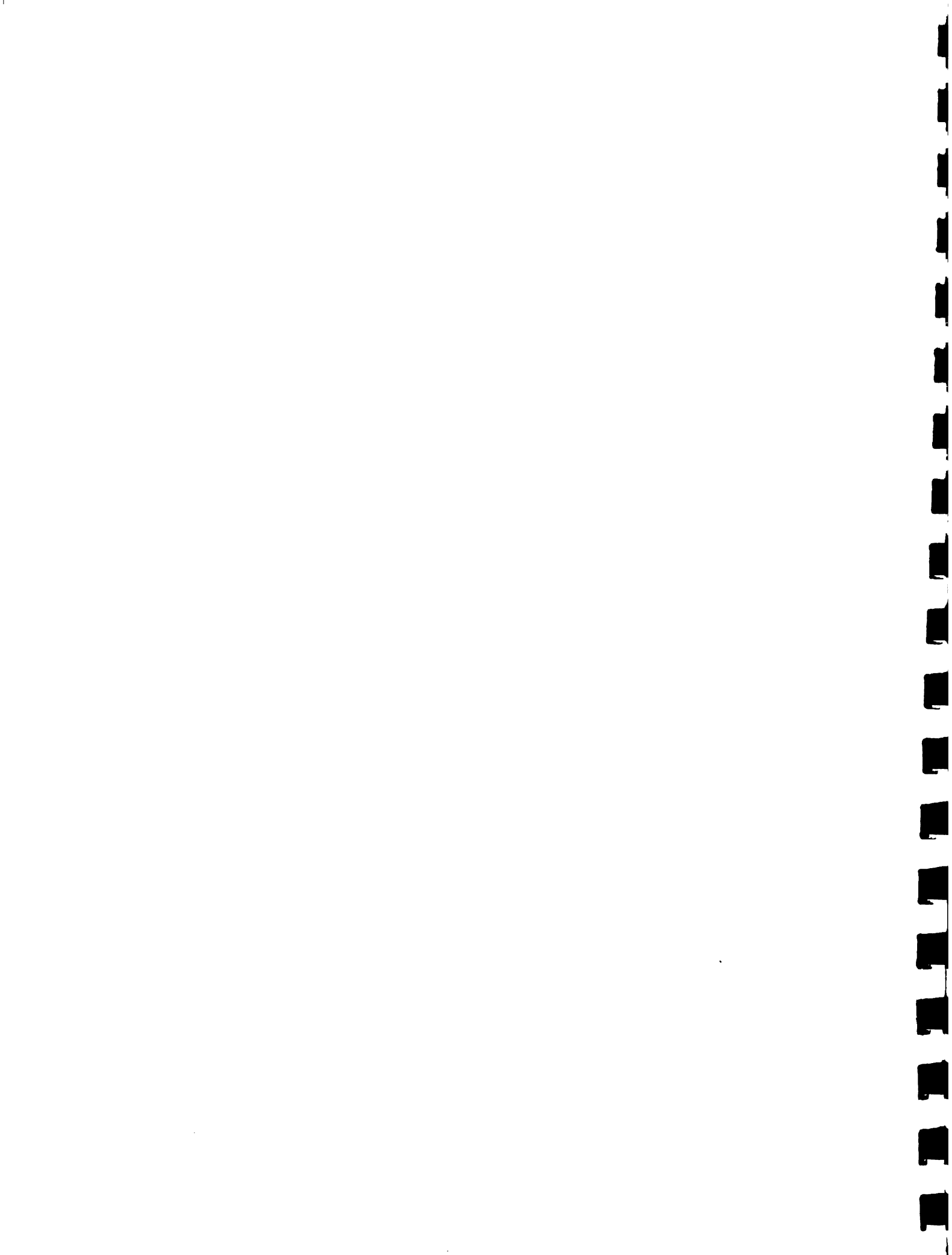
In the small countries there is an other important sector, which is the handicraft industry. However, this industry is often diverted and does not reflect the native cultural and social structure. there remains for the Region two ways: the first is the Agricultural Sector and the second is the Agroindustry. But the main point is to change the concept of the development for these sectors in the area. It is necessary to implement the Caribbean Development process within the reality and the potentiality which exist in the area and within the interests and priorities of the Region. That means that any agreement for technology generation and transfer with South American and Central American countries will cause damages to the Caribbean countries, because any horizontal transfer of technology will have benefits and advantages for the largest countries and will introduce behaviour and consumption patterns in the Caribbean production structure. It can be inferred from our agricultural historic analysis as follows:

On one hand: since 1950 the need of food for the Region has had a significant increase. The countries of the Region introduced the available world technology. Together with the modernization ideas of the export agricultural sector, the diversification ideas have been established. These proposals were transferred to the small farmers. The driving force of the proposals was the technology. The technological transfer packages brought great limitations and constraints for the agricultural sector in the Caribbean countries.

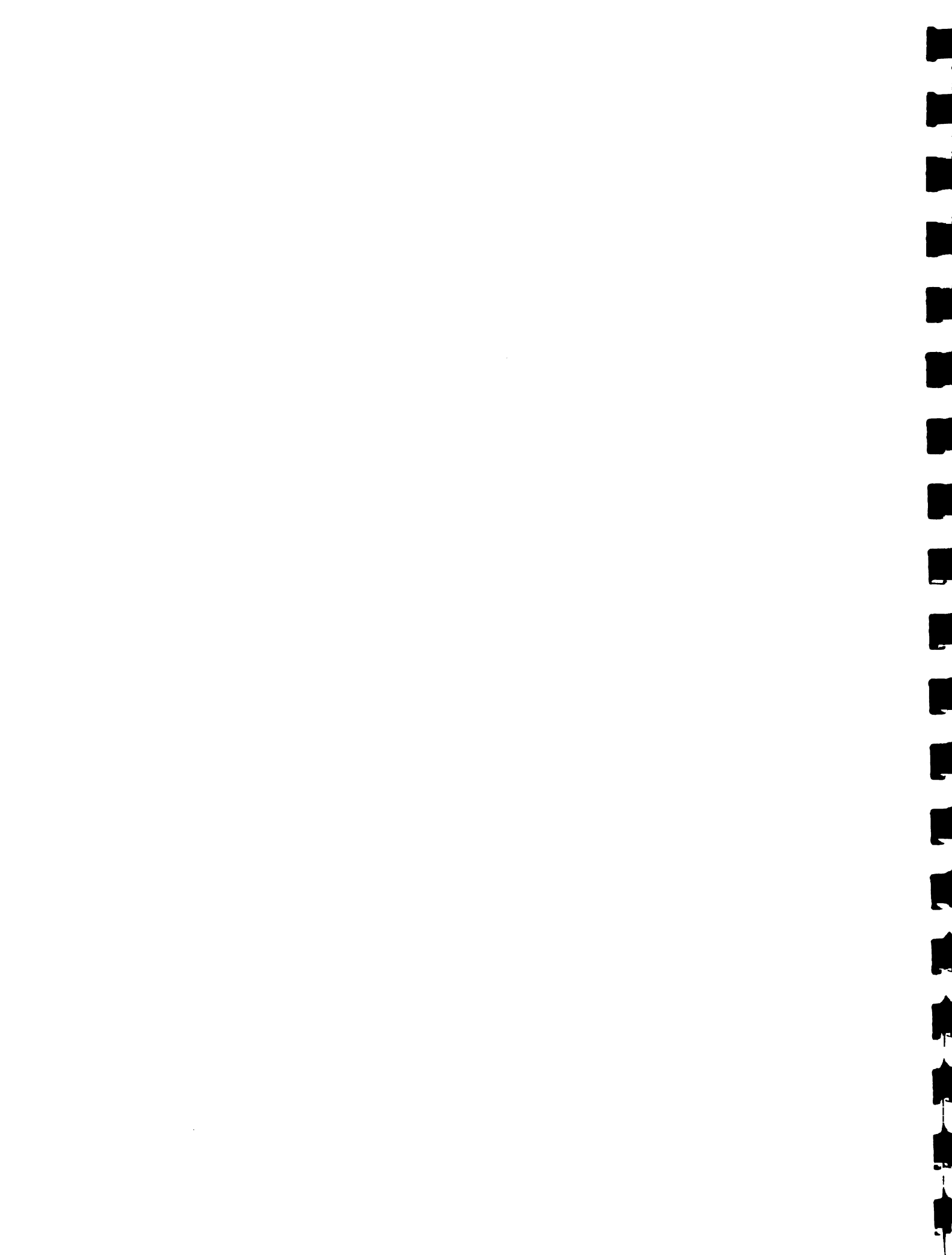


First of all, the small scale of production, secondly the small domestic market for local agricultural products, did not promote interests and opportunities to implement the genetic, agrochemical, mechanical and pharmaceutical industries for the establishment of their unit productions. Thirdly, the price of labour force and land transportation discouraged any initiative. Fourthly, the economic production structure in the Region was the main reason to set up the agricultural input industry in the territory of the Caribbean area. Therefore, the smallest countries have been depending entirely on the transnational companies to implement agricultural technology. As a result, the total dependence of petroleum and the high foreign dependence of the agricultural inputs and the high energy costs has impeded the modernization and diversification proposals for the agricultural development, while it became more difficult year by year to get an autonomous agricultural development. On the other hand, the agroindustrial sector in the Caribbean area has continuously been depending on the foreign industrial inputs of the processing system, like chemical inputs (conservatives, additives, vitamins, etc.) and the packing inputs (cans, glass, paper, etc.) and machineries for the agroindustries. The medium and the large Caribbean countries ^{1/} present better economic alternatives, but each one would have to be analysed separately.

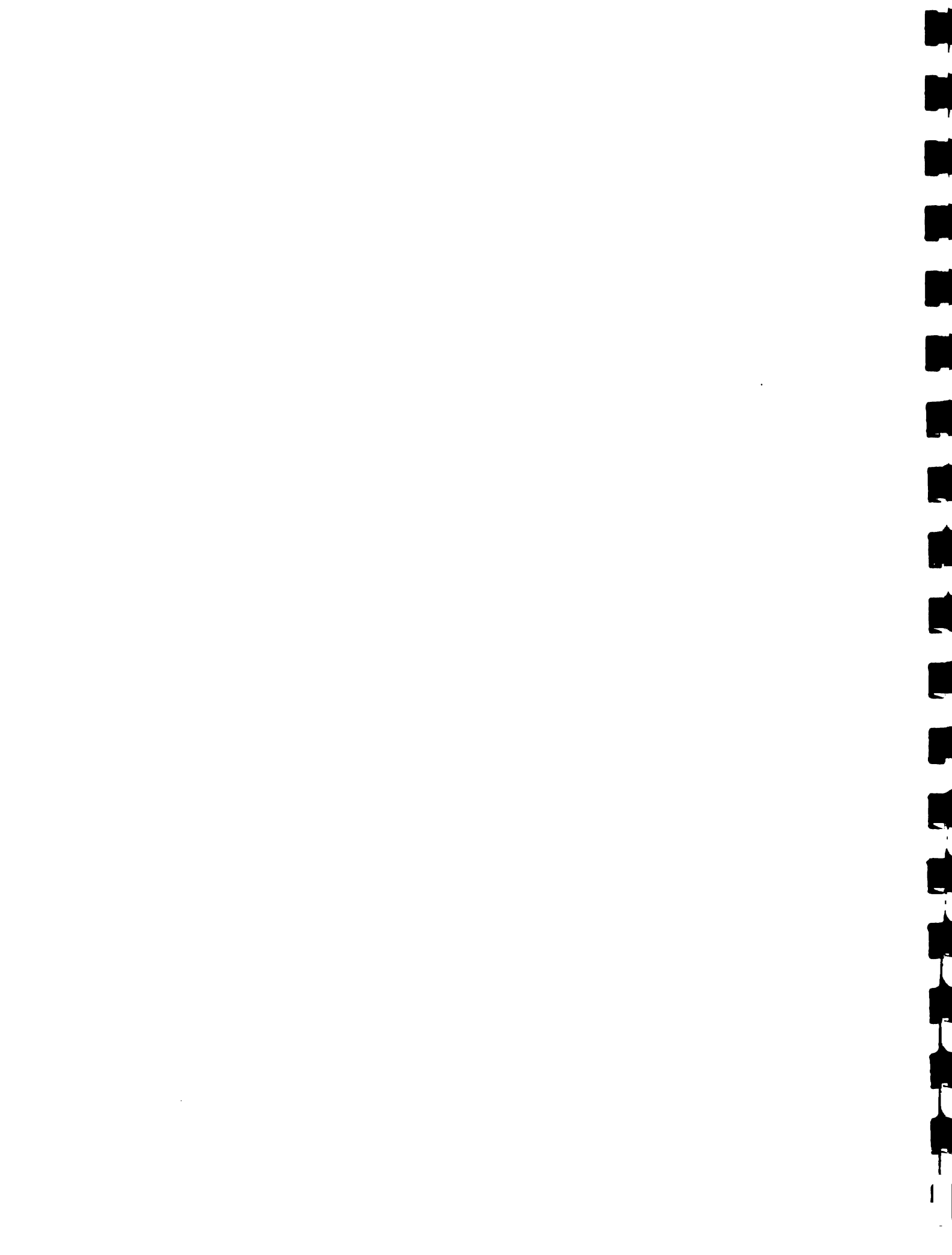
^{1/} Trinidad & Tobago, Jamaica, Haiti, Dominican Republic, Guyana, Suriname and Cuba.



Any proposal for technology generation and transfer should begin with the precise appreciation of the weaknesses and potentialities of the Agricultural Sector in the area. The Technology Generation and Transfer has to be viewed from an integrated approach towards the area and should be implemented in the Regional Program, which should be considered as a whole system at the same time of production, marketing and consumption. Of course, a Regional Cooperation Agricultural Program can be more effective than isolated efforts. The behaviours and consumption patterns should return to the historical agricultural demand requirements. The advanced technology introduced qualitative changes which are nowadays impossible to turn back. However, the foodstuff demand requirements can revert the tendency, principally if it directs this specific agricultural program to the domestic market. The internal agricultural market of the Caribbean countries is considered to be relatively small and the only exception in a research investment approach is Haiti, which means having a very low rate of return. The principal reason for this proposal lies in the fact that countries of the Region import more agricultural commodities in the amount and value every year, much more than the export agricultural products. But the main attention should be put in the fact that the agricultural products which have been imported, do not only go into the tourism complex industry, but a significant part goes into the national consumption as well.



The export agricultural sector should continue to receive assistance, but the proposal for technology generation and transfer research should be contributed to the fact that it has broken the increase of import of the agricultural products, and encouraged the domestic agricultural production. To implement this agricultural research system, it is necessary to redesign and build a new concept of appropriate technology and within the agricultural environment less use should be made of the foreign agricultural inputs, while major research efforts on the bio-energy, solar energy, wind energy and consequently the use of the biological control and ecological control should be carried out. At the same time the countries of the Region should identify the plant quarantine requirements to export and import foodstuff goods and to implement a Regional Center for the diagnosis of plant pests and diseases in the Caribbean. To complement the program the conservation of renewable natural resources and forestry and small livestock production should be incentivated. For the Caribbean area the livestock feeding should be built on the base of available regional plants, despite the existing low prices and available supplies of grain on the world market.



The grain culture is almost universally dominant in the livestock feeding, but as the imported agricultural input prices rise more quickly than those of local agricultural products, there is significant room for diversifications and import substitutions of final consumer goods in the areas if one considers the regional alternatives for appropriate technology generation and transfer in a new concept and approach and if a vigorous regional marketing among the countries should be implemented and maintained.



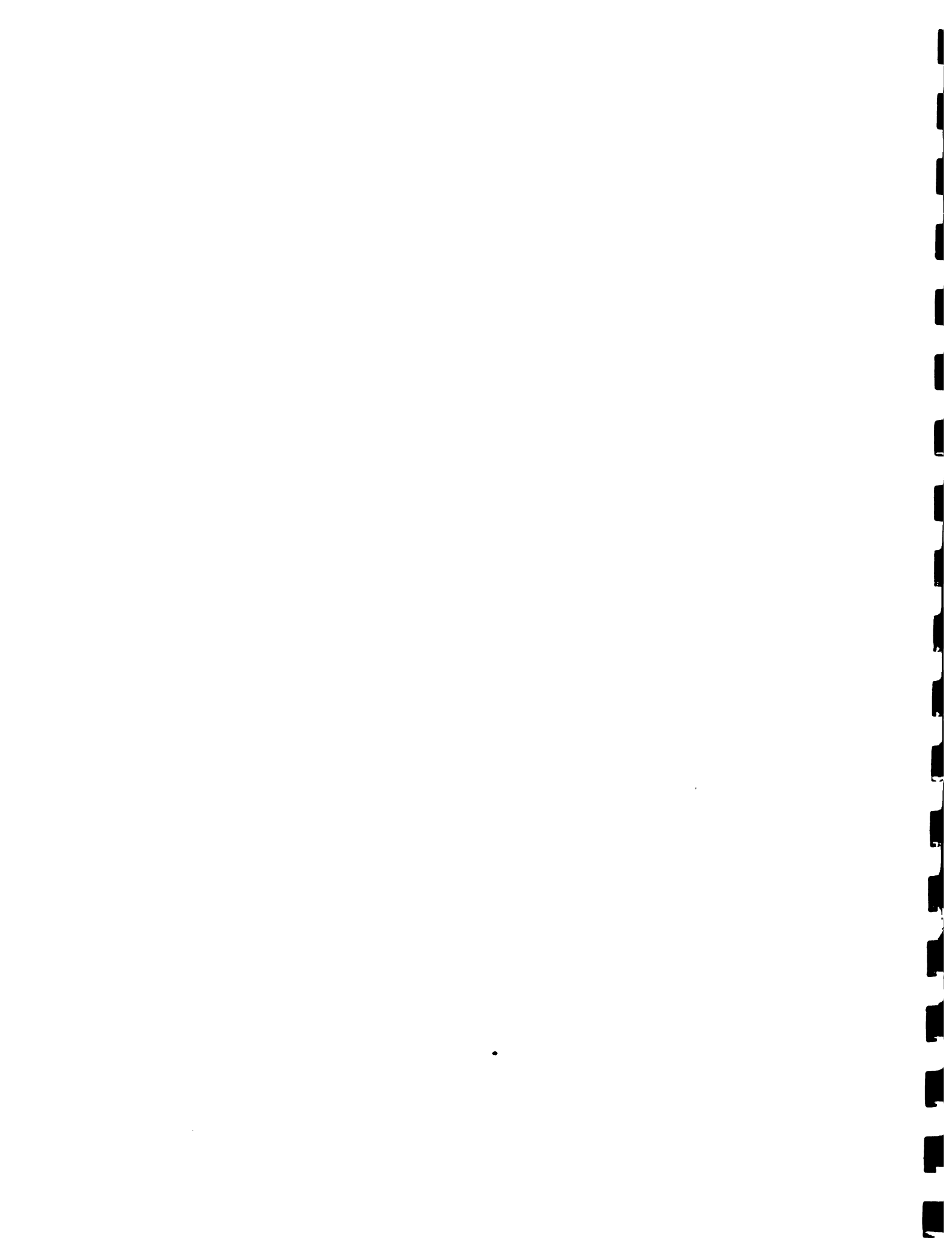
STRUCTURE



II. STRUCTURE

2.1 The Implementation of Technology Generation and Transfer for the Caribbean Countries.

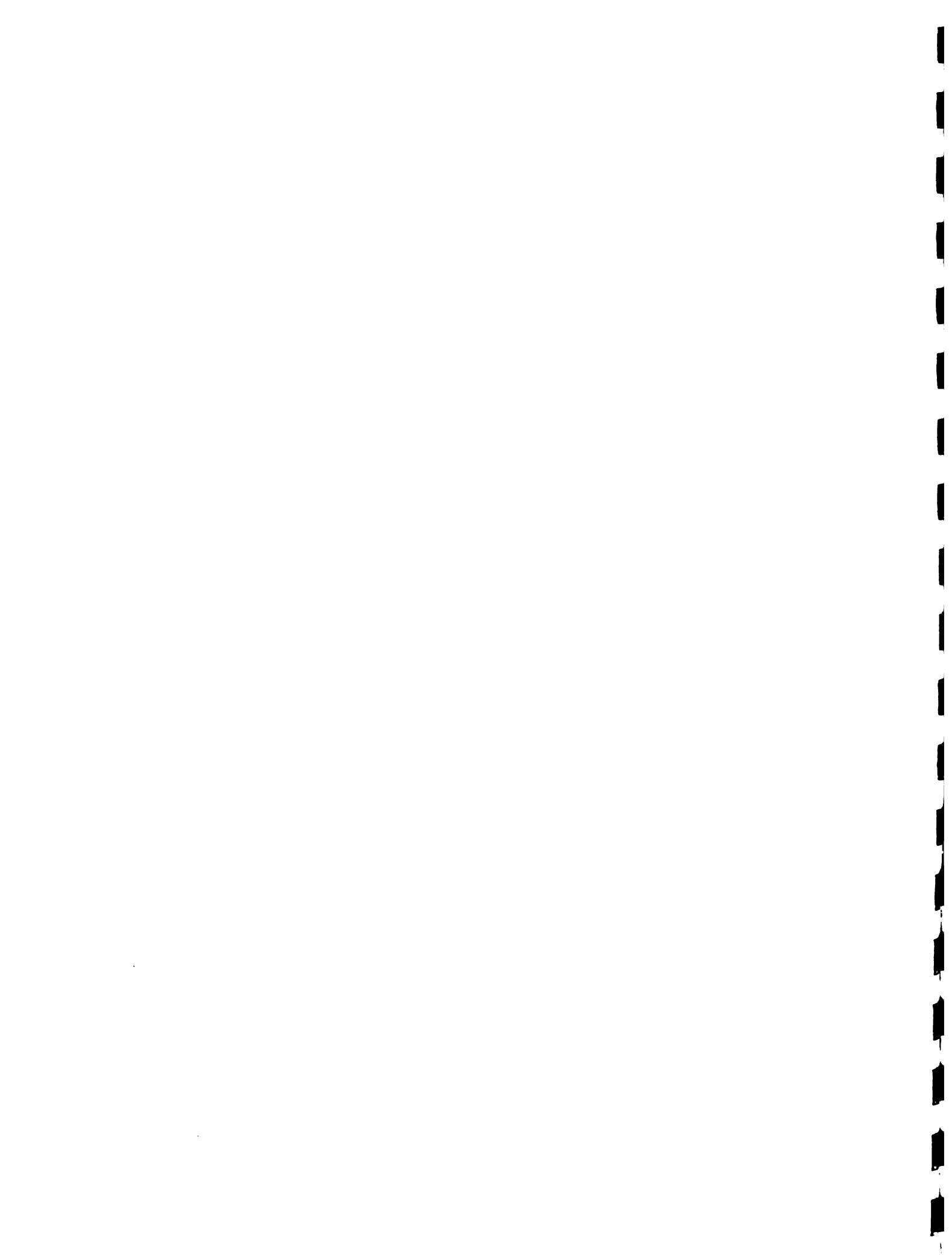
The interdependence of the world economy and the agricultural market have constantly grown. To carry out the technology generation and transfer for the Caribbean Countries a new concept of needs and priorities should be built. The capital accumulation process for the Caribbean countries should brake the extremely drainage of area resources to the industrialized countries. The starting point could be based on the domestic agricultural market. However, a major research effort should be required. Joint actions among the Caribbean countries at the Regional and subregional levels should be implemented. In this proposal for technology generation transfer, the main principle is to drastically reduce the foreign agricultural inputs applied in the domestic agricultural consumption and increase in these foodstuffs products ecological and biological production and productivity. The domestic and regional plant research should be encouraged to be introduced within the human consumption and livestock feeding.



The generating which cares for this research system, should be guided, managed and controlled by the Caribbean Institutions.

The research core of the Caribbean Institution should be composed by the following agencies:

- Agency?*
- a. CBI - Caribbean Basin Initiative
 - b. CARDI - Caribbean Agricultural Research and Development Institute.
 - c. CARICOM - Caribbean Community Market
 - d. CARIFTA - Caribbean Institute of Food Science and Technology
This is the predecessor of CARICOM
 - e. CARIRI - Caribbean Industrial Research Institute
 - f. CDB - Caribbean Development Bank.
 - g. BANKS - Agricultural Banks from the Caribbean Countries
 - h. MINISTRIES - Ministries of Agriculture from the Caribbean Countries.
Ministries of Planning from the Caribbean Countries
 - i. UNIVERSITIES - Universities from the Caribbean Area.
- What's that?*



The other components of the system would be the Technical Cooperation Institutions and the External Financing Agencies which have operated in the Caribbean area and would implement the programs and projects generated and designed by the research core system. Firstly, the principle objective of this is to block the introduction of the foreign behaviour and consumption patterns and secondly to reduce the amount of resources transferred outside the Caribbean Area. To implement this research system proposal, first of all it is necessary to elaborate for each country of the area the analysis of the effects of the qualitative changes which were carried out in every agricultural production structure, and the policy analysis from the economic development process.

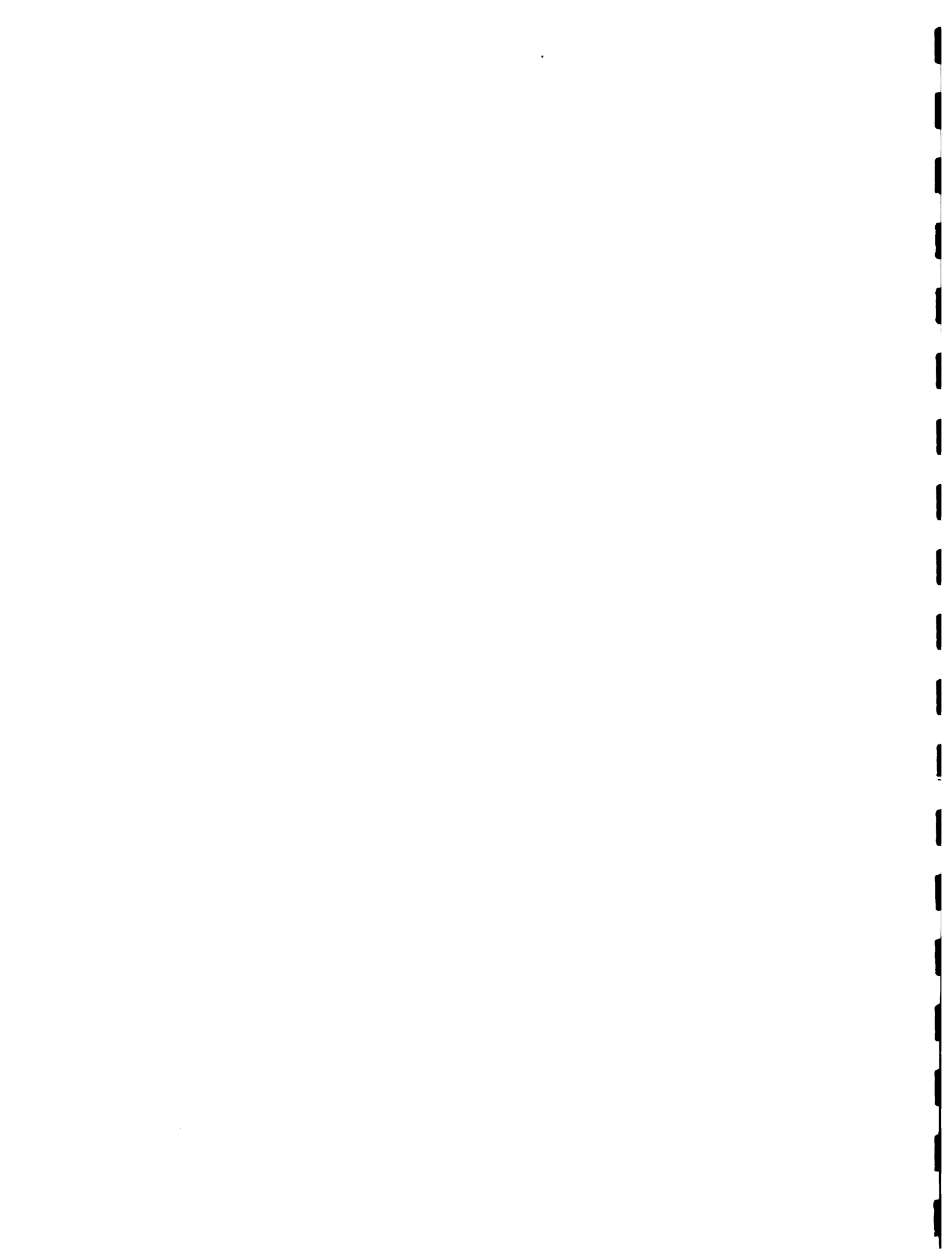


2.2 The Limitations and Opportunities for Technology Generation and Transfer for the Caribbean Countries.

The technical cooperation assistance and financial support from international organizations, have had a tremendous growth in the last two decades. If one considers the agricultural production structure and the population as a whole in the Caribbean Area, there are relatively significant human and financing resources available in the Region much more than Latin American countries. However, exist another problem in the Caribbean Area, because the number of resources have not provided a corresponding agricultural development. The technology applied have created more dependence. It was not impossible to carry out an import substitution for final consumer goods. Nowadays the countries of the region are more depending on agricultural inputs, foodstuffs and agricultural products than in the past. The agricultural diversification changes in the agricultural sector have penalized the domestic agricultural market. The high energy costs and the high prices of foreign agricultural inputs have raised the food production. The export agricultural sector of the Region have constantly reduced the competitiveness on the world market.



The costs rapidly have been fully transferred from the external and internal market to the level of national consumer prices. The national population has been penalized strongly for the foreign decision making. The different kinds and levels of economic production structure and the significant number of areas which did not get the political independence, made the initiative for an integrated joint actions for production and marketing research programs. Difficult income from captive agricultural marketing has been reduced and the incentive policies in the Caribbean Area have to promote the agricultural production while the productivity did not get the achieved goals as expected. It must be emphasised that any technology generation and transfer for the Caribbean countries will only be successful if the small-scale farmers system and the agricultural research which were guided and managed by the technological inovations were considered as a whole to integrate the production and marketing in the Caribbean Area.



TECHNOLOGY GENERATION
AND TRANSFER
IN SURINAME



III. TECHNOLOGY GENERATION AND TRANSFER IN SURINAME

Agricultural research was institutionalized in Suriname in 1903 to give assistance to the plantation system. To support this activities the Agricultural Experiment Station was established. The agricultural research started, in the colonial period, focussed on traditional crops of the plantation system such as cocoa, coffee, sugar cane and coconuts. In a secondary plan some research activities were carried out for crop adaptations to Suriname conditions and to control diseases for non-traditional plantation crops. The Agricultural Experiment Station became an independent department of the Ministry of Agriculture in 1919 and in 1925 it acquired its own administrative operation. In 1950 the emphasis of the agricultural research was placed on food crops. In 1951 a general mandate was given to the Agricultural Experimental Station to engage in the agricultural research.



Since 1947, when the Development Planning was implemented in Suriname, as a result of the Welfare Fund, the aid from Holland, the main proposal was to revive the decline of the plantation system.

Initially the objective was to collect basic data which was required for the preparation of subsequent long-term and medium-term plans 1/.

The implementation of the Development Planning System in the economy of the Suriname has introduced qualitative changes in the agricultural sector. From that period the Agricultural Sector was divided to organize the operation in the agricultural market in two subsectors:

The foodstuffs agricultural sector based on private small farmers production and the export agricultural sector based on private and public large scale production. The adjustment of the agricultural sector reproduced a domestic agricultural subsector which the principal characteristics has been the use of part-time work and apply few agricultural inputs.

1/

- a. Ten Year Plan (1955-1964)
- b. Supplementary Development Plan (1955-1966)
- c. Five Year Plan (1967-1971)
- d. Five Year Plan (1972-1976)
- e. The Long-Term Development Programme (1975-1985)



On one side, based on the private sector, that achieves the autonomous development of the rice crops that use heavy foreign agricultural inputs and on the other side the public sector through parastatal companies that establish agricultural development projects in bananas, oil-palm, citrus, sugar cane and rice. The technology generation and transfer system of Suriname is led by the Agricultural Experiment Station under the Ministry of Agriculture, Animal Husbandry and Fisheries, the Anton de Kom University and some parastatal institutions.

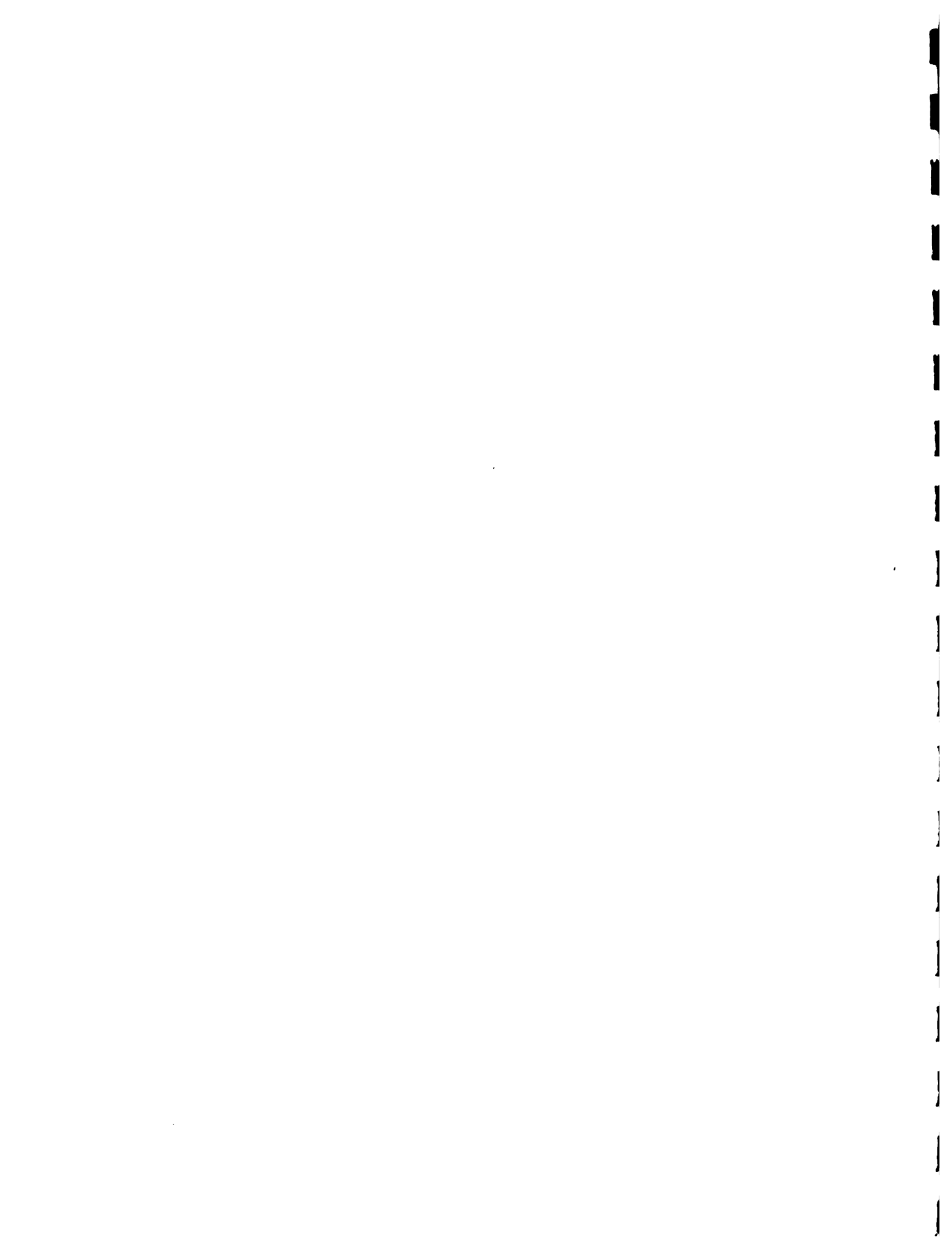
<u>INSTITUTIONS</u>	<u>RESEARCH TOPICS</u>	<u>STATUS</u>
1. Agricultural Experiment-		
tal Station	- Agrohydrological	Public
	- Mechanization	
	- Soils	
	- Mycology	
	- Virology	
	- Entomology	
	- Crop Management	



<u>INSTITUTIONS</u>	<u>RESEARCH TOPICS</u>	<u>STATUS</u>
2. Foundation for the Development of Mechanized Agriculture in Suriname (SML)	- Mechanization - Rice Cultivation Technique	Parastatal
3. Foundation for Experimental Farms	- Livestock - Citrus	Parastatal
4. Surland Limited Company	- Banana - Shrimp - Pineapple - Rice	Parastatal
5. Practical Research on Rice - POR -	- Rice Cultivation Technique	Public

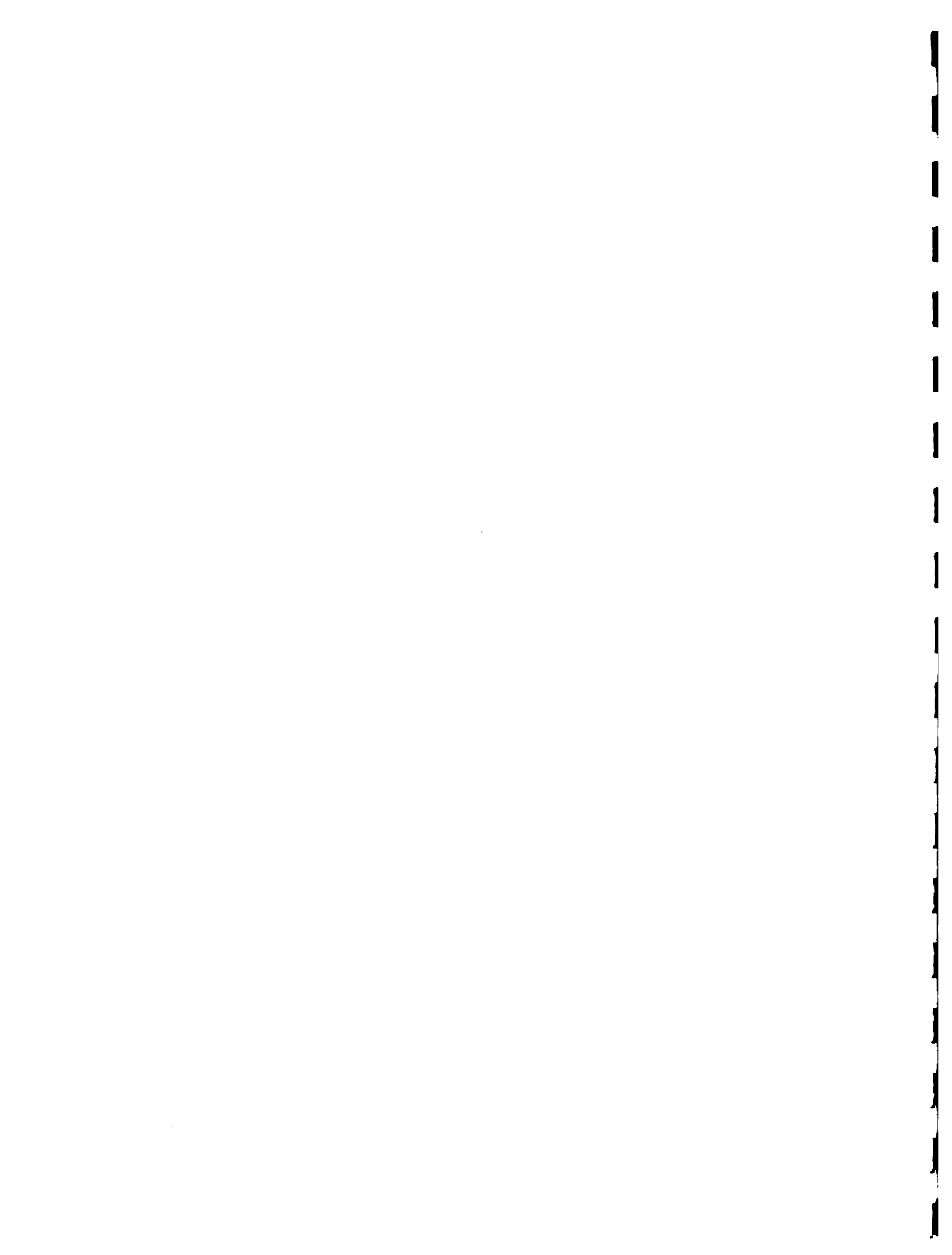


- | | | | |
|---|----------------------|-------------------------------|------------------------------|
| 6. Foundation for Experimental Gardens in | Suriname - STIPRIS - | Flowers | Parastatal |
| 7. Foundation for Agricultural Development Plan | Commewijne - SLOC - | Rice Cultivation
Technique | Parastatal |
| | | - Passion fruit | |
| | | - Beans | |
| | | - Cattle Management | |
| | | - Dry Crops Management | Parastatal |
| 8. Center for Agricultural Research in Suriname | - CELOS - | Crop Management | University
of
Suriname |
| 9. Victoria Limited Company - | | Oil Palm | Parastatal |

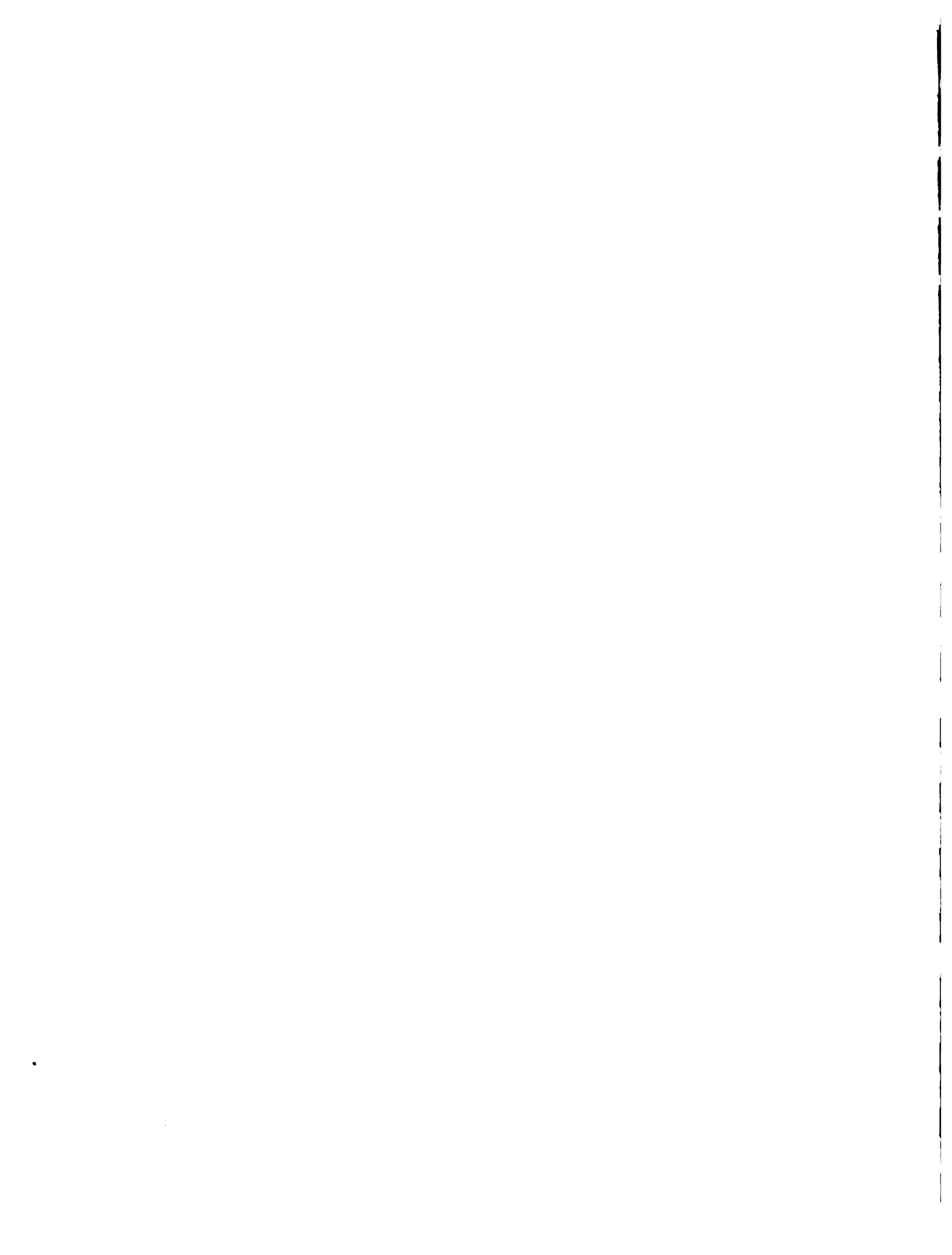


It can be inferred from the historical background of agricultural research in Suriname that at present there is no national research program and there exists duplication and very low resource budgets for agricultural research activities. Suriname has increased in the last two decades the amount of food imports and the social and economic crisis has promoted the migration of postgraduate personnel in the agricultural research. A National research Program that will be implemented in Suriname should consider operational mechanisms to obtain coordination and harmonization among all the components of national technology generation and transfer system. On one side agricultural research in the sense of development oriented technology for import substitution import of food products and to contribute to the growth of agricultural diversification process. On the other side to implement rural communities the food production research should be oriented to the small farming system.

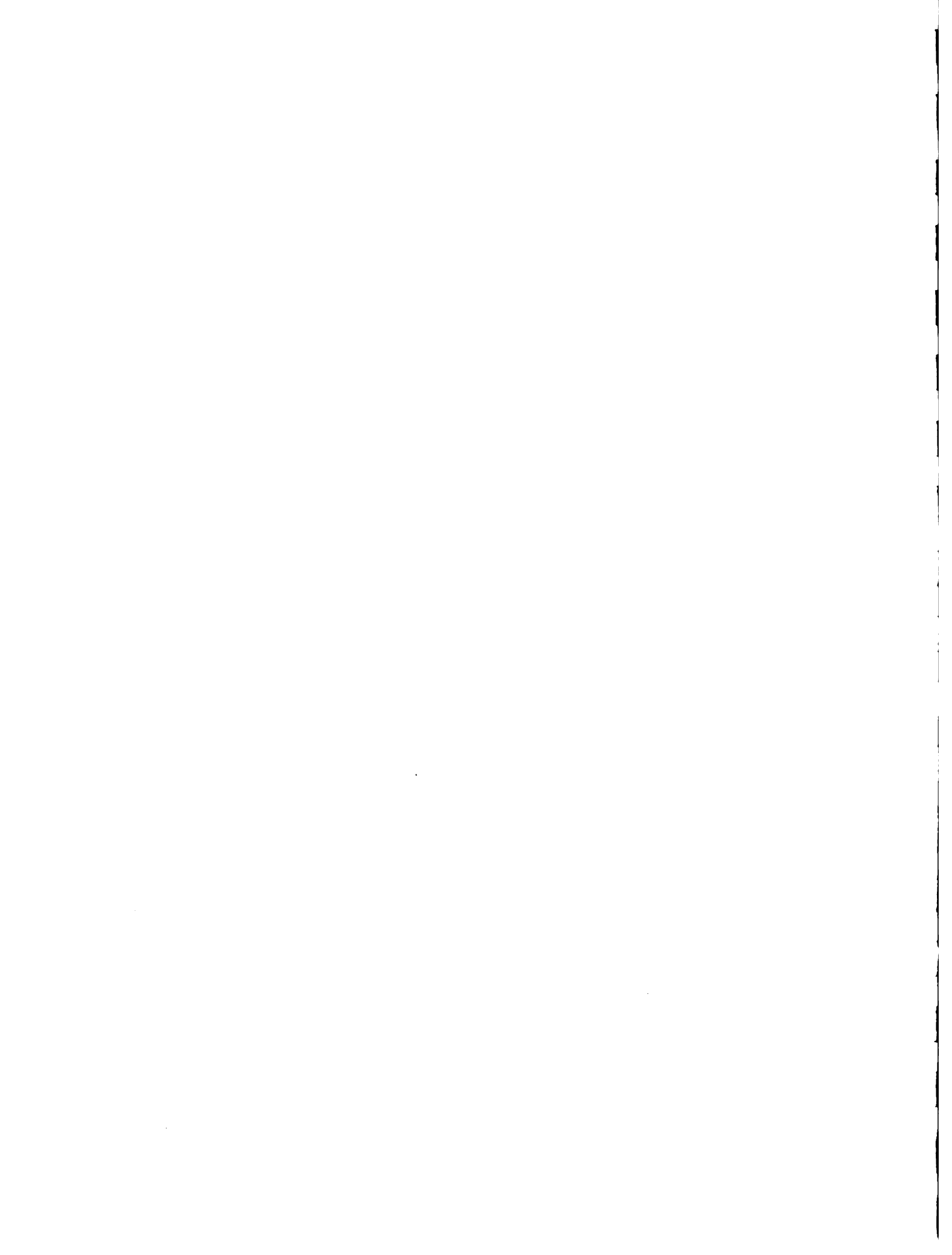
In Suriname there is a weak linkage between the agricultural research system and the extension service. In order to establish a coordinating mechanism to improve the linkage between the two sectors to eliminate the two main obstacles, the information blockages and identification of research problems.



The technology development process for Suriname must be realistic. It has to be settled among advanced technologies which has high dependency of foreign agricultural inputs and traditional technologies. The agricultural sector played a significant role within the economic production structure for this reason the research should be strengthened.

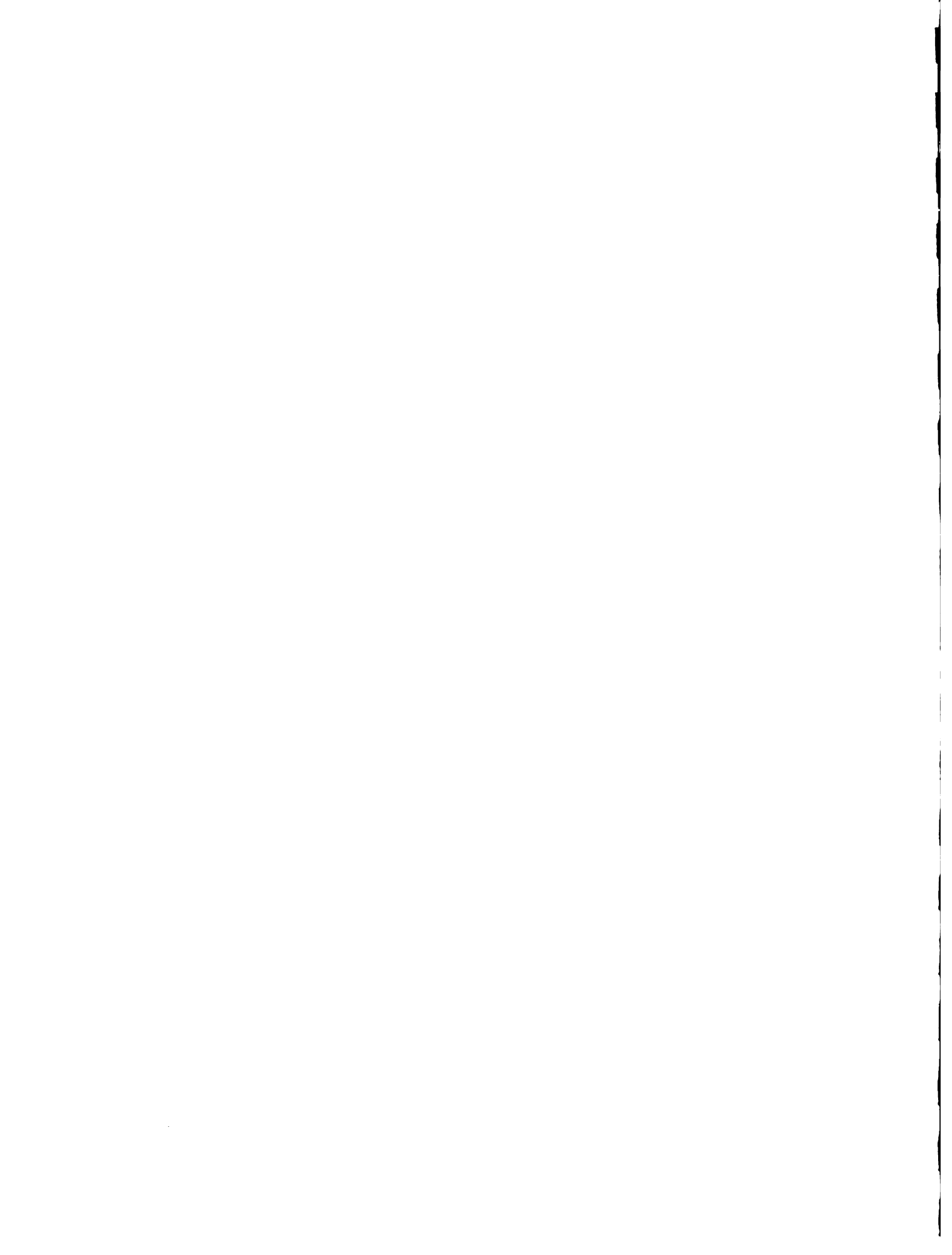


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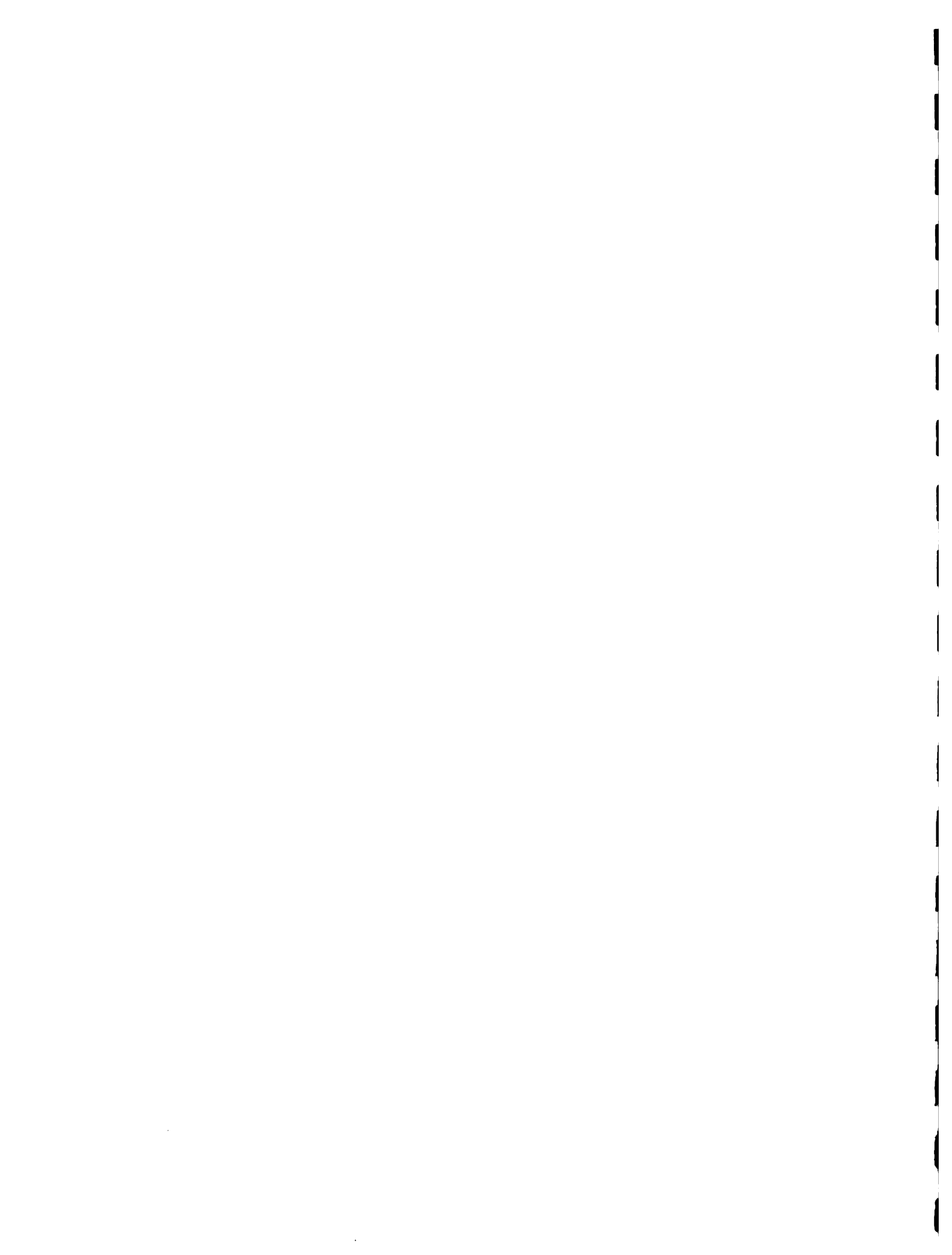


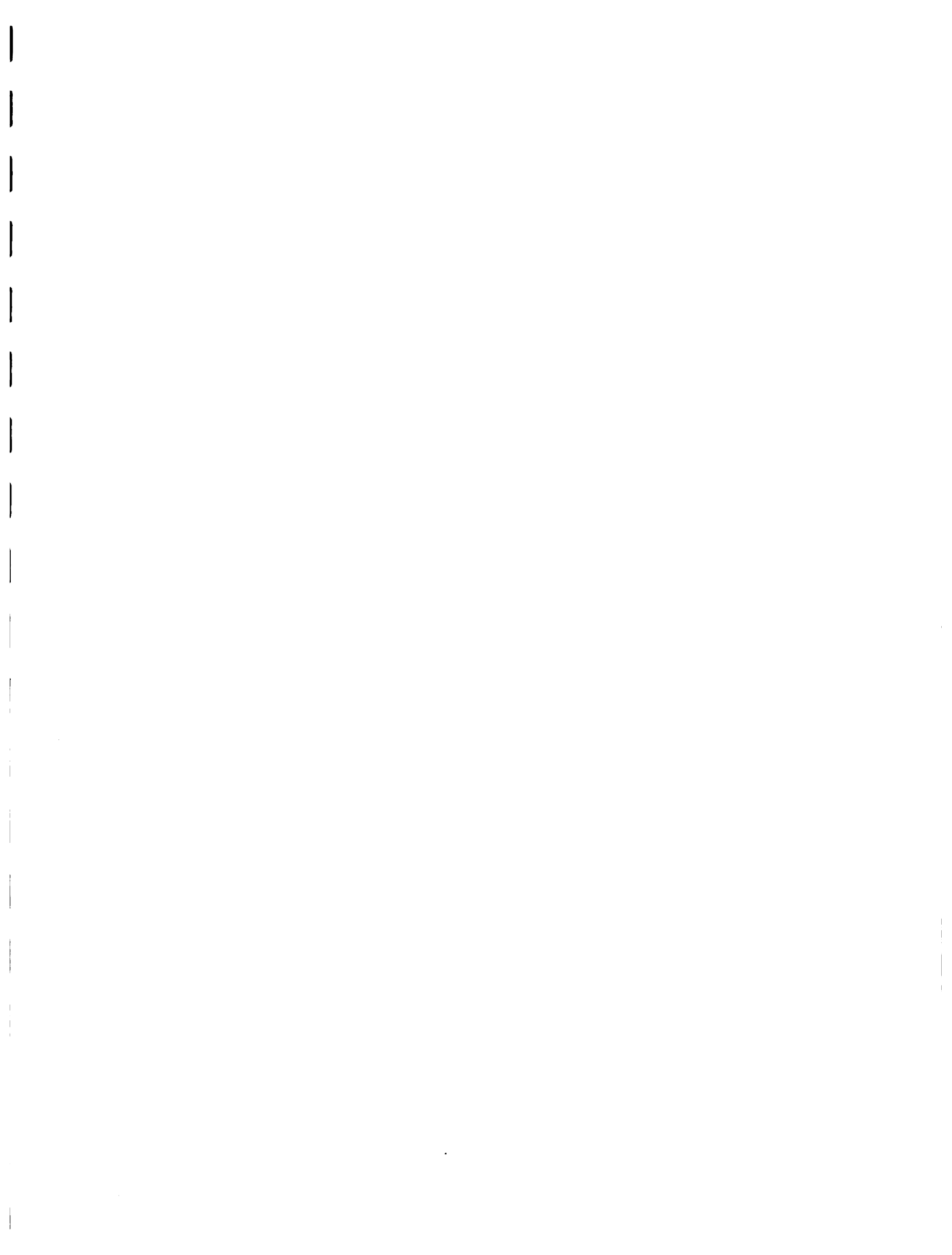
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