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**Over-exploitation of Natural Resources:
A Comparative Study of Argentinean and Mexican
Agricultural Modernization**

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To my parents, brother and sisters

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INTRODUCTION

This paper seeks to explore the roots of the over- exploitation of natural resources involved in agricultural and livestock production in Argentina and Mexico. The focus will be on forest, water and soil resources¹.

There is no one way to look at the problem of natural resource degradation. Each one is originated by different assumptions about how the interaction between nature and society is. One of them, the Neo-Malthusian view, see that the over-exploitation of natural resources is originated by population growth and poverty. Other one, looks at the roots of over-exploitation in historical processes which are related to the evolution of the international food system, the international insertion of countries and their development strategies. The later will constitute the theoretical framework used in this research. The basic differences among the two will be found in Chapter I. "ganaderizacion" in the Mexican case, and they are the terms used

Within the above mentioned historical view, one of the mayor changes came after second World War with the transnationalization and internationalization of agriculture, and the beginning of a new international division of labour in agriculture. Moreover, from within, both countries have had the same global development strategies and the role of the agricultural sector has been the same, even though social organization of agricultural production have been different in each country. As an outcome of international changes and the role designated to both agricultural sectors, a

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It is beyond the scope of this paper to deal with the degradation of global commons, degradation by natural disasters or by natural process, as well as another environmental problems of both countries.

process of agricultural modernization commenced. Such processes brought about great changes in their agricultural productive systems, in their social base and therefore in natural resource use. In the Argentinean case it has meant a tendency towards intensifying certain crop production displacing cattle production in the Pampeana region. In Mexico the contrary processes happened, a tendency toward displacing basic grains crops for cattle and for sorghum production. Both processes are called in spanish "agriculturizacion" for the Argentinean case and in the bibliography published in Spanish that analyzes both modernization processes.

Chapter II will describe general characteristics of both countries, their similarities and their differences, their development strategies and the policies which led to agricultural modernization. I would like to clarify that many interacting aspects of both modernization processes are not deeply and fully developed here because of the length constraint of a research like this one.

Chapter III will analyze the international changes in the international food system. The international food system works through three complexes: the wheat, the consumer durable and the livestock/feed grain complexes. However, the focus will be on the livestock/feed grain complex which, from my point of view, constitutes the main entry point to understand the changes in the demanded products for external or internal markets, and therefore, to understand the changes in their productive systems.

In both countries the environmental and social change brought about is different because of the differences in the agroecological systems and the social base in which modernization happened. Therefore, in the next two chapters there will be an analysis of

the specific existing changes. In both countries, the modernization processes has brought many changes in the agrarian structures which show great complexity. However, in this paper will not be analyzed all those changes, but it will be considered such crucial social changes to understand the specific dynamics with natural resource use.

Chapter IV will deal with the impact in soil conditions and the emergence of a new social actor due to "agriculturizacion".

Chapter V will analyze the impact on deforestation, soil conditions and water use as an outcome of the "ganaderizacion" process as well as the new social relations established.

To end the analysis, Chapter VI will present how the agricultural modernization has lead to the end of self-sufficiency in the Mexican case and in both countries the development strategies has not provide food security at household level. In this way, it will be shown that the problems of food availability are related to socio-economic process, the same which have lead to over-exploitation of natural resources, and are not related to population growth, as the Neo-Malthusians believe.

Finally, some concluding remarks will be given.

CHAPTER I SOME BACKGROUND OF THE ENVIRONMENT-DEVELOPMENT RELATIONSHIP.

The integration of environmental issues with concerns about economic and social development became a major point of debate at both the theoretical and the operational levels in the 1980's.

The main problem in the relationship between environment-development is seen as caused by population pressure and poverty, as well as the lack of private property which leads to inefficient management of natural resources. This analysis corresponds to the Neo-Malthusian view and it is possible to find it in the World Bank analysis.

According to this framework, the cause of population pressure is due to population growth, which increases the number of people and puts more stress on natural environments either directly by using them more intensively and or indirectly by increasing the demand for food, goods and services². Consequently, this population growth rise another problem, which would be the problem of feeding a growing population without environmental damage³.

² In World Bank's words, " population growth increases the demand for goods and services and this, if practices remain unchanged, implies increased environmental damage. Population growth also increases the need for employment and livelihoods, which, specially in crowded rural areas exerts additional direct pressure on natural resources" (WB,1992:26).

³ However, the focus of the Neo-Malthusians is only on the technological problems of the food supply. See for instance the article of John Bongaarts(1994), which views the different positions analyzing the problems associated with food supply and growing human population.

This framework assumes, on the one hand, that poverty is reproduced and created by the poor themselves by having more children, endangering their own survival, and the survival of future generations and, on the other hand, that the use of natural resource is determined by the amount of people.

However, to have more children is a rational strategy of survival in the face of structural factors which have been submerging them in poverty⁴. This survival strategy is also a long run strategy because it becomes the re assurance which society does not provide. Moreover, to count the absolute number of people, as Neo-Malthusians do, appears a simplistic way of analyzing the direct as well as the indirect pressure on the environment. In order to analyze the direct population pressure, it is crucial to analyze the distribution of resources, in quantity and quality by different social groups and how the production systems and their social base have come about.

The analysis of the socio-economic changes brought about by past development strategies can explain how, in such cases where population pressure on the environment could exist, it is a consequence of the economic and ecological marginalization the poor face rather than the rate of population growth. Besides, with such approach, it can be explained also such cases where over exploitation of natural resources exists in rural areas with abundant natural resources in relation to their population. Therefore, over- exploitation of natural resources does not necessarily corresponds with local demands, but rather coincide with external (either urban or international) demand on these ecological system, and has more to do with aspects of the commercialization, or modernization, of agriculture in food-producing regions. In addition, neither the demand from this

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See for instance Hartman (1987).

ecological systems is according to the quantity of people who live in a particular country nor everybody benefits, in terms of food access, for the same strategies which reshape agricultural systems. Therefore, the causes of particular resource uses are related to more wider processes going on in specific countries, called development, which, in turn, is very much related to the international economy and the particular insertion on it each country has.

In this sense, mayor changes came with the establishment of a new international food system and the emergence of a new international division of labour in agriculture after Second World War.

On the one hand, food was no longer something produced by farmers and directly or in origin bought by consumers, but became a profitable product of capitalist enterprise, transnationally or nationally sourced, processed and marketed. Thus, the agri-food sector became central to capital accumulation in the world economy and agriculture became internationalized and transnationalized.

This process of internationalization, or globalization of agriculture, has brought a transnational integration of production itself by mean of the introduction of new technologies, stimulating the production of specific products to be sold in the international market and reshaping consumption patterns in developing countries which exerts specific demands(Arroyo et al 1985, Kay 1994).

As a consequence, the use of national natural resources became internationalized as productive structures have been approximated to international patterns through technological and managerial internationalization (Sanderson 1987) and nations/states became not the real space of production. As Redclift points out, the environment in such an internationalized economy is an internationalized environment dependent on the evolution of the international economy (Redclift, 1987).

Therefore, the evolution of the international food systems, the role given to the agricultural sector to be devoted to agricultural exports and to upper class internal markets has changed the demand from the agricultural systems. In the whole process of modernization, commodity relations have been extended in the countryside by the introduction of new technologies (machinery, improved seeds, and agrochemicals). The outcome has been that new crops, new technologies and new agricultural and rural activities emerged in developing countries bringing new social relations in the countryside and new use of the natural resource base.

Argentinean and Mexican over-exploitation of their natural resource base constitute a good example of how the above described processes work. The impact of modernization on the productive systems of Argentina and Mexico has been different. In Mexico it has lead to a "ganaderizacion" process, which means a "very accelerated growth process devoted to cattle production, as well as to the sown surface with fodder crops (mainly alfalfa, sorghum and soya)" (Rama, Arroyo, Rello, 1985: 233). In Argentina, in contrast, it has led to an "agriculturizacion" process. According to Gutman and Feldman, "agriculturizacion" is the process that happened in the Pampeana Region of Argentina by which the cereal and oil seeds sector has strongly grown, in contrast with previous periods of agricultural stagnation and a predominance of the cattle sector (Gutman and Feldman 1992:124).

The "agriculturizacion" and "ganaderizacion" processes, analyzed separately could be seen as brought about by the inner characteristics of each country, as isolated from each other. However, even though each one has its own dynamic because of the differences of both countries in agrarian structures, ecological systems and dietary patterns, among many others, what links them is agricultural modernization, the evolution of livestock/feed grain

complex in the international food system and the role assigned to the agricultural sector within the development strategy. Within this context, the natural resource over-exploitation and social change brought about are a consequence of both development strategies and the international insertion of both countries within the new international division of labor which emerge after Second World War.

The next part of this paper is devoted to describe some differences of Argentina and Mexico, the general policies of agricultural modernization, and to analyze the impact at national and producer levels in general terms.

CHAPTER II THE MEXICAN AND ARGENTINEAN AGRICULTURAL SECTORS

II.1 Basic differences between Argentina and Mexico.

Argentina and Mexico show important differences in their agricultural productive structures, their social and agroecological bases, as well as their dietary patterns.

The first difference between both countries is to be found in the land tenure systems. In Argentina, land is completely privatized in the most productive areas and it is possible to find a wide variety of arrangements to use the land, such as sharecroppers, and others which have been changing according to the agrarian evolution. There is no communal land tenure and there was no Agrarian Reform. In Mexico there has been an Agrarian Reform in 1917 by which a new legal property system had been established, called the "ejidos". In this particular social organization, the ejidatarios (the members of the ejidos) have the right to use land, but they do not have the property on it. Land could be individually worked, except in the cases of ejidos' forest land which has to be exploited communally. For all the cases, by law, it has been forbidden to sell or to rent any of the ejidos' land. The ejidos' lands have been distributed throughout the country in spite of the fact that they were given land of worst quality compared to the privately owned. Thus, in Mexico it is possible to find ejidos, private property and communally land tenure systems. However, in 1992 a constitutional reform was promulgated to reorganize the ejidos land tenure, by which the ejido'land can be sold or hired which means privatization of the ejidos

Other important differences are to be found in the role that different producers have within each economy. Mexico and Argentina have a regional division of agricultural activities but this

productive division is carried out by different social actors. In Argentina, there is a historical regional division of agricultural activities between the Pampeana Region and the called "Regional Economies". On the one hand, the Pampeana Region, with one of the most fertile lands of the world, with temperate climate, with low population density and the richest rural areas of the country, has been traditionally linked to international markets since the past century, providing wheat and meat, among other crops.

However, historically, its productive expansion has been also linked to the internal market because the same products, wheat and meat, have been an essential part of Argentinean dietary patterns. In this region the producers are commercial ones and they have provided, and still do, the basic food for the country. In this sense, Argentina has exported what had not been internally consumed and the changes brought about by modernization have not affected the Argentinean food self-sufficiency, even though it has changed crop composition according to the changes in the international trade of agricultural products.

On the other hand, the so called Regional Economies provide raw materials for the agroindustry, such as sugar, cotton, tea, among many others, and food for the internal market such as fruits and vegetables and even meat in some regions. These Regions include the different irrigated areas of the country. In the Regional economies the agroecological conditions vary widely, and most of the small producers⁵ of the country, closed to commercial unities of production, are to be found. The small producers have been a reservoir of cheap labor, and it is possible to find among them and along with landlessness, historically most of the agricultural

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By small producers or minifundios is meant such unit of production with not enough amount of capital, land of both to maintain and reproduce a family. Minifundista is the person who own these unities.

labor force of the country. In the so called Regional economies is also possible to find the highest levels of rural poverty, which vary according to the productive insertion of each province in the national economy (Eclac, 1985).

Therefore, as Basco states," the productive specialization of the minifundistas is based in industrial crops and not in the production of basic grains, which implies a different functioning in the economies compared to the rest of the Latin American peasant" (Basco, M, 1990: 32).

Moreover, the historical Argentinean pattern of land distribution has been characterized by a very uneven distribution throughout the country. According to the Argentinean Census of 1988, at national levels (so the regional differences are not included) the strata up to 100 Has embraces 62.1% of the total of unities of production, occupying only the 3.8% of the produced land. The total numbers of unit of production with more than 2500 has 61.7% of the land, but represents 3.2% of all unit of production.

In Mexico, the national division is fundamentally between irrigated areas of the North and Northwest, and rain fed areas. In the irrigated areas, most of the producers are commercial ones with private property or the richest ejidos. This area is connected to the international markets as well as internal market, with a low population density. In the rain- fed areas, historically, the subsistence sectors (small producers and ejidatarios), have produced staple crops, such as maize and beans, which are an essential part of the Mexican diet. Within them is found the highest level of rural poverty and also in the rain fed areas there is the highest population density⁶. In Mexico, land, even though

⁶ Redclift points out that a basic problem in Mexico is that "the distribution of the population does not coincide with the distribution of water resources"

after the Agrarian Reform, have been unevenly distributed. In 1960 the subsistence sector embrace 84.1% of unit of production occupying only the 32 % of the rain fed area and 2.7 % of the irrigated areas. In rain-fed areas, the commercial producers embrace 15.9 % of unit of production and occupy 65.1% of the area, while in irrigated areas they occupy 97.3% of the area (Cynthia Hewitt de Alcantara, 1976).

Another important difference between Mexico and Argentina is that Mexico has important forest areas, being the fifth in the world by its extension as well as for their biodiversity. In Mexico, it is estimated that a total of 18 millions of people inhabit the forest lands (25% of the population), while 6 millions of them live in the tropical forest. According to Belausteguigoitia Rius and Fernandez Ugalde, three social groups can be identified in the forests, jointly with commercial producers. The indigenous people, with sustainable productive practices, the indigenous people who have been dispossessed of land and gone to the mountains, and finally the new "mestizos" ejidatarios who as result of the Agrarian Reform were given lands of worst quality (Belausteguigoitia Rius and Fernandez Ugalde, 1993:6).

The tropical forest coincide with situations of extreme poverty and inequality in terms of access to forest lands and to income. For instance, de la Torre and Velez point out that, "agricultural producers with the ejidal land tenure system have 50% of the probabilities to be in the extreme poverty" (de la Torre and Velez, 1993:18). Most of the forest land is property of the ejidatarios. As Barbier et al points, " of the total area occupied by all forest types, ejidos control about 70% of this area, while private owners and communities own 25% and 5% respectively. (Barbier,Burgess, Collins and Clancy,1993:44).

(Redclift,1987:86)

II.2 Development strategies and the Agricultural sector

After Second World War Argentina and Mexico's rural economies and societies have been transformed by both the increasing integration of their agricultural sectors into the global agro-industrial food regime and, from within, by States policies⁷. The States policies ranged from placing the agricultural sector as an "adjunct of industrialization" (Sanderson 1986) with an import substitution industrialization (ISI) up to the 1970's towards an export oriented policy (Structural Adjustment Programs).

Both countries experienced great economic growth up to the collapse of ISI in the 70s, while in Mexico during the 70s there was still a rise of the real growth rate per capita because of the oil boom at period (Urrutia 1991). In the 80s, both countries faced an instable economic situation, high rates of inflation, an industrial crisis, with even negative economic growth, and the debt crisis. As Kay points out, "since the 1980s, the shift away from import substitution industrialization towards a new outward-oriented development strategy, has further integrated the Latin American agricultural sector into the world economy" (Kay 1994). The virtual absence of economic growth for the first time in four decades reinforced the priority of economic growth while agricultural exports faced the fell of international agricultural prices and the subsequent declining in export earnings, situation which persists up to now.

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Even though both countries have been always connected to international markets, the characteristics of the international trade changed according to the growing agroindustrial expansion and the changes brought by the new international division of labor.

Regarding to the agricultural sector, in both countries, there has been a decreased contribution of both agricultural sectors to GDP. In Argentina, between 1955 and 1965, agriculture was 17.% contributor to GDP decreasing to 13% in 1986 while industry has grown from 36 to 42% to 44%. In Mexico, the contribution declined more compared to Argentina, from 18, to 14 to 9 % in the same periods, while industry contributes to 31% from 1955 to 1965, increasing its contribution in 1986 to 39% (Urrutia 1991). As it can be see, in Argentina, the contribution of her agricultural sector has remained more important than in Mexico since 1965s. Moreover, the contribution of the Argentinean agricultural sector through exports has been much important than the Mexican one. For instance, agricultural exports as a percentage of all exports was 61.7% in 1970 and 67% in 1990 in Argentina while only reached 11.7 % in 1970 in the Mexican case (Grigg 1993, Obschatko, 1992). In addition, the agroindustrial integration have been important in both countries and it has been growing in times of de-industrialization (Obschatko 1992, Gutmand and Gatto 1992, Montes de Oca and Zamorano Ollano 1983).

In order to fulfill the required roles, both agricultural sectors faced the modernization of their agricultural sector, which has brought important changes within the agricultural sector and for both societies as a whole.

II.3 Agricultural modernization

Agricultural modernization has include not only a technological package, but also a set of policies to encourage its adoption, like credits, subsidies, technical assistance, extension services and agricultural prices. These policies have been addressed for such regions and producers which were important within the internal capital accumulation processes of both countries, the Pampeana

Region and its producers in the argentinean case, and the irrigated areas of the North and cattle producers in Mexico. Those areas have been linked to international markets and/or to supply a growing urban demand.

In both countries the first technological change has been mechanization, with the purpose of establishing large scale, capital-intensive agriculture, based in the increased productivity of one crop, mainly in the areas integrated to international markets. In both cases, it was strongly promoted by both States through strong incentives (via credits and imports of machinery at the beginning) as an important component of the strategy of industrial substitution and also of a vision of a countryside following the American path of agrarian transformation. It was argued that this mechanization has been promoted by the rural labor shortages in both countries (Obstachatko 1992 and 1988, Cynthia Hewitt de Alcantara 1976). As Cynthia Hewitt de Alcantara points out for the Mexican case, mechanization was " encouraged by the notable shortage of labour in the countryside during the Second World War years, and guided by the vision of agricultural progress based on the experience of the United States" (Cynthia Hewitt de Alcantara, 1976:64)⁸.

The outcome of mechanization in both countries has been a decrease in the demand for labour in the agricultural sector with a consequent strong migration to the cities, in which most of the industries were placed. In the Pampeana Region, according to Bocco, between 1947 and 1960 there was a diminution of the capacity of wage worker absorption, which includes the permanent and seasonal ones, a tendency that went on during 1960-1970. During the 70-80s,

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See also Boltvinik (1976) for more details of the adoption of the american model in the North of Mexico.

the Region was completely mechanized in all the phases of production, and jobs were reduced by 10 %.(Bocco 1991). Besides, there has been important changes in agrarian relations with the emergence of an important social actor called the "contratistas" (a special kind of sharecropper which will be explained in more detail when the impact of soya is analyzed).

In Mexico, the changes brought about mechanization have been a reduction of permanent agricultural jobs, employees and migratory labor were substituted for independent workers and the ability of agriculture to continue absorbing new workers was reduced (Barkin, 1991). Besides, the establishment of large scale units of production has displaced producers from their land and "many small farmers have turned to off-farm employment opportunities to support themselves and their families" (Barkin, 1991: 26)⁹.

At national levels, the impact of mechanization can be seen in the decrease of the percentage of the total population economically active involved in agricultural production. In Argentina the percentage of the total population economically active involved in agricultural production has dropped from 26% in 1955, to 18% in 1965, to 13% in 1980. In Mexico, during the same periods of time, this decrease has been more stronger even though in comparative and quantitative terms is higher than in Argentina. In 1955 the agricultural sector entails 62% of the population economically active, dropping to 50% in 1965 to 37% in 1980 (Urrutia, 1991).

The next step of technological change came with the incorporation of improved seeds and chemical technologies.

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In the Mexican case, the inability of the economies to absorb the growing number of displaced producers and workers has fueled temporary and permanent migration of laborers to cities but also to the United States (Barkin, Batt and de Walt, 1991).

In Argentina there has been incorporation of hybrids, maize and sorghum, and Mexican varieties of wheat which allowed later the double cropping with soya. Fertilizer were not much used because of the historical high prices and some chemicals were incorporated. However, since 1970s the whole technological package of soya has brought a massive use of chemical technologies in the Region (Obschatko 1988).

In the Mexican case, the basic food crops, maize and beans, have been neglected in the diffusion of hybrids or improved varieties, having being sorghum and soya most promoted. Moreover, as Appendini and Liverman point out," the use of the fertilizers, and to a lesser extent, hybrid seeds, is fairly widespread in Mexico, but poorer farmers cannot afford the use of them in some regions (Appendini and Liverman, 1994: 151)¹⁰. In Mexico, the operation of ejido cultivator were tied to the Ejido Bank for credit, input supplies, information and technological assistance, which did not pay much attention to the requirements of ejidatarios, for instance there was lack of fertilizers (at least the first years) and bad quality seeds were delivered (Pearse, 1980:57).

Other important components of agricultural modernization have been price policies.

Within the import substitution strategy, the agricultural sectors had to provide cheap food. Therefore, the basic food to be massively consumed has received low prices and this has been one of

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See Obschatko (1988) for the technological changes in the Region. See also Pizarro and Cascardo 1991 to go deeper in the particular changes in the technology applied in the different crops. For the Mexican case see World Bank (1990) "Agricultural technology sector review" and Suarez(1983) 'Las semillas mejoradas y los cambios en el sector agropecuario en Mexico 1970-1977', Schjetman,A (1983) "Oaxaca y Sinaloa: Campesinos y empresarios en dos polos contrastantes de estructural agraria.

the components which has affected the comparative rentability of crops and agricultural activities.

In Mexico this did not encourage the production of basic grains (maize and beans) but, rather, the promotion of exports or high value products for the middle and upper classes, such was the case of sorghum to be sent to livestock producers and cattle production. In the rain-fed areas, small producers and ejidatarios were not able to afford the costs of new technologies due the lack of financial and technical assistance, keeping their production centered around maize and beans. This situation, joint with the lower prices they obtained for their maize production, led to their impoverishment resulting in a process of economic marginalization, which lead in some cases to peasant involvement with cattle producers in different kind of arrangements, with the emergence of new social relations in the countryside and to new land use. In 1973, rural development programs were established, called PIDER (national programs of public investments) intended to address the problems of the small producers, mainly of rain-fed areas. However, as Friedman, Gardels and Pennik state, "in those programs, the money was mainly to the irrigated areas where most of the producers were commercial ones, the areas with high level of peasant protest and those rural regions of World Bank interest" (Friedman, Gardels and Pennik, 1981:261). As it will be shown latter, the regions of World Bank interest were linked to livestock production, including cattle production.

In Argentina, the impact of prices was different on small and commercial producers. As it has been mentioned above, the main products to be exported in times of ISI, wheat and meat, were produced by the commercial producers of the Pampeana Region, and both products were also an essential part of the national diet. In

this sense, lowering their prices¹¹ has not affected the total production, but it has constituted what many authors point out as an agricultural export bias (Cirio 1988). However, the relatively better prices for agriculture against livestock production has been one important component of the process of agriculturization in the Pampeana Region, even though agricultural prices have declined. Later on, the favorable price of soya to be exported has constituted, since the 70s, an important determinant of crop shift and soya has become the most favored price in relative terms to other crops consumed internally.

Due to the great importance of this Region, the producers in the Pampeana Region have benefitted from investment, credits, subsidies and technological transference during the modernization process (Basco, 1990:33. Meanwhile, there has not been a special policy for the small producers who constitutes more of the 50% of the producers of the Regional economies, because " they do not produce either basic grains or products to be exported" (Basco, 1990:33). However, some authors point out that these Regional economies have been favored by the expansion of the internal market due to the higher purchasing power of working classes until the 70s. However, the presence of structural constraints faced by the minifundistas, the lower (nearly 50% less) agricultural nominal wages (compared to those wages in any other economic sector)¹², and the lower net investment in those regions, have pushed rural workers and minifundistas into a worst condition.

The general outcome of technological change in Mexico has been the establishment of a commercial, and modernized sector mainly in

¹¹ The mechanism used has been through controlling the exchange rates and export taxes.

¹² See Cavallo and Mundlak (1982).

irrigated areas and a neglected small producers of basic food sector in the rain-fed areas.

Due to the high cost of the new technologies and the lack of institutional support, Mexican peasant economy " was unable to articulate its production with the market without suffering damage to traditional cropping, ecological practices, and community survival strategies" (Sanderson, 1986:239). As a result many ejidatarios "were obliged to rent out their land clandestinely to entrepreneurs, accepting occasional wage work on their own lands and a rent (Pearse, 1980:57). In the ejido agrarian structure is forbidden to rent or sell the land to outsiders. Thus, the rent perceived could be low due to the illegality of this act. Therefore, the disintegration of ejidatarios and small farmers (minifundistas) as rural producers led to "the reappearance as a rural day laborer or urban migrant" (Sanderson, 1986:239).

As a consequence of the modernization process, in both countries the pre-existing regional gap within regions has increased. In the Argentinean case, it has increased the historical gap between the region devoted to exports and the Regional economies (Eclac 1985, Basco 1990, Morandi 1992, Biondolillo 1993) and in Mexico between irrigated and rain-fed areas generally and between commercial and peasant producers (small producers and ejidatarios) within all regions (Moreno and Rosenfeld 1983, Rousserie and Romero 1983, Barkin 1987, Gigena 1987).

Therefore, the processes of modernization linked to agricultural exports or to the production of agricultural luxury goods, has permitted to increase the agricultural productivity but it has not meant rural development. As Biondolillo points out that, " in Argentina and in many other Latin American countries, the process of agricultural modernization has not proceeded with rural development" .."it is seen that jointly with a great growth of

agricultural production mainly to be exported, it has been incremented rural poverty" (Biondolillo et al, 1993:1).

The process of agricultural modernization, joint with an industrial strategy based on urban industries establishment, has brought important changes in the population distribution in both countries. In both countries, rural areas were neglected and the process of agricultural modernization has provoked the out migration to cities (Káy 1994), increasing the food demanded by the urban sectors as well as the creation of new dietary habits (Sanderson 1987, Rama et al 1987). It is more, as Brignol states that, "the nature and characteristics of agricultural growth through the process of modernization and the consequent migration from the countryside to urban areas, have not solved the problem of rural poverty and have aggravated the problem in the cities" (Brignol, 1990: 60).

Within the agricultural sector, the whole process of modernization in both countries have developed in important changes in their productive systems, which have had a significant impact on the social and environmental base. According to the changes in the international food system, one of the most important influence in the productive side has been the livestock/feed grain complex, to which the next part of this paper will be devoted.

CHAPTER III THE LIVESTOCK/FEED GRAIN COMPLEX. Origins of the "Agriculturizacion" and "Ganaderizacion" processes.

The livestock/feed grain complex is one of the three complexes which regulate the functioning of the international food system. According to Friedman, "the transnational integration of intensive livestock production within the advanced capitalist sphere create the livestock/feed complex; this movement extended commodity chains across national frontiers, so that apparently national sectors, such as livestock, came to be tightly linked for inputs and sales to international trade(Friedman, 1991: 68).

One of the main changes in the international food system after the Second World has been the great increase in meat consumption in developed countries allowed by the increase in income and also by the changes in the diet patterns, based on meat (poultry, veal, beef, pork, mutton and lamb), dairy products and oleaginous consumption. This change in the dietary patterns started in USA, has been transferred to Europe (through the Marshall Plan). Later on, the same dietary patterns have been fomented in the medium and upper classes of developing countries.

In the case of beef, the few exceptions to this trend are the Argentinean and the Uruguayan cases, countries which had the highest level of beef consumption in the world, even before the above mentioned changes (See table Nr1).

This increase of meat consumption in developed countries has been in regard not only to high quality meat but mainly to consumption of industrialized and cheapest meat such as hamburgers, hot dogs, etc.

In the case of beef, the differentiation into both types of products has been in through previous changes in beef industry, and this facts brought about " new trend and redefinitions of the productive structure and the world commerce of beef" (Arrollo, Rama,Rello, 1985:147). Therefore, developed countries specialized

in producing high quality beef by intensive techniques (Rama et al 1985) as well as other high quality meat, while the increase in the demand of low quality beef has been met by beef imports mainly from some tropical developing countries.

In the case of beef production, developed countries protected their increased markets and production in different ways. One of them was, and still is, sanitary barriers, which impose important restrictions for exports from developing countries. The creation of two markets, one free of foot and mouth disease and other not free has segmented the international meat markets (Sanderson 1986, Cascardo and Pizarro 1991). The net effect of the above mentioned changes on Argentina, being under the foot and mouth commercial sector, facing quota restrictions, the European increase in beef production and their production and exports, has been the loss of her traditional European markets, leading to a decrease in meat exports¹³. At the beginning of the 60s, the argentinean participation in the international beef trade reached a 31%, diminishing to 11% at the beginning of the 70s, to reach only a 6% in 1991" (Cascardo and Pizarro, 1991:267). The contribution of the livestock sector as a percentage of the total exports of Argentina has been declining from contributing with 19.7% in 1970 to 11.0% in 1977 to 8.2 % in 1986 (World Bank 1987). On the productive side, it has meant the retraction of cattle production in the Pampeana Region, where cattle production is produced for internal and external markets.

Moreover, due to the intensives systems of production established in the United States, there has been a reduction in the production of old cows, the main source for industrialized meat. Therefore, with a growing internal demand and having reducing the internal

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Kay points out the negative impact for Uruguay and Argentina countries which compete with US and the EC in cereals and beef production (Kay, 1994:2). See also Jarvis(1986) "Livestock development in Latin America"

production of cheap meat, the United States promoted the production outside their frontiers, what constitutes the known 'hamburger connection'. Mexico became an important supplier of cheap meat, mainly to the United States, according to the new international division of labour (Rama, Rello and Arroyo, 1985: 234). The sanitary restrictions have also affected Mexican cattle production, leading to the establishment of two cattle productive areas: the North of the country entering into the free disease market exporting to the United States and the South into the foot and mouth disease circuit, specializing in production for the internal market¹⁴.

Besides the above mentioned process, in developed countries and later in Mexico and Argentina, livestock producers became increasingly linked with agri-food corporations to buy inputs (Friedman, 1991: 79). Accordingly with the changes in the productive techniques, one of the most important inputs has been those used in the alimentation system of animal production. Therefore, livestock sector demanded specific feeds, which were purchased from corporate feed manufactures. At the international levels, this has increased the demand for fodder to be used for animal feeding, mainly soya, which is used for the protein content forming part of a huge mix of animal-feeds components. Thus, the world demand of pellets is related to the evolution of cattle and poultry production in developed countries. The pellets of soya became the most important ones in the international market for its

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However, in 1990 for instance some states of the South, like Veracruz has exported to USA. This kind of sanitary barriers are in fact another way of protecting markets and has less to do with real sanitary problems. For instance Argentina, even though is in the food and mouth disease circuit, one of the most important imports are those of high quality meat, Hilton quota, which is not restricted by sanitary problems but it is by quotas.

high level of protein (Gutman and Feldman 1992) and Argentina could enter into the international market after 1973¹⁵. The production of soya expanded since the 70s in Argentina which became the fourth largest producer in the world.

Therefore, the changes in the external demand, through the reduction of beef demand and the increase of soya' demand, led in Argentina to an "agriculturizacion" process, in which soya plays a predominant role, bringing great productive, technological and environmental transformations (Gutman 1992, Obstchatko 1988, Tort 1992), occupying an important place in the areas where the decrease of cattle production has been important since 77s.

In Mexico, both the increased agroindustrial integration with a phenomenal growth of the livestock sector and the incorporation into the new international beef trade has lead to the "ganaderizacion" process.

As an outcome of the modernization process, the productive systems have been reshaped in a different way. In Argentina there has been a decreased importance of the cattle sector in the Pampeana Region, which can explain also the decreased importance of sorghum in the Region. On the contrary, cattle production in Mexico expanded in the whole country as it did sorghum. In both cases, soya has increased. In the Pampeana Region there has been also an important

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As Friedman states, "after 1973, transnational integration of production chains for both durable food and livestock/feed complexes extended to certain Third World countries and state socialist countries, with new and contradictory effects. I call this latter group the New Agricultural countries" (Friedman, 1991: 68). Mexico fits also into this category, but also shares some characteristics of the Nics, mainly because the establishment of the "maquiladoras", of which meat industry is important.

increase in the productivity of all crops, which can be associated with the new technologies adopted. In Mexico, there has been also great gains in productivity specially in sorghum but less in maize (World Bank 1990).

These changes in crops and agricultural activities has brought new social relations in the countryside and in the natural resource base. Therefore, having made clear the common roots of such changes, the next two chapters will be devoted to analyze the specific internal dynamics of both processes and the changes in the social and natural resource base brought about.

CHAPTER IV : The "agriculturizacion" process

IV.1 The Soya boom in Argentina

The soya was introduced in Argentina in the late 60s, but its cultivation has been fully developed since the 70s (Pizarro and Cascardo 1991). The growth of soybean cultivation in Argentina experienced an explosive rate, with an annual growth rate of 36% between 1960/62 and 1983/85 and Argentina became the fourth largest soybean producer in the world (den Boer, 1991:10)

The causes of this boom have to be seen in the existence of an avid external market, the retraction of cattle exports, the promotional national policies which fostered its incorporation, the promotion of this crop by transnational enterprises which had imported the whole technological package, and finally the previous existent productive structure of the Pampeana Region.

The access to international markets began after July of 1973 when the USA imposed a brief soya embargo and, thus, other countries, such Brazil and Argentina, were able to enter into European markets and thus increase their production, processing and exports at an accelerated rate (Bank and den Voer, 1991:2, Gutman and Feldman 1992). This fact, along with the role of the agricultural sector as an important source of currency at this time to adjust the balance of payments, placed the soya as the main source of external currency, making it more important than any other crop and livestock production, since the middle of the 70s when the exports of the soya became important.

The soybean production is almost entirely exported, either before or after internal processing in the form of pellets and expellers and soybean oil. As den Boer states "Argentina exports almost all

its soybean production, though there are fluctuations in the form it takes" (den Boer, 1991:28). For instance in 1984-1986, 42 % of the soya produced in the country was directly exported, another 56% was processed, leaving 2% for seeds. The products obtained by industrial processing are pellets and expellers of which 86% was exported, and oil, of which 79 % was exported (Gutman and Feldman 1992). This is in accordance with the high demand for these products for intensive livestock production in Europe.

Even though the growth demand of the European Union seems to be stable now, soya is still a boom crop in Argentina, expanding production in areas outside the Pampeana Region such as Tucuman, Salta and Santiago del Estero.

The second condition has been the promotional policies of the Argentinean government which includes favorable relative prices and rentability conditions. As with any other commodity, the internal price is determined by the international price, the exchange rate and the exports taxes. In Argentina, there have been the mechanism used to derive currency from the agricultural sector to other sectors. However, since 1960 till total market liberalization in the 90s (when soya is still taxed), the internal price was better compared to other agricultural exports (Cirio, 1984, Pizarro and Cascardo 1991), even though all of them have been declining.

Besides, not only the prices have been favorable, but so has the rentability of this crop compared with other agricultural activities (Tort 1992, Gutman and Feldman 1992, Obstchatko 1988, Pizarro and Cascardo 1991). At producer level, the high rentability of this crop compared to any other agricultural crops and to cattle production along with the possibility of getting cash in two periods of the year with soya and wheat, has been the motor behind

its adoption. According to the relative rentability¹⁶, the possibility of getting cash in two periods of the same year, and the retraction of the meat exports, has given fuel to the expansion of the area under soya cultivation. As will be shown later, in spite of that, not all producers were able to afford the high cost of production of soya and this fact has brought about some changes in the social organization of agricultural production in this Region.

The third condition has to be found in the contribution of private enterprises, specially multinationals, through the imports and diffusion of the whole technological package to produce soya (Gutman 1992, Brailovsky and Foguelman 1991). The technological package included seeds, Rhizobium, insecticides and herbicides. For instance, according to del Bello, the incorporation of soya has brought important changes in the herbicides and pesticides markets, incorporating new specific products adapted to the needs of this crop (del Bello 1988). Besides, there has been also important changes in the industrial sector related to soya processing which has experienced technological changes to cope with the growing importance of this crop (Gutman 1992, Gutman and Feldman 1992)

The fourth condition is found in the productive structure of the Region to which the next part of this paper will be devoted.

IV.2 Soya production, expansion and intensification.

The soya was first introduced and adopted in the Pampeana region, because soya is particularly suitable for large scale, capital

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With rentability is meant the favorable relation between prices and cost of production. See Cascardo and Pizarro 1991 who show a detailed analysis of rentability between crops and activities. See also Jarvis (1986).

intensive production and these characteristics are to be found in this region. Soya (a summer crop) fit perfectly into the agroecological characteristics of the region and it can be also cultivated in rotation with wheat (a winter crop) in the same year. This has been possible due to the strong diffusion of the techniques to produce the double crop wheat-soya in the same year along with the introduction of the whole technological package and its knowledge in the production of soya (Gutman and Feldman 1992)¹⁷.

Moreover, soya can be produced as the only annual crop, which is also important, outside and inside the Pampeana region.

The other important fact has been the retraction of the area under cattle production which has been covered by agricultural crops, areas where there is competition between different land use. Thus, it is possible to find that there has been an important retraction of the cattle area in the whole region from 39.278 thousand of ha in 1974 to 36.196 thousands of ha in 1986 (-7.8%), while the area under "second soya" (that is area under wheat-soya in the same year) has increased in the whole region for the same period of time from 165 to 990 thousand of has, increasing six times its area under cultivation (Peretti and Gomez 1991). However, this only includes the area under soya-wheat cultivated in the same year. The total amount of area devoted to soya in the Region reached a total of 3.934.362 has in 1988 (Argentinean Agricultural Census of 1988).

This is related to what had been happening with cattle production as well as the retraction of some crops like sorghum. As Peretti

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Soya is a very delicate crop, in the use of inputs and also technological management. As the producer did not have previous knowledge to produce soya, the technological package includes inputs but also know-how (Obstchasko 1988).

and Gomez state, "since 1977, it is characterized by a low relative price for beef which has impacted on the investment level of the cattle sector. It also coincides with the most important phase of stock liquidation" (Peretti and Gomez, 1991: 291).

The changes in the land use has been different according to the agroecological division of the region. In the Pampeana Region there are three areas. One is called the Agricultural zone, in which the soil to be cropped is excellent; in the second called the Mixed Zone suitable activities vary between agriculture and cattle production; while the third one, called the cattle zone, is suitable for cattle production. The adoption of soya has not been equal in all the zones. Considering only the soya/wheat area, in the Agricultural Zone the area has grown from 156.000 has in 1974 to 826.000 has in 1986. In the Mixed Zone, the growth has been less important from 9.000 has to 164.000 in the same periods, and there was no adoption of soya/wheat in the cattle Zone (Peretti and Gomez 1991). Thus, soya has increased the land under cultivation mainly in the called Agricultural zone displacing cattle production, and secondarily in the called Mixed zone, in which it has displaced also cattle production.

The increment of the area is one of the components of the soya explosion, which contribute to 49 % of the total production increase. A spectacular increase in productivity, in terms of yield per hectare, contributes to 51 % of the total production increase. Within the Pampeana Region, the Agricultural Zone, contains the 70.3% of soya and contributes to 73% of the production, with an output of 21.55 qq/ha. In this area one also finds the major quantity of second soya (wheat/soya). The Mixed Zone, where the diffusion occurred later, is the second in importance, with 18.6 qq/ha of output and only 20 % of the soya is "second soya". The cattle Zone, is even less important and with 17.2 qq/ha (Pizarro

and Cascardo 1991). Soya production outside the Pampeana Region contributes only with 7.25% of the total soya cultivated area in the country in 1988(Argentinean National Agricultural Census of 1988).

IV.3 The environmental and social impact of soya.

IV.3.1 Environmental impact, changes in the social relations and their interaction in the Pampeana Region

In the Pampeana Region, the introduction of soya has intensified greatly the process of soil erosion. The most important phenomenon is the hydric erosion, which affect 32 % of the total area (1.3 millions of Ha) (Mirassou and Calcaterra 1993). As a consequence, yields have not increased during the past six years. As Mirassou and Calcaterra highlight, the process of erosion and soil degradation had been within the tolerable limits during the previous period when a combined agriculture and livestock system predominated in the region.

Since the middle of the 70s, the process of agricultural expansion, mainly with soya, has broken one of the most sustainable ways of combining cattle with agricultural production in temperate areas which had been characteristic of the region (Mirassou, Calcaterra, 1993:11) This practice consisted in rotation between agricultural cycles and pasturage periods. After four or five years of agriculture, the fields were left under pasturage, allowing them to restore the soil fertility and physical soil conditions. Besides, within the agriculture cycle, the crop rotation was better with the use of sorghum and maize, which contributed with much volume of organic matter due to the vegetal volume they have. However, both crops have diminished during this process of agriculturization and the problems associated with soya production have been aggravated.

Besides this break, as soya is combined with wheat in the same year, it has led to an intensification of land use. This tendency to produce wheat and soya in the same year, searching for rentable alternatives in the short run, has led to an almost continuous practice of agriculture. Soils became more time plugged, soils nutrients are extracted by two crops in the same year, there is less organic matter contribution, and there is no fallow. The outcome was a dramatically increased process of soil erosion (Brailovsky and Foguelman 1991)¹⁸. Moreover, the characteristics of this crop, and the process of almost continuous agriculture have led to a more intensive use of chemical inputs such as herbicides and pesticides to cope with the increased risks illnesses and pests brought about by this intensification.

As Brailovsky and Foguelman states which in some way summarizes all the above mentioned

"International technological models were adopted. Even though they ensure a immediate rentability, they imply aggressive practices to the soil, an increase in the artificialization of agroecosystems, growing restrictions to few practices and management styles and to few crops, machinery each time more heavy and speedy but at the same time more aggressive, and to an agricultural specialization which eliminate the pasture rotations."

(Brailovsky and Foguelman, 1991:341)

In the region, all the producers are commercial ones. However, not all producers have been able to adopt the technological changes brought by this new crop. The most affected have been the small and

¹⁸ It is important to note that there has not been great incorporation of fertilizers because of its historical high costs (Calacaterra and Mirassou 1993).

some medium ones, due to, on the one hand they had the economy of scale needed to apply the whole technological package of soya, and on they were able to afford the high cost of production on the other hand (Tort 1992, Brailovsky and Foguelman 1991, Mirassou and Calcaterra 1993, Gutman and Feldman 1992). As Tort states, " the technological change and the agricultural specialization incorporated in the area in order to maintain acceptable levels of rentability, as a response to antagonistic trends between prices and cost of production, generated an accelerated degradation of the agroecological base and new economies of scale, which have been marginalizing the unities of production under 100 has" (Tort, 1992:14).

The process of technological change, specially mechanization, has given rise to a new social actor, the "contratista"¹⁹. The "contratistas" are a heterogeneous group, but what they have in common is that they are agrarian capitalists who own agricultural machinery and tools, which give them the capacity to work in services, in production itself or in some combined way. In fact they are not producers in the classic sense, and while they can be producers, they can be also urban renters working in the services sector and commerce. This phenomenon arises from the previous stimulus via government credits from the 50s to 70s for mechanization, by which a stratum of family producers ("chacareros) with capital but without access to more land became capitalized and invested in machinery. Moreover, there has been also the emergence of rural entrepreneurs without land who have also invested in machinery. Thus, these new social actors entered into the

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See Llovet (1991) "Contratismo y agricultura", Barsky and Pucciarelli (1991) "Cambios en el tamaño y régimen de tenencia de las explotaciones agropecuarias pampeanas", Sola (1990) "Los tipos de empresarios agrícolas".

agricultural productive process taking land under different arrangements with producers who gives them land to be produced. Within the producers who gives land, is found the smallest and medium de capitalized stratum, who, in many cases, have opted to leave the direct exploitation of their units of production and have the land only as a rent, for instance between 1970 and 1980, many producers left their farms and migrate to the cities (Bocco 1991).

With soya introduction, this social articulation which has the "contratista" as the main actor, became more important due to the economy of scale they had and the lack of access to technological change for the smallest and some medium producers (Calcaterra and Mirassou 1993, Llovet and Tort 1990, Obschatko 1988). In some way, the "contratista" started to concentrate the productive process while the landowners lost power decision upon the productive process itself. This fact has been pointed as one important factor in bringing soil erosion because the contratista works land but he is not the owner. However, the short run contracts between the landowners and the contratista vary accordingly to the stratum of producers involved, and consequently it does the degree of decision power upon the productive process of the contratista (Llovet and Tort 1990)²⁰. Llovet and Tort show that, the biggest stratum has remained with cattle production which allowed rotation with pasturage. In such cases, they did not face economic pressures and they were able to make arrangements with the contratistas by which they kept the decision power about crop management (Llovet and Tort

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The arrangements between landowners and the "contratistas" vary according to the strata of producers and also because of heterogeneity of the contratistas and also of the agricultural producers. In general, the contracts deal with inputs to use and the technological management of the crop. The decision of what to produce as well as the land used within each unit of production for cropping remains in the hands of the landowner.

1990, Peretti and Gomez 1991, Bocco 1991). On the contrary, within the smallest and some medium producers (below the 400 ha), the sustainable practice of combining agriculture with livestock production has been almost left, searching for short terms rentability with soya (Calcaterra and Mirassou 1993, Llovét and Tort 1990, Bocco 1991). As Bocco states, " the conservative practices are scarce because of the need of the smallest producers of introducing more technology and not to leave the land in fallow" (Bocco, 1991: 635). In such cases, the management of crops are more probably in the hands of the *contratista*, while structural reasons (including the restricted amount of land, which difficult proper rotations) and economic ones, push small and medium ones to go on with continuous agriculture, of which soya is the predominant crop.

As a consequence of the negative impact of soil erosion in yields, there have been, and still are, many attempts in order to reverse or at least stop this kind of land use. However, due to the important place this crop has as the main source of external revenue, most of the alternatives are technological ones, like using reduced farming in order to plug the soil less times within the same productive strategy. This imply the use of costly new machinery while producers go on with soya in order to maximize benefits, and the smallest ones are forced to continuous agriculture in order to remain in production.

IV.3.2 The environmental and social impact on other Argentinean Regions

Since the 60s, there has been an expansion of the agricultural frontier by which marginal areas have been incorporated. The technological model adopted in those new areas was with high level of mechanization and intensive use of chemical inputs, the

same used in the Pampeana region which has been exported into areas with completely different agroecological characteristics. (Eclac 1985, Manzanal 1990). As Eclac states for the case of Santiago del Estero, "the development of soya, maize and sorghum, has been based in the acritic transference of the pampeana productive style, which has brought about ecological and social important problems" (Eclac, 1985:72). One of the main crops has been soya. As Manzanal points out, "this expansion has been centered in the diffusion of soya" and "it has implied the development of capitalist modes of production" (Manzanal, 1990:303).

This agricultural expansion has been brought about through the elimination of natural forest in the Tucuman Northwest, in the East part of Salta and the West part of Santiago del Estero, in Formosa and Chaco in the Northeast part; in Cordoba in the Central part of the Argentina²¹. According to Casas and Michelena, those provinces " have suffered an intense process of degradation by anthropic causes, through the irrational cleaning of forest and woodlands, the posterior bad use of land due to the machinery used and the lack of proper rotations" (Casas and Michelena, 1988:233).

For instance, in Tucuman, in 10 years 195.000 has have been deforested, in Santiago del Estero 90.000 has (Zuccardi 1988) being 24.000 ha deforested between 1976 and 1986 (Brailovsky and Foguelman 1991).

This agricultural expansion has led to soil erosion. With productivist model of the Pampeana Region applied under different agroecological endowment, soils get degraded quickly compared to the Pampeana Region, the quantity and kind of weeds have increased

²¹ Salta, Tucuman, Chaco, Santiago del Estero y Cordoba belong to the "parque chaqueno occidental". Theses are temperate forests of which the most affected areas are the subhumid and semiarid.

and after a few years, the yields have declined. Once arrived to this situation, the commercial producers, who are the responsible for deforestation in those areas, leave the degraded agroecological systems.

The social actor who began the process of clearing woodlands is a "contratista", who comes from the Pampeana Region with machinery to clean the forest. In general, because the "contratistas" do not allow time to use the fallen trees, the trees are burned (even though there is a law by which this practice is forbidden).

In the case of Santiago del Estero, the land is sold (or it could be sold before clearing it) to commercial producers from other province (Tucuman). They come to Santiago del Estero with modern technology, they extract as much as possible and, then, when, due to the soil degradation the activity becomes unprofitable they return to their original province, leaving the land degraded.

This province is one of the poorest of the country, with a high percentage of minifundistas and landless who used the forests to extract firewood, to manufacture charcoal and to raise goats. The subsistence sector did not participate in soya production at all, but rather they suffered the consequences. This is because soya production was a capital intensive production and as Eclac states, "in the main department of soya production, the minifundios, only occupy the 0.3% of the area" (Eclac, 1985:75).

The process in Tucuman, the province in which soya growth has been the most important outside the Pampeana Region, has been similar. The soya has been a boom in this province since its introduction, a process which started with the introduction of Brasil varieties of soya that were better adapted for this region. In 1988, 135.297 has have been cultivated with soya. Commercial producers cleared the forest, usually with a contratista, they separated the

marketable wood and the rest was burnt. At the beginning, the high fertility of this forest soil provided high yields. However, after few years of continued soya production, the yields declined dramatically because of the growing deterioration of the soils and the land was abandoned.

CHAPTER V The "ganaderizacion" process

V.1 The cattle and sorghum boom.

The outcome of modernization in Mexico has been a spectacular increase in the cattle heads, and a spectacular increase of the area under pasturage and sorghum production.

The cattle expansion was either in new areas, through clearing the forests in the South and in the irrigated areas, where cattle production had been important even though before Second World War. According to Sanderson, cattle production following Second World War grew rapidly in the North (15% between 1960-80), in the Gulf region 41% during the same period, while in the central states stagnate (-5.3% growth) (Sanderson, 1986:133)²². In terms of occupied land, between 1950 and 1980, the land used for cattle production grew from 50 to 78 millions of has (Rama et al 1985).

In the both regions, cattle production has expanded in an extensive way and with a productive system characterized by the alimentation with natural and or implanted pasturage. Therefore, the growth of the area under pasturage has been possible through displacing land previously devoted to basic grains. In 1940 there was not cultivated grass in Mexico, expanding to 511.000 has in 1979, while the land area of natural grasses expanded from 56.172 thousands of

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According to Jarvis, the average annual growth rate of beef production in Argentina and Mexico have been: between 1960-70 in Mexico has grown 3.1%, in Argentina 2.8 %; between 1970-80 in Mexico 1.3% while in Argentina 6.5%; between 1971-1981 in Mexico 3.3% and in Argentina 3.6% (Jarvis, 1986:35). However, it is important to note that, even though both productions are in an extensive way, argentinean production is much higher than Mexican one, which implies that the growth in the area cultivated has been very much stronger in the Mexican case (Jarvis 1986, Rousserie and Romero 1983).

hectares in 1940 to 74.998 thousands of hectares in 1979 (Sanderson 1987).

The spectacular growth of cattle production has been a consequence of the existence of an external market, the changes in the consumption patterns in the country and the strong government and International financial support²³.

The Mexican government and the World Bank have strongly promoted cattle production through loans, credits and subsidies.

Mexico have been the most benefitted country with loans coming from the World Bank for livestock production, and cattle production. It included also the Pider (rural development programmes). Mexico received the first loan in 1965 and until 1985 twelve projects for livestock production have been financed, while the maximum obtained by other Latin American country was financial support for 6 projects in Uruguay (and Argentina only one). However, in the total amount of money only Mexico obtained the 48% of the total of money given to Latin American (Jarvis, 1986:124)²⁴.

The second condition has been the presence of two important markets, the international, mainly the United States, and the internal one. This existence of both lead, at the beginning, to the

²³ It is important to note that there has not been strong agroindustrial integration compared for instance to sorghum or other crops. See Rama et al (1985:153-154), Rousserie and Romero, 1983 and Montes de Oca-Zamorano Ulloa, 1983.

²⁴ See for instance Feder, "Lean cows fat ranchers. The international Ramifications of Mexico' beef cattle industry". See also Jarvis (1986: 197-198 and 124) when there is a description of the loans given by the world bank for the livestock sector in general and cattle sector in particular.

creation of two areas because of the existence of the food and mouth disease ('aftosa'). In the irrigated North, free of 'aftosa', the cattle production responded to external demand exporting alive calves and lean meat. Moreover, Mexico began to export boned, frozen, and fresh beef to the States, after the elimination of sanitary barriers and the establishment of the processing plants in the border frontier (Sanderson 1986).

The great increase in the internal demand has been also very important. In the South, the cattle production was mainly devoted to the internal market even though in 1990s some states, like Veracruz, exported beef. In such states where cattle production lead to deforestation there has been another important reason which is that forest activities has been less favorable than agricultural and livestock production, constituting a strong foment for deforestation and the adoption of such activities. As Barbier et al point out, " while there has been heavy subsidies for credit to agriculture and cattle ranching, the levels of credits directed to forestry activities have been small" " the bias against forestry is further evidenced by Mexico's research and extension policy" (Barbier et al, 1993:i).

The other component of the ganaderizacion process, which also displaced the production of basic food, has been the increase of fodder crops, mainly sorghum in irrigated areas.

In the case of sorghum, its production grew in response to a very important agroindustrial integration, the increased demand of the internal market for livestock products, the internal price policies, and the previous capital intensive unities of production established in irrigated areas.

The sorghum production grew in response to the dramatic growth and industrialization of livestock production (Barkin 1991, Batt and de

Walt, 1990:35), which has been mainly brought about by the establishment of transnational feed companies which were transforming poultry and pig-raising technologies (Barkin 1991, Sanderson 1987) and to a less degree to cattle production. These industries have showed a high dynamism and they had a high degree of concentration guided mainly by transnational companies (Montes de Oca and Zamorano Ulloa 1983).

The other important factor has been price policies, which embrace two important factors. One, the prices of most of the basic grains were frozen in 1962 till 1973 which keep them low²⁵.

The other price policy was that sorghum obtained a high guarantee price. Both situations have fostered the shift to sorghum in the North by the commercial producers. As Barkin points out, "these two decisions made wheat and maize less profitable to grow while stimulating sorghum cultivation" (Barkin, 1991:26). Besides, sorghum had higher yields, lower production costs because of lower labor requirements, and reduced risks. (Barkin, 1991:27).

Sorghum was a commercial crop (Montes de Oca and Zamorano Ulloa 1983), produced with high level of technology and therefore its production was centered in those regions with commercial producers, who were found in the North of the country.

V.2 The environmental and social impact in the North

One of the most important agronomic characteristics of sorghum is its resistance to droughts. Surprisingly, in Mexico it has been more diffused and adopted in irrigated areas. This has happened because the new crops have been expanded in regions where they already had been capitalist (Rama et al 1985) as an outcome of the previous mechanization and the establishment of large-scale,

²⁵ See Appendini and Liverman (1994).

capital intensive production. Thus, as Barkin, Batt and de Walt point out, "nearly one-third of all production is taking place on irrigated land, despite the fact that sorghum was originally introduced to Mexico in the 1940s to make use of marginal dry lands. Sorghum expansion was highly concentrated regionally in the most productive agricultural area of Mexico, on lands formerly planted in maize and, in some cases, wheat" (Barkin 1991, Batt and de Walt, 1991:36).

The social actors involved in this crop shift have not only been the commercial producers, but also the richest ejidatarios. The commercial producers have been favored by the government, so "sorghum producers have taken advantage of governments credits for tractors, fertilizers and other inputs to modernize their operations" (Batt and de Walt, 1991:36).

The ejidatarios and smallholder face another situation. As Cynthia Hewitt de Alcantara points out, "all available evidence points to the fact that ejidatarios and smallholder have competed without advantage for agricultural credit and irrigation water. They have also been handicapped by the nature of their relationship to the official credit system which has in effect made them captive buyers of manufactured inputs selected for them by a banking bureaucracy" (Cynthia Hewitt de Alcantara, 1976: 51). However, in such ejidos of irrigated land where technological could be incorporated, it has meant important changes in the productive organization of those units of production. The National Bank, of which they depended, took decisions about the crops to cultivate, the technology to use and the cultural practices; it established the quantity and quality of inputs to use, and provided tools ejidatarios could not afford, such as machinery. Thus, the decision of what and how to produce became into the hand of the Bank (Boltvinik 1976), affecting peasant survival strategies and promoting such key crops as sorghum within the agricultural development to which they adhered.

However, as it was mentioned in the part of modernization, the ejidatarios and minifundistas could not incorporate such technological change and as a result many ejidatarios rented out their land clandestinely. In this way, cattle production has been expanded. Cattle production has been historically produced in an extensive way. The extension of the activity have been made mainly through territorial appropriation by different kind of contracts. This has meant the expansion of cattle ranches over ejidos and communal lands, leading to a strong process of economic concentration (Rousserie and Romero 1983)

Besides, there has been important environmental impacts in the North, related to soils and water use. In Mexico, one of the most important environmental problems are related to water scarcity and high vulnerability to droughts. Water, even though in irrigated areas, is scarce, and being devoted to sorghum while the country started facing basic grains surplus, is a socially inefficient way of using natural resources²⁶.

Moreover, in the irrigated North there has been a sensational increase of cattle herd. This expansion has been based in an extensive way on fragile pasturage which, due to the over cattle population has led to overgrazing, with the outcome of soil erosion. In 1983, 128 millions of has had been degraded. As Rousserie and Romero point out, "the extensive and inefficient pasturage caused by the over cattle population lead to overgrazing which has conducted to almost end the national pasturage" (Rousserie and Romero, 1983:31).

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In general, it is said that water resources has to be used, for its scarcity, with high value crops. This can be true from a private point of view, but not from a social one in cases such Mexico where water scarcity is a national problem. See for instance Appendini and Liverman (1994).

V. 3 Environmental and social change in the South

The destiny for cattle produced in the South has been mainly Mexico City, and other important cities due to the fast growth of internal demand brought about by the income concentration of the urban groups (Rousseries and Romero 1983, Rama et al 1985, Gigena 1985)

The impact of cattle production on the rates of deforestation has been very important compared to other activities, even though the percentage of deforestation attributed to cattle production vary according to the different type of forest considered. In table Nr2, one can see the different causes of deforestation in each type of forest and the rates attributed to each cause. In tropical evergreen and tropical deciduous, livestock production contributes 58 and 57 % to deforestation respectively, decreasing in the case of temperate forests to 28%. However, taking into account that the land devoted to agriculture is finally destined to pasturage, the total importance of cattle production growth in both type of forest to 68 %, 61% and around 45% in the case of temperate forests (See table Nr2).²⁷

Deforestation was fostered by different policies ranging from colonization plans from other regions to open agricultural lands, to the price policies which affected negatively maize, associated extensive livestock production allowed by the hungry of land of private producers which allowed to rent illegally ejido's land and

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Besides the impact at global levels that deforestation could brings, such as the loss of biodiversity and the impact on climate change, there has been a great impact in soil erosion and the changes in the agroecological characteristics increased the productive risks because of droughts, floods and the increase in pests (Foro de Veracruz, 1992).

the official foment to livestock production for the ejidos (Mestries 1992, Foro of Veracruz 1991).

Deforestation started in many areas because of the government colonization plans to open the agricultural frontier since the 40s, in the so called "running to the South" projects (la marcha al Sur). For instance in Veracruz, during the colonization process landless from the North and Central Mexico, displaced by agricultural modernization in those areas, have been encouraged to open the forest and many of them have integrated later ejidos in the 60s and 70s²⁸. However, at the beginning this peasant colonization had been articulated with the forest exploitation by concessions to privates who used the peasant labor force, under contracts to clear the forest and to crop grassland.

In all the cases, the growth of livestock production has been historically in an extensive nature, with a coefficient per hectare below the national average (1.81 ha per animal unity). For this expansion more land has to be incorporated and this has been possible through different mechanism by which the cattle ranchers and the small producers and ejidos interact in this expansion. In general in all the deforested areas, the different arrangement arose because of the existence of two different situations. On the one hand, the cattle ranchers who faced a legal limit to extend their private property but were hungry of lands, with land

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However, there has been no clear definition in their land tenure, giving place to high speculations with the land cleared. This lack of definition in the land tenure system, the lack of roots in the region of those people and the ecological knowledge brought by them from other regions, lead to a circle of clearing and then migrating again to clear new forest, following the slash- and-burn agriculture (Mestries, 1992:52). See also Mouroz (1980) "Mexican colonization experience in the humid tropics".

scarcity in relative terms to cattle numbers they own, or wanted to own²⁹. On the other hand, the small producers and ejidatarios of the South, subsistence producers, have been devoted to the production of staple crops such as maize which had low prices. They had to combine the production of their plots with off farms incomes even though some of them remained producing basic grains.

However, in most of the cases they have played an important role interacting with the commercial cattle producers ("hacendados) in the expansion of the grassland. The mechanism used have been different sharecropping contracts which implied renting illegally ejido's land, with no labour contracts and varied according to productive specialization.

In fat cattle production, the contracts were a direct rent of the existent grassland ("renta directa del pasto) either in individual parcel of the ejidatarios or in their communal lands. In both cases the production of cattle was responsibility of the owner.

In the case of breeding productive system, the most common system, was that the cattle rancher gives pregnant cows or with young calves to peasant until they are ready to be sold or to fat. This process lasted between 12 and 18 months, and at the end, the peasant received half of the money obtained by selling cattle and all the milk produced, having had to pay the death animals during this process. In general, this meant a productive specialization: the peasant are devoted to breeding cattle, running with all the productive risks in this delicate period of cattle production while the cattle ranchers increased their profits from having cheap food for their cattle as well as cheap labour force. This happened for

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The commercial cattle producers prefer to expand their production and not to intensify it because of the fear of expropriation.

instance in Veracruz³⁰. The outcome in this State has been that since the 60s, cattle production tended to displace the production of basic grains, especially maize, beans and rice. Between 1970 and 1987, maize contracted its area 50%, becoming this State a net food grain importer (Mestries, 1992:51).

The same social dynamic can be found in the State of Tabasco. which became in the 70s one of the main meat centers of supply for Mexico DF. The number of cattle increased from 494 millions in 1960 to 1650 million head in 1980, while the area under maize decreased (See table Nr3). There has been a joint growth of agriculture and cattle production up to the mid 70s, and then the cattle production continued growing while agriculture got stuck. As a consequence, basic food has been imported from other regions of the country. In the State of Tabasco, the tropical evergreen forest decreased from covering the 50% to 4% between 1940 and 1980, while the area under pasturage has grown, in the same period from 20% to 66%. (See table Nr4). In Tabasco, the social dynamic described has meant the marginalization of peasant economies but also has led to destroy some sustainable practices of the indigenous people who inhabited the forests. Originally the subsistence sector used a slash- and-burn system to cultivate their "milpas", a subsistence crop system which has been considered a sustainable practice. The productive techniques of the ejidos needed for each ha in production five or six time the same quantity of land to put in fallow. This land to be put in fallow, called "acahual", played an important role in recuperating the fertility and the flora and fauna needed to the

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Veracruz is the main cattle producer area of Mexico supplying 35-45 % of Mexico City demands, and also exported calves to the USA in 1990 (Mestries) Its livestock production is essentially extensive, with half of the land under natural grasslands, without fertilization, with a coefficient of animals per hectare below the national average (1.81 ha per animal unity).

tropical equilibrium. In the 60s, the total cycle of rotation lasted seven years, but in 1975 "the reduction of the alcahuales (the land in fallow) by expansion of grasslands reduce, on the one hand, land available for annual crops and on the other has reduced the cycles, which brought about loose of fertility" and also the increase of pests (Moreno and Rosenfeld, 1983:92). Therefore, the cattle expansion has generated relative scarcity of land which obligates peasant to shorten rotations, with more intensive use of land. The condition of soil became worst for cropping grains and this encouraged the shift to grassland. This is one good example of a process of ecological and economic marginalization.

Mexican government has promoted the "ganaderizacion" though financial support especially devoted to fat cattle and the cattle ranchers were most benefitted. However, since the end of the 70s has promoted also the peasant cattle production, through fostering the creation of the collective ejidales, composed by ten ejidatarios with 20 Has each (the member in the best position within the ejidos) joining their land, planting grasslands and buying animals. The adoption of the cattle production by the peasant can be explained by the greater rentability of this activity, the greater availability of time that it brings, allowing them to sell their labor force. However, the outcomes have not been successful, with the consequent loss of self-sufficiency of the communities, high rates of mortality of animals, chronic indebtedness, strong social differentiation and concentration of communal lands in the ejidos (Mestries 1992)

As a general outcome, the displacement of the cultivation of basic grains by livestock production in the humid tropics in general, jointly with the extensive form of its production, "has reduced the area available for peasant activities, without creating alternative employments, because it is only necessary only one worker for 80-

100 has due to the extensive production systems" (Mestries, 1992:51). In general, the ganaderizacion process has been extended above the agricultural frontier areas, "bringing about either the looses of peasant communities or the economic asphyxia due to the reduction of their expansion and bringing about the ecological destruction of the tropical and subtropical areas."(Rama, Rello and Arroyo, 1985:234)

CHAPTER VI Agricultural production for whom.

VI.1 The end of the Mexican food self sufficiency

The process of fast internationalization of the animal production has meant the productive substitution of basic grains (maize, wheat, rice and beans) by sorghum, alfalfa, oats and new oil seeds like soya and cartamo which were demanded by the feed industries and the oil industries. While this happened mainly in the North, in the South part of the country, the production of the basic grains has been displaced by the expansion of the cattle production. Thus, as an outcome of the ganaderizacion process, Mexico arrived, besides the environmental crisis, at a crisis in basic grains which meant, at the national level, the end of Mexican food self sufficiency. As Leff points out " the agrarian policies that have promoted irrigated agriculture and high technology for exports have led to the necessity of importing basic food. Since 70s, there has been a reduction in the harvested area and in the production of basic food in rain-fed areas, while the irrigated areas were devoted to exports. Thus, in 1980, 90% of the internal demand of basic food has been imported." (Leff, 1992:40-41) (Sanderson 1986, Barkin 1991, Barkin and Batta and de Walt 1990).

Besides, in spite of the increase in production, sorghum and soya had to be also imported, and Mexico became one of the most important buyers of sorghum in the international market, joint with Japan (Sociedad Rural Argentina 1992).

The process of ganaderizacion has been the cause of the end of food self- sufficiency and not because of an increase in population. As Pelto points out, "the decline in per capita grain production was not due primarily to population increases; rather, it resulted from government policies that encouraged the production of sorghum and discouraged grain production. Although sorghum is preferred for

animal feeding, some of the basic grains (wheat, barley and maize) have also been diverted to feed livestock."(Pelto, 1987:536). Barkin, Batt and de Walt hold the same position. They state that "Mexico's growth rate of 4.6% in cereal production between 1961-65 and 1981-1985 continued to surpass its population growth of 3% during the same period"(Batt and de Walt, 1990:35). However, in terms of crop adoption and increase in hectares sown, sorghum has been an even greater success than wheat, the first Green Revolution crop (Barkin, 1991:15) and this fact, the shift from food crops to feed grains, is the most important cause of the gap between population growth and food availability. The same can be said of beef which experienced an 3.3% average annual growth rate of production between 1960-70, while in the same period population growth has been 3.3%; in 1971-78 was 9.3 % while population grew 2.9 % in the same period (Jarvis, 1986:35; Urrutia 1991).

Moreover, the expansion of livestock production has not been translated into an increase in meat consumption by most of the population. Mexico has an average consumption of meat of 60 kg per year and per person (Barkin 1991). However, as Barkin, Batt and de Walt point out, " in 1980, over 35% of the population never eats meat. While many poor people may eat eggs and milk, the overwhelming proportion of livestock production is consumed by middle and upper income groups. As a result, malnutrition is widespread" (Barkin, Batt and de Walt, 1990: 37)³¹.

As Sanderson points out, "many commodities formerly consumed in the countryside became inputs in a transnationalized agroindustrial network. And the cattle industry veered to the export market, drawing domestic resources away from basic foods toward the

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See Ginneken (1979)" Basic needs in Mexico: analysis and policies"; Rousserie and Romero(1983)"Una aproximacion al enfoque de sistemas en la ganaderia"

generation of foreign exchange and the satisfaction of upscale consumer needs." (Sanderson, 1986:6). Pelto also points out, "50% of the increase in animal production since 1960 is consumed in Mexico city. Thus, the consumption patterns of the affluent, which feature meat as a central component of the diet, have diverted scarce resources from food grain to livestock production-a far less efficient use of land and water resources"(Pelto, 1987:537).

Therefore, the ganaderizacion process has brought environmental degradation, it has been devoted to the satisfaction of the middle and upper groups of societies, it has brought land concentration and the impoverishment of rural producers and workers, while the general development strategy contributes with a high income unequal distribution (Urrutia,1991, Rousserie and Romero 1983).

The national food system came into crisis, with the dependence in external markets for purchasing maize, but also for sorghum. As a consequence consumers of tortilla complained because they were made with imported yellow maize (used in animal feed in Usa) (Barkin 1991, Appendini and Liverman 1994).

As an attempt to reverse this situation and to increase the production of basic grains, a National Food system program arrived in 1982 but only lasted two years at the same time that Structural Adjustment Programs arrived. Since this time, the nutritional conditions of the most vulnerable groups have worsened with the decrease in real wages, the increased underemployment and unemployment and the gap between food prices and wages(Barkin 1987).

VI.2 The impact on the Argentinean food access

Argentina is a good example of great availability of food and the lack of access to it for many social groups. The agricultural

sector has performed properly its role, being the most important source of external currency. However, while the cereals and oils exports has been growing continuously as a consequence of the modernization process, food consumption levels have decreased between 1965 and 1985/86 (See Teubal, 1992:23, Lischinsky 1990) in almost all the items considered as an essential component of the Argentinean diet. However, beef dropped to 67 kg in 1992, an amount far away from the historical patterns (Sociedad Rural Argentina 1992). The causes of this decrease has to be seen in the decreased purchase power of most of the population (Sociedad Rural Argentina 1992) and because a tendency to reduce beef consumption in the high income groups of the country. There has been also other changes in the composition of the diets which is reflected in the increased consumption of poultry products, yoghurt and other processed food, mainly in the upper strata. In the lower strata there has been an increase in the consumption of bread, pasta and cereals in the same period (Teubal 1992).

In 1984, the argentinean food crisis has been recognized with the implementation of an National Food Program (PAN, Programa Alimentario Nacional) which delivered free food to almost 2 millions of people, in rural and urban areas during three years until it finally was cut mainly for financial constrains.

This lack of access to food cannot be attributed to population growth, while Argentina has one of the most low rates of population growth³² and high agricultural productivity.

Therefore, in Argentina and Mexico, the agricultural modernization process and agricultural exports did not contribute to improve the

³² Between 1950-60 it has been 1.9%, in 60-70 lowered to 1.6, in 70-80 107% of average annual rate.

food availability for most of the population and has meant over exploitation of their natural resource base. As Teubal highlights for the Argentinean case, " while cereals and oil seeds exports expanded substantially, this apparently was done at the expenses of domestic food consumption, specially in the lower income groups of society. This also reflects the lack of an adequate food policy" (Teubal, 1992:22). In Mexico there has not been an adequate food policy either. This fact seems to be crucial. As Barkin points out, " policies of agricultural modernization will fail to provide for basic food needs unless these policies are accompanied by a corresponding food policy that will guarantee and adequate diet to the whole population" (Barkin, 1987:36).

The structural adjustment policies have worsened the food purchasing power, with the increase in the rates of underemployment and the drastic diminution of real wages (Barkin 1991, Beccaria 1991, Kostzer et al 1992). The problem is in both, rural and urban areas, being quantitatively most important in urban areas where 73,7% of the Mexican population and 86.8 of Argentinean population live. As Kay points out, " poverty in Latin America is mostly an urban phenomenon today as the crisis and adjustment process of the 1980s particularly affected the urban sector and because of the continuing high rate of rural-urban migration" (Kay, 1994:25). However, rural poverty is important in both countries. In Mexico between three- quarters and a half of the rural population live in poverty, while in Argentina rural poverty is below a quarter of the rural population.

At the same time, the policies directed from 1940 to 1982 has given high priority of economic growth and sustainability was largely not perceived as a consideration until late in the period when some environmental awareness started to be manifested.

The growing awareness of environmental degradation at government level can be seen in the Argentinean case, with the implementation of a National Soil Conservation Law in 1981 through which some subsidies were given to apply conservationist practices. However, they were given only during 4 years and then due to the posterior economic rationalization they were cut. In 1993, the same kind of policies could have only been implemented with loans given by the World Bank. Other important fact has been the creation of the Secretary of Natural Resources and Human Environment in 1991. However, in terms of government environmental care, Argentina can be considered in a backward position concerning environmental issues.

Mexico is very much in advance than Argentina in regulating some environmental problems. In 1988, the General Law for Balance and Environmental Protection has been promulgated as well as a National Environmental Protection Program, and a National Development Plan for 1989-1994.

However, this legal regulations are not guarantee that natural resource will be better used when both economies are completely open and more exposed to international markets. In 1994, the strategy is to promote economic growth with agricultural sectors more integrated into the international market. Moreover, when environmental protection and food policies are more needed, Structural Adjustment implies a reduction of State intervention by which social welfare spending was substantially reduced, even in such sensitive areas as subsidies for basic foods.

SOME CONCLUDING REMARKS

The new international division of labor, the internationalization of agriculture and both development strategies have brought about modernization in both countries. The outcome has been that their productive systems were reshaped with opposite trends among them and related to their previous productive structure. The cause is because global process happened under different agroecological and social organization of agriculture. The social impact has been the destruction of the peasantry in Mexico while the small producers in Argentina, who did not interact with commercial producers of the Pampeana Region and did not enter in basic grain and oil seeds production, were neglected. In Mexico, the expansion of agricultural commercial and cattle producers have been, in many cases, engaging impoverished peasants in livestock production under different arrangements with cattle producers; in the Argentinean case it as lead to the appearance of the "contratista". In both cases it has been showed that economic pressures, which entail the lack of credit, prices, and technological advises, is the driven motor to over-exploitation of natural resources. At national levels such economic pressures mean, in the Argentinean case, her high dependency on agricultural exports (soya) to obtain foreign currency. In the Mexican case mean external financial support, cattle exports and the role of the agroindustries. In this two cases studied, it has been observed therefore that agricultural systems, natural resource use and food availability are not related to population growth and poverty, but are dependant on global process and development strategies. In times of Structural Adjustment Programmes, the agricultural sector is more integrated into the world economy and therefore agricultural systems and the use of natural resources are more exposed to its fluctuations. Environmental protection is needed but the States will not afford it. This mean an increasing external

financial dependence to protect the environment, feeding a vicious circle of falling into debts. Meanwhile, food will be produced for external or upper class markets or to be exported increasing food insecurity while the natural resource base will keep their path of degradation.

ANNEX

TABLE Nr 1

Per capita annual consumption of meat.

Kgs

	1961-65	1969-70	1975-78
Argentina	82	81	84
Estados Unido	38	49	56
Uk	26	64	66

Source: Based on Rama, Arroyo and Rello

TABLE Nr 2
DEFORESTATION IN MEXICO, estimations for 1980

	Millons of Has	Has/year deforeste	Annual rate of def.(%)	Main causes of deforestation	Percentag
1) Tropical evergreen	9.7	237000	2.44	Fire Extensive Livestoc Agriculture Others	22 58 10 10
2) Tropical deciduous	16.1	322000	2	Fire Extensive Livestoc Agriculture Timber extraction	7 57 14 21
3) Temperat coniferous	16.9	163000	0.96	Fire** Livestock* Agriculture Clandestine loggin	49 28 16 5
4) Temperat broadleaf	8.8	82000	0.93	Fire Livestock* Agriculture Clandestine loggin	47 28 17 5

References: *bovine, caprine and ovine

** largely anthropogenic

Geographical location:

- 1) Lowlands of the Gulf Coast of Mexico, South of Yucatan, northern part of Veracruz State.
- 2) Lowlands of the Pacific Coast, northern Yucatan, south of Peninsula Baja.
- 3) Mountainous ranges of Mexico, Sierra Madre Oriental, Occidental and Sur, neovolcanic bel
- 4) Lower parts of the ranges occupied by temperate coniferous forests.

Source: Based on Masera, Ordonez and Dirzo, "Carbon emission from deforestation in Mexico. Current situation and long-term scenarios."
Forestry Report of Mexican guvernement 1992.

TABLE Nr 3

Land use in Tabasco as a % of total State area

	1940	1960	1970	1980
Tropical evergreen	50	30	12	4
Grassland	20	40	58	66
Crops	16	20	11	5
Plantation	5	5	5.5	4
Unproductive land	9	5	13.5	21

Total state area: 2.6 mill of Has (1990)

Source: Based on Masera, Ordonez and Dirzo.

TABLE Nr 4

Tabasco: Evolution of the Cattle stock and has cultivated of maize

Year	Number of cattle (millions of head per year)	Increase %	Maize (has/year)	Variation %
1960	494	base=10	38739	base=10
1965	575	116.4	56114	144.85
1970	634	128.3	55821	144.09
1975	1282	259.5	84900	219.15
1978	1451	293.72	31469	81.23
1980	1650	334	37949	97.96

Source: Based on Moreno and Rosenfield.

"Peasants, cattle ranchers and
agricultural frontier in the Humid Tropic".

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