Drought and Man

The 1972 Case History

Volume 3:
The Roots of Catastrophe

by

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with special contributions from

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Foreword

FOR survival, the world community needs to anticipate long-term problems more quickly and to respond to them more effectively. This places particular responsibility on the scientists. A main strategy of IFIAS is to bring together research institutions, scholars and decision-makers round the world to attack problems. They can then co-operate, exchange ideas and stimulate new and innovative thinking on these problems which are too complex for any one discipline or country.

IFIAS is a dynamic organization designed to co-ordinate and utilize the efforts of many of the world's leading research institutes to attack the most pressing global problems effectively.

IFIAS was formed in 1972 on the combined initiative of the Nobel Foundation in Sweden and the Rockefeller Foundation in the U.S.A. It is non-governmental, non-political and non-profitmaking. Since it began, it has grown from 12 members to more than 30. Its membership spans the Natural and Social Sciences as well as the Humanities, and reflects the multifaceted approach that IFIAS brings to its work.

One of the first major programmes that IFIAS initiated in 1974 was called "Impact of Climate Change on the Character and Quality of Human Life". Within this programme the project "Drought and Man: the 1972 Case" became the biggest one. Its Project Director has been Professor Rolando Garcia, who led a team of some 40 researchers in many disciplines and in many countries for about three years, 1976–79. The co-ordinator of the IFIAS Climate programme has been Dr Walter Orr Roberts, a founding Trustee of IFIAS and President of the IFIAS member the University Corporation of Atmospheric Research in Boulder, Colorado, U.S.A. Professor Garcia conducted his work from another IFIAS member, the Graduate Institute of International Studies in Geneva, Switzerland.

IFIAS is very pleased that the final volume, entitled *The Roots of Catastrophe*, is now completed. It is Volume 3 in the series presenting the results of the "Drought and Man" project. The two previous volumes are:

Vol. 1: *Nature Pleads Not Guilty* (1981)
Vol. 2: *The Constant Catastrophe: Malnutrition, Famines and Drought* (1982)

One of the leading motives of the "Drought and Man" project when it was initiated by IFIAS in 1974 was to try to go beyond the symptoms of drought and famine that were revealed by the events in the Sahel region of Africa in 1972–74, and to see if lessons could be learnt for the future in case a similar situation occurred here or somewhere else in the world. IFIAS is convinced that a more extensive study of the

root causes of the "drought-triggered" tragedy, and of the structural changes of the social and ecological systems, has never been carried out. The present volume, *The Roots of Catastrophe*, is extremely pertinent to the present tragedy in Sub-Saharan Africa. As is evident from the interdisciplinary research by Professor Garcia and his colleagues, the African situation will take a very long time to remedy and will be possible only if we realize that it represents a major structural change of society and not only a reaction to a temporary climate anomaly.

On behalf of IFIAS I wish to express our sincerest gratitude to Professor Garcia and his team for the pioneering work, and to Dr Walter Orr Roberts for his vision to initiate and then to co-ordinate the IFIAS Climate programme. IFIAS also wants to thank two of IFIAS members, Aspen Institute for Humanistic Studies in the U.S.A. and the Graduate Institute of International Studies in Switzerland for generous support of the "Drought and Man" project.

Last but not least we wish to express our gratitude to UNEP, Rockefeller Brothers Fund, Lilly Endowment and Deere and Company for their financial support of the project.

Stockholm, *February 1985* Sam Nilsson

Preface

THIS third volume in the series "Drought and Man: the 1972 case history" appears several years after the first two volumes. When the project was finished at the end of 1978, I prepared and sent to IFIAS a complete version of the three volumes. The third one contained all the "case studies" carried out in several countries by local research groups. Most of this material had already been very briefly summarized in Chapter 7 of Volume 1.

The first two volumes were accepted and published in 1981. I was asked to revise the third one in the light of the fact that the contributions had a combined length far greater than that acceptable to the publisher.

A request to "reduce the size to less than one half" was not easy to implement. I envisaged two alternatives: either to make an extended summary of the papers, or to eliminate more than half of them. I oscillated between both solutions. The first proved to be an almost impossible task. The second would leave some serious gaps and would require some very arbitrary choices. It soon became evident that a third solution would have to be adopted that would be a combination of both, plus a considerable amount of new writing to introduce and to bridge the chapters. Such a plan was easier to formulate than to carry out.

In the meantime, commitments to new projects that were linked, one way or another, with my former work at IFIAS and that involved, among other things, changing countries of residence and affiliations to institutions, made it difficult to find time to come up with a new version of this third volume.

I was fortunate that my work in "Drought and Man" attracted the attention of UNRISD (The United Nations Research Institute for Social Development), who asked me to join their programme "Food Systems and Society" and to develop a conceptual framework and methodology for it, along the lines of "Nature Pleads Not Guilty".

My association with UNRISD gave me the necessary "push" to expand my own "developmental structuralism" (in the sense explained in the present volume) as a way of approaching inter-disciplinary research into complex problems involving interactions between physical and socio-economic systems. A paper came out of these efforts,* but the real challenge was to apply such an approach to a concrete case study. The opportunity arose when I was invited to be Visiting Professor at the Autonomous Metropolitan University (UAM) of Mexico, in Xochimilco. The

*Two mimeographed versions of this paper were circulated by UNRISD (1979 and 1981). A third version was published with the title: "Food Systems and Society: a conceptual and methodological challenge" (Palais des Nations, Geneva, 1984).

Rector strongly supported the UNRISD programme and offered to house a related project. The SAS Programme was thus born by agreement between the UAM and UNRISD The acronym SAS is derived from the Spanish name of the Programme "Sistema Alimentario y Sociedad: el caso mexicano".

Another regional programme, associated with the general UNRISD programme Food Systems and Society, had started in India some time before under the direction of Pierre Spitz in Geneva and of Dr Chattopadhyay in Calcutta. It was obvious that both regional programmes (Mexico and India) had to interact with each other. Geographical distances and time availability proved to be obstacles to a satisfactory interaction between the two research groups. Individual discussions with Pierre Spitz were, however, quite frequent. He had already written a contribution for Drought and Man. In fact, it was his participation in the IFIAS project that brought me in contact with UNRISD. The new association with him through Food Systems and Society gave me further opportunities to profit from his vast knowledge and experience in agriculture and related fields, and from his open-minded views on world problems. I am very grateful to him for his willingness to join forces in order to bring this volume to completion.

Spitz's idea of focussing the analyses of the case studies on the particular kind of dominant "disjunction" that was mainly responsible for the instability of the system in each case proved to be very useful. It helped in establishing the criteria, not only for the selection of the case studies (only those that were clear examples of a characteristic type of disjunction were retained), but also for the choice of such parts of the original papers that were more relevant to the analysis of the mechanisms in operation in each case.

I hope that the authors of the papers that were produced as part of the Drought and Man Programme* will kindly understand and accept both the omissions and the inclusions. As for the omissions, I very much regret that the limitations imposed upon us made it impossible to honour all contributions. Some very fine pieces of work had to be left out. As for the inclusions, Spitz and I have taken the responsibility of placing the contributions that have been retained (or parts of them) within a context that may not be exactly what the authors had in mind. I firmly believe that this has not betrayed in any way the leading ideas that were agreed upon in the workshops and personal discussions held with the authors during the development of the programme.

The association with Pierre Spitz in this volume was possible thanks to the support provided by the Director of UNRISD, Dr Enrique Oteiza, and the Director of IFIAS, Dr Sam Nilsson. This co-operation points towards the establishment of closer links between both institutions. This may prove to be very important for two programmes that have very much in common: the IFIAS ABC Programme (Analysing Biospheric Changes) and UNRISD's Food Systems and Society.

Such links between IFIAS and UNRISD are already in operation in Mexico. On 1 January 1984, I left UAM-Xochimilco, having been asked by the Centre for Research and Advanced Study (CINVESTAV) to establish a Section called Methodology and Theory of Science directly under the direction of the Centre. In

*The complete list is included in the Annex.

addition to theoretical studies on the History and Philosophy of Science, the Section will conduct research programmes of an interdisciplinary character.

My own contribution to the present volume was strongly stimulated by CINVESTAV. I am grateful to the Director, Dr Héctor O. Nava, for providing me with free time and the institutional support that was necessary to bring this book to its completion.

México, April 1984 Rolando García

Introduction

DROUGHT AND MAN started as a project aimed at assessing the "impact" of the droughts that, around the year 1972, affected several continents and appeared to have catastrophic effects, not only in several countries, but also on the world economy as a whole.

The general framework within which the project was conceived and was intended to be developed could be summarized as follows: "There was a natural catastrophe—a drought—that in some regions lasted for several years. We know roughly the effects: hunger and deaths in the Sahel and elsewhere; depletion of world grain stocks; skyrocketing of food prices; a worldwide food crisis. Such tremendous effects produced by the drought must be due to a natural phenomenon of unusual intensity: Let us look into it and find out how it happened. Try to evaluate whether it may happen again and whether it could be forecast. So, next time, if it comes, we will have been able to take some measures in advance."

The above statement contains a number of implicit assumptions shaping a rather rigid conceptual framework that is seldom submitted to a critical analysis. Let us spell out some of them:

(a) Catastrophic events taking place in a society are always the "effect" of some outside "cause" impinging on an otherwise peaceful existence. Such a "cause" may be natural in origin (droughts, floods, earthquakes), or political (the intervention of a foreign power or even the influence of "foreign ideas").
(b) Effects are directly proportional to the magnitude of the cause.
(c) The effect of a given cause may have far-reaching consequences. However, it is always possible to link such consequences to the original cause, by a linear chain of cause–effect relationships.

The first assumption is in need of serious qualifications. As it is stated, it is both confused and highly misleading. The other two assumptions are, more often than not, wrong. They certainly do not apply to complex situations such as the interaction between the physical environment and society. The last two assumptions are an inherent part of the Newtonian paradigm that dominated the scientific conception of the world until the beginning of this century and is still prevalent in the minds of most scientists. The extraordinary influence of this paradigm over the whole of science becomes evident through the words of one of the foremost scientists of the nineteenth century, Hermann von Helmholtz. He was primarily a physiologist, but he said: "To me no theory has the status of a scientific theory, unless it can be formulated in terms of Newtonian Mechanics."

In Volume 1 we tried to show that the search for linear causal chains that is found in most studies on the "impact" of natural catastrophes leads to results that are wrong or, at the very least, highly misleading. We therefore proposed another method of dealing with these phenomena that we called "a 'structural approach' for diagnosing the impact of climatic anomalies", and that became the subject-matter of Chapter 6. We have further developed this approach, after the first volume was sent to press (beginning of 1979), in connection with other research programmes (cf. the Preface to this volume).

The title of Chapter 6 in Volume 1 was rather unfortunate. In spite of the explanations provided in the text that—we thought!—should leave no doubt that the "structural approach" we proposed had nothing to do with current forms of "structuralism", the reaction of social scientists was in general rather negative. The association of the word "structure" with de Saussure or Levi-Strauss was unavoidable, and the "allergic" reaction to it was easy to explain.

It is difficult, however, to avoid using such a word. To prevent misunderstandings we could use more elaborate expressions such as "the theory of the origin and transformation of organizational patterns in complex systems"; but this would be too cumbersome to use throughout the text. We therefore decided that we should keep the word with a strong qualification. The expression "developmental structuralism" (equivalent to the expression "structuralisme génétique" used by some francophone writers) was then adopted. It is important to realize that "developmental structuralism" is equally opposed to two positions that Piaget, in a very lucid way, has described as "development without structures" and "structures without development". The first would mean continuous changes not leading to more or less stabilized structures, not even to quasi-stable structures lasting for short periods of time. The second would mean static structures without history. Developmental structuralism stands against both.

This subject is far from trivial and we believe it deserves serious consideration. In the third chapter of this volume we refer to it *in extenso*. In doing that we took into account that most of the attacks against "all forms of structuralism" come from sectors that claim to get support from dialectic materialism. Strangely enough, we are firmly convinced that Marx was the first developmental structuralist, without ever referring to structures but consistently using such a concept. We have found that some prominent contemporary Marxist writers maintain views that are quite similar to ours: Lucien Goldmann and Jürgen Habermas are two such examples. The first, in particular, has made important contributions that, as far as we know, have remained unnoticed by the numerous textbook writers on the methodology of social sciences. We have therefore devoted a space to his views that to many readers may appear as an unusually long digression.

Our insistence on keeping the words "structure" and "structuralism" is based on our belief that we have convincing evidence that "the roots of catastrophe" are to be found in "structural properties" of the systems involved. In other words, concepts like "vulnerability" or "fragility" are not properties of the *elements* of the systems, but rather properties of the kind of relations existing among the elements, i.e. properties of the structure.

When we tried to explain this in Volume 1, we first intended to get a number of "pseudo-explanations" out of the way that are found in some simplistic accounts of

catastrophic events due to natural phenomena. This dismissal of pseudo-explanations started by showing that certain "facts" invoked as "causes" of the effects to be explained were, in fact, pseudo—or partial—facts. We coined the expression "P-facts" to refer to them. Our method led, however, to some misunderstandings. We shall refer to two of them.

In Volume 1 we strongly argued against Malthusian and neo-Malthusian positions. This was interpreted as if we had in fact maintained that population increase was not a problem that deserves the serious attention it has been given. This is quite a wrong interpretation that in no way reflects what we said. Let us clarify the situation. We claim the following:

(a) In none of the case studies we made (and we could add many more examples that were studied after Volume 1 was written), was "population pressure" at the root of the problems. To say it in our own terminology: population pressure was not a factor playing a leading role in determining the instability of the system.
(b) Population pressure did play a role as an *aggravating* factor in catastrophic situations, the roots of which are to be found elsewhere.
(c) Population pressure has been used as a "scapegoat", as an easy way out to "explain" situations that in order to be properly explained would require going deeply into the analysis of prevalent socio-economic and political conditions in extended regions of the world.
(d) Population pressure is *becoming* a most serious problem. Unless some remedies are found, population pressure that exceeds certain limits may trigger off irreversible processes that will get entirely out of control.

We believe that these four points do not dismiss the problems of population increase at all. They only try to put the problems in an appropriate context.

A second misunderstanding of the position held in Volume 1 (and confirmed in the present volume) is found in an objection often made by its critics. It can be summarized as follows: "you seem to give low priority to the study of *physical* aspects of the drought, since the focus of your analyses is on the socio-economic conditions in the countries or regions that have received the impact of the drought. However, we are witnessing an alarming aggravation of droughts in Africa, and this is a physical phenomenon that needs to be studied as such, because it will have serious consequences regardless of the particular situation in each one of the countries involved." We agree with the last statement. Taken as an objection to our position we think it is out of focus and, again, it misrepresents what we intended to show. Answers can be found in analyses of the case studies included in various chapters of this volume.

Let us now turn to the general plan of the volume. This requires some reference to its origins. The case studies that were sponsored by the Drought and Man project throughout the world were quite heterogeneous in character. This was due to actual differences in the way the research was carried out by the local researchers in charge of each sub-project, as well as other factors related to both the financial and human resources available in each case. On the other hand, the "structural approach" was developed by the Director of the project *in parallel* to the case

studies. Although the main ideas became clear at an early stage, and were discussed by the Director of the project in individual visits, there was not enough time for these ideas to permeate the work of each group and to change the orientation of the research. Half-way through the project a large workshop held in Geneva, with active participation of most of the researchers involved in the project, did lead to a greater understanding of those ideas and to a general acceptance of their conceptual and methodological implications. No case study could claim, however, that it has been a practical application of the "structural approach". Nonetheless, such an approach presided over the whole conception of Volume 1 and guided the *interpretations* of the results of each case study.

In organizing the material included in the present volume, the basic conceptions of "developmental structuralism" provided the guiding principles as well as the criteria for selecting the case studies included in the various chapters. The presentation of each chapter has been written with the purpose of introducing the subject within its proper context and, at the same time, showing how each study confirms the structural character of the "crisis" that the Drought and Man project intended to explain. It should be clear, however, that the authors of each case study, although having these general objectives in mind, did not make use of the conceptual and methodological framework that we had propounded and that is outlined again in the third chapter. It is our contention that, had such a framework been applied to these studies, the search for "evidence" would have been different and the conclusions much more clear-cut. We now have further evidence that tends to prove such a contention. In this regard, we could mention case studies that were not originally carried out for the Drought and Man project, such as studies within the UNRISD Food Systems and Society project and within the IFIAS ABC programmes referred to in the Preface. They were conceived from the start in order to test interdisciplinary methodologies that are in line with the basic tenets of developmental structuralism. Such case studies provided us with very illuminating examples of the need to make clear distinctions between: (a) the drought as a physical phenomenon measured by an "anomaly" in the amount of rainfall; (b) the differences in the "impact" of the same "kind" of drought, over the same territory, in different periods in the historical development of the physical environment; (c) the socio-economic factors that are at "roots" of such differences; (d) the perception of such phenomena by the rural populations.

CHAPTER 1

*Drought, Agricultural Production and Self-Provisioning**

1. Preliminary Remarks

DROUGHT, being a variation, cannot be defined in absolute terms. Associated with a "normal distribution" of water supply, it is, by the same token, associated with an economic and socio-technical system based on that norm which admits variations in distribution up to certain thresholds. Once these thresholds have been crossed, the system as a whole can no longer function in the usual way for a given time or with respect to certain elements.

When thrown out of the equilibrium that enables it to reproduce itself the system tends, in order to regain its balance, to draw on its internal reserves of energy and/or to resort to external energy. The restored balances and their thresholds of tolerance are not necessarily the same as the initial balances or thresholds of tolerance.

During a drought crisis the original system may, if internal reserves are insufficient, become a qualitatively different system. When the crisis passes, the system at a different level of balance, or the new system, will be more fragile or more resistant to changes in water supply. In the first instance, a situation which was previously considered as normal but which is below the new threshold of tolerance, will become a drought situation; in the second instance, a situation which was previously considered as drought, but which is located within the new margin of variation, will become a normal situation.

What is true of a relative shortage of water is equally true of a relative excess; namely, flooding. A river in spate, up to certain level curves, is considered to be normal and is used rationally for the production of flood plain crops. Egypt provides the best-known example of this. The spate becomes destructive when it exceeds certain curves, and it is then called flooding. Below other curves again, an insufficient spate is identified with a drought situation.

Thresholds may differ according to whether they relate to agriculture (and to specific crops), inland navigation, river crossings, the protection of land-based transport networks, human settlements, industrial sites, etc. It should be noted in this regard that the indirect factors increasing or lessening the drought are to be sought in the agricultural and pastoral sphere, although the causes related to the growth of towns, industries and their pollution should certainly not be disregarded.

*This chapter was originally written by P. Spitz for the Drought and Man project. Parts of it have since been used in *Climatic Constraints and Human Activities*, J. Ausubel and A. Biswas (eds), IIASA, Pergamon, Oxford, 1980.

Nevertheless, the effects of the drought are generally mainly felt in the context of agricultural and pastoral production.

However, the systems of organization in which water—the outcome of present or past, local or distant precipitation—plays an important, even a central role, are not merely the agricultural and pastoral systems, but also the systems for supplying drinking water and water for other domestic and communal uses, as well as the systems which use water to provide energy or to service industrial production (dilution, cooling and cleaning), or for inland water transport. The normality of the distribution of the water supply can be appreciated only in relation to the objectives and operational tolerances of these systems. The permissible margin of variation in the physical, chemical, microbial and other characteristics of the water must also be specified.

Finally, even if water is free, expenditure is involved in gaining access to it, either actual expenditure (on wells, mains, etc.) or unpaid labour (for drawing water, transporting it, etc.). There are also social constraints which regulate access to water. In India, for instance, access to drinking water, in rural areas at least, involves strong social discrimination which is tantamount to a severe water shortage for the low castes and untouchables.

If the effects of a drought are considered exclusively in the agricultural, pastoral and food production context, it should not be forgotten that food production systems consume energy in the form of fuel and electric power. When a sizeable proportion of electric power is provided by water, drought also has repercussions on the production of electricity. A fall in output exacerbates the effects of the drought when the operations of industries providing agriculture with inputs (for example, fertilizers) or processing agricultural products (flour mills) are hampered by frequent electricity cuts. Further, the choice of the source of energy (electricity or fuel oil) for irrigation pumps has to take into account the fact that energy is required in the dry season at a time when hydroelectric production is at its lowest level. It should be borne in mind here that the development in northern India, for instance, of irrigation by deep tube wells equipped with diesel pumps is replacing the dependence on the rainy season by a dependence on supplies of fuel oil. Breakdowns in supply and/or sharp increases in the price of fuel may have consequences for this type of agriculture, which is in theory protected from drought, as drastic as the droughts themselves.

The construction of a dam for the production of electricity is a classic example of a system of production which, on the basis of estimates or measurements of past fluctuations in the collection of water in the catchment area over as long a period as possible, assumes certain anticipated fluctuations in future collection and, with due regard to cost constraints, aims for average electricity production at as high a level as possible with a variance as low as possible. Such calculations do not call simply for minimum and maximum forecasts but for the preparation of a probability chart, since years of high and low rainfall do not alternate, but are often clustered. (1)*

The probability distribution of inflows and the desired distribution of outflows thus allow an initial evaluation to be made in the planning of the maximum capacity which the storage basin and the power station, respectively, should have. However, cost constraints and the possibility of securing other sources of energy, either

*Figures in parentheses refer to notes at the end of the chapter.

regionally or nationally, may result in a reduction of the calculated capacity of the storage basin. This reduced capacity might be sufficient to withstand a single drought year; but for certain sequences of drought years the storage basin may not be refilled to the adequate level.

The calculation of the storage capacity of the basin based on forecasts of inflows into the system and desired outflows is rendered more complicated if the system has two objectives; namely, to provide for electricity production and for irrigation at the same time.

These choices, between various average values and the variances associated with them, are somewhat analogous to the choices that arise during the composition of a portfolio of securities.

2. The Impact of Drought on Plants

Every species and variety of plant has its margins of tolerance with regard to the supply of water, minerals, solar energy, etc. Since the beginning of the Neolithic age, empirical plant selection has made it possible for the various human groups to choose the plants they want to cultivate from the plant species and varieties growing spontaneously in the vicinity. These species and varieties were adapted to local climatic conditions in the sense that they survived despite climatic variations. However, their survival in the local ecosystem simply indicated that certain plants did not die out in the most extreme conditions of rain or heat, thereby assuring the continuity of the varieties and species concerned. Floating rice, for instance, was chosen very early in Bengal as the only crop surviving flood conditions thanks to its capacity to elongate its stem. In modern plant breeding this characteristic was not found worth selecting for, and as other factors worked in favour of a shorter and non-extendable stem, rice is now periodically destroyed by floods. It is only in recent years that genes associated with floating capacity are being retrieved for incorporation in varieties used in flood-prone areas.

The technical, economic and social system which has grown up around certain varieties and species of cereals or tubers has made it necessary not only to guard against the loss of seeds and seedlings in order to ensure crop continuity, but to obtain a large enough harvest to guarantee the perpetuation of this system of human organization.

We cannot speak, therefore, merely in terms of adaptation to climate, soil and so on; there is a twofold adaptation to natural conditions *and* to the organization of the human communities that exploit them. This process of adaptation is constantly challenged by the changes produced in the environment itself as a result of human activities and the changing ways in which these activities are organized—wholesale use of fire in primitive agriculture; forest destruction; the transformation of soil composition, structure and topography; alterations in the distribution and regime of surface waters; and extensive changes brought about in the composition of the flora and fauna (by crop farming, animal husbandry), the introduction of new elements and the discarding of others. The very concept of nature exists only through human activity; it represents man's image of his environment.

It is difficult for people who are not acquainted with the long-term transformation of nature to realize the extent of the disruption of the earth caused by man in

the course of history. They are aware of the changes they observe in the landscape around them during their own short lifetime or of those described by the preceding generation. They perceive the fading traces of these changes through past generations until they reach what they think of as nature, in its original and stable state—in the golden age.

With the evolution of the landscape, nature has become increasingly artificial since Neolithic times. This process has been accompanied by the establishment of food stocks and reserves that make for new activities and a progressive social division of labour.

> "With storage, came continuity, as well as a surplus to draw on in the lean season. The safe setting aside of unconsumed seeds for next year's sowing was the first step towards capital accumulation . . . . Out of [the village] came directly or by elaboration, the granary, the bank, the arsenal, the library, the store . . . . The irrigation ditch, the canal, the reservoir, the moat, the aqueduct, the drain, the sewers are also containers for automatic transport or storage." (2)

The development of the agricultural sciences over the past two centuries has speeded up the artificial development of nature to a great extent and considerably increased both the yield of the food crops cultivated, and, especially, the size of the food surpluses. Contemporary agricultural science is largely the product of the historical conditions in which it has developed in Europe and North America since the middle of the nineteenth century. In the North American continent, where land was abundant and labour scarce, preference was first given to research into higher labour productivity through mechanization. In Europe, where reverse conditions prevailed, preference was given to research into maximum yield (through the use of fertilizers). In a poor agricultural country, however, where the loss of a harvest after a year of drought can mean the difference between life and death (in the absence of reserves or access to credit), the research undertaken must be aimed not only at obtaining a high yield but at stabilizing it through good and bad years alike.

The problem of stability is of vital importance for impoverished peasants and poor regions. Agricultural researchers automatically and unthinkingly take the dominant countries and the dominant social groups in their own country as their base of reference. The institutions in which they work are shaped by international forces and by the national forces of social coexistence, and they consequently reflect international power relations and are sensitive to the needs of the rich farmers and the affluent regions. Poor peasants and poor regions cannot readily command recognition for their specific needs. Research funds in India, for instance, have been assigned as a matter of priority to irrigated wheat in the rich areas and not to millet—the cereal of the poor peasants—in the regions that are subject to drought. The effects of drought on the yield of a cultivated plant thus depend not only on the local system of cultivation and particularly the degree of irrigation, but on the allocation of resources in agricultural research. Research work has been done on millet at the International Crop Research Institute for the Semi-Arid Tropics (ICRISAT, Hyderabad, India), with special reference to resistance to drought combined with maintaining yields at a good level. But as the maximum yield of the varieties studied (all conditions being favourable) is lower than that of the existing varieties, although the latter's yield drops in a drought year, the ICRISAT varieties did not find general acceptance by those responsible for authorizing the marketing of new varieties. This reluctance is to be linked to the

ideological domination of the maximum-yield model rather than to assumed farmers' attitudes.

Together with the considerable increase in yield, there has been an increasing tendency to homogenize mixed crops. The intensive gathering of certain graminaceous plants and wild tubers, local crop systems, the more extensive systems of mixed crops, multivarietal monoculture, followed by monovarietal crop cultivation and extension of the one-variety crop over vast areas of land are all so many stages in the elimination of heterogeneity in farming. The life of poor peasant families depends on the capacity of the crop system to withstand the shock of droughts, floods, diseases, parasites, etc., and if several varieties and species are grown in the same field, the risks can be distributed. Diversity is a form of resistance. Agricultural research has thus destroyed the crop systems of the peasants instead of improving them. Rather than examine how the diversity of root systems allows plants to explore various layers of soil and to tap the water and mineral resources in them, agricultural research has chosen the easy path of monovarietal cultivation. Some fringe research which Professor S. K. Roy of the Indian Statistical Institute at Calcutta has been engaged on with little financing for 15 years or so is now beginning to attract attention. His research has consisted of planting two varieties of rice in the same field. The inhibition and stimulation effects observed led him to undertake basic research on root systems in order to identify the factors responsible for such interaction, and in particular the substances diffused by the roots. In other words, research based on traditional peasant systems calls for a high degree of sophistication and not a nostalgic return to the past. This also holds good for the interaction between cereals and pulses, for the introduction of *Rhizobium*—which can fix soil nitrogen—into cereal root systems and for the identification of the balancing mechanisms of ecosystems which are necessary for the biological struggle against diseases, parasites and predators.

Another consequence of the homogenization of the crop system is the reduction of genetic variability. (3) Discarded varieties disappear more quickly than the few gene banks that exist in the world are able to collect them. Moreover, transnational enterprises, which are more interested in profit than in preserving the genetic inheritance of mankind, are appropriating genetic resources on an increasing scale. (4) The excellent short-term results obtained should not be allowed to mask the vulnerability that comes with homogenization (5) and the control over the seed industry gained by transnational corporations. Agricultural research is liable to find itself faced with major climatic changes that it is powerless to deal with.

> "The process represents a paradox in social and economic development in that the product of technology (breeding for yield and uniformity) displaces the resource upon which the technology is based." (6)

Lastly, the increasing consumption of energy which goes with the "modernization" of crop systems (7) may mitigate the effects of drought but, as we have already pointed out, it introduces a considerable element of risk in the event of an interruption (through economic or military conflict) of the energy supply and, over the very long term, through the depletion of non-renewable energy resources.

Although drought is thus linked dialectically with society, it is convenient for analytical reasons to consider it as an independent variable. This convenience

should, however, never disguise the fact that drought is perceived through a socio-economic system.

3. The Differential Impact of Drought on Agricultural Production

The following example is based on observations made by one of the authors in 1962/63 in the district of Hazaribagh, a part of the hill-plateau area known as Chota-Nagpur, occupying the southern half of the state of Bihar in Eastern India.

Average annual precipitation is between 1200 and 1300 mm, and the average annual temperature around 25°C. There is a very remarkable concentration of rainfall during the months of June and July. Precipitation over the four months June–September accounts for more than 75 per cent of the total, and that of the six months May–October for about 90 per cent. This imposes a decisive rhythm on agricultural output, especially since, in the absence of any systematic additional irrigation (which is difficult for geological, hydrographic and topographical reasons), such output is virtually a single-crop production of cereals.

Eighty per cent of the area planted with grain is occupied by paddy, and paddy represents about 90 per cent of the grain production, its yield being higher than that of maize and millet.

The rice fields are located in hollows in the terrain, arranged in a series of terraces. Rice cultivation depends mainly on rainwater, which is accumulated in these flat-bottomed basins.

The "tanks" (improved natural reservoirs) are small and only serve as regulators during the monsoon. Unlike those in southern India, they are of no use for producing a second harvest. Thus, agricultural output is not very diversified and, since it is almost exclusively single-crop production, it is extremely discontinuous, resulting in a very unequal distribution of labour during the year, the most important part of the crop, i.e. paddy, being harvested in a single operation. Moreover, the agricultural produce is mostly consumed either by the productive unit itself or locally, after passing through very limited channels of trade.

The crop systems, their cycles and their techniques are influenced by the mean climatic year (or "typical" year) and its pronounced seasons. The simultaneous timing of labour and subsistence crops (harvested in November–December), their spacing (labour peak in June–July when the granaries are empty), and more generally the distribution of labour and subsistence crops over the calendar are of paramount economic importance, since they present the various social forces with the vital problem of ensuring the balance between flows and stocks and, secondarily, the social control of stocks.

There are strong climatic variations from one year to another. Precipitation varies in a ratio of 1 to 4 for May; 1 to 3 for June; 1 to 4 for July; 1 to 2 for August; and 1 to 5 for October. Climatic fluctuations lead to fluctuations in supply, and consequently in prices. However, the effects of good and bad years are not felt with the same intensity by all producers.

The various micro-economic studies at our disposal show, at best, the effect of drought on agricultural output by farm sizes: less than 5 acres, 5–10 acres, etc. (8) Where there are great differences in soil fertility, and where the farms do not have

the same distribution pattern of land of varying fertility, such a classification fails to bring out important aspects of rural dynamics.

Let us take a very simple example, and consider three families of farmers, first taking a good year. The first family X owns 5 bighas (local unit of area) of first-class rice fields (Gaira), the second family Y owns 6.66 bighas of second-class rice fields (Singa), and the third one Z, 10 bighas of third-class rice fields (Bad). With yields of 20, 15 and 10 maunds (local unit of measurement) of paddy, these three families produce the same annual crop = 100 maunds. Instead of the index classification of 50/66/100 which we would obtain by considering only the areas, we have a classification of 100/100/100, taking into account the differences in fertility and yield. After deducting the seeds (1.5 maund per bigha), the available paddy is respectively 92.5 ($100 - 5 \times 1.5$); 90.1 ($100 - 6.66 \times 1.5$); 85 ($100 - 10 \times 1.5$, or in terms of indices a classification of 100/97.5/91.8.

One consequence of the differences in productivity is that family Z must work twice as hard as family X, assuming that there is no economy or diseconomy of scale; if this double work is done entirely by family members they are not paid for their labour. However, it involves increased consumption, since consumption on working days is higher than on non-working days.

The differences between the two families X and Z may be due to climatic constraints which require the work to be done within a specific period of time. If, for example, the work force of family X (the most privileged family) is such that full employment is possible during a working period, the duration of which is fixed (by the arrival of the monsoon, combined with a bioclimatological constraint), family Z will have to procure additional manpower (and animal traction) and pay for them. The same problem may arise in an even more acute form at the planting stage, since planting must be done quickly and requires many hands. Thus, a real cost item emerges.

Climatic fluctuations, and particularly fluctuations in precipitation, accentuate the differences between the three kinds of rice fields. The yields observed in a dry year are 15 for Gaira, 8 for Singa, 2 for Bad, or a decrease of 25 per cent, 47 per cent and 80 per cent. This is due to the arrangement of the crops in terraced rice fields, since the higher fields retain less water, because of both their location and their clay content. The lower ones receive more water and retain it better.

Classification by net paddy production (seeds deducted) gives 67.5–43.3–5 instead of 92.5–90.1–85, or in terms of indices, 100–64.1–7.4 instead of 100–97.5–91.8.

Let us assume that families X, Y and Z have the same level of self-provisioning, of 40 maunds, as shown in Table 1. A bad year, therefore, reduces the surplus of X by only half, but eliminates that of Y almost entirely. For Z it presupposes the existence of certain mechanisms which, while ensuring the survival of this class, the most sensitive to fluctuations, accentuate the social difference brought about by the ownership of lands of such unequal productivity. Theoretically, the average for two years, 45, can ensure a level of self-supply of 40, provided that stocks are laid in during a good year. (9) However, any failure of good years to alternate regularly with bad makes such an adjustment impossible, so that it can only be made by way of an interest-bearing loan, which reduces accordingly the share available for consumption and widens the gap between family Z and family X. X will obviously

TABLE 1.

Normal year	Surplus	Deficit
X	5.25	
Y	50.1	
Z	45	
Drought year		
X	27.5	
Y	3.3	
Z		35

act as a lender and increase its income accordingly, thus widening the gap with Z. Thus, between these two families which have the same gross income in a normal year, we find a lopsidedness due to the effect of yearly variations between yields in lands of unequal fertility. This lopsidedness was inherent in the fact that the lands were of different value, but it was concealed in a good year by the equality of the harvests, and is accentuated by a cumulative process.

This observation points to a theoretical development which of itself needs separate treatment—the added dimension given by the impact of climatic variability to the Ricardian concept of rent, interpreted by Marx as differential rent. (10)

The care with which fields of different categories are divided up at the time of inheritance shows how keenly aware the farmers are of the risks involved. The economic behaviour of a family is dictated in part by the composition of its land in accordance with these three categories, each involving different risks. It is noteworthy that, unlike the classic problem of the choice between average value and variance (as exemplified by a portfolio of securities), here the highest mean value is associated with the lowest variance.

In the group of villages studied, 90 per cent of the families did not succeed (in 1962/63) in meeting their annual cereal needs in a normal year and, consequently, had to find the means of purchasing cereals in order to survive, without counting the earnings needed to pay for other minimal necessities. In the absence of any cash crops the funds had to be obtained by selling their labour, especially through working on other people's land; by the sale of handicrafts; and by the provision of miscellaneous services connected with the caste system.

In other parts of the Indian subcontinent, cash crops are relatively well developed. Experience with past climatic fluctuations, however, and particularly with past droughts, makes farmers very cautious about cash crops. They have to consider possible variations in prices and yields, both for basic cereals and for cash crops.

Because of storage and financial constraints, which limit the less affluent, only the rich farmers are able to wait for the most favourable moment to sell. It is very difficult for a poor farmer to be independent of marketing and moneylending, which are, in practice, based on seasonal variations. He is in no position to argue about buying and selling terms with the purchaser of his crop, the cereal merchant and the moneylender, for even if they are not all one and the same person, as is often the case, they make common cause in maintaining their economic and social power.

Price fluctuations, operating through institutional machinery which distorts the effect of yearly crop fluctuations, all contribute to the creation of a world fraught with uncertainty, in the light of which the farmer must nevertheless take his decisions.

Whether in an objective or a subjective way, prices and yields have their own inherent probability distribution. Let us assume a probability $P = 0.5$ corresponding to one year out of two, whether good or bad, from the point of view of yield or from the point of view of prices. Let us also assume provisionally that there is no co-variation between yields and prices for a given crop (cereal or cash crop) or between different crops. No yield or price varies in relation to any other yield or price.

Let us use the procedure followed by Falcon to clarify the choice between wheat and cotton in Pakistan: (11)

Cereal crop (wheat)		
Yield per acre	7 maunds	probability 0.5
Yield per acre	9 maunds	probability 0.5
Price per maund	12 rupees	probability 0.5
Price per maund	8 rupees	probability 0.5
Cash crop (cotton)		
Yield per acre	2.5 maunds	probability 0.5
Yield per acre	5.5 maunds	probability 0.5
Price per maund	20 rupees	probability 0.5
Price per maund	30 rupees	probability 0.5

If a farmer owns 5 acres and plants them with cereals, he will obtain 35 or 45 maunds. If his level of consumption is 35 maunds, he will achieve this level regardless of prices. In a good year he will have a surplus of 10 maunds, either to sell or to barter.

If he chooses the cash crop there are eight equally probable options (assuming no correlation between prices and yields) (see Table 2). The hypothesis of a probability equal to 0.5 for years divided into only two categories (good and bad)

TABLE 2.

Price of wheat	Price of cotton	Quantity of cereals theoretically available
Good cash crop (cotton)		
Favourable	Favourable	103 (12)
Favourable	Unfavourable	68
Unfavourable	Favourable	68
Unfavourable	Unfavourable	46
Bad cash crop		
Favourable	Favourable	38
Favourable	Unfavourable	31
Unfavourable	Favourable	31
Unfavourable	Unfavourable	21

may be supported by studying series of yields and distinguishing between different yield levels to which distribution probabilities can be assigned. These distributions can reveal the existence of periodicities comparable to those shown by climatic studies, especially precipitation studies.

Statistical observations allowing for various modifications of yields, prices, areas and probabilities can be grafted onto the elementary model shown, complicating it in such a way that a complex econometric treatment will become necessary, especially in order to divide up the area planted between two kinds of crops and not choose one to the exclusion of the other.

This kind of approach was tried by Behrman in Thailand. (13) Using a supply model of the Nerlove type, he expresses the area which the producer wishes to use for rice during the year as a function of several variables, in particular the anticipated price and yield and the farming population. He concludes that reluctance to take risks is very strong among peasant farmers near the subsistence level because the advantages of an income above that anticipated may not offset the severe penalties resulting from an income lower than that expected.

Poor peasant farmers, therefore, try to reduce the risks associated with market fluctuations first of all by planting an area large enough to guarantee minimum self-provisioning in bad years, particularly in years of drought. When cash crops were imposed by force, these peasant strategies for resisting climatic and economic fluctuations were destroyed. (14)

Over the past 15 years the strategies used in the green revolution, by increasing spending on inputs, have expanded the role of money and thus increased vulnerability to fluctuations in the price of inputs and marketed products. In an expanding market economy, poor peasant farmers have to compete with rich farmers who have the necessary food, cash and capital reserves and who, because of their social and economic power, can turn to banking institutions. In the absence of powerful organizations of small farmers, the marginalization process has accelerated, reducing the ability of poor peasant farmers in poor regions to maintain their basic level of self-provisioning. (15)

A phenomenon such as drought accelerates these trends. In the event of a drop in production intended for self-provisioning, and in the absence of means of exchange to procure foodstuffs, those who no longer have control over reserves are condemned to migrate to the towns in the hope of finding casual employment. Once all opportunities for individual relief have been exhausted, and unless large-scale government intervention is forthcoming, they can no longer find anything but death.

4. Drought and Consumption Patterns of Various Groups of Agricultural Producers

In considering three theoretical groups of agricultural producers (X, Y and Z), we assume the level of consumption for each group to be the same. However, either the families are of the same size and composition and the greater amount of work needed on the farms of Y and Z proves all the more of a disadvantage, or families X and Z have a greater work force and their annual consumption per unit of consumption is, therefore, lower.

The difficulties involved in conducting micro-economic surveys to assess the impact of drought on the production, income and consumption of various groups of agricultural producers are considerable. We need to have precise area measurements (in order to classify by types of land), to estimate the volume of production, to know the surplus sold, and to deduce the level of producer consumption, which must be collated with the size of the family in order to have an idea of *per capita* consumption by the producers. However, in order to determine the annual average nutrition level, all additional quantities purchased must be added to the producer-consumed items. In order to ascertain these purchases, regular and frequent surveys must be conducted and collated over two consecutive years—one normal year and one drought year. Considering their cost, it is understandable that surveys of this type are extremely rare.

Moreover, this approach imposes on those being surveyed the concepts of those conducting the survey. When the framework for surveys based on interviews is established beforehand, as is generally the case for economic surveys, it would seem that the sole remaining purpose of the survey is to "flesh out" the basic framework by extracting information stored in the memory of the person surveyed. Such an attitude may imply:

(a) either that the information is stored haphazardly in the minds of the persons surveyed and that the task of ordering, classifying and conceptualizing is the privilege of the person organizing the survey; or
(b) that the "programme" governing the storage of the information is quasi-universal and coincides sufficiently with that of the researcher, so that once certain precautions have been taken (timing, attraction towards certain numbers, etc.), the date may be gathered on the basis of the programme, i.e. the conceptual apparatus of the surveyor.

The above hypotheses are, unfortunately, not without foundation. Even when it is acknowledged that information is not stored haphazardly, economic questionnaires remain totally closed, indicating excessive confidence in their universality. It is acknowledged, however, that certain questions (concerning yield per unit of area, work periods) give rise to adjustments or calculations which are not always explained by the person replying and thus represent sources of error.

Interviewers for large-scale statistical surveys, who must force figures to fit into columns, are well acquainted with such difficulties. The more experienced they are, the more techniques they know for circumventing these difficulties and cross-checking in such a way as to obtain figures that can be used with a certain degree of confidence. However, these roundabout methods are subsequently, as it were, erased, and the completed questionnaires bear no trace of them; the latter not being designed to cope with such unorthodox devices.

The general tendency in economic surveys is to conceal such difficulties or at least to regard them, quite negatively, as so many obstacles. They should, on the contrary, be taken as evidence of discrepancies between the categories used on either side and the concepts behind them. By continuing to impose totally inflexible language on the economic concepts of the "other side", the investigator renounces any attempt to understand the specific system of reference according to which

information is stored and classified. Yet, this system is in tune with the economic behaviour which the survey is trying to assess amid the false trails which always surround the data-gathering process and which must always be cleared up.

In the group of villages in the state of Bihar to which reference has already been made, price-quantities per monetary unit were still in occasional use in 1962–63. They have now practically disappeared from the Indian subcontinent. The price of rice was then still quoted in quantity per rupee, as had been the general practice in previous centuries. (16) This price is a clear reflection of the concept of purchasing power: for the same number of rupees I can buy more or less rice depending on changes in the price. Price-quantity is not the exact inverse of the monetary price to which we are accustomed: when the price-quantity falls by half, it means that the monetary price has doubled; however, if the price-quantity rises by half (for example; from 8 seers per rupee to 12 seers per rupee), the monetary price falls by only one-third (from 0.125 rupees per seer to 0.083 rupees per seer). (17) Other examples of concepts that reflect economic behaviour are to be found (and persist) in the grouping of purchases by periodicity. Daily, weekly, monthly, seasonal or annual outlays may be grouped into categories which, for the investigator, come under different budgetary items, and there is no way of breaking down expenditure by product. Daily outlays are expressed thus: 2 or 3 rupees to buy kerosene oil, matches, snuff, spices, oil, salt, etc. The system of mutual services performed among castes, termed "Jajmani" in anthropological literature, and on its way out in India, provides for annual "dues" (in the form of a certain quantity of grain given at harvest time) representing goods and services, the quantity or extent being fixed approximately but varying to a greater or lesser degree: for example, the blacksmith must supply two ploughshares, but must also sharpen them and repair them for nothing, the farm hand must work in the fields at the request of his employer, without the exact number of work days being laid down, the laundryman must launder linen, the priest officiate, etc.

One concept that is of direct interest to us in the framework of this study is that of the number of months of self-provisioning. In this region of India, peasants themselves used this concept to establish their place and that of others in the economic hierarchy. Thus, they distinguished between those who had enough rice for their entire family and sold a surplus in both good and bad years; those who, in a good year, had a surplus; those who barely managed to cover their annual needs, those who covered half, a third, a quarter, etc.

Self-provisioning will be considered mainly in terms of cereals. The latter are peculiar in that the harvest cannot begin until a precise moment has been reached in the vegetative cycle, and, once this moment arrives, the crop must be harvested as quickly as possible in order to reduce losses caused by seeding, mould and the inroads of various predators. Moreover, the vegetative cycle of cereals is, at least traditionally, relatively fixed in relation to the annual climatic calendar. In contrast, the cultivation of tubers such as manioc, potatoes, or sweet potatoes can be staggered over a much longer period. The special problems related to livestock production (annual feed surpluses or shortages, discrepancies between resources and labour) will not be dealt with here. Also, in order to simplify and clarify the situation, we envisage the case of a single annual harvest of cereals. The conclusions we can draw from this extremely simplified model, however, can be

applied without difficulty to the more frequent case of two annual harvests of cereals, or even to cases of more than two harvests.

Food has a dual function, as a basic need and as merchandise. When self-provisioning still plays an important role we find both efforts to extract food from the producers and efforts to retain it. The forces of extraction are of a composite nature:

> "financial needs for non-cereal consumption, tax payments, repayments of loans, payments for farm rent, etc. Retention forces are those that in an uncertain universe of relative prices, ensure food security by self-provisioning. There is a mechanical and almost Newtonian translation of this conflict, which explains the effects of non-proportionality in variations in production and prices and incomes, (18) a translation at the level of production relations (for example, between landowners and sharecroppers), a translation at the level of relations between subsistence producers and non-producers (between town and country in particular)."
>
> "Within this conflict between the forces of extraction for the market and forces of retention for self-provisioning, in this relationship of forces and power are defined the quantities put on the market in comparison with the desired self-provisioning, the dates of putting on the market in the interval between two harvests and, finally, the prices at which the commodities in question will be exchanged."
>
> "For an external observer, annual self-provisioning can only be appreciated in retrospect: it represents the entirety of the produce that has not come on the market, which of course does not mean that this volume has been determined independently of market conditions. Food products that exist as family stores at a given moment can be transformed into merchandise at any time, whether or not this transformation is foreseen by the producing family. In the latter case, economic and/or social pressures erode the stocks built up for the future. The desired self-provisioning, intended for future consumption, is constantly put in jeopardy by the pressures to which it is subject."
>
> "In conventional agricultural economies, when the market share is taken into account, it is called 'marketed surplus', an apparently technical term that masks the nature of the food problems of the poor peasants in the Third World. 'Surplus' implies that the basic food needs of the peasant family have been met and that what remains 'over and above' is placed on the market. This is only true for a minority of farmers in the Third World who produce enough cereals to nourish their family adequately throughout the year, and have a genuine surplus available."
>
> "The peasant family is aware, at each harvest, once, twice, even three times a year, of the volume of its cereal production. It knows its own food needs from the experience of generations. Finally, it knows what will be the overall movement in the price of cereals, a movement that will continue to rise until the next harvest. Just after the harvest, therefore, a peasant family is well aware of the situation. If it has a surplus over its own anticipated food needs, it is to its advantage to wait until the period between seasons to sell this surplus at the highest possible price. However, it has been observed that families behaving in this way are rare. Most of them sell in the weeks immediately following the harvest, when the price is at its lowest. Sometimes, they even sell the standing crop in advance. Many families not only sell part of their harvest immediately, but are also obliged before the next harvest to buy food back, either of the same kind but of inferior quality and different form (husked paddy or flour), or finally food of a kind considered inferior."
>
> "In all cases, the family has lost in this operation, from the financial point of view and/or from a subjective point of view. Often the loss is still more dramatic, since, having sold their cereals after the harvest, these families have no financial resources left to buy food when their own food reserves are exhausted, and are obliged to borrow at usurious rates, or survive on wild products gathered, or migrate to the towns in search of casual work."
>
> "If, despite all the information in its possession after the harvest, the peasant family sells knowing that it will make a loss, this is because it is subject to pressures it cannot withstand. Consequently, what is placed on the market cannot be described as surplus. The process by which this grain comes on the market is sometimes described as extraction of surplus, a contradictory expression; because if it is a simple surplus in relation to the consumption needs of the peasant family, why does it have to be extracted? It should arrive quite naturally on the market.

> Moreover, if forces of extraction come into play, it is because there are also retention forces opposed to them: surplus then ceases to have its meaning of excess and ends by representing a quantity torn from the peasant family by market forces. The expression 'extraction of surplus', by making the concept of surplus relative, contradicts the implicit meaning of the word when it is used by itself, and should, therefore, be eliminated."
>
> " 'Food squeeze' seems preferable to me, meaning both the process of placing on the market, and the quantity placed on the market as a result of this process. Moreover, extraction implies resistance. Only when market forces have vanquished peasant resistance are the forces for retention of the peasant family's produce nullified; the peasants cease to exist as such and are transformed into capitalist farmers entirely subject to the market and totally absorbed by it; the great majority join the unemployed, without either land or factory." (19)

As long as peasants cannot control the prices of the produce which they sell on the market and the prices of what they have to buy (agricultural inputs and food), their attempt to retain some food for self-provisioning is an attempt to stay alive in an environment of fluctuating yields and prices. In a country such as India where food self-provisioning still plays an important role, we submit that the conflict between forces of retention and forces of extraction play a central role in the economic, social and political dynamics of social classes and their interaction.

To illustrate the dual nature of food and to demonstrate the forces at work, let us assume that 100 units of food are produced in year 1, and a reduction to 90 units occurs the following year due to a climatic event such as a drought. If in year 2 the level of self-provisioning remains the same, this means that the forces governing retention of food for self-provisioning are stronger than the market forces of extraction (Table 3). If in year 2 the level of marketed food remains the same (Table 4), it means that the forces of extraction are stronger. An indication of the balance between extraction and retention is, therefore, shown by the way in which the decrease in production is traded off between self-provisioning and marketing.

The fact that a decline in production (with the amount retained remaining constant) has greater repercussions on the marketed food when the latter represents only a small proportion of production is well known, and has often been studied at the level of international trade. In contrast, this phenomenon seems to be less well understood at the national and, above all, at the micro-economic level in an agricultural situation where self-provisioning still plays a major role. Surplus and producer consumption are, in fact, often treated implicitly as if they were linear

TABLE 3.
Case in which the Forces of Retention are Stronger than the Forces of Extraction (units of food)

	Production	Self-provisioning	Marketed food
Family X			
Year 1	100	50	50
Year 2	90	50	40[a]
Family Y			
Year 1	100	80	20
Year 2	90	80	10[b]

[a] A reduction of 10 per cent in production corresponds to a reduction of 20 per cent in the marketed food.
[b] In the case of Family Y the same reduction of 10 per cent in production entails a reduction of 50 per cent in the marketed food.

TABLE 4.
Case in which the Forces of Retention are Stronger than the Forces of Extraction (units of food)

	Production	Self-provisioning	Marketed food
Family X			
Year 1	100	50	50
Year 2	90	40[a]	50
Family Y			
Year 1	100	80	20
Year 2	90	70[b]	20

[a] In this case the impact of a climatic event reducing production by 10 per cent is to reduce the level of self-provisioning by 20 per cent.
[b] Under the same conditions, the level of self-provisioning is reduced only by 12.5 per cent.

functions of production, which they never are. At the most, as in the simplified example we propose, they may be related functions, where production equals the sum of producer consumption and marketed surplus, to each of which is attached a varying coefficient of retention or extraction.

Drawing on the results of research conducted in 1962/63 in Eastern India, (20) we wish to take further the simple exercise presented above and to develop a different approach to the relationships between food production fluctuations, prices and food availability. This approach is based on an indicator used locally by the peasants themselves to establish their own place and that of others in the socio-economic hierarchy. As noted above, this indicator is the number of months of self-provisioning, and its use makes it possible to give a calendar dimension to food/climate variability. This indicator also highlights the problem of stocks.

The number of months M of self-provisioning may be expressed as follows:

$$M = \frac{1}{UC_m} \sum_{i=1}^{i} a_i y_i - S$$

where M is the number of months of self-provisioning, C_m is the average monthly consumption by consumption unit, U is the number of consumption units, a_i is the area of fields under cultivation (by surface unit), y_i is the yield per area unit of fields having a surface area a_i, and S is the surplus.

A fundamental fact is that M can be arrived at *directly*, without any calculations, in the course of a survey, for it constitutes a classifying category in the minds of the persons interrogated; the question, "For how many months were you able to feed your family last year from your own production?" elicits an immediate response. If there is a deficit in production, the exhaustion of the cereal stocks at the beginning of the tiding-over period necessarily entails the purchase of basic cereals; this usually comprises about 80 per cent of the budget when converted into monetary terms. The exact moment at which they have to purchase cereals is clearly fixed in the memory of the persons interrogated, even if a source of income prior to that date has enabled them to build up some monetary reserves. In the absence of earlier income they have to seek work or draw on their capital (in the broadest sense), or borrow.

Two families with a capacity of six months' self-provisioning in basic cereals may not use their resources in the same fashion; the families may not be of the same size nor have the same level of consumption. However, once their food reserves are exhausted, they face the same situation in that they must find the necessary resources to enable them to live for the six months that remain until the next harvest. This they will be able to do with greater or lesser difficulty, depending on their circumstances, especially the possibility of the sale of agricultural produce, craft products, or labour.

The fact that M may be arrived at directly makes it unnecessary to adopt a restrictive hypothesis of average consumption per family; real consumption is not constant throughout the year and unless it can be followed from week to week or from month to month, it can be arrived at only with difficulty; similarly, consumption may vary by unit of consumption. A fairly good approximation of total production $\Sigma\ a_i y_i$ may also be arrived at directly, and this is a means of corroboration. However, exact knowledge about the surface area is not only difficult to obtain, but also has little significance in view of the wide variations in yields from one field to another. The concept of yield itself is not a category present in the minds of the persons surveyed, and, in the absence of direct measurement, it would be illusory to evaluate a_i and y_i.

The variable M gives us no information about the level of consumption. Consumption may be very high for a short period if there is additional income, and it is, therefore, necessary to examine such income. It may be connected with a traditional activity, such as a craft, and may be stable; or it may derive from an activity outside the village, of a more or less specialized nature, depending on whether or not there is guaranteed work, whether the work is permanent, semi-permanent, or temporary, and whether the pay is on a monthly, weekly, hourly, or piecework basis. The stability of the income varies, often reflecting a greater or lesser degree of specialization.

Even in the case of highly stable employment, circumstances may be such that the source of additional income dries up. The most obvious case is that of a fairly long illness. Since highly stable employment is rare, its interruption, apart from cases of illness, is most often the result of the curtailment of the employment itself. Several examples of this were observed in the area surveyed, such as the closure of certain coal mines with no opportunity for re-employment, and a similar reduction in jobs resulting from a crisis in the mica industry. In such cases a retreat to the most stable base of employment, i.e. farming, occurs. Consumption pressures then arise, and the period of self-consumption of supplies is extended; if M is below 12 months and if there is no other income, there are not many ways out—a loan at usurious rates, migration, or reverting back to food-gathering.

How does a "rational" farmer behave once he has completed his harvest? From his past experience, and with possible readjustments because of changes in the composition of his family, he calculates the number of months of supplies available for self-provisioning at the level of consumption to which he is generally accustomed. If this number is under 12, he will have to consider the possibilities for obtaining additional income and, on that basis, choose his consumption level. He can readjust this level periodically according to new factors or new expectations. The way in which a farmer actually behaves appears to be not far removed from

such rational behaviour, aimed at minimizing the risk of being simultaneously without both food and resources during the tiding-over period.

Even given equal probabilities of obtaining additional income, substantial differences may be expected between the economic behaviour of a farmer who sells food in any year and that of one with a permanent deficit in cereals. In order to assess economic behaviour, therefore, it is necessary to stratify the field under study by average production characteristics (in relation to family characteristics, consumption levels, and work opportunities in the outside world), and also to take account of the variability of such characteristics in different years (i.e. basically according to climatic variations), the distribution and size of food deficits and supplies and the probabilities associated with them.

5. An Application of the Model of Self-provisioning to a Drought Year

As reference years, we take agricultural years between one harvest and the next. To show the effects of drought, we must study three consecutive years:

—year 1, a good year from the point of view of agricultural production;
—year 2, a bad (drought) year from the point of view of agricultural production;
—year 3, a good or bad year from the point of view of agricultural production.

In the area in which the research was carried out, no security stocks were built up in good years to provide for unfavourable years, even in the richest families. We will, therefore, not take such stocks into account. On the other hand, as climatic conditions deteriorate in year 2, forecasts are made about the volume of the coming harvest. Such forecasts induce those who still have stocks available to reduce their consumption level, so as to have a carry-over stock to add to the harvest. We will assume provisionally that reduced consumption only begins at harvest time. We will, therefore, consider that self-provisioning for year 2 is "normal" and that it is reduced only for year 3, following the drought year.

Let us make another hypothesis for purposes of simplification: the production available to each family productive unit is reduced by the same proportion, namely, one-third. However, because the richest families generally have better land and more control over water, their production is in fact usually less affected than that of the poorer families. The disparity between rich and poor farmers during a drought is, therefore, even greater than that which is described below.

Take the case of three families (A_1, A_2, A_3) which, in year 2 have respectively the equivalent of 36, 24 and 21 months of self-provisioning, i.e. a 24, 12 and 9 months surplus (see Table 5). Their production in year 2 is equal to 24, 16 and 14 months of self-provisioning. We shall work within the hypothesis (to be revised later) that the reduction in production affects only the marketed food or, in other words, that these families maintain a constant level of self-provisioning (see Table 5, a case in which the forces of retention are stronger than the forces of extraction).

The effect of the drought is to reduce the marketed food of A_1 by 50 per cent, that of A_2 by 67 per cent, and that of A_3 by 78 per cent. The smaller the percentage

TABLE 5.
Self-provisioning and Marketed Supply Expressed in Number of Months for Families A_1, A_2 and A_3 in year 2 and year 3

	Year 2 (drought year) (still good from the point of view of consumption)		Year 3 (bad from the point of view of consumption)	
	Year 1 production available in year 2	Year 2 marketed food	Year 2 production available in year 3	Year 3 marketed food
A_1	36	24	24	12
A_2	24	12	16	4
A_3	21	9	14	2

of marketed food in relation to production, the more such marketed food will be reduced in a drought year.

A 33 per cent drop in production, therefore, leads to a 50, 67 or 78 per cent reduction of the marketed food (Table 6). Even assuming constant demand this reduction in market supply will consequently lead to a considerable rise in prices, the more so as—given unequal land distribution—A_3 families are generally more numerous than A_1 families.

Let S_2 and S_3 be the surplus and P_2 and P_3 the average selling prices of cereals in years 2 and 3. To maintain the same income derived from the sale of the surplus, it is sufficient that:

$$S_2P_2 = S_3P_3$$

i.e. for A_1, that $P_3 = 2P_2$, for A_2, that $P_3 = 3P_2$, and for A_3, that $P_3 = 4.5P_2$.

TABLE 6.
Marketed Food in Relation to Production, Families A_1, A_2, and A_3 in year 2 and year 3

	Marketed food as a percentage of production $\frac{\text{Marketed food}}{\text{Production}} \times 100$		Percentage reduction of marketed food between years $\frac{\text{Year 2 surplus} - \text{year 3 surplus}}{\text{Year 2 surplus}} \times 100$
	Year 2	Year 3	
A_1	66	50	50
A_2	50	25	67
A_3	43	14	78

Let us suppose that the average selling prices of cereals are doubled or trebled in year 3. Let us then examine three cases with regard to the level of self-provisioning: in case 1 the consumption level remains unchanged (forces of retention are stronger than forces of extraction); in case 2 the level of food consumption is reduced by one-third (forces of extraction are stronger than forces of retention); in case 3 the level of food consumption is reduced by one-sixth (intermediate trade-off between forces of extraction and retention). Table 7 summarizes the consequences of these

TABLE 7.
Changes in Income from the Sale of Surplus Cereal in Families A_1, A_2, and A_3, for Three Cases of Change in Self-provisioning, Assuming a Doubling or a Tripling of the Average Selling Price of Cereals in year 3

	Change in self-provisioning from year 2					
	Doubling of the average selling price in year 3			Tripling of the average selling price in year 3		
	Case 1 0	Case 2 −17%	Case 3 −33%	Case 1 0	Case 2 −17%	Case 3 −33%
Percentage change in family income from year 2						
A_1	0	+17%	+33%	+50%	+75%	+100%
A_2	−33%	0	+33%	0	+50%	+100%
A_3	−56%	−11%	+33%	−33%	+33%	+100%

hypotheses in terms of changes in income from the sale of surplus food. These changes are expressed as a plus or minus percentage of income in year 2.

If prices are doubled, A_1 can maintain the same level of consumption, while A_2 must reduce its consumption by 17 per cent and A_3 by 21 per cent in order to maintain the income derived from the sale of the surplus. That is to say, families A_2 and A_3 must cover year 3 with the equivalent of 10 months and 9.5 months respectively of self-provisioning in year 2. Any reduction in the level of consumption beyond these thresholds increases the income derived from the sale of the surplus.

If prices are trebled and self-provisioning levels stay the same, the income A_1 increases by one-half and that of A_2 remains constant. In order to maintain its income, family A_3 must reduce its level of self-provisioning by 8 per cent. In order to increase family income by one-half, A_1 does not reduce its consumption, A_2 reduces it by 17 per cent, and A_3 by 21 per cent.

Subject to the hypotheses we have adopted, such price increases consequently enable farmers of type A to maintain or improve the income derived from the sale of cereal surpluses, possibly at the cost of a slight decline in the level of their own cereal consumption. Moreover, a drought situation enables them to obtain manpower at lower costs and to reduce their annual payments, as Rao (21) observed in respect to the Andhra Pradesh drought of 1971–73:

> "While the drought situation was disadvantageous to the lower sections of the society who mainly depend on manual labour, the well-to-do sections . . . found it advantageous to them. As they were getting labour at a cheaper rate, they took the opportunity to get their irrigation wells repaired and new ones dug at a much lower cost."

As we shall see below, families of type A can also take advantage of sales of land, cattle, and agricultural tools at distress prices. Finally, because of their political and social power and the economic guarantees they can offer, they are the first to benefit from low-interest bank loans which enable them both to make these advantageous purchases and to re-lend the money at usurious rates.

6. Poorer Families and the Peak Period Problem

Let us now envisage the case of the additional families B, C, D, E, and F. The characteristics of these families in terms of cereal production are shown in Table 8.

If in year 3 family B fails to reduce its level of self-provisioning, it is faced with the situation that it cannot sell any surplus. The hypothesis that the reduction in production affects only the surplus (which was not unlikely in the case of family A_1) becomes altogether unlikely in this case. With the money earned from the sale of six months' surplus in year 2, family B was able to afford a certain level of expenditure; some of the expense items typical of "good years"—improvement of

TABLE 8.
Number of Months of Self-provisioning in year 2 and year 3 (following a drought), in the Case in Which the Forces of Retention are Stronger than the Forces of Extraction

	Year 2		Year 3
	Production	Surplus/deficit	Production
B	18	6	12
C	12	0	8
D	9	−3	6
E	6	−6	4
F	3	−9	2

Reduction of surplus family food supplies following a drought, in the case in which the forces of retention are stronger than the forces of extraction.

Family A_1

. . . . . .

Year 2 self-provisioning Year 2 surplus (24 months)

. . . . . .

Year 3 self-provisioning Year 3 surplus (12 months)

Family A_2

. . . . . .

Year 2 self-provisioning Year 2 surplus (12 months)

. . . . . .

Year 3 self-provisioning Year 3 surplus (4 months)

Family A_3

. . . . . .

Year 2 self-provisioning Year 2 surplus (9 months)

. . . . . .

Year 3 self-provisioning Year 3 surplus (2 months)

(The dots represent units of food production)

housing, agricultural investment, ceremonies (particularly marriages)—can be reduced, cancelled, or postponed. The requirements for cash expenditures in year 3 are so compelling that the forces of retention of food for self-provisioning are insufficient to maintain the level of consumption of the previous year. In families of type B, which represent the upper stratum of peasants of average means in the survey area (Hazaribagh district, state of Bihar), education of children is, for instance, considered particularly important. To give an education to a son is to give him some prospect of employment outside the peasant community, in which life is subject to growing uncertainty because of the scarcity and high cost of land, while property is whittled away with every inheritance. Education, therefore, represents a "must", and the level of self-provisioning will be reduced to cover its cost. More generally, the attainment of a relatively high income in a good year creates a consumption model which tends to be upheld, though, of course, at a lower level, in difficult years. Because of this "ratchet effect" (22) observed in the survey area, the hypothesis that the entire decline in production is reflected in the amount of surplus, therefore, cannot be upheld. The level of self-provisioning is inevitably reduced. To obtain a surplus equivalent to two months' self-provisioning (reduction of the surplus to one-third of the year 2 surplus) means reducing the level of self-provisioning by one-sixth.

The fact that family C does not need to sell any surplus in year 2 (a "good year" from the point of view of consumption), means that it has some income, from whatever sources, to meet cash requirement. Assuming that these resources do not diminish in year 3, a very favourable hypothesis, this family will at least try to stretch its self-provisioning period until the next harvest. In order to achieve this it must reduce its consumption level by one-third.

In order to maintain self-provisioning for the same number of months, families D, E, and F must reduce their consumption by one-third. However, they are faced with a price increase following the drought. Again adopting the highly favourable hypothesis that their income is maintained, these families will not be able, with their unchanged income, to buy more than one-half or one-third of the cereals that they bought in the good year—depending on whether the price doubles or trebles. They will have to reduce their self-provisioning level of consumption by one-third, and in addition will have to reduce the amount of cereals purchased for consumption by one-half or two-thirds.

In the Chota Nagpur region, the varieties of rice grown in 1962–63 had a vegetative cycle of about five months (more recent varieties have a shorter cycle). If the months following the harvest are numbered from 1 to 12, the first soil preparation work begins with the monsoon in month 7 (May–June). The peak period for agricultural work is in month 8. During this period a production unit has its full complement of labour. Family members who work away from the village return, and those who are engaged in a craft interrupt that activity. Month 8 is, therefore, a month in which monetary income is at its lowest. It is also the month in which food consumption is at its highest both because of the number of workers and because of the increased consumption level resulting from the hard physical labour required of them. Observation has shown that, in order to cope with this situation, families of types E and F tend to build up food reserves for this period. Self-provisioning is voluntarily stopped whenever monetary resources can be found;

these resources are then used to buy basic foodstuffs, particularly cereals, at a lower price than they would cost later, since prices rise steadily up to harvest time.

The purchase of basic cereals, therefore, does not necessarily mean that granaries are empty, since stocks may be kept for this peak period of agricultural work, as well as for festivals or other anticipated events. The building up of such intra-annual reserves (which are distinct from inter-annual security stocks) depends, of course, on the size of the harvest and on the possibilities of finding paid work, whether it be permanent or temporary, anticipated or casual. Families with permanent work outside the village are the ones who most frequently build up cereal reserves for the peak agricultural period; those who can rely only on casual work find themselves without reserves and even sometimes without any seed by June or July. They, therefore, have to resort to loans in cash or in kind. In the latter case the loan is repayable at harvest time, four or five months later, with interest in kind of 50 per cent, or in the case of seed, 100 per cent.

In year 2, family D has nine months of self-provisioning, and is, consequently, in a state of self-provisioning during the peak period of agricultural work. Family D thus does not normally have to build up stocks for this period. Consequently, it finds itself facing a shortage after a bad harvest, with the result that its period of self-provisioning would be reduced to six months if it kept its consumption for year 3 at the same level as for year 2. Family D, therefore, has to reduce its consumption so that its period of self-provisioning is extended to cover the peak period of agricultural work.

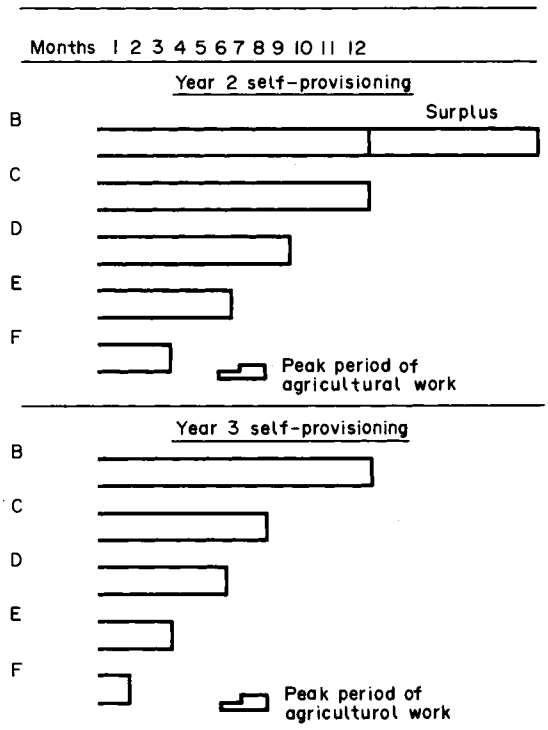
If the first signs of a drought situation appear four or five months before the harvest, family D (and for the same reason also families C, B, and A) may have to reduce certain expenditures in view of the difficult year ahead. Family D cannot, however, reduce its level of self-provisioning so as to build up a carry-over stock, since it no longer has sufficient reserves to tide it over to harvest time and at the same time to possess a significant surplus. Family C, on the other hand, has this possibility and so, of course, do families B and A. Only in the case in which sufficient reserves are available can carry-over stocks exist.

7. Methodological Consequences

Our study of the influence of drought on the self-provisioning of various groups of agricultural producers has not used the classical and apparently sophisticated tools of micro-economic analysis. Instead, on the basis of fundamental observations, we have tried to highlight a number of elements whose interaction appears to help in explaining the functioning of the food system of an economy still largely dominated by the phenomenon of self-provisioning. This approach may lay the foundations for a more complex study, taking account of the relationships between ownership and production, relationships created by indebtedness, relationships between food and non-food agricultural production, between rural agricultural and non-agricultural income, between rural and urban income, and so forth.

The approach used in the research described so far, makes a basic distinction between the self-provisioning sphere and the monetary sphere, on the one hand, and on the other, relates the analysis to the different time scales of agricultural production, in terms of the calendar of the different seasons and dissimilar years.

Reduction of the self-provisioning period following a drought in the case in which forces of retention are stronger than forces of extraction



These two dimensions are closely linked in the economic system which we have taken as a reference point. This system is largely dominated by the self-provisioning of family units of production and consumption, and operates in the framework of individual land-ownership, in a world in which land is a scarce factor; it is a system perpetuated at a low level of productivity, making it extremely sensitive to variations in productivity, whether of climatic, economic, or social origin. While monetization remains incomplete, any analysis must separate the economy based on payment in kind, whether related to self-provisioning or unpaid family labour, from the monetary economy.

It is, of course, possible to make these two sectors into a single sector by assigning prices to the non-monetized part of the economy. A merger of this kind makes it possible to use seemingly sophisticated analytical tools, which have been developed in the context of the rural economies of industrialized countries. Self-provisioning plays only a minor role in such economies. For them, seasonality becomes a simple problem of cash flows and no longer has the same central character as in the poor countries. The level of productivity is high enough for variations not to endanger the farmers' very lives. The risks are, therefore, not of the same kind.

Moreover, farming in industrialized countries has a certain autonomy, which makes it possible to undertake an analysis in terms of a firm. In contrast, in order to

analyse economic behaviour in a poor country, it is necessary to consider the family unit and all the monetary flows into it. An analysis of behaviour in relation to risk and uncertainty, therefore, cannot be made solely at the level of farming, but has to take into account the probabilities of anticipated income, of whatever origin. Such income probabilities also have to be considered in relation to the calendar of resources and expenditures. The same applies to income in kind. Although some of this income might appear negligible in relation to the annual budget, it is, nevertheless, of a strategic nature; at a particular time of the year such income may make it possible to avoid reaching breaking point. This applies, for example, to resources obtained by gathering in the forest. (23)

The fact that each family is both part of an economy based on payment in kind and of a monetary economy is of central importance. Failure to take this into account and to give a time dimension to the analysis means that the essential elements of the system will be left out. This is why, in the field survey carried out by CRESSIDA in 1981–82 (24) in West Bengal and Orissa, it was considered essential to establish budgets in physical and monetary terms, both seen in terms of a multiple calendar within the framework of a full agricultural year. Such a calendar makes it possible to register changes in stocks and flows, discrepancies between resources and employment, variations in nutrition levels, (25) the connection between these nutritional variations and labour time distribution (festivals) ceremonies, pregnancies, (26) migrations, indebtedness phenomena, discrepancies between the working periods of draught animals and the availability of fodder, and so on.

One of the few reliable pictures of drought has been given by N. S. Jodha. (27) Jodha analysed the drought in Rajasthan in 1963–64, which led to a famine situation. Data concerning reductions in consumption are presented not by socio-economic categories, but as a percentage of households in three consumption groups (see Table 9). Although no distinction is drawn between self-produced and purchased cereals, the table provides valuable information on the impact of a drought on cereal consumption levels.

The figures for April 1964 are particularly striking: almost 70 per cent of households were at the 300–450 grams per day consumption level, while the corresponding figure for the "normal" year following the drought was a little over 7 per cent. The progression of percentages shown is also noteworthy and bears witness to the progressive decline in consumption levels.

In an agricultural system still oriented towards food self-provisioning, such as that which characterized the poorest parts of Eastern India, cultivation of staple cereals is predominant. Our classification of families from A to F on the basis of amount of cereal production, therefore, corresponds to a mounting scale of poverty. Generally speaking, the classification also corresponds to levels of food consumption (of which cereals are the major component), from the highest level (family A) to the lowest (family F).

The lower the nutritional level at the outset, the more it is reduced by a drought. Families at the lowest levels cannot go below a minimum threshold compatible with their biological survival; and the lower their level of consumption the more rapidly this threshold will be reached. They are thus obliged to resort to substitute foodstuffs at lower prices than their habitual cereals, or even, as has been observed,

TABLE 9.
Monthly food Grain Consumption by Farmers during the Drought Year 1963–64 expressed as the Percentage of Households in each of Three Categories of Daily Per Capita Consumption[a,b]

Daily per capita food grain consumption (grams)	Oct. 1963	Nov. 1963	Dec. 1963	Jan. 1964	Feb. 1964	March 1964	April 1964
300–450	7.7	21.3	34.6	48.1	57.7	60.5	69.2
	(—)	(—)	(1.9)	(5.7)	(3.8)	(5.7)	(7.6)
451–600	21.2	25.0	38.5	34.6	35.5	32.7	25.0
	(67.3)	(73.0)	(69.2)	(74.9)	(76.8)	(78.7)	(78.7)
601–750	71.0	53.8	26.9	17.3	5.8	5.8	5.8
	(32.7)	(27.0)	(28.9)	(19.4)	(20.4)	(15.4)	(13.9)

[a] The figures in parentheses indicate the corresponding details for the year following the drought year.

[b] The food grains consumption data, collected partly with the help of the primary health centre in the village, were originally collected for a bigger sample of 80 households in different landholding groups. However, as some households did not reside in the village for the whole period during the drought year, they are not included in the table. Similarly, landless labourers are excluded as this table describes only the cultivators' adjustment mechanism. The consumption details were collected by recording (in some cases by actual weighing) the actual food grains consumed during one day each week. Thus, the daily per capita consumption, presented in the table, is an average of four (or five) days in a month.

Source: Jodha (1975) (see Note 26).

to go back to such primitive stages of agriculture as the gathering of fruit, plants and roots.

In bad years, credit possibilities are limited and interest rates increase. The poorer families fall into debt with A families, who take advantage of the opportunity to use their maintained or increased income to buy up means of agricultural production (especially draught animals) and land at low prices. Jodha (28) gives examples of average selling prices of animals, fodder, ox-carts, etc., in the drought year 1963–64, as well as in the "normal" years preceding and following it. The drought year prices represent one-half, one-third, or one-quarter of the prices in "normal" years. For example, the average price of a pair of oxen was 875 rupees (Rs.) in 1962–63, Rs. 431 in 1963–64, and Rs. 988 in 1964–65. Jodha does not identify the purchasers of the oxen; however, he does identify the purchasers of land. This is rarely the case in the numerous studies on drought and famine in India, which indicate only the "distress" sales, an indicator which by itself does not show the tendency towards increasing concentration of landholding which accompanies drought.

In relation to eastern India, K. S. Singh (29) points out that in the district of Palamau (Bihar), land mortgages rose by 204 per cent during the famine year 1967 in relation to those of the reference year 1964, while land sales, in the year following the famine, increased by 33 per cent because of the recall of mortgages. He does not, however, designate the purchasers. Ladejinsky, of the World Bank, analysing the food shortage situation in the West Bengal in 1974 (a year marked by both drought and flooding) writes:

> "One of the consequences of the rural condition in Bengal in 1974 was the spurt of sales of land by the small and marginal farmers, thereby increasing the size of the landless group. Such sales are mostly 'distress' sales. Although land values have been sharply rising in recent years, and more so under the impact of inflation, sales of such land command a very low price; if occasional reports and discussions in the field are to be taken at their face value; a piece of land normally worth Rs. 1000 sells for half the price or less. The badly affected Cooch Behar District (West Bengal) illustrates the situation. June, July and August, normally dull months for land sales, registered 6000 of them in one sub-division of the district; the total sales for the year will be the largest on record. It also estimated that 80 per cent of the sales do not exceed one acre and they fall in the 'distress sale' category." (30)

Such distress sales enforced by a drought accentuate social polarization and inequalities, and make the position of the poorest families even more marginal; as a result of losing their means of production they have nothing left to offer but their labour.

8. Classes, Time and Reserves

In the analysis of the impact of drought on specific social groups belonging to a society in which self-provisioning plays a major role, we have made a certain number of simplifications. When we come closer to reality, the conclusions we have drawn are reinforced. For instance, the poorest families, caught in the endless cycle of indebtedness, no longer possess even their crop: it is sold in advance, and at the lowest price, i.e. the one in effect at harvest time. They must, in consequence, buy back their means of subsistence on conditions dictated by those who control the economic and social life of the village. They have to sell their labour at prices which they fear to challenge. We have not considered the influence of drought on the situation of agricultural labourers or on that of the various categories which have come into existence as a result of the complexity of rights to the land. Sharecropping in no way alters the arrangements set forth above: "production" simply becomes available production, after deduction of the amounts due to the owner. If production falls by 30 per cent, the shares of the sharecropper and of the proprietor each fall by 30 per cent, whatever the customary proportion established for their respective shares. Of course, since most of the fixed costs are generally borne by the sharecropper, he is penalized since available production for the same amount of work and the same level of expenditure has fallen. The level of available production does not generally make it possible for him to sell on the market and thus to take advantage of any increase in prices. The owner, on the other hand, usually has sufficient resources to enable him to sell part of the cereals produced on his land by one or several sharecroppers. He therefore benefits from increased prices. The sharecropper, although he has had to reduce his consumption, or even to make distress sales, has thus helped to place part of his production on the market.

As has already been pointed out, distress sales endanger the contractual relations of farmers and sharecroppers with the landowners, when such sales undermine the means of production as in the case of draught animals, for example. The landowners often take advantage of this situation to evict tenants and sharecroppers in order to take on others on whom they impose even stricter conditions, or to farm the land themselves with the assistance of agricultural labourers.

The biological need for daily food involves specific requirements which have to be satisfied from uncertain resources. The smaller the amount of resources secured from agriculture, the more severely felt are any fluctuations (resulting from climate, for example) and the more the social control of reserves becomes fundamentally at stake. In the case of a fall in the production intended for self-provisioning, and in the absence of any means for procuring a living, those without reserves are condemned to emigrate to the towns in the hope of finding casual work there. When all the possibilities have been exhausted, nothing but death awaits them.

Technical, economic, social, and political behaviour patterns involve forecasting, and therefore come within the horizons of specific time scales, which are themselves related to the amount of reserves (food, monetary, and social) held against risk: the landless agricultural worker lives from day to day or from season to season. The horizon of the poor peasant is limited to the next harvest. A person who possesses food and monetary reserves, and can rely on the social reserves represented by his share of power, has a horizon of several years, or even, if his reserves are substantial, of a generation.

As Necker wrote in 1775, a little more than a decade before the French Revolution, short-term variations:

> ". . . are a source of anxiety for those who live by their labour. Landlords or their stewards can strike a general balance in their accounts, offsetting the income of one year by that of another; but ordinary people cannot regulate their manner of living in the same way: a man who is haunted by the fear of losing his means of subsistence cannot be expected to think of the present year in terms of the next or of today in terms of tomorrow." (31)

Each peasant family's vision of the future, and the over-all vision of the social class to which it belongs (which in the final analysis determines the family's political behaviour), therefore, depend on the changing conditions of the present means of livelihood and the memory of a past marked by crises which have imperilled the lives of some and enabled others to strengthen their power. (32) In general, a food crisis triggered by a climatic event such as a drought enables changes to be made in favour of those who wield the economic and social power or, in other words, of those who have the greatest and most diversified reserves. In an agricultural system in which self-provisioning plays a major role, power can be measured in terms of reserves, which are the link between the past and the future. Rural power is thus particularly linked to the capacity to resist the efforts of those not engaged in agricultural production (owners of share-cropped land, cereal merchants, money-lenders, etc.) to siphon off food surpluses intended to guarantee their own supplies; and/or it is linked to the capacity to intervene in the surplus extracting mechanisms.

The nature of the surplus (for example, crops), the type (foodstuff or non-foodstuff), the means of extracting it (taxation, credit, market controls, etc.), its destination, the method of its appropriation, and its utilization all largely depend on the historical periods under consideration. In all historical eras (e.g. pre-colonial, colonial, or post-colonial), drought results in an extension of the tiding-over period, which, even in a "normal" year, is the difficult period during which seasonal hunger occurs, whether for the pastoralist in the absence of adequate purchasing power, or for the cultivator in the absence of adequate food reserves. These phenomena are not, however, inherent in the eternal cycle of the seasons.

They are always linked to a specific mode of extraction of agricultural surplus by economic and political powers. A drought situation is thus a test of the vulnerability and resilience of the different elements of the economic and social system.

The forces working within society towards an increased control of the land by a few and the dispossession of marginal peasants (who are then forced to migrate to cities) find the opportunity to expand in a crisis situation such as a drought.

This statement applies to a larger system (including cities) in which self-provisioning is set. The positive feedback described would lead to a disintegrative runaway state only if the local system described above was closed (and only if the local ruling classes did not adopt countervailing measures). As the system is not closed, the climatic shock constituted by a drought is dissipated on a larger spatial scale, while the positive feedback operates on a longer time scale. Migrations decrease the tensions within the sub-system, which might regain its original balance, while they increase inequality and, therefore, tensions in the larger system. Migrations increase the number of consumers who were previously relying on self-provisioning to a certain extent and who now have to procure their food on the market. These new urban consumers have lost their livelihood and can generally find, if at all, only a very precarious one in the cities. It is not only that increased quantities of food have to be found on the market but they have to be found at very low prices or even at a zero price if the new migrants are totally unemployed. This increases the forces of extraction, with the possible result of depleting even more the food reserves, and, therefore, preparing the ground for still more acute crises in the future.

One way to decrease this pressure on the national food supply is, of course, to rely on food imports, to maintain social order in the cities. But these have to be paid for, financially and politically. Therefore, while there is not necessarily increased inequality in the sub-system, there is greater global inequality. If this effect is considered by the ruling classes (or the dominant countries) to be so serious that it threatens the conditions for perpetuating their domination, a counter-transfer of resources in the form of aid becomes necessary. (33) Alternatively, in some cases, under increased pressure, the ruling classes may promise and even adopt reformist measures, in order to avoid the development of contervailing forces which could break up the process of increased polarization through popular mobilization and intervention.

Depending on the food/population rates of increase at different levels (for different systems and sub-systems) and on the perceptions and bargaining powers of the different social actors involved, a strong climate variation, such as a drought, can be a key factor in shifting a system from one state to another or even in transforming a system into another system, whereas in other cases the original balance will be restored. We therefore return to our opening point: that a climatic hazard like a drought cannot be meaningfully considered in isolation from the specific character and state of food systems as a reflection of social systems.

Notes and References to Chapter 1

1 The old example of the seven fat years followed by seven lean years, a simplifed example of food planning in which guesswork takes the place of statistical forecasting, reminds us of this.

2 Mumford Lewis, *The City of History*, Penguin, 1961, p. 26

3 The most dramatic example is the Irish famine of 1845–49. Owing to its very low genetic variability, the potato (coming from a small number of clones, which by definition have no variability) was unable to withstand the attacks of *Phytophthora infestans*.

4 See, for instance, Mooney, P. R., "The law of the seed", *Development Dialogue*, 1983: 1.

5 J. R. Harlan, "Genetic resources in wild varieties of plants", *Crop Sciences*, May–June 1976.

6 1978 Report of the National Academy of Sciences, Washington, D.C.

7 D. Pimentel, L. E. Hurd, A. C. Bellotti, M. J. Forster, I. N. Oka, O. D. Scholes and R. J. Whitman, *Science*, 1973; **182**, 443; John S. Steinhart and Carol E. Steinhart, *Science*, 1974; **184**, 307; Gerald Leach, *Energy and Food Production*, IPC Science and Technology Press, Guildford, Surrey, 1976.

8 See, for example, Borkar, V. V. and Nadkarni, M. V. *Impact of Drought on Rural Life*, Popular Prakashan, Bombay, 1975.

9 The size of stocks held from year to year as family security has declined in proportion to the monetization of the Indian rural economy. As evidenced by G. Watt (*The Commercial Products of India*, p. 1088), such security stocks existed at the end of last century. Describing the development of Indian cereal exports to Europe in the 1870s following the opening of the Suez Canal, he writes: "This was first met by the outcry that, for greed, the better classes of the community were exporting the surplus stocks that formerly were stored against times of scarcity and famine" (Cf. P. Spitz, "Silent Violence: Famine and Inequality", *International Social Sciences Journal*, Vol. XXX, No. 4, 1978).

10 See, P. Spitz, "Differential rent in the context of climate variability", UNRISD, Geneva, forthcoming.

11 W. Falcon, *Farmer Response to Price in an Underdeveloped Country—A Case Study of West Pakistan*, Ph.D. thesis, Harvard University, 1962.

12 This quantity of theoretically available cereals is calculated as follows:

$$(5 \text{ acres}) \times (30 \text{ rupees}) \times (5.5 \text{ maunds}) = 825 \text{ rupees}$$

$$\frac{825 \text{ rupees}}{8 \text{ rupees}} = 103$$

His average purchasing power in cereals is 52 maunds, as against an average of 40 maunds obtained from an exclusively cereal crop. Although, on the average, it is better to choose the cash crop, it should nevertheless be noted that in three cases the minimum of 15 maunds is not obtained and consequently the level of consumption will have to be reduced.

13 Jere Behrman, "The relevance of traditional economy theory for understanding peasant behaviour", Discussion Paper No. 37, The Wharton School of Finance and Commerce, Dept. of Econ., University of Pennsylvania, Philadelphia, January 1967 (extract from an unpublished thesis, MIT, 1966, *op. cit.*).

14 See, for example, Clifford Geertz, *Agricultural Involution—The Process of Ecological Change in Indonesia*, University of California Press, Berkeley, 1966.

15 See Andrew Pearse, *Seeds of Plenty, Seeds of Want*, UNRISD, Geneva, 1979, and from the same author, *Towards a Peasant-Based Strategy: a Dissident View*, UNRISD Report No. 79.1, Geneva, 1979.

16 The British administration long resisted the temptation to convert price-quantity into monetary price for the basic foodstuffs. See, for example, *Imperial Gazetteer of India*, Vol. III, p. 458—Statistics in Price-Quantities from 1861.

17 It could be easily seen if

$$y = \frac{1}{x}$$

$$y' = y \pm \frac{1}{n} y \text{ implies } x' = x \mp \frac{1}{(n \pm 1)} x$$

18 See P. Spitz, "Economic consequences of food/climate variability", in: W. Bach, J. Pankrath and S. H. Schneider (eds), *Food–Climate Interactions*, D. Reidel, Dordrecht, 1981.

19 See P. Spitz, "Livelihood and the food squeeze", *Ceres*, FAO, May–June 1981.

20 As indicated above, the survey was carried out in the district of Hazaribagh, a part of the hill-plateau area known by the name of Chota Nagpur. The district occupies the southern half of the State of Bihar.

21 N. V. K. Rao, "Impact of drought on the social system of a Telengana Village", *The Eastern Anthropologist*, 1974; **27**(4), 299–314.

22 F. Modigliani was the first to introduce into fluctuation models the idea that consumption depends

both on the income for the preceding period and on the maximum income that may have been obtained in the past. Cf. F. Modigliani, "Fluctuations in the savings–income ratio: a problem in economic forecasting", vol. 2, pp. 371–443. Conference on Research in Income and Wealth, Studies in Income and Wealth, New York, National Bureau of Economic Research, 1949. A. Smithies has used this "ratchet effect" at the macro-economic level. Cf. A. Smithies, "Economic fluctuations and growth", *Econometrica*, 1957; **25**(1), 1–52.

23 This includes gathering of wild fruit, herbs, small animals, wood, and animal fodder. The prohibition of access to forests at the end of the Middle Ages provoked bitter peasant revolts in Europe. Similar measures in India have been a source of great tension.

24 This survey was carried out in the framework of the UNRISD Food Systems and Society project, as well as a similar survey in 1985, by the Centre for Regional, Ecological and Science Studies in Development Alternatives (CRESSIDA). Results are being published by "Ecoscience, CRESSIDA Transactions", Chaturanga, 32 Gobinda, Auddy Road, Calcutta 700027. See also: P. Spitz, "Food systems and society in India: the origins of an interdisciplinary research", International Social Science Journal, 1985; 37(3), 371–388.

25 Nutritional data in terms of annual averages have very little meaning. It is essential to record variations, particularly declines, in such variables as the quantity and quality of foodstuffs, body weight, and so on.

26 As births tend to occur at certain seasons, it is important to place pregnancies and nursing periods on the nutritional calendar.

27 N. S. Jodha, "Famine and famine policies: some empirical evidence", in *Economic and Political Weekly*, 11 October 1975, p. 36.

28 N. S. Jodha, *op. cit.*

29 K. S. Singh, *The Indian Famine 1967*, People's Publishing House, New Delhi, 1975.

30 W. Ladejinsky, "Food shortage in West Bengal, crisis or chronic?", *World Development*, 1976; **4**(2), 103–110.

31 J. Necker, (1775) "Sur la législation et le commerce des grains". In *Oeuvres Completes* (compiled in 1820–1821, reprinted 1971), International Publications Services, New York.

32 See P. Spitz, "Silent violence: famine and inequality", *International Social Science Journal* 1978; **30**(4), 867–892.

33 *Ibid.*

CHAPTER 2

Food Insecurity and Social Disjunctions

1. Preliminary Remarks

A CHARACTERISTIC of agricultural production, as opposed to industrial production, is the year-to-year variability of its input–output ratio due to "Nature" itself. For the same inputs as the disposal of producers (including their own labour) the output is uncertain as long as environmental inputs are not under control. This control exists only in the very limited cases of crops grown in totally artificial environments (hydroponic cultures in controlled hot-houses) which have high energy costs. Even in systems with well-controlled irrigation drawing on large water reserves, temperature fluctuations can have a decisive impact on output, untimely rains can spoil the crops, etc. Pests and diseases can be controlled by chemicals but at a cost lowering the input–output ratio, not to speak of the other well-known internal and external costs induced by the uses of pesticides. The same applies to animal production in artificially controlled environments.

In industrialized countries, agricultural fluctuations are absorbed without jeopardizing the lives of the people. Even in a country largely dependent on agricultural production such as Australia, the recent prolonged drought has not, to our knowledge, resulted in any starvation deaths. The less industrialized countries of Africa, Asia and Latin America have not the same capacity to absorb shortfalls in agricultural production and the most vulnerable groups can reach the point of having their very lives endangered. As early as 1926, the economist Corrado Gini described famine as an economic calamity and treated it on the same footing as economic crises and raw material crises. According to him, famines, whatever their triggering causes, were for poor countries what economic crises were for industralized countries and their prevention required industrialization on the one hand and, on the other, technical advances in agriculture, combined with social redistributive measures (including state control of year-to-year fluctuations in food supply through forced procurement in good years and distribution of food or monetary means to buy food in bad years). It is noteworthy that this analysis by Gini, famous for his coefficient attempting to reflect unequal distributions, was the only theoretical approach ever to appear in the scientific journal *Matériaux pour l'Etude des Calamités* (Data for the Study of Calamities) which was published in Geneva from 1924 to 1965 at the instigation of the President of the Italian Red Cross and accumulated vast quantities of empirical data on droughts, floods, earthquakes, etc. without even attempting to set them in an analytical framework.

We feel that the two first volumes have sufficiently established that while *Nature pleads not guilty*, the 1972 drought revealed the nature of the "constant

catastrophe", namely the food insecurity of large numbers of small farmers and herdsmen, landless agricultural labourers and jobless urban poor, in Africa, Asia and Latin America.

In this third volume we wish to take further the critical issue of food insecurity, reflecting the structural imbalances created by wide inequalities within nations and between nations and which are at the "roots of catastrophe".

2. Food Security and Development

There is no development without improvement of the food security of the most vulnerable social groups throughout seasons and years. We know that spectacular increases of per capita GNP in "developing" countries may mark increased inequalities and deterioration of the living conditions of the lowest income groups. The case of Brazil has been pointed out in Volume 2 (pp. 180–193), particularly the continuous increase of infant mortality rates in the northeast between 1967 and 1976 (p. 191).

We also know that increased per capita agricultural production does not necessarily mean an increase in food availability nationally and locally and, often, means exactly the opposite when cash crops for exports are responsible for the per capita agricultural production increase. We need not here cite the many examples in Latin America, Africa and Asia of cash crops or livestock for exports which have been driving out food crops from the best lands, in the context of deteriorating terms of exchange and at the expense of the food security of the most vulnerable groups. That staple food is discriminated against in government policies was evidenced by the good performance of some export crops, such as cotton, during the 1972 Sahelian drought.

We even know that increased per capita staple food production (such as cereal production), as well as change from a food importing position to national self-sufficiency, does not mean better food security for all. India has achieved remarkable progress in food grains production, thanks mainly to large increases in areas and yields of only one crop, wheat, in the irrigated conditions of one part of the country (Punjab). Food production has been lagging behind in other parts of the country—particularly the production of coarse cereals such as millet and sorghum, mostly grown in rainfed conditions and the staple food of poor people in large areas of the semi-arid tropics.

National cereal self-sufficiency is certainly important for national independence as it allows the country to be free from immediate economic and political pressures applied by large cereal-exporting countries taking advantage of the time-bound character of food crises. It is, however, necessary to qualify national cereal self-sufficiency in relation to its import component (oil for tractors, irrigation pumps, and as feedstock for nitrogenous fertilizers; other fertilizers, pesticides, etc.) and to its possible negative impact on other food crops, particularly those nutritionally and culturally important as part of the traditional diet of the poorer groups, such as pulses in the Indian subcontinent or beans in Latin America. Moreover, large grainstocks, such as those retained by the Food Corporation of India after, e.g., the bumper year of 1978–79 as an apparent security for national self-sufficiency in drought years, can also be seen as a measure of the deprivation of those who,

without sufficient purchasing power, were not in a position to buy the food they needed.

That hunger and food stocks coexist side by side is unfortunately an old historical evidence forgotten by those who take national food self-sufficiency as equivalent to food security and do not hesitate to play with figures of food (or income) at high levels of aggregation including the world level; thus, therefore, masking wide disparities. History, for instance, teaches us that in 1846 a million Irish perished and hundreds of thousands were forced to emigrate, whilst ships continued to export grain produced by tenant farmers for their landlords from Ireland to England. From Waterford, the Commissariat Officer wrote on 24 April, 1846: "The barges leave Clonmell once a week with the export supplies under convoy which, last Tuesday, consisted of 2 guns, 50 cavalry and 80 infantry escorting them on the banks of the Suir as far as Carrick."

Cecil Woodham-Smith, who quotes this remark, comments: "It was a sight which the Irish people found impossible to understand and impossible to forget." (1)

Another example of the coexistence of large food exports and famine is to be found in India after the opening of the Suez Canal in 1870–71. As the use of the Suez route reduced the cost of transporting Indian wheat, and made it less expensive than American wheat, cereals became the main Indian export between 1883 and 1914. Their destination was the United Kingdom, whose principal supplier India was to be for several years. This abrupt increase in exports was not matched by an increase in Indian grain production, but was coming "from surplus stocks that formerly were stored against times of scarcity and famines". (2) In the three years from 1876–77 to 1878–79, which were drought years, India exported 3.75 million tons of cereals, while according to the British official statistics, 6 million people perished.

During the 1943 Bengal famine, which resulted in about 3 million deaths, Calcutta was a net exporter of rice. (3) There are many other historical examples and we should not, therefore, be surprised by the description of the Ethiopian famine of 1973–74 by Sheperd (Vol. 1, pp. 200–201) during which 100,000 to 250,000 persons perished:

> "Throughout 1973 and during the first half of 1974, while tens of thousands starved, other Ethiopians hoarded and exported grains . . . there were between 20,000–30,000 tons of grain in commercial warehouses. . . . Those 20,000 or more tons were at least half the amount needed to keep all the starving peasants of Wello and Tigre alive throughout 1973. . . . Ethiopian merchants exported hundreds of tons of grains, beans and even milk to Western Europe and the Saudi Arabian peninsula. In 1973 while 100,000 of its people starved to death, Ethiopia exported 9,000 metric tons of grain (food for 100,000 people for three months) almost double its 1972 exports . . . the country was additionally exporting 177,000 tons of pulses—a staggering amount of exports for a country whose people were begging for food and dying from starvation."

We are also reminded, in Volume 1, that a country with large food exports, such as Argentina, has officially recorded in 1970, 2439 deaths whose "basic cause" was malnutrition, with an actual number of malnutrition-induced deaths quoted as 13,000. (4)

National food security should not, therefore, be confused with national self-sufficiency (defined by the absence of net food imports or by net food exports). It cannot, moreover, be precisely defined in normative terms with specified amounts of food per capita as a host of factors (related to labour, health, physiology,

environment, cultural habits, etc.) intervene in the definition of nutritional requirements (by age and sex) of different social groups. Certainly orders of magnitude, or even better, ranges of nutritional requirements (for instance in calories and protein terms) are useful; but for our purpose we prefer to deal in relative terms. What is important nutritionally *and* socially is the actual changes—degradation or improvement—of food security and the perceptions of these changes by the peoples themselves. Some statisticians might live by averages, but people do not.

Not only should everyone eat "sufficiently" in nutritional terms, every day, whatever the season, whatever the year, but this food should be satisfying socially *and* culturally. Promotional campaigns of transnational firms or of government influenced by them, as well as "demonstration" effects linked to the lifestyles of dominant social groups contribute to modify patterns of socially desirable foods. An analysis of these complex issues is outside the scope of this text: by adding culturally desirable to socially desirable, we summarize our position in relation to universal models which more often than not turn against the interests of the most deprived. We have already referred earlier, for instance, to the cultural as well as nutritional role of leguminous crops, such as pulses and beans in traditional diets in Asia and Latin America—leguminous crops which are, on the other hand, well suited to the ecological conditions prevailing in their host countries.

We would even go further and state that when in food scarcity conditions "normal" nutritional requirements are still met but by the use of "famine foods" such as leaves, roots, wild plants or animals not normally eaten, food security has declined because human dignity has been impaired.

The improvement of food security at the national level requires an improvement of people's food security or, in other terms, the simultaneous improvement of the food security of the most vulnerable groups, whatever the intra-annual and inter-annual food availability may be.

3. The Urban Poor

As non-food-producers, the urban poor depend entirely on the distribution across time of their earnings on the one hand, and on food availability and prices on the other. Although there are some seasonal employment opportunities (construction activities, road repairs, linked to weather; processing, packaging of agricultural products) their earnings are generally erratic, and not time-bound. Their sources of livelihood consist of makeshift arrangements.

For these most vulnerable urban groups, often made up of recent immigrants from the countryside, there are, of course, no unemployment benefits. Prolonged unemployment periods, due to the lack of work opportunities, bad health, or just bad luck, might lead to starvation and death, unless it is possible to have some access to welfare centres or hospitals (most often overcrowded) or to rely on begging, or on some other forms of solidarity. The latter are not easily found in large cities. Credit is not easily obtained due to lack of surety (including interpersonal relations). As a result of unemployment and problems of food availability and prices, starvation deaths occur in large cities of the "Periphery", each death surrounded by its own peculiar circumstances. The atomistic nature of these

individual tragedies without a collective strongly time-bound pattern, is such that the sum of such deaths does not constitute the collective phenomenon equivalent to a famine in rural areas.

The poorest urban families number millions. Their daily concern is to extend by one day the odd job at hand, or find a new job as their lives are at stake. In such conditions their bargaining power with respect to wages is, of course, almost nil. For those living, or rather trying to survive, from one day to the next, in slums, favelas, bidonvilles, or just sidewalks, insecurity is the key word: job insecurity, food insecurity, health insecurity. This is why we continue to use the notion of "food security" as what should be the minimum objective function of a desirable food system in spite of the widespread use, particularly in international organizations, of food security in the narrow sense of food stocks. At this point it should be clear to the reader that food stocks are only an element of food security at the national or regional level, and that the crucial aspect is the accessibility of food. In order to avoid confusion and qualify what we mean by food security, it is better to use the notion of food accessibility and security: to have access to food—that is nutritionally sufficient and socially and culturally satisfactory—every day means to have enough food reserves, in the case of self-provisioning, or enough food purchasing power across time.

The food purchasing power of the urban poorest is, on the one hand, constantly threatened by the instability of employment and income opportunities, and, on the other, by periodic food shortages and price increases. We would like to stress again the difference in the time patterns and social characteristics of the two sets of variables. On the income side there is no definite pattern for the poorest, whose essentially fragmented employment opportunities are only weakly structured by time. The general tendency is towards anomy in Durkheim's sense of the word, with wages usually fixed at the employer's will in each case, by the chance profits of petty trade, and other uncertain sources of income such as begging, stealing, etc. (5) in an everyday struggle for individual survival.

On the food availability side there is, for society as a whole, a strong structuring by time, linked to market arrivals and price fluctuations: food scarcity and price increases affect all consumer groups at the same time, although to varying degrees, and trigger temporary solidarity between classes in order to bring pressure on the government. Individuals knowing the likely impact of food price increases on wages, use their political influence on governments, as do the middle class whose food expenditure is still an important item in their budget. Trade unions organize protests, or else, if they are too strictly controlled or nonexistent, employees and workers take to the streets, for the benefit of all social groups, which, therefore, support them either actively or by a passive benevolent attitude. It is only when street demonstrations cannot be kept under control by the police, and particularly when what are variously described in government or trade unions' literature as "uncontrolled, undesirable elements: agitators" (often from the "lumpen proletariat") and not necessarily manipulated by opposition forces to government give a too-violent form to social disorders, that inter-class solidarity weakens. Several bloody food riots developed in recent years in Africa, Asia and Latin America, due to sudden food price increases advocated by the International Monetary Fund in the name of "economic realism". In each case governments had to back down. The

threat of food riots is generally sufficient to induce public authorities to carefully watch the food situation in cities and to decide, accordingly, the necessary measures to take, particularly regarding food imports mainly intended for city-dwellers.

On the employment and income side, public authorities are also keen to avoid the sudden drying up of resources for a large number of workers at the same time, for instance, by subsidizing ailing factories and mills or nationalizing them, or trying at great cost to phase out public works gradually. A shortfall of national food production, triggered by a climatic event such as, in this project, a drought, thus entails a drain on public resources in order to maintain peace and social order in the cities. The impact is limited to reduced employment opportunities linked to a diminished volume of agricultural produce (in processing and trading sectors) and to some politically tolerable price increases, both phenomena entailing additional sufferings for the poor, but not to the extent of triggering a famine. In peacetime at least, those who hold political power do not allow a famine situation to develop in the cities to the point where their own existence could be threatened. (6)

4. The Rural Poor

On the rural side, things are quite different. The flow of resources and food availability are structured by time, by the season of the year, both for agricultural producers and labourers and also largely for rural artisans, craftsmen, rural industrial workers, traders, etc. . . . There is a definite pattern of distribution of income in kind (mostly in terms of food) and in cash across time in the case of the poorer rural groups, unlike the poorer urban groups. Recurrent events establish a pattern which, through the experience accumulated by generations, allows some forecasting of the future, again as opposed to urban situations: the effects of bad weather (or harvest) are known to be felt after a certain time lag.

Patterns of social coexistence are also quite different in rural areas. Inter-personal and inter-group relationships have been structured across time in a non-anonymous way made possible by the smaller size of the social groups involved. Seasonal crises, such as those arising from lean months, and periodic crises (e.g. those induced by recurrent droughts) have been incorporated into the web of social inter-relations, developing solidarity forms as well as exploitative forms. In pastoral nomadic societies of the Sahel, droughts were, until colonial disjunctions operated fully, factors which were built into the system, as shown by Bonte in his contribution to this volume. In the Sahelian agro-pastoral systems, the organization of the village community, including collective granaries, could mitigate the impacts of drought, until it was disrupted by colonial requisitions (in kind, in cash, in labour) and taxes. In pre-colonial times wars and epidemics were probably more important than droughts.

Where private property prevails drought and other recurrent calamities are embedded in social relations. In newly settled areas, such as the Sertao of North East Brazil

> "from the beginning, power has been in the hands of local elites, usually landowners and merchants, located in the major towns across the region. These elites, often consisting of family networks, maintain links downward throughout the local populace by the granting of favours, employment and intercession with the authorities. They maintain links upward through personal

> ties with regional elites (centered in State capitals) to whom they deliver votes. It should be emphasized that the relationship of dependency between local elites and the populace is strengthened by the periodic droughts. Small farmers, sharecroppers, and others, who are normally relatively self-sufficient, require loans, jobs or aid when their crop and livestock die and drinking water disappears. One major role of local elites is to receive and administer drought relief funds in their localities. To be sure, they often use them to make improvements on their own properties, but most of the dependent peasants are more than ready to forgive them for such pecadillos, faced with the alternative of starvation for their families." (7)

In old settled areas of private (8) property such as in India, unequal distribution of land before the British rule was, to a certain extent, offset by the income derived from the production of handicrafts, customary services and by a system of reciprocal, although unequal, relationships often referred to in the anthropological literature as the "Jajmani system". Handicrafts production which could help even out seasonal income fluctuations was severely eroded by British industrial policies, supported by tariff systems discriminating against Indian exports to Britain, favouring British imports to India and turning the terms of trade in favour of the metropolitan economy. Such policies were part of the wider British policies in India, conceptualized by late nineteenth-century economists as "the economic drain" and including financial and monetary measures, investment preference, tax and land revenue systems, as well as measures to favour cash crops for export. These policies had a profound impact on land tenure, further skewed land inequalities and, by throwing craftsmen out of employment and peasants off the land, contributed to the increase of landless labourers. Until the 1840s landless hired agricultural labour was not a distinct, easily discernible category in India's countryside. S. J. Patel (9) has estimated that this category, deprived and expropriated of the wherewithall for self-provisioning, rose as a proportion of the total agricultural population, from about 13 per cent in the late nineteenth century to about 38 per cent in the 1931 census. This proportion has continued to rise: according to the government's Rural Labour Enquiries there was a 78.6 per cent increase in the number of agricultural labourer households between 1964–65 and 1974–75, compared to an increase of only 16.6 per cent in the total number of rural households.

With such a tremendous increase of agricultural labourers, the old system ("Jajmani" or otherwise) through which dominant agricultural classes offered some protection to the labour they employed in times of scarcity such as drought periods, ceased to operate, as large farms no longer had the necessity to ensure a stable labour supply by restricting its mobility (through loans and personal bondage). The only limits to the lack of concern of large farmers for the starvation of agricultural labourers during the off season or drought years are set by the necessity to maintain some social order and secure votes. In addition, according to the 1976–77 Agricultural Census nearly three-fourths of holdings are below 2 hectares, with 55 per cent of all holdings being less than 1 hectare, and representing only 10.7 per cent of the total area worked.

This means that, in a country such as India, the majority of the rural population, maybe three-fourths, has to buy food grains in order to survive, and does not have enough cash income from other crops to do so. It has, therefore, to sell its labour locally or through temporary seasonal migration to cities or to more affluent pockets of agriculture.

Food price increases, therefore, hurt the majority of the population, while a minority which is still able to sell, and at much higher prices, benefits from the price increases and distress sales. This point has been stressed in the first chapter.

It reminds us that there is no social unanimity, like in the cities against price increases following a bad crop—the dominant rural class (large farmers and traders) not only benefit directly from scarcity conditions but also from government relief, increasing their political influence by orienting the distribution of what they have not pocketed. In Eastern India a current saying refers to three crops: winter crop, summer crop and relief crop. Those who are hurt cannot take to the streets. Spatially dispersed, linked by personal bonds to the rural power nexus, they have great difficulties in organizing social protests and bringing pressure on governments. They therefore starve or die, not because of a drought, but because of their economic, social and political weakness. Their only hope of survival is to go to the cities, if local conditions of communication allow them to do so and if they are not prevented from entering the cities by police or army cordons.

5. Summary

The preceding section was intended to set the stage for the analysis of the catastrophic effects of prolonged droughts that generate starvation and famines. The concept of "food security" as measured by the amount of grain stocks of the grain-exporting countries was indeed cooked up during the so-called "food crisis" that chronologically followed on the drought periods of the late 1960s and the early 1970s. The association of famines in the Sahel and elsewhere with droughts, as well as the association of "food aid" with the decrease of "food security" (in such a restricted sense) at the international level, as a purely mechanistic cause–effect linear relation provided what we have called "the official version" of the crisis (cf. *Nature pleads not guilty*, pp. 19–27). We have tried to show that such an oversimplified and distorted version of "food security" is not tenable.

Enough evidence has been given to make it clear that food security for individuals and social groups is not provided for just by having plenty of food reserves in their countries—*nor* is national self-sufficiency. Likewise, natural catastrophes such as prolonged droughts do not result in famines as a direct cause-and-effect action. In all three cases the consequence-relationship is mediated by a very complex process having to do with the whole structure of the society involved.

One is tempted to summarize the nature of such mediation by saying that food insecurity and catastrophic effects of droughts are the result of social inequalities that lead to the existence of highly vulnerable sectors of the population. However, such a statement, although basically true, may be very misleading. Moreover, even in the cases that it is clearly applicable, it has such a degree of generality that it retains little explanatory power. One may argue, for instance, that in some highly industrialized countries there are strong social inequalities, and yet a natural catastrophe does not result in famines. On the other hand, traditional societies with a considerable degree of social homogeneity do suffer from starvation and famines under severe conditions of environmental stress. Social inequalities, although being a very relevant factor in the analysis of "the roots of catastrophe" do not explain it by themselves without further elaboration.

As we have already said, a cause–effect relationship between drought and famine is mediated by the whole structure of the society. Vulnerability to a natural catastrophe is in fact a structural property of the society. The analyses should, therefore, start at this point.

Enough has been said in the first volume—and it has been reiterated in the introduction to the present one—about structural analysis (from the point of view of *developmental* structuralism) to allow us to use such a conceptual framework without going into the theory in detail. We refer the reader to the next chapter for further theoretical considerations.

Vulnerability is a structural property of a system depending on two factors: the kind of relations among the elements of the system (i.e. the kind of relations that *define* the structure), and the homeostatic mechanisms that prevent disruptions in the set of relations under the influence of perturbations.

Keeping these two factors in mind, we may now go back to the formulation of the problem as stated at the beginning of this section. Social inequalities by themselves, we said, do not explain the link between drought and famines. From the perspective of structural analysis the reason becomes clear. The expression "social inequalities" may refer to any one of the two factors referred to above. It may refer to the kind of relations between one social group (or a social class) and the rest of the society in so far as the distribution of wealth or the participation in the productive system is concerned. But it may also refer to unequal access to the homeostatic mechanisms that the society in question has at its disposal to prevent or to counterbalance disruptions in the system. The vulnerability of a society under environmental stress is related to the simultaneous presence of both factors. In such cases one sector of the society is segregated from the rest. The combined effect of both types of inequalities establishes a real fracture within the society. In what follows, the term disjunction will refer to such an internal fracture.

We have found that these disjunctions are the common denominator in all the case studies we have analysed. Needless to say those disjunctions have quite different origins and operate in a variety of ways depending on the geographic area and the historical period. Developmental structuralism emphasizes the fact that such differences can only be understood through the particular history of each specific case. But society is not a natural phenomenon subject to deterministic laws. Society may react to a process that generates a given situation and may change its trajectory. How these changes could be carried out or are actually carried out is an essential part of the analyses. In brief, the analysis of each one of the case studies ought to consider:

(a) the structure of the system under study, with its three main components or subsystems: the natural environment, the productive subsystem and the socio-economic subsystem;
(b) the nature of the internal disjunction within the system;
(c) the way the disjunction developed (the historical background of the present structure);
(d) the societal response when catastrophes threaten or actually occur.

Such a sequence of steps in the analysis of each case study would not be sufficient to account for the endlessness of starvation and famines in countries of Africa, Asia

and Latin America. The critical questions that still need to be asked are the following: granted that such situations are due to internal disjunctions within the countries, or disjunctions among countries, why do such disjunctions persist? Why do relief measures in famine situations act in such a seemingly erratic way? Why do such measures not seem to be conceived so as to provide a definitive solution to the problems?

Notes and References to Chapter 2

1 C. Woodham-Smith, *The Great Hunger—Ireland 1845–1849*, New England Library, Times-Mirror, 1962, p. 72

2 P. Spitz, "Silent Violence: Famine and Inequality", *International Social Science Journal*, 1978; **4**.

3 See Boudhayan Chattopadhyay, "Notes towards an Understanding of the Bengal Famine of 1963", *CRESSIDA Transactions*, 1981; vol. I, No. 1, Calcutta.

4 See Escudero, Vol. II, Chapter 11. Annex I.

5 Such problematic material conditions of existence, each one particular and individual, of human beings thrown into a world of instability and risk, of pain, frustration and death, and having continually to make choices, but only in order to survive, evoke some of the basic tenets of Existentialism and, in the humanist politically oriented avatars of Existentialism, such as Sartre's, point to the historic necessity to win, if "development" has any sense at all, the fight against the most extreme forms of alienation, in which the right to food itself is denied. One should note that if these conditions of existence have not been expressed in philosophical terms by those who are subjected to them, they are expressed linguistically in coining new words or giving a new meaning to existing words. This is for instance the case of the verb "scrounge", which in the slums of the West Indies has become a key work covering the whole range of activities from hunting for jobs to working and stealing; or of "biscates" in Brazil. D. R. Gross and N. M. Flowers write in their contribution to the project: "Northeastern migrants ('retirantes') survive (in the cities) by 'biscates', or odd jobs, such as washing cars, peddling, panhandling, prostitution, carrying packages and other loads, washing clothes, domestic service, as well as certain criminal activities which have increased geometrically over the past ten years. Millions of children are involved in these activities." More attention should be given to the linguistic forms expressing people's perception of their own conditions of existence. The life and death of slang in subcultures are more indicative of what the French sociologist Gurvitch analysed as "destructuration, astructuration and restructuration" than statistics.

6 Famine conditions have of course developed in besieged cities throughout history. During World War II, near-famine conditions occurred, particularly in eastern Europe and the Netherlands. In the United Kingdom the necessity to fully utilize the country's agricultural resources (particularly by cutting wasteful meat production) and to mobilize the population in the war effort resulted, as shown in J. C. Escudero's paper in Vol. 2 (pp. 141–145) in reduced inequalities in food intake and an improvement in the diet of the lowest income groups. British authorities in India had to pressure and develop the industry necessary for the war, as well as their political domination. As Boudhavan Chattopadhyay puts it, it was necessary not only to feed Calcutta industrial workers to keep the war machine going "but also" to keep (Calcutta inhabitants) out of the ground swell of the "quit India" movement which had started in August 1942. In his telegram dated 13 December 1942, the Viceroy, Linlithgow, wrote to the Secretary of State, Avery: "The fact that this is mainly a country of subsistence farmers encouraged me to believe that political reaction of any shortage might admit of being largely confined to towns and industrial areas. But these, as you know are precisely the most inflammable areas in some ways from the political point of view".

British authorities decided to feed Calcutta, and even exported food to their troops in Ceylon, with two results: firstly no resident of Calcutta seems to have died of starvation; secondly "the subsistence farmers" referred to by the Viceroy, with agricultural labourers, boatsmen, fishermen, rural artisans, died of starvation in their villages, on their way to Calcutta, or in Calcutta itself. The death toll was between 1.5 million (official figure) and 3.5 million (K. P. Chattopadhyay's estimate). See B. Chattopadhyay's "Notes towards an understanding of the Bengal famine of 1943", *CRESSIDA Transactions*, 1981; Vol. 1. No. 1, Calcutta.

7 Daniel R. Gross, and Nancy M. Flowers, The Political Economy of Drought in Northeastern Brazil. Contribution to IFIAS Drought and Man project.

8 "Private" is used here as opposed to communal forms which have prevailed, and to a certain extent still exist, in Africa, in the Indian communities of Latin America, in the tribal areas of India, etc. It does not encompass all the features of private property defined for instance in Roman laws and

which developed in Europe out of the ruins of feudalism. A major disruption introduced by British rule in India was precisely to introduce the British concept of private property into a very different system of non-communal ownership we still call private in the large sense.

9 S. J. Patel, *Agricultural Labourers in Modern India and Pakistan*, Bombay, 1952.

CHAPTER 3

The Structural Roots of Catastrophes

THE LATE appearance of this volume, several years after the Drought and Man project was finished, poses a number of problems. Some of them have already been mentioned in the Preface. On the other hand, the time that has elapsed now provides the opportunity to reshape the original plan, adding much experience that has been gained in other projects of a similar nature. In particular, we think that we now have a much better knowledge of the ways and means needed to evaluate interactions between the physical environment and the society related to it.

Research in this field has been expanding in the past decade. Some ideas that were advanced at the beginning of the project, back in 1976, and were considered as rather extravagant, are now commonplace. We do not mean to imply that our work has had such an effect, but rather that other researchers have been led to the same kind of conclusions.

Such is the case, for instance, with the formulation made in Chapter 6 of the first volume: "The evolution after the drought has 'struck' is much more determined by the structure of the *whole* socio-economic system than by the drought itself." It is now increasingly accepted that the effect of natural catastrophes cannot be evaluated purely in terms of "physical impacts", and that the word "impact" itself is highly misleading.

There have, however, been some serious misunderstandings expressed by critics of our work, concerning both the way we arrived at our conclusions, and the conceptual framework that sustains them. It is the latter that provides the basis for our claim that those conclusions have a level of generality far beyond the specific case studies carried out under the IFIAS project.

When we began Drought and Man there were two main concerns with reference to the prolonged drought that culminated in 1972. First, some of the leading climatologists thought that the extension and duration of the rainfall anomaly was an indication of dramatic changes in the world climate. Second, the so-called "world food crisis" that prompted the FAO's World Food Conference in 1974, was thought to be *caused* by the drought.

By mid-1976, a few months after the project had started, we were convinced that neither of the above assertions could be seriously sustained. No-one could deny, however, that *there was* a serious drought, affecting countries in various continents; that there was a lack of food in some of those countries; that there were extended famines; that some dramatic alterations had taken place in the world food market. This notwithstanding, it soon became evident that there was no linear chain of cause-and-effect relationships linking all these events.

Alternative explanations came from researchers belonging to various schools of dialectic and historical materialism. They had always maintained that linear cause–effect relationships would not account for complex situations in which a society is involved. They have insisted, moreover, that the key word in describing and explaining those situations was not "impact", but "interactions".

Needless to say we agree with this, except that we do not believe that it takes us very far. The concept of "interaction", by itself, is much too vague to have enough explanatory power, and more often than not it is applied in a sense that is highly misleading or even plainly wrong. A word is added sometimes as a sort of magic formula that provides a clear explanation: "dialectic". And so, "interaction" is transformed into "dialectic interaction"; but this does not shed much light on the problem. Let us dwell a bit on this subject because we consider it essential to understand why we looked elsewhere for further explanatory tools.

Within the schools of thought we are referring to, "interaction", or rather "dialectic interaction", is associated with "attraction and repulsion", or with "action and reaction", or "pressure and counter-pressure". This would mean that whenever A "acts" on B, then B "reacts" on A, and thereby modifies both A and the subsequent action of A on B.

Such a *direct* action-and-reaction process, although clearly non-linear and seemingly closer to reality, can hardly represent the actual processes of the kind we are investigating. There are several reasons for this assertion. First, it is simply not true that whenever A acts on B, then B reacts on A and modifies A. The failure of a crop due to lack of rain may change the price of grains in the market, but the change of price does not "react on the rain" modifying the rainfall pattern. This is trivial, but it is sometimes forgotten by acritical theoreticians of dialectic interactions. Second, to conceive of "dialectic interactions" as something similar to the classical mechanical principle of action and reaction does not help the understanding of physics; nor does it clarify the meaning of "dialectic". If all interactions are "dialectic", then the word "dialectic" would be superfluous and we may eliminate it without altering the meaning of what is being said. If there are interactions that are not dialectic (as we believe), then we have to differentiate one from the other. "Action and reaction", if it means anything similar to the (classic) mechanical principle (which requires an instantaneous reaction), does not belong to the category of "dialectic interactions". If, on the other hand, it means something quite different, it should be explained.

Third, and this is much less trivial than any of the two former reasons, each domain of phenomena has its own space and time scale of events. The actual interactions among phenomena of different domains are mediated by processes that link those various scales in a complex manner *not* reducible to a set of "action and reaction" processes, in the classical Newtonian sense.

The above is not meant to imply that we reject the relevance of a concept such as "dialectic interaction", but rather that we do not use it as a magic formula. Once the mechanistic idea of the world as well as the oversimplified forms of "dialectical" explanations are abandoned, we are left with the necessity of approaching the study of natural and socio-economic problems by analysing sets of events that are organized in a certain way. This is not new. In fact, dialectical materialism adopted a notion that had been introduced earlier in the last century: the concept of

"totality" as a fundamental category to understand world phenomena. However, although Marx made good use of this concept, he never theorized about it. The followers of Marx did not go too far in this direction either. Quite the contrary, they often utilized the concept in such a way that it only introduced a good deal of confusion. There are, however, some exceptions. One of them, perhaps the most lucid of all, was Lucien Goldmann. This French thinker and literary critic was in contact very early with the developmental psychology and epistemology of Jean Piaget. He was thus the first to realize that the Marxist category of totality acquired a clear meaning and became operational at the research level when it was reformulated within the context of Piagetian "genetic" (i.e. developmental) structuralism.

Goldmann takes an epistemological position as a starting point that questions both rationalism and empiricism. He rejects both the rationalistic acceptance of innate or self-evident ideas, and the empiricist acceptance of sensation or perception as the basis of human knowledge. "Dialectical thinking—says Goldmann—maintains that there are no starting points that can be considered to be "certain", nor problems that are solved once for all, that our thinking does not progress on a straight line, because every partial truth acquires its real significance only by its place within a totality, in the same way as the totality cannot be known except through progress in the knowledge of partial truths. The path of knowledge thus appears as a perpetual oscillation between the parts and the totality that must become mutually clarified" (*Le Dieu caché*, pp. 14–15—free translation). (1)

If Goldmann had stopped here, we might have been in agreement with him, but we would not advance one-tenth of an inch in the search for conceptual frameworks that are needed in research into concrete problems. Fortunately Goldmann, himself a researcher, faced a very specific problem and could not be content with general statements. His task was to understand and to explain an important period in the seventeenth century, in France, when both philosophical and literary production had had quite peculiar characteristics. In the search for a leading idea that might serve as guidance for his inquiries, Goldmann arrived at two basic principles:

> "(a) Every human fact is inserted in a certain number of significant global structures that must be clarified to be able to know the nature and the objective meaning of that fact.
> (b) In order to extract from reality as a whole a set of facts that may constitute such a significant structure, and in order to separate within the raw empirical data what is essential from what is accidental, it is indispensable to insert such facts, not yet well known, in another wider structure that would embody them. . . . It should not be forgotten, however, that the provisional knowledge we have concerning the facts that were our starting point are—insofar as they constitute elements of the wider structure—one of the most important points of support to get to the nature of the latter". (2), p. 114.

Goldmann does not provide a definition of structure. He only makes reference to Piaget's small book on "structuralism". (3) Then he identifies "structure" with "internal consistency" and defines the latter as the set of necessary relations among the elements that constitute the particular work he is analysing. "Necessary" means here that it is impossible to make a valid study of the elements of the work outside the "ensemble" to which they belong. It is the whole that determines the nature and the objective meaning of the elements. In other words, the researcher will arrive at an understanding of the elements of the work only after he has apprehended its

structure. However, the general features of this partial structure can only be understood once it is included in the study of a wider structure, the *genesis* of which provides the means of elucidating the majority of the problems formulated by the researcher at the outset. It should be clear, on the other hand, that the study of such a wider structure may require, in turn, its inclusion in another still wider structure that would embody the former.

We firmly believe that Goldmann's methodology translates into more modern language, and enlarges upon, Marx's conceptualization of totalities, as well as the vaguely formulated ideas on the relations between the parts and the whole. In this language, what Marx called "a rich totality of multiple determinations and relations" becomes "a structured totality". Nineteenth century thinkers never made use of the word "structure" because the concept was not well established at the time. The reason is not hard to find: the logic available at that time was unable to define such a concept. Aristotelian logic was still prevalent, and as is well known, it did not include the logic of relations. Aristotle and his followers were only able to master the relation of inclusion, but no complex structure can be reduced to any combination of inclusion relations.

Goldmann's approach—extremely interesting but, for our purposes, still insufficient—served to dispose of those for whom the introduction of the concept of structure would lead them to feel obliged to throw out of the window concepts such as "historicity" that play such a central role in Marxist theory. Goldmann shows that such a presumption is simply false. The study of the structure of a system, if properly understood, does not exclude the study of its historical development. Diachronic and synchronic studies are both necessary to understand how a system works. One clarifies the other, and vice-versa. Goldmann *saw* this and *applied* it. We believe that today there are theoretical foundations which permit going a little further than that.

The kind of problem that Goldmann was facing is a particular case of a much more general problem. In very broad terms he was concerned with structures of various different levels that were embedded one inside the other. There was, so to speak, a "transfer of meaning" from the outermost to the innermost structure. His aim was to explain what this "transfer" consisted of.

The theoretical foundations of positions like those of Goldmann have to be found today in a general theory of systems of the type we have outlined in Chapter 6 of Volume 1. We shall not repeat it here, but it is necessary to review some of the most important concepts and to sharpen them a little further.

Development and Dynamic Equilibrium

One of the fundamental tenets of a general theory of systems is the assertion that the development of an *open* system is neither a continuous growth (or decay) nor a linear process. The existence of successive "stages" of relative (dynamic) equilibrium is just an expression for these two facts. In this, Piaget in psychology and epistemology, and Marx in political economy, have pioneered what nowadays is called a general theory of systems (although neither of them were quite conscious that they were that). We know today that open systems, i.e. systems that exchange

matter, energy, information, etc. with the environment, are self-organizing systems. This means that such systems acquire an internal structure that becomes stabilized when the exchange fluxes that constitute a system's interactions with its environment become stable.

The key word in this formulation is "stability". That a structure is stable by no means implies that it is static. It does not mean either that it is in equilibrium conditions, in the sense given to this word in classic thermodymanics. A structure may be stable because it is in a state of equilibrium, or it may be stable because, *being far from equilibrium conditions, it is kept stable through exchanges with the environment.* In the first case the word equilibrium may be applied without additions. In the second case it may not be. We may talk about *dynamic equilibrium*, or may coin another word, as Piaget did, calling it *equilibration*, which conveys better the idea of a *process* rather than a static state.

To be kept in stable conditions, *far from equilibrium* conditions means that the system fluctuates around some *mean*. These fluctuations are due either to *internal* variations, or to *external* variations in the environment. The stages of development of an open system present two characteristics that must be clearly understood to get away from the idea of continuous growth (or decay) and of linear causal chains.

First, the transition from one stage to the next cannot be depicted in any way as some sort of "addition" of new elements to the system. Each transition means a reorganization of the previous stage. This, in turn, means that the former dynamic equilibrium had been destroyed. The theory of transition from one stage to the next is, therefore, a theory of disruptions of states of dynamic equilibrium, i.e. a theory of *instability*.

Once the instability is triggered off, the system is disorganized and, under certain conditions, it may find new patterns of organization. This reorganization means a clear-cut *discontinuity* in the transition from one level to the next. But the discontinuity is *structural* not (or not necessarily) functional. Systems *may* evolve by developments characterized by structural discontinuities and functional continuity. We shall elaborate this point in the next section.

A second important point concerning the evolution of an open system is its unpredictability. When a physical (open) system becomes unstable, its subsequent evolution is *essentially* unpredictable. The point representing, on the part of the system, the unstable state is in fact a *branch point*, and there is, therefore, more than one possible path that the system may follow. This seems to be a characteristic of *all* open systems.

Structure and Function

The word "function" has a large variety of meanings in the common language as well as in the language of science. Among the sciences there are two quite different uses of the word that need to be clearly distinguished. The first is the concept of function as it is used in mathematics, as represented by the expression $y = f(x)$. The second is the concept of function used in biology. In this text, unless we explicitly indicate the contrary, we shall make use of the latter.

It is important to recall at this point that the notion of a system introduced above does not refer to a set of static elements, but to elements that are changing with

time. We are, therefore, explicitly excluding logico-mathematical systems. It follows that evolution in time is an essential part of the study of the systems we are going to consider. It also follows that once we distinguish between the evolution of the system in time and its structure at a given moment, we must then investigate how the latter is affected by the former. Moreover, we will need to compare systems that are rather different from each other, but that behave or evolve in similar ways. What this similarity consists of is also in need of some explanation. For all these purposes the concept of function plays an important role, as we shall now indicate.

The evolution of a system is linked to the kind of activity that the system performs. We are not going to provide a precise definition of the word "activity" since its meaning becomes clear in each one of the domains to which the system we may consider belong: a motor, a cloud, an enzyme, an agricultural community, etc.

We shall adopt here a terminological distinction, introduced by Piaget (4), between functioning (fonctionnement) and function (fonction). The term "functioning" refers, in a system, to the performance of its activity. The term "function" applies to the action that is exerted by the functioning of a subsystem over the functioning of the total system. It should be clear that the words "subsystem" and "system" are relative terms and that the latter may in turn, be, a subsystem of a wider system.

The notions of "functioning" and "function" become important when attempting to compare systems with structures that differ from each other. Comparability of two systems has meaning either in the case that both have similar activities or when both have subsystems that perform analogous functions. Thus, comparability requires having criteria to define, among functions, some kind of relation corresponding to the relation of "similarity" between structures. Piaget defines such a relation in the following way (5). Let us compare a total system B_1, with a total system B_2. We say that the function of the subsystem A_1, with reference to B_1, is similar to the function of the subsystem A_2, with reference to B_2, if the relations taking part in the functioning of A_1 and A_2 are in correspondance with each other, term to term, in their actions on the functioning of B_1 and B_2.

An example may help to clarify the above definition. The structures of the bodies of a human being and of a fish are quite different. However, both breathe, although in a different way. We say that the respiratory system of the fish and the respiratory system of a human being accomplish *similar functions* even though no organ from one system is similar (structural similarity) to an organ of the other system. For in both cases the corresponding system performs the same kind of actions: to extract oxygen from a surrounding fluid (water in one case, air in the other).

The concept of function does not exclude a dialectic interaction between the system and its subsystems. The system as such imposes, we may say, its own laws, as a totality on the component parts. This is what Piaget calls the "organizational function" of the system. Thus, *function* is the action that the functioning of a subsystem exerts over the total system and, reciprocally, *organization*, as a totality function, is the action that the functioning of the total system exerts over the subsystems.

Within our conceptual framework, the organizational function is equivalent to what we have called the "structuring" of the system. This is, in turn, related to

another concept that is necessary for the understanding of the evolution of a complex system: the concept of genesis.

Structure and Genesis

We have been using the term "system" as being synonymous with "organized totality". Furthermore, we have defined the "organizational function" of the totality over the parts, as being that function by means of which the system acquires a structure. The concept of an organizational (or structuring) function is related to the concept of evolution or transformation of a system in the following ways:

(a) First, the organizational function maintains the *continuity* of the system in time, i.e. it characterizes its evolution as being the evolution of the *same system* that is undergoing transformations. This implies that we have, at the same time, a *transformation* process, and one or more *invariants* that keep the identity of the system as such.
(b) Second, maintaining a system through a process of transformation assumes an internal organization that is nothing but a composition of the parts interacting with each other. Without such interactions we would not have a system but only a set of elements.
(c) During the process of transformation of a system, the contents are being renewed, which means that the inter-relations among the elements have to be constantly re-established. There is, therefore, a continuous reconstruction of the system. But this means that what is being conserved is the set of relationships, not the elements themselves. In other words: the structuring functions of the totality over the parts consists in conserving the structure of the system through successive transformations which change the contents of the system. This is only possible through interactions involving a feeding of the system from the outside, i.e. fluxes across the boundaries.

Here we find the bridge with the theory of dissipative systems (i.e. self-organized systems, the structure of which is maintained by boundary fluxes). Before entering this terrain, however, we need to introduce some clarification in our terminology.

In the first place we have to consider the concept of transformation again. This term is being used with two different meanings. On the one hand, the term has been used in the definition of a structure, insofar as the latter was characterized as "a set of transformations". On the other hand, the term transformation is applied with reference to the modifications the system undergoes through time.

The relationship between both senses of the word "transformation" is essentially the same as the relation between "genesis" and "structure", a fundamental problem within the theory of systems. Developmental epistemology has summarized such a relationship in a simple Piagetian dictum: there is no structure without a genesis, nor any genesis without structures. Structures without a genesis would mean either that there are permanent structures, static sets of relations without change, or else that structures may just appear out of the clouds without anything that would prepare them and without explanation. Genesis without structures would mean

accepting the idea of purely contingent relations within systems that appear as well-organized systems.

The study of genesis is the study of becoming. The study of structure is the study of forms. Neither static structuralism (structures without genesis), nor historicism (genesis without structures) is capable of explaining the behaviour and evolution of complex natural systems. The classic polemic concerning diachronic versus synchronic analyses is thus in need of reformulation. The attack of historicism against narrowly synchronic analyses is quite right. But historicists miss the point if their diachronic analyses do not take into account that becoming is in fact a series of transitions from one form of internal organization (a structure) to another form of organization (another structure).

The key questions are not whether there are structures or whether the history of a system is essential to an understanding of how it operates. The answer to both questions is obviously affirmative. The key question is how *during the historic evolution of a system*, the structure it has at a given moment becomes disorganized and is replaced by another structure.

Vulnerability: Internal Disjunctions in a System

The kind of theory of systems propounded in Volume 1, and further developed in the Introduction to this volume, led us to consider drought as a perturbation acting not on, but *in* the system. The two main consequences that follow from our analysis are: (a) the catastrophic effects of droughts are the combined result of both the intensity of the anomaly and the fragility of the system acted upon; (b) the evolution of the system depends to a great extent on its structural properties at the time of the anomaly.

It now remains for us to go into the analysis of the actual relationship between perturbation, system vulnerability and instability in more detail. The basic questions to be answered here are: what does fragility consist of? how does perturbation act in order to release the potential instability of the system?

Let us reconsider the state of a system before it is "hit" by the catastrophe. Under "normal" conditions such a system is in a state of dynamic equilibrium. This means that the forces acting on the various parts of the system compensate each other and that fluctuations across boundaries do not alter, beyond certain well-established limits, the internal relations among elements of the system. How does instability develop in such situations? Before dealing with the cases we are concerned with, we shall analyse a quite different situation belonging to a field where these matters have been worked out in detail.

The field of hydrodynamics offers perhaps the clearest examples of the development of instabilities in well-controlled experiments that allow a detailed description of the operating processes as well as a clear explanation of what the rupture of equilibrium consists of. Perhaps the rotating dish-pan experiment is the best available example. We have referred to it in Volume 1 (Chapter 9, pp. 252–255) as a model that illustrates some of the mechanisms driving the general circulation of the atmosphere. Here we shall consider it as a very general model of a system that undergoes structural changes due to external perturbations. Let us recall the main features of the experiment.

A flat pan is heated around its outer wall and a small cylinder that can be cooled is placed in its centre (see Figure 9.2(a) in Volume 1 reproduced here). The whole system is filled with water, and is rotated upon a turntable or other device. Dyes or particles in the water allow the motions to be discerned. We set the pan to rotate at a given speed and then hold this rotational speed constant.

The experiment consists of slowly increasing the temperature difference (temperature gradient) in the fluid between the centre and the outer walls. At first, the fluid rotates with the inner and outer cylinders, in a smoother laminar type of flow, as depicted in Figure 9.3(a), of Volume 1, reproduced here. The flow regime here is adequate to transport the heat input at the outer wall to the heat sink at the inner wall. As the temperature gradient is increased by increased heating of the outer wall, the flow tends to concentrate. An annular jet stream is formed, as shown in Figure 9.3(b), which has a higher temperature gradient across it.

With a further increase in heating at the outer wall, and *after the temperature gradient exceeds a certain threshold*, there is an abrupt change in the regime of the motion: waves form on the jet. The reason is quite clear. Waves can introduce radial-type motion over a larger cross-section and hence increase the transport of heat radially across the jet stream region, as depicted in Figure 9.3(c).

As the rim heating is increased, additional waves are formed, as seen in Figure 9.3(d). More and more heat must be transported to the centre to maintain equilibrium and thus the waves increase in number. Eventually the number of waves cannot increase around the annular path and the waves become distorted (Figure 9.3(c)). Finally at some critical temperature gradient, the waves break up into turbulent elements (Figure 9.3(f)). Thus we distinguish quite distinct flow regimes: laminar; concentrated but still laminar (with a jet); wave; distorted wave; turbulent.

If the experiments are repeated, and the physical system is large enough to observe small details carefully, it will be seen that these same regimes repeat themselves quite regularly, in terms of their characteristic kinds of flow. There will, however, be variations in exactly where the waves occur, or they may drift along, or they may actually be unevenly spaced. Also, the waves could oscillate between flow conditions of, say, three waves or four around the annulus.

The nature of the instability that is released in this example is quite clear: heat is being accumulated in the peripheral regions of the fluid because the fluid cannot transport it inwards at sufficient speed, due to the motion pattern that set in during the first phase of the experiment. When the accumulation of heat reaches a certain limit, thermodynamic forces generated by the temperature gradients inside the fluid will disrupt the motion. A new pattern has to be established (wave motion) that is more efficient in transporting the heat inwards. It will, therefore, decrease the gradient of temperature and bring the fluid again to a stable state. The latter is nothing but a new state of dynamic equilibrium brought about by a new structure in the motion patterns (streamlines).

It seems that in all physical models that can be analysed in detail, the source of instability is always found in the development of strong internal gradients inside the system. In these cases it is clear that the vulnerability of the system can be measured by these gradients. The system is vulnerable *to* those perturbations that may increase the gradients beyond certain threshold values. Whether a perturb-

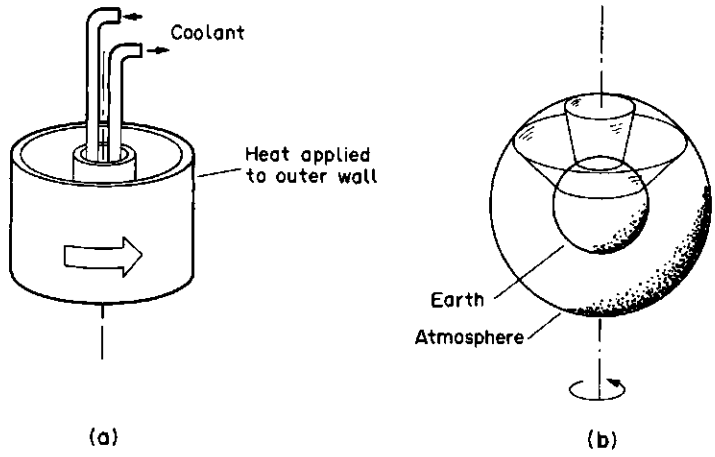


FIG. 9.2. (a) schematic of experiment, showing rotating cylinder, cooled at centre, warmed at rim, filled with water; (b) schematic of earth-atmosphere (not to scale) showing analogy of rotating cylinder (after Greenspan, *Physics of Rotating Fluids*).

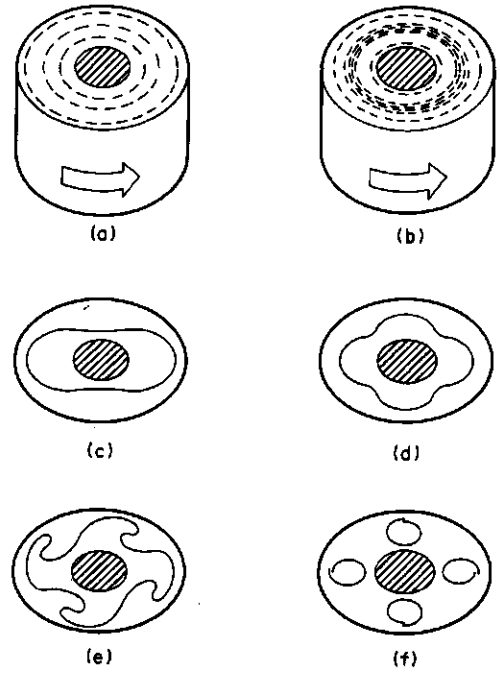


FIG. 9.3. Flow régimes in rotating-cylinder experiment: (a) uniform flow at low-temperature difference between centre and rim; (b) formation of jet flow; (c) establishment of first wave régime; (d) increased number of waves to adjust to higher temperature gradient; (e) eventual wave distortion as temperature gradient becomes too high for wave régime to account for heat transport; (f) turbulent eddies form for even more efficient energy transport at high temperature gradient. (After R. Hide.)

ation may trigger off the instability or not, depends on *two* factors: (a) how close the internal gradients are to the threshold values; (b) the size of the perturbation.

We may translate this description (which can be expressed in very precise terms by making use of differential equations describing the behaviour of the systems) into a slightly different language that will guide our search for instability mechanisms in more complex systems.

The stability or instability in the case of the dish pan experiment may be visualized as the opposite action of two mechanisms: one of them injecting heat into the system, the other distributing such an amount of heat within the system.

We have tried to generalize this description and use it as a working hypothesis to help explain what has happened in the case studies we are dealing with. In this connection, our formulation will be as follows:

> A system is potentially unstable when there is an opposition between different mechanisms acting in—or on—the system, in such a way that the equilibrium conditions between them may be disrupted by some internal or external perturbation. Internal "displacements" that are not compensated in other parts of the system will then set in. If the perturbation persists, the system may undergo a complete rearrangement of its component parts (elements or subsystems) and the relations among them (i.e. it will acquire a new structure).

The systems we are considering in this book have considerable complexity. It is difficult if not impossible to define forces that can be measured, or to determine gradients of fields variables. This notwithstanding, as shown in the various chapters, dramatic developments due to perturbations acting on a system (droughts, in our cases) have a clear interpretation when they are analysed as being the result of releasing potential instabilities that have developed in the structure of the system.

We wanted to avoid being guilty of making illegitimate extrapolations (the fallacy of generalization) by using terminology that belongs to the physical sciences where the terms have a very precise meaning not directly applicable to other fields. There was a temptation to refer to such potential instabilities as "contradictions". In a way they are. We prefer, however, to reserve use of the term "contradiction" for uses closer to its logical origin. We have, therefore, adopted another word to refer to such "opposite mechanisms" and we have referred to them as "disjunctions".

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CHAPTER 4

Climate Variability, Agriculture, Industry and the State: Disjunction between Sectors and within Agriculture in Latin America

A. Introduction

IN CHAPTER 1 we have underlined that, for food producers, food has a dual and somewhat conflicting nature, fulfilling a basic need through self-provisioning and serving as a commodity for exchange. In pre-industrial societies or in today's less industrialized societies, this conflict is particularly acute in the context of the inter-annual variability of food production. Rulers of pre-industrial agrarian societies were well aware of the conflict between the livelihood of food producers and the wealth of the state as well as between food producers and food consumers. Although trying to maximize fiscal income, they were nevertheless keen to avoid the social troubles and disruptions that enforced tax collection could trigger in a bad agricultural year. Similarly, high food prices in a bad agricultural year would hurt food consumers but might benefit those producers still able to sell a sizeable part of their crops. In all ancient societies for which we have written evidence, this dilemma was reflected upon, and was at the root of the development of political economy.

For instance, Li K'uei, counsellor of Duke Wen of Wei (about 400 BC), stated this dilemma very clearly:

> "If grain is very expensive, consumers suffer and their families are scattered and emigrate; if grain is very cheap, the producers suffer and the state is impoverished. Whether the price is very high or very low, the prosperity of the state suffers." (1)

His solution was to stabilize prices through state purchase of grain in years of plenty and sale at controlled prices in years of scarcity.

Although Li K'uei was, to our knowledge, the first to build a quantitative model for food price stabilization, and one which was much more sophisticated than the biblical granary of Joseph (a fact entirely ignored by the ethnocentric western history of economic thought), public granaries had already been established much earlier. Thus the annals of Chinese history indicate that a great famine led the legendary Emperor Shun (at a date fixed by some scholars at around 2000 BC) to nominate a minister of agriculture, ranking first among other ministers, whose task

was to control the production and distribution of grains. Confucius himself, according to some of his disciples, was, in his youth, in charge of a public granary. Food price equalization and stabilization schemes, as well as public grain policies, have therefore been discussed and implemented with varying results in China for nearly 4000 years. The same questions of how to guarantee food in bad years recur frequently in Chinese annals. Should food be secured through state or village granaries, through tax exemptions in difficult years, through regulating trade, through attacking the problem at its roots by implementing egalitarian land reforms, through redistribution of income or assets, through egalitarian policies ensuring basic needs and forbidding luxuries, or through an economy which stresses the dynamic role of inequality, through an emphasis on agriculture or crafts, on food crops or cash crops?

All schools of thought in ancient China have taken a position on these questions. Public granaries, first mentioned around the eighth century B.C., have been a constant subject of theoretical and practical considerations right through to the beginning of this century. The necessity for the state to adjust fiscal systems, as well as internal and external trade regulations, to uncertain harvests have led to the early development of statistical crop reporting systems and of meteorological observatories in China.

Very much the same debates took place in Europe in the seventeenth and eighteenth centuries. For instance, in France, Vauban (1633–1707) thought it necessary to develop a state statistical organization and at the same time to reform the fiscal system drastically. Taking into account variability in climate, he proposed a single agricultural tax proportional to the output in order to avoid famines on the one hand and outrageous private accumulation of wealth on the other. Such a drastic change in the organization of society was not tolerated by the King: Vauban's book (published in 1707) was immediately banned. (2)

Similarly, Boisguilbert (1646–1714), moved by the famines devastating France at the time, wrote on the same topic and was immediately sued. (3)

What is striking in the analyses of this period, in contrast with many contemporary ones, is that the central question is not "what is the impact of climatic variability on society", but "how does the organization of society incorporate climate variability?" and "how can we improve this organization?" In the major intellectual undertaking which the French Encyclopaedia represented in the middle of the eighteenth century, one finds an article entitled "Grains" which is particularly significant. "Grains" were a subject of primordial importance in France at the time, as "Food" is today in Third World countries. Most of the writings of French political economists were then dealing with food policies and famines. The article "Grains" was published in 1757 and written by Quesnay (1694–1774), the leader of the French "Physiocratic" school. (4) It is entirely built around the issue of variability in grain output, itself governed by climatic variability. Quesnay characterizes five different years by wheat yields in "setiers" (measure of capacity) per "arpent" (measure of area) and indicates for each the price, gross income and income before tax in "livres" (pounds). He keeps the expenditures at the same level.

As can be seen in Table 1, income (gross or before tax) is at its maximum in the year with the worst climate and declines as the yield increases to reach its minimum

TABLE 1.
Actual food price variations according to Quesnay (1757)

Crop year	Yield[a]	Price[b]	Gross income	Expenditures	Income before tax
Very good	7	10	70	60	10
Good	6	12	72	60	12
Average	5	15	75	60	15
Poor	4	20	80	60	30
Very poor	3	30	90	60	30
Average	5	17.4	77.4	60	17.4

[a] Net yields (after deducting the seeds). In "setiers" (measure of capacity) per "arpent" (measure of area).
[b] In "livres" (pounds).

in the best climatic year. Quesnay writes "when the wheat harvest is such that it provides a surplus of three to four months of consumption over the needs of a year, the wheat price falls so low that this superabundance ruins the farmer." This is why, according to him, during famines large farmers become rich in an "ocean of misery", and "make a small profit only in bad years". In very good years, income before tax is one-third of what it is in "very poor" years. He calls this the "misery of abundance", thus echoing the drunken porter in "Macbeth": "Here's a farmer that hanged himself on the expectation of plenty."

If Quesnay had left the issue at that point he would certainly have demonstrated the importance of climatic variability for large farmers' incomes but in the unidirectional way of the "impact" of climate on yields, prices and income. In the rest of his article he deals with interaction, in formulating agricultural investment and trade policies. As we do not intend to deal here with economic history, we will not discuss the details of these policies. It suffices for our purpose to look at Table 2, which gives the hypothetical results of these policies, according to Quesnay. It is astounding to note that with the same distribution of years and not a very different range of yields (from 4 to 8 instead of from 3 to 7), he obtains the exactly opposite result: income is maximum in the year with the best climate and declines with the yield.

TABLE 2.
Ideal Food Price Variation according to Quesnay (1757)

Crop year	Yield[a]	Price[b]	Gross income	Expenditures	Income before tax
Very good	8	16	128	66	62
Good	7	17	119	66	53
Average	6	18	108	66	42
Poor	5	19	95	66	29
Very poor	4	20	80	66	14
Average	6	18	106	66	40

Turgot (1728–81), who became Louis XVI's Minister of Finance in 1774, proposes another set of policies (5) and, with the same distribution of yields, obtains an entirely different result, representing a compromise between the actual and ideal Quesnay's curves. The highest income is obtained in the average year and decreases symmetrically as yields increase or decrease (Table 3). This "Turgot parabola", as well as the concave and convex Quesnay curves, demonstrate eloquently how these early economists dealt with interactions between policies and natural factors.

TABLE 3.
The Turgot Table

Crop year	Yield[a]	Price[b]	Gross income	Expenditures	Income before tax
Very good	7	15	105	96	9
Good	6	20	120	96	24
Average	5	25	125	96	29
Poor	4	30	120	96	24
Very poor	3	35	105	96	9
Average	5	25	125	96	29

Li K'uei, Vauban, Boisguilbert, Quesnay, Turgot, Necker, Steuart and their contemporaries were dealing with climate variability in the whole framework of society in their time, with government policies related to taxation, prices, investment, imports and exports. Variability was therefore perceived in the context of the relations between agriculture and the state. With the beginning of industry, this context was not lost sight of by the Italian economist Galiani (1728–87). He stated very clearly the fact that industry had to be protected from fluctuations in food output and prices, as food was the major wage good. His "dialogues on the grain trade" introduce two aristocrats, "Le Chevalier" (the Knight, Galiani himself) and "Le Marquis" (the Marquis). In his second dialogue, "Le Chevalier" asks: "Have you ever examined what is the fundamental difference between the product of the soil and the product of the industrial worker?" and answers in the following way: "There is no good or bad harvest year in manufacturing. Geneva watches do not fear frosts, hail or drought." He goes on to say that the Marquis, hearing of the doubling of the price of champagne, will still buy it. "But if a watchmaker sets the price of a watch at eight francs because it was made in 1760 and wheat was expensive that year, but sells an identical watch at six francs because it was made in 1761, a year of abundance, what would you say?" (6)

Galiani then explains the importance of the stability of wages for industry and therefore the need for state intervention through public grain purchases, price controls and granaries. But he is careful to write that what is good for Geneva is not necessarily good elsewhere. Geneva authorities did not have to care much about their own wheat farmers' income, as they were few in the limited hinterland of the Republic. Purchases were made throughout Europe at the best prices thanks to a network of agents, who at the same time organized a financial and banking network facilitating their grain deals, a network which expanded with the development of

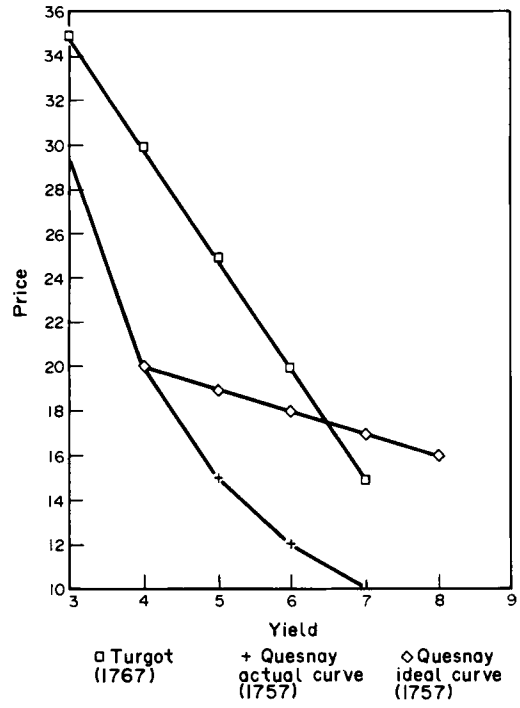

FIG. 1. Three French eighteenth century interpretations of cereal prices.

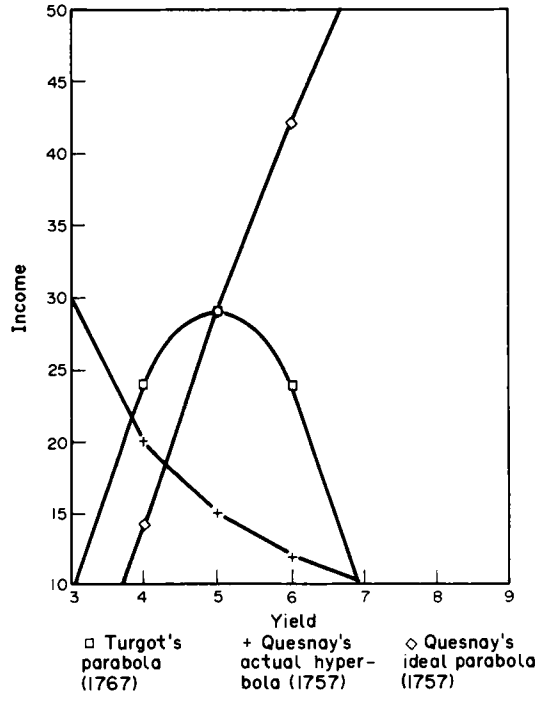

FIG. 2. Variation of incomes before tax for six different crop years.

watch exports. The Geneva public granary ("la chambre des blés" 1628–1798) first encouraged, like the Chinese granaries, by local famines, was thereafter geared to the watch industry and linked to the banking system. (7)

Studying climate variability in even this microcosm involves studying the whole of society, and particularly the relationships between agriculture (and its uncertain harvests), industry (and the food price component of its goods) and the state decision-making, which reflects the politico-economic nature of its base and its bargaining power *vis-à-vis* other states.

Some readers used to detailed studies of the impact of climatic variability on agricultural and livestock production might be surprised by this historical approach and by its inclusion at the beginning of the 1972 case studies. Even those who are conscious of the social and political dimensions of droughts more often than not tend to treat them as social and political consequences and not as associated causes. To such readers, the following text by Portantiero might appear as yet one more analysis which neglects "concrete" realities and couches everything in the most general political terms related to inequalities within and between nations. In short, our decision might appear provocative. This is certainly not our intention. On the contrary, we would like to sensitize such readers to the fact that their own analyses, as professionals, as opinion leaders or decision-makers could acquire much more relevance in relation to the effective improvement of food security if, instead of taking drought conditions as a point of departure, they would first look at the overall economic and social conditions and then figure out how climatic variations interact with them to produce specific effects. This was the general approach of the eighteenth-century writers we quoted above.

For instance most analysts will agree that drought conditions have a particularly strong impact on the weakest groups bringing additional suffering to their already wretched conditions, even to the extent that they may have to dispose of their already meagre assets, including, in many instances, mortgaging or selling their land. In such cases drought eliminates from the productive process the most vulnerable, and sparks off migrations in search of employment or of better social protection in cities. But two observations have to be made.

First, while "distress sales" are often referred to in the current literature on drought, food scarcities and famines, very seldom are references made to those who benefit from such distress sales and acquire labour, land, cattle, etc. at low rates. This was clearly denounced in the eighteenth-century economic literature. The quasi-absence, in contemporary analyses, of those who benefit from famine conditions (and also from the distorted distribution of public funds, subsidies and even food), is disturbing. It appears as if those who treat drought as an exogenous variable and attempt to monitor its impact in a linear way on socio-economic structures are not following as rigorous a method as they claim, in putting more emphasis on those who suffer than those who benefit. Perhaps they consider it more objective, less "political", to describe growing poverty than growing wealth, particularly when the latter finds its source in the former.

Whatever the reasons for these asymmetric analyses, objectively they reinforce the unidirectional dramatization of drought not only as an exogenous variable but also as limiting its effect to one segment of society only, as if society was made of totally disconnected fragments.

Second, once the impact of drought on the whole of society is admitted, it should also be realized that recurrent droughts themselves do not generate societal structures. From time to time, social polarization might be reinforced by recurrent droughts, but the social process pre-exists. If inequalities were the result of drought, the social history of England will be hard to explain. We might use an analogy with seasonal crises in the lean months: these crises reinforce unequal social relations, such as those linking the agricultural labourer to the landowner, the small farmer to the trader and moneylender, the "client" to his "patron". Of course, such relations also exist in areas with low seasonality or a more even level of food production during the year, such as in equatorial regions or subequatorial regions with high multi-modal rainfall. High seasonality clearly does not create rural patterns of unequal land and income distribution. As the yearly seasonal crises of the lean months are incorporated in the local socio-economic organizations of these societies, the recurrent drought crises of the lean years become part of their overall structures. Similarly, at the international level, the likelihood of sudden and sharp increases in the food demand resulting, for instance, from drought in Africa or frosts in the Soviet Union, has been incorporated in the organization of farm production of the large exporting countries, and in this way, food scarcities and misery in some parts of the world feed abundance in others.

As we have seen above, the fact that climatic factors are part of the organization of society was observed a long time ago by the French physiocrats in the eighteenth century and, long before, by Chinese economists and statesmen. One might even say that the concern for food/climate variability was at the root of the development of political economy, particularly since the late seventeenth century in Europe. But as industrialization developed, this source of instability became less and less important for the economy. As western social scientists tended to reflect on what they perceived as the most important phenomenon of their times—the industrialization process—these early analytical insights were lost, except for a few analysts prompted by particular situations, such as Marx when he dealt with the 1847 Irish famines. Without developing this theme further, let us note that the dominant thinking in the social sciences has been shaped by the specific history of Europe and northern America and is ill-fitted to conditions prevailing elsewhere, particularly when behind the mask of modernity it hides its own historical character. The process of industrialization in Europe since the eighteenth century and thereafter in northern America has increased the capacity of the industrialized countries—the central states referred to by Portantiero—that fluctuations in climate can be increasingly more easy to absorb by the social and economic fabric of these societies.

Hopefully by now the reader will have accepted not only that drought hurts some for the benefit of others, but also that climate variability, far from being independent of society, is embedded in society. But there is a further step to go: in societies going through a major process of change, such as industrialization in Latin America, drought must be related to this process, through the role that the agrarian sector plays in the general transfer of resources (capital, food, raw material, labour) within and between nations.

Roots of instability leading to catastrophes have been located by Li K'uei in the tensions between the interests of food producers and of food consumers. Catholic

theologians of the European Middle Age have debated endlessly on what should be the "just price" ("justum pretium"). (8, 9) A little more than two centuries ago, Galiani pointed out how the tensions around food prices became central in the early phase of industrial development. Li K'uei and Galiani designated the state as the regulating agency, while Thomas Aquinas was relying on the moral principles of the Church. But the state (or the church) is not a neutral entity. It has a social base and conducts international relations. According to the composition and mapping of these constellations of social forces tensions might be reduced or increased. Tensions between agriculture and industry may increase to the point of disjunction.

Once this disjunction occurs, climatic fluctuations cannot be dissipated throughout the whole socio-economic system, but only within the agricultural sector where they originate. In this case, semi-industrialization does not mitigate the effects of a climatic variation such as drought, but on the contrary increases them. Furthermore, as Portantiero shows in the following text (which having been written more than seven years ago does not take into account recent economic developments), a disjunction might be produced within the agricultural sector itself. While the subsector oriented towards export earnings is relatively well protected by the state and therefore better sheltered from climatic shocks, the other subsector, with small producing units more oriented towards food production, is left unprotected and bears the brunt of the impact. The disjunction between industry and agriculture tends to insulate industry, the disjunction within the agricultural sector tends to insulate the "modern" export sector: the poorer and weaker, the more vulnerable are those who are not protected. As with embankments built along flood-prone rivers, the longer and higher these embarkments, the more violent are the floods in unprotected sections. These are not industrial sites, high-income neighbourhoods, or fields of affluent farmers (unless they are in a position to reap more benefit from flood relief funds than from protecting their fields). These are poor people's fields and settlements. Storms, droughts or floods, the poor are the less protected by society precisely because they are the more vulnerable.

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B. Agriculture, Industry and the State in Latin America*
by Juan Carlos Portantiero

1. General Framework of Analysis

Droughts occur within a complex network of relations linking "nature" and "society", and within a system of state economic decision-making which operates through what has been described as a "web of exploitation". (1) In this context a drought reveals how what we might call "receptive social structures", shaped by the state, respond to "demands and pressures" originating from within society. In addition, the nation-state itself has to be viewed in relation to other nation-states since it responds also to international pressures. Most analyses of international relations contrast industrialized countries and "developing countries" (described also as the "Third World") or, in a different theoretical framework, "centre" and "periphery". "Third World" or "periphery" thus tend to appear as a homogeneous reality.

The linkages between "central" and "peripheral" countries as well as "central" regions and "peripheral" regions within countries are, however, more complex than is suggested by the centre–periphery model. We consider the specific problems of the agrarian sector to be caused by the way in which the state pursued and still encourages the industrialization process and the expansion of urban markets. In Latin American countries urban and industrial growth under state protection have determined the characteristics of the agrarian sector and resulted in a structural relationship between industry and agriculture which is different from that prevailing in the "central" countries.

The Latin American countries which have advanced furthest in the industrialization process are Argentina, Brazil and Mexico. In these countries agrarian problems are closely related to the path chosen in pursuit of industrialization and the policies implemented by the state to achieve this aim. Analysis of the agrarian problem cannot, therefore, be simply sectoral—as is often the case. An integrated approach is required in the same way that understanding the vulnerability of a society to natural disasters such as drought depends on looking at an integrated set of variables: there are close connections between all sectors of economy and society and between these and the state.

2. The Role of Agriculture in the Latin American Economy

Within the space of a few years the major countries of Latin America—in particular Argentina, Brazil and Mexico—confronted the new world market conditions created by the crisis of 1929, and later by World War II by embarking on a process of accelerated industrialization. This gradually changed the structure of these economies which until then had revolved almost exclusively around the export of primary products and the import of manufactured goods. In these three countries (as well as in Chile, Uruguay, Colombia and, after World War II, Venezuela—due to the economic impact of the discovery of oil), the industrial sector which was promoted between the 1930s and the 1950s permitted a change in the pattern of capital accumulation. To an increasing extent, local manufactures

*This paper is translated from the Spanish and incorporates some revisions by P. Spitz.

began to substitute for a range of consumer goods that previously had been available only through international trade.

These changes involved an expanded role for the state, and produced a substantial transformation of social relations through, for example, rapid domestic migration and the concentration of the population in large cities. The traditional links between the different sectors of the national economy were also drastically changed.

Prior to this state of "import substitution industrialization" (a process also referred to as "industrialization without an industrial revolution"), these economies and their integration into the world market during the last quarter of the nineteenth century, had been "assigned roles" by the large powerful states who controlled the accumulation of capital on the international level.

During the colonial period the export economy had been largely extractive in nature, linked to the mining of metallic ores. At that time, agriculture mainly served to produce a few exotic foods for consumption in the affluent countries and some basic products for the local labour force. The colonies located in the Rio de la Plata basin lacked metals and languished during this period. As was discovered later, however, this area was one of the most fertile in the world. The "assigned roles" began to change with the beginning of the industrial revolution in Europe. The clearest example was in Argentina.

Argentina occupied a position of privileged dependence, particularly with regard to Great Britain. Given the wealth of its fertile soil, Argentina became an enormous source of cheap food that contributed towards reducing the cost of reproducing the labour used in industry in the central countries. During the second half of the nineteenth century the development of livestock raising and cultivation of cereals on the Argentinian "wet pampa", spurred by high and steady demand of cereals from abroad, initiated a period of externally oriented growth.

Under this initial impetus the Argentine economy began to register growth rates equalled by only a few other countries. One author reports that, during the 50 years prior to 1914, one of the highest growth rates in the world to be sustained over a long period of time occurred in Argentina. (2) By 1895, per capita income in Argentina almost equalled that of Germany, Holland or Belgium and surpassed that of Austria, Spain, Italy, Switzerland, Sweden and Norway. (3)

Although the case of Argentina is a special one (more comparable perhaps to the cases of Canada, Australia and New Zealand than to those in the rest of Latin America) during that period growth based on the export of primary products was common to all countries on the continent. The role of the agrarian sector remained the same for the major countries of Latin America up until the 1930s: to serve as a base for exchanging primary products for manufactured goods. Despite the modernization that occurred during the period, the links between land, state and industry were not complex. The growth of society depended on the capital accumulated in that part of the agrarian economy which provided the exports and in which land ownership was relatively concentrated.

The State—virtually new in so far as it had only recently gained centralized control over the whole territory—represented in a straightforward manner the interests of the economic alliance between landowners and foreign capital. Industry had very little importance. It was the crash of 1929, and the subsequent

restructuring of the world economy brought about by the crisis, which, by altering the pattern of development and the process by which the economic system reproduced itself, changed the characteristics of agriculture and livestock activities and redefined the relationship between these activities, state and the urban industrial sectors.

3. The Industrialization Model and the Rural Sector

The Great Crash of 1929 and the subsequent depression precipitated a major economic crisis in Latin America: exports fell, primary product prices slumped and the consequent foreign exchange crises meant that supplies of manufactured imports were cut off. The crisis propelled Latin American governments into seeking to change the basis of their economic growth from externally stimulated growth to a pattern of capital accumulation based on internal sources, as part of a new international division of labour. The continent's major countries quickly developed an industrial sector which produced consumer goods but which was characterized by a relative lack of technology and vertical integration. This made the model very vulnerable, with the world market furnishing the capital goods, intermediate goods and raw materials crucial for the local production process.

What role was assigned to the agrarian sector in this new accumulation process whose source of dynamism was changing? On the one hand there was an increase in production of so-called "industrial" crops (fibres in particular) in response to increasing local demand, giving rise to a degree of agricultural diversification. At the same time, traditional peasant production expanded in countries where this type of production still existed, as in Mexico, though not in Argentina, in order to satisfy the increasing demand for food by the growing urban labour force. Lastly, although the traditional exporting sector was losing relative importance, it continued to play a key role as provider of foreign exchange necessary for the new economic structure. The new economic structure, although beginning to cater to local industry and increased domestic demand, simply redefined rather than ended dependence on the central countries.

Economic growth during the import substitution industrialization phase required three contributions from agriculture:

(a) furnishing certain raw materials as industrial inputs;
(b) providing cheap food for a rapidly expanding industrial population;
(c) earning foreign exchange through exports in order to obtain capital goods which were not produced within the country.

In some countries, such as Mexico and Brazil, this led to increasing specialization and class differentiation within the agrarian sector, while in other countries, particularly Argentina, these functions—or at least the last two—were performed by the relatively homogeneous agrarian sector.

Whereas at one time there was a tendency to consider agriculture as an autarchic sector within the national economy, it is neither methodologically nor substantively correct to analyse the behaviour of the agrarian sector independently of other economic sectors or of the state.

The "dualism" approach in vogue in the 1950s, interpreted dualism to imply a complete distinction or even antagonism between a "backward" agrarian sector and a "modern" industrial sector. Mutual influence between these sectors was supposed to be slight or non-existent. In the assumed conflict between "backward" and "modern", the latter world supposedly triumphed, providing an updated, oversimplified version of the nineteenth-century concept of progress.

It is now accepted that this dualist approach contributes little to explaining problems of underdevelopment. In contrast, today it is not the conflict between the two structures which is stressed but the functional links between the two structures and the way they complement each other with the overall process of national economic growth. Thus the Economic Commission for Latin America (ECLA) refers to "structural heterogeneity" as a situation

> "in which there are great differences in productivity and degrees of 'modernity' between sectors of economic activity and within sectors, but in which there are also complex links of exchange, domination and dependence, within the national socio-economic structure." (4)

Moreover, the state, in its alliance with industry, had a significant impact on the structure of the rural sector; and, as will be shown later, its influence on the agrarian socio-economic structure was not neutral.

In addition, it is important to remember that the agrarian sector of developing countries also needs to be analysed in relation to the international economy and each successive phase in the changing international division of labour.

4. The Role of Land in Determining Urban Wages

As mentioned previously, the industrialization process which occurred in Latin America required the agrarian sector to play two major roles, one relating to the external market and the other to the domestic market. With respect to the second role, it is important to point out that in countries such as Brazil and Mexico the food supply for urban centres did not come, at least during the early states of rapid industrialization, from an expanded commercial sector in agriculture, but from the mainly subsistence-oriented sector.

It has been mainly the peasant economy, with very low levels of real income, which has provided the labour force in the recent urbanization process with the food necessary for its reproduction. All consumption statistics in Latin America show high percentages for total household expenditures devoted to food. These high percentages do not apply only to low-income groups but to middle-income groups as well, as can be seen in Table 1.

If the two highest income groups are excluded, it is clear that 80 per cent of the population would be seriously affected by a rise in the price of food. The obvious consequence of such an increase would be increasing pressure by urban employees and industrial workers for a wage increase, which would lower the rate of industrial profit and reduce the level of capital accumulation in the industrial sector.

Indeed, industrialization in Latin America has been facilitated by keeping labour costs low as a share of total production costs, the purchasing power of low industrial wages being increased by setting artificially low prices for agricultural products.

It can, therefore, be said that a good part of the cost of industrialization has been

TABLE 1.
Percentage of Income Spent on Food by Income Levels in some Countries of Latin America (circa *1969)*

	Mexico	Argentina	Brazil	
			Sao Paulo	Recife
Upper 5%	23.5	25.2	24.5	37.6
Next 15%	40.8	36.2	33.8	47.6
Next 30%	52.9	45.7	41.9	58.7
Next 30%	61.7	51.8	49.3	63.4
Lower 20%	65.8	56.5	53.4	68.1

Source: CEP, *Economic Study of Latin America*, 1977, pp. 73–74, United Nations, New York, 1971.

borne by agricultural workers, peasants and small farmers. As explained by one author:

> "this level of exploitation allows Latin American countries to increase the accumulation of capital despite the fact that they themselves are victims of a constant transfer of resources towards countries which have economic hegemony." (5)

However, this particular urban–rural relationship mainly applies in those economies with a substantial traditional peasant sector. In other cases, such as Argentina, the relationship between agriculture and industry is different.

Agriculture's role in determining the cost of urban labour and, therefore, the level and rate of industrial capital accumulation is complemented by its role in generating foreign exchange earnings. While the traditional system provided the basis for wage-goods consumed by urban workers at an extremely low cost of reproduction of the peasant (and thereby reduced the cost of reproduction of the urban labour force) export agriculture provided the means to obtain the capital goods which the unintegrated and limited industrial sector could not supply itself.

This differentiation in terms of market orientation within the rural sector is reflected in both social and spatial terms. There are in effect two subsectors: one modern and one traditional. In assessing public policy it is important to bear this in mind, because the state treats the two subsectors differently.

Industrialization efforts in Latin America did not develop new industries integrated with agriculture: industry was seen as complementary to agriculture. While the rural sector has had to bear the costs of a low wage policy in the urban sector by accepting low prices, it has also had to obtain, through its own exports, the necessary foreign exchange to purchase imports of machinery, technology, crucial raw materials and the intermediate products vital to industrial development. If this division of function within agriculture fails to coincide, even loosely, with social divisions within the rural sector, the possibilities of a conflict between agriculture—considered as a single entity—and the industrial sector are greater. This is the case in Argentina, where the same rural class assumes both productive roles. In Mexico, in contrast, the sharp social and spatial distinction between agriculture for export and agriculture for the domestic market enables the state to harmonize better a stable alliance between urban industrialists and export farmers. The main burden, however, falls upon the poor rural classes—mainly comprising

peasants with small plots of land—who produce for the urban masses. In such situations the state usually channels most credit and investment to the modern rural sector producing for export. The export sector is given priority by the state in an even more pronounced way in countries which embarked on the limited industrialization process somewhat later, such as those in Central America, for which figures are shown in Table 2. Moreover, the criteria which allocate state loans to export agriculture obviously favour large modern farms, as indicated in Table 3.

TABLE 2.
Loans for Agriculture in Central America by Type of Produce (percentage)

	Main export products	Cattle	Others
Guatemala	73.4	18.3	8.3
El Salvador	72.3	4.6	23.1
Honduras	52.4	23.8	23.8
Nicaragua	54.2	24.9	20.9
Costa Rica	70.0	21.8	8.2

Source: Peter Dorner and Rodolfo Quirós Guardia, "Institutional dualism in Central America's agricultural development", *Journal of Latin American Studies*, 5(2), November 1973, pp. 217–232, quoted by Dillon Soares, *op. cit.*, p. 41.

TABLE 3.
Percentages of Area Devoted to Export Crops and to the Domestic Market in Costa Rica, Nicaragua and El Salvador by Size of Property

Size	Domestic market	Export
Sub-family plot	80.5	19.5
Family plot	58.7	41.3
Medium multi-family plot	42.7	57.3
Large multi-family plot	25.4	74.6

Source: Dillon Soares, *op. cit.*, p. 43.

As mentioned above, if there is such a clear dichotomy between a "privileged" agriculture for export and that for the domestic market, a "disaster" will undoubtedly have different effects on the two types of farmers. The subsector benefiting from government loans and investments that produce for export or for local high-income groups will better withstand a shock such as a drought. On the other hand, peasants with small plots of land will be badly hurt.

Therefore, in any analysis of a drought situation in Latin America, it is essential to link the natural factors with the socio-economic factors. This, in turn, implies considering the interrelationships between land, state and industry, and particularly between the "export" and "domestic" sectors of agriculture.

5. Agriculture and the New Process of Capital Accumulation

The dynamism of Latin America's industrialization process begun in the 1930s started to falter in the 1960s, due mainly to the limited size of the domestic market for consumer goods. The internal market was limited by low levels of rural and urban income, which meant that economies of scale were insufficient to foster a viable capital goods industry.

However, the 1960s was a period of prosperity in the world's main industrial economies and their demand for both primary products and manufactures was expanding. Parallel to this there was an expansion in their overseas direct investment, introducing a new phase in the internationalization of capital under the aegis of multinational firms.

In Latin America, particularly in the more developed countries of the region, a new process of growth emerged about which much has been written by ECLA and Latin American social scientists. Its two central features were a continued restriction of the domestic market (both for agricultural and manufactured goods) and the promotion of agricultural and manufactured exports. Within this emerging new international division of labour, agriculture assumed a somewhat new role, the main new tendency being the growth of agribusiness. This involved the growing presence and dominating influence of multinational firms as important features of the agricultural sector.

For some authors this reorientation in agricultural strategy in developing countries under the influence of policies and institutions of countries at the centre could mark a major turnabout in the international economy. Immanuel Wallerstein explains this as follows:

> "What we shall probably see in the next 50 years is the last great expansion of the world economy. The ground will be prepared by worldwide agricultural reorganization during the downward cycle and then, in about 1990 or whenever the world economy expands again, the shift to wage employment, the proletarianization of the work force, may become virtually universal." (6)

It is within this general framework that drought has to be replaced:

> "For several years now there has been an acute famine in a semi-arid belt in tropical zones, reaching across Middle America, the Sahelo-Sudanian regions of Africa and South Asia. How do we explain it? From a short-run perspective we can talk of various climatic shifts which reduce output in marginal areas to near zero while reducing total output in the world's lusher areas. This has also some short-run self-reinforcing patterns. For example, when a sedentary farmer abandons his land because of drought, he thereby reduces the following year's production because he does not sow. This is a very short-run perspective."

Without denying the existence of this or other causes, Wallerstein prefers to point out others:

> "Basically, over two hundred years, the so-called subsistence areas of the peripheral countries have undertaken to produce a larger and larger food surplus on land which has been unimproved by technology, and this process has led to massive erosion on a world scale. (. . .) Add the fact that immediate climatic conjuncture joined a turn in world economic cycles, and the pattern of the near future becomes clear. Millions will die of quick starvation. Millions more will die of slow starvation. That is, many will be forced off their land, salvaged by humanitarian agencies, drift to bidonvilles in towns. . . . And then what? Much land will have been cleared of most of its present population. Such land will be regrouped under new ownership in a plantation form. It will be partially mechanized. The owners will hire wage workers and will sell the commercial products

> (including food) on a world market. Who will own these plantations? There are several possibilities: the states, cooperatives of small commercial farmers, multinational corporations, or some combination thereof." (7)

Agriculture and livestock activities have now become parts of a complex chain of activities linking agriculture and industry: agro-industry. In this new model agriculture is only one of the four subsectors included in the general social process of food production, the four sub-sectors being:

(a) production of inputs for agriculture and livestock production;
(b) agriculture and livestock production proper;
(c) industrial processing and transformation along the agro-food chain (agro-food industries proper);
(d) distribution of agro-food products for the consumer market. (8)

Of the four links in the chain, (1), (3) and (4) are the most concentrated sectors and under the control of transnational companies or their local affiliates. As regards agriculture production proper, there is an increasingly strong trend toward "modern" agriculture, in which "traditional" small or medium-sized plots of land tend to be eliminated or their owners forced to rent out the land. So national agricultural structures gradually become incorporated into a world agribusiness network through the aforementioned links.

The autonomy of the peasant sector is ended and it is virtually integrated into the more "advanced" part of the sector through production contracts with large corporations, who provide for the export market or national high-income urban markets.

Of course this process does not occur in precisely the same way or at the same time in all countries. But it does seem to be an irreversible trend, in that it represents one dimension of a new international economic order, determined by the countries at the centre. Of the major Latin American countries Mexico and Brazil are examples of countries which have become integrated into international agribusiness.

It is important to emphasize that this new model aggravates the food situation of the low-income urban and rural masses. While food production for export and for local high-income consumers increases supplied by large, modern agricultural companies with state support in the form of loans and investment for infrastructure, the traditional peasant economy languishes. This subsector faces increased problems of poverty and poor diet until it gets to the point where basic foods must be imported in order to prevent famine. At the same time, more sophisticated crops and cereals for animal fodder are exported to the central countries.

It seems impossible to curb the expansion of agro-industry or change its current role in developing countries. Modernization itself is not detrimental to these countries, but the fact that it plays a subordinate role in the new phase of world accumulation which is developing under the control, and largely to the benefit, of the central countries. We should not lament the disappearance of the low-productivity peasant economy, but rather seek to increase agricultural productivity in such a manner that the food requirements of the majority of the population are met.

6. General Hypotheses in Relation to Agriculture and Drought

Drawing on Latin American experience, it is suggested that further research on the effects and role of drought should consider the following hypotheses:

(1) The agrarian sector participates in the reproduction of economic systems in two main ways:
   (a) as the principal earner of the foreign exchange necessary to satisfy requirements for machinery, technology, raw materials and intermediate products vital for industrial development;
   (b) as the main factor determining the rate of industrial profit to the extent that, given certain physical and historical limits to the working day, the profit rate in industry is largely determined by the sector which produces wage-goods. Under the general consumption conditions for urban workers in dependent industrializing countries, these are mainly agricultural and livestock products.

(2) The agrarian sector's double role corresponds to two areas of demand satisfied by agriculture and livestock production: the foreign market and the domestic market. It is generally in the interest of urban industrial groups to have high prices set for agricultural products for export and low prices for domestic agricultural commodities. One can conclude—and this is supported by substantial empirical evidence—that whenever this duality of interest presents itself, the first role, (production for export) is assumed by companies with substantial capital, and the second role (production for the domestic lower-income market) by the more typically peasant economy.

(3) If this hypothesis is true, and if the industrial process requires low prices for wage-goods, then the cost of industrialization falls mostly upon the poorest peasant sector, especially if agricultural productivity in this subsector cannot be increased. The comparison between Mexico and Argentina is of special interest as relationships between land, industry and the state function differently in each case. Within a similar development strategy, their differently structured agrarian sectors give rise to different relations between sectors.

(4) Where there is a clear divide between "modern" agriculture for export and "backward" agriculture for the domestic market, a natural disaster such as a drought will have different effects on the two different parts of the agrarian sector and on society as a whole. The more developed parts of the agricultural sector (which produce mostly for export and for higher-income domestic groups), which have usually benefited most from state-financed infrastructure and loans, will be in a better position to withstand the impact. On the other hand, the peasant who lacks sufficient infrastructure to afford adequate protection from drought, and the urban worker, who earns low wages and spend most of his or her income on products, will suffer most.

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CHAPTER 5

Regional and Subregional Disjunctions: The Case of Northeastern Brazil

A. Introduction

IN THE the preceding chapter on "Agriculture, industry and the state in Latin America", two functions of the agrarian sector were underlined: subsidizing low urban wages through low food prices and generating foreign exchange necessary for industrial development. Reading Portantiero again:

> "If this division of functions . . . fails to coincide, even loosely, with a division among classes within the rural sector, the possibilities of a conflict between agriculture considered as one entity—and the industrial sector are greater. Such is the case of Argentina, where the same rural class assumes both productive roles. In Mexico, in contrast, the sharp social and spatial distinction between agriculture for export and agriculture for the domestic market enables the state to harmonize better a stable alliance between urban industrialists and export farmers. The main burden, however, falls upon the poor rural classes—mainly comprising peasants with small plots of land—who produce for the urban masses. . . . If there is a clear dichotomy between a 'privileged' agriculture for export and that for the domestic market, a 'disaster' will undoubtedly have different effects on the two types of farmers. The subsector benefiting from government loans and investments that produce for export or for local high-income groups will withstand better a shock such as a drought. On the other hand, peasants with small plots of land will be badly hurt."

The different case studies selected in this volume suggest that a common conceptual framework could be applied "ex post" to them. Or, to put it differently, a common theme appears, at last implicitly, in these case studies. We have made this theme explicit in suggesting the concept of "disjunction", firstly as a general—or primary—disjunction between agriculture and industry. In the text quoted above we are now able to perceive two types of secondary disjunctions within the agricultural sector: a disjunction of functions in the case of Argentina which reinforces the general—or primary—disjunction between agriculture and industry and a social and spatial disjunction in the case of Mexico.

In the Mexican case it is not the same agricultural class which takes up the two functions. In the same small region or locality, the fields of the large export farms might be contiguous to the fields of the small food-oriented producer. The disjunction of functions might also occur on the larger spatial scale of regions or subregions. As a shorthand we will refer to that case as "regional disjunction", as a particular form of secondary disjunction. The role of northeastern Brazil within the national context provides an example of such a disjunction, as the functions of the different subregions of the northeast. This is the subject of the following case study

comprising sections of the contributions written for the IFIAS Drought and Man project, by Gentil Martins Dias, Daniel R. Gross, N. Flowers and Edison Nunes.

From these contributions it will be seen that for a long time large sections of the ruling classes in northeastern Brazil have lived off federal subsidies, particularly those linked to "catastrophic" situations, such as droughts, which perhaps secretly they wished would become "constant catastrophes". A situation has thus been created in which those with vested interests in the status quo are also those who dramatize problems such as droughts or poverty, while giving the impression they are trying to solve them.

Such were some of the thoughts of Celso Furtado when, around 1960, he was shaping the policies of the SUDENE. In the late fifties and early sixties others such as O'Reilly Sternberg (1), Josué de Castro (2), the CIDA team directed by Solon Barraclough (3), Correia de Andrade (4) or even Alfred Hirschmann stressed the role of socio-economic structures (5). For instance Josué de Castro has pointed out:

> "Just as the whole Northeast is not drought-ridden, so drought is not the whole story, even in zones of the Sertao. We have long been struggling to demonstrate, to drive home in the national consciousness, the truth that drought is not the main factor in poverty or hunger in the Northeast; that it is scarcely even a serious aggravating factor in a situation whose real causes must be sought elsewhere. These causes are far more linked to social structures than to the vagaries of nature or to the physical conditions obtaining in the area." (6)

The CIDA study singled out among causes linked to social structures the persistence of "latifundismo":

> "If the interpretation that the rural problem of the Northeast is not basically one of lack of rainfall but of the social and economic organization of its agriculture is correct, then any attention given to the drought or the Northeast as an isolated problem is diverting attention away from the major problem of Brazil's agriculture: namely the persistence of *latifundismo*." (7)

But Celso Furtado introduced a new dimension in the analysis. Whereas he agreed that land tenure characteristics, and particularly "latifundismo", are certainly important explanatory variables, for Furtado the major explanatory factor was, and probably still is, that "the northeast is not an autonomous economic system—it is part of a wider system which is Brazil" (8); and, of course, Brazil itself occupies a subordinate position within the world economic system.

Sharing the general analysis made by Portantiero in the preceding chapter; we cannot but be struck by what the authors who analyse the drought-related problems in northeastern Brazil have to tell us: drought is a climatic factor which is used to the full as a resource in the reproduction of a system which contributes to the growth of the rest of Brazil. Catastrophes in northeastern Brazil are locked into this spatial model of unequal development. The utmost misery of the "flagelados" (the poorer members of the population in the drought-stricken areas) is the price paid for the affluence of the industrialists of São Paulo. Those who insist on treating drought as a variable which is exogenous to the system should at least ponder why, considering the vast land and water resources of Brazil, people have to live in a semi-arid area such as the "sertao" with highly irregular rainfall.

That drought can be considered a factor of production is reflected in the expression commonly used in the northeast—"The drought industry". This industry is financed mainly by funds from the federal government which amount to only a fraction of the resources drained out of the northeast by the rest of the

country. The bulk of its "output" contributes to maintain what Quesnay would have called "unproductive" classes—merchants, civil servants and bureaucrats, to which we would add the low-productivity "latifundistas". In such circumstances the latifundistas have no interest in intensifying their production and oppose any land reform which will fragment their estates. As Dias puts it in his contribution to IFIAS Drought and Man project:

> "by benefiting the large landowners and higher social strata of the arid hinterland, the drought produces effects which damage them in the long run. The reason is that in manipulating public resources [the 'drought industry' we referred to above] the oligarchies of the Northeastern hinterland manage to compensate themselves for the losses resulting from drought and at the same time increase their power and material resources. These resources thus operate as a powerful stimulus to inaction. . . . Droughts therefore facilitate the continued survival of the Northeastern élites through the transfer of public resources, instead of pressuring them into playing new roles similar to those played by ruling classes in other parts of Brazil."

Latifundism itself is not at the "root of the catastrophe" in northeastern Brazil, as its persistence has to be related to the transfer of resources (goods, capital and labour) from the "sertao" (the internal semi-arid drought-prone region) to the "zona da mata" (the humid coastal zone of large sugar cane plantations) and from the northeast to the rest of Brazil. With respect to the transfer of resources within the northeast, we would say that this occurs as a result of a subregional disjunction and, in the latter case, is due to a regional disjunction (within the national economy). A drought in the "sertao" triggers migrations as this subregion cannot absorb the shock, which is then dispersed over a larger spatial area within the northeastern region, particularly in the direction of the more economically active "zona da mata", and, within the whole of Brazil in the direction of the most affluent areas. In both cases these migrations, temporary or permanent, release cheap labour.

In order to maintain such a drain of wealth it is politically necessary for the oligarchies of the "sertao" to feel contented and therefore, taking the opportunity of recurrent droughts, a counter (though smaller) transfer of resources must be put into effect. This in turn allows them to maintain low levels of productivity and low wages, which constitute the conditions of reproduction of their latifundia. Such causal chains of explanation always have certain weaknesses when unsupported by strong empirical evidence. Research along the lines of the systems approach used in the UNRISD Food Systems and Society programme should permit further testing of these hypotheses and could possibly generate new ones. But we refuse to consider the causal chain as a chicken-and-egg problem. What we have learned through the IFIAS project and through the current UNRISD research, is (a) that no single factor explanation is valid (in this case latifundism alone or drought alone); (b) that there are complex interrelations; and (c) that there is a specific hierarchy of processes as well as levels of explanation in each situation. The misery associated with drought situations in northeastern Brazil is for us, and until further research disproves this hypothesis, a result of a major process occurring in Brazil—in the form of an unequal spatial model of development inserted in the present international economic order.

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B. Drought as a Social Phenomenon in Northeastern Brazil*

1. Northeastern Brazil: General Features**

1.1 NORTHEASTERN BRAZIL: A BRIEF HISTORY

The area which now constitutes the northeastern region of Brazil was formed in the sixteenth century when tropical agriculture was first successfully developed on a large scale. The earliest known agro-industrial complexes were established in this region and since then the region's most significant economic activity has been the sugar cane agro-industry.

Due to its very high levels of economic return, the sugar industry soon attracted substantial investment and opened the way for an original and complex productive system which comprised slave labour in large production units, which almost specialized in one single product. This established the three main characteristics of northeastern agriculture which lasted for more than three centuries: slavery (and its multiple variations), the latifundism and monoculture.

This system, which resulted in the concentration of wealth, political power and social prestige in the hands of a small number of the region's population—the rural oligarchy—had a profound influence which marks the social structure of the northeast even to this day. As sugar production became the region's most important economic activity, it was unable to absorb an increasing proportion of the population, due to the limited consumption capacity of the market, as well as by the limits to the area which could be used for cultivation of sugar cane, given current levels of technology.

Such limitations acted as powerful stimuli to the concentration of sugar-producing activity around the few "lords of the sugar mills". They also permitted the rural oligarchy to have almost exclusive influence on the administration and political control of the state. Economic privileges and highly favourable labour relations provided these élites with the bases of their political power, which in turn legitimized and strengthened their economic privileges. Politics and economics were thus two sides of one and the same reality: the power of the northeastern oligarchies.

In such conditions, few options were open to the surplus population generated within the system. The usual solution was to occupy the interior, or sertao,

*This section is based on the contributions to the IFIAS Drought and Man project by Gentil Martins Dias, Daniel R. Gross, Nancy Flowers and Edison Nuñes.

**By Gentil Martins Dias. Drawn from "Drought as a Social Phenomenon in Northeastern Brazil", prepared for IFIAS Drought and Man project.

composed of arid hinterland, where a precarious form of subsistence agriculture provided the possibility of survival. But the ecological conditions of this hinterland were very different from those existing near the coast—the "zona de mata"—where the sugar-producing agro-industry prospered. In fact, this northeastern region comprises three subregions: the "zona da mata" (a narrow strip of land along the coast, reaching from the extreme south of the state of Bahia to the state of Paraíba, a subregion with high rates of rainfall and comprising the most fertile lands of the region); the "agreste" (characterized by lower rainfall and by a flora which is transitional between the semi-tropical humidity of the "zona da mata") and the "sertao", a semi-arid subregion.

Given such distinctly diverse ecological characteristics, the economy and society which developed in the three subregions differed substantially. In the "zona da mata" large "plantations" of sugar cane, cocoa, coconut and piacavan palm were established, while in the "agreste" and "sertao" cattle-raising, cotton and subsistence crops such as manioc, beans and maize were produced mainly on small and medium agricultural holdings, although extensive latifundia could also be found. High rates of rainfall and a regular climate in the "zona da mata" have permitted the cultivation of highly profitable crops for large international markets. In contrast, low rates of rainfall and/or its irregular distribution through the year in the "agreste" and "sertao" cause periodic crises in cattle-raising, cotton and subsistence crops in the drought periods. These crises became more serious as population increased in the "sertao", due to the impossibility of expelling the surplus population from the sugar producing and exporting sector, which soon became highly concentrated in the hands of a small group of large landowners—the "lords of sugarmills" of the past—and the factory-owners ("usineiros") of today.

The rate of return on capital invested in sugar-producing, and, from the beginning of this century, in cocoa production, allowed the development of large urban centres on the coast, which also served as commercial centres for the landed élite. These centres, which nowadays constitute the main demographic, political and economic nuclei of the region, became regional power centres controlling the economy and society of the "agreste" and "sertao". In time, these urban nuclei became integrated, in a dependent way, into the central, national power structure which gradually concentrated in the centre–south region of Brazil in the nineteenth century.

The "sertao", its people and economy played an increasingly subsidiary role in inter-regional economic and political relations. At the same time, large numbers of people with relatively easy access to the land began to establish agriculture either on a small number of large properties devoted to cattle-raising on an extensive basis, or on a large number of small and medium units characterized by the use of family labour to produce food crops.

1.2 SOME FEATURES OF THE NORTHEAST TODAY

The northeastern region nowadays comprises a single federal territory consisting of nine states, whose population statistics are given in Table 1.

In the last three decades the population of the northeast has experienced high rates of growth, especially in the urban areas. However, when compared to growth

TABLE 1.
Population in the Brazilian Federation of the Northeast

States	Population	Density (inhab./km²)
Maranhao	2,997,576	9.2
Piauí	1,680,954	6.7
Ceará	4,366,970	29.7
Rio Grande do Norte	1,552,158	29.2
Paraíba	2,384,615	42.3
Pernambuco	5,166,554	52.5
Alagoas	1,589,605	57.4
Sergipe	901,618	40.9
Bahia	7,508,779	13.4
Fernando de Noronha*	1,239	49.5
Total	28,150,068	17.6

Source: *Anuário Estatístico do Brasil*, 1972. Brazilian Institute of Geography and Statistics (IBGE), Rio, 1973. Federal Territory.

rates for the country as a whole, we see that urban population growth has been more rapid in the rest of the country and that national population growth rates have been higher, in general, than in the northeast (see Table 2).

These differences reflect the lower level of urbanization in the northeast, lower standards of living compared with the rest of the country, and high rates of migration. These differential rates are the continuation of a trend beginning in the nineteenth century in which the northeast has a declining share of the total population of Brazil. For example, in 1940 the northeast had 35 per cent of the national population, while in 1970 the proportion was reduced to 30 per cent. In the same period, and as a result of differential rates of growth in the cities and the rural areas (Table 2), the northeast's proportion of urban population grew from 23.4 per cent in 1940 to 41.8 per cent in 1970. The region's urban population growth was concentrated in the coastal cities, especially in state capitals such as Recife, Salvador and Fortaleza. Between 1950 and 1960, and between 1960 and 1970, the annual population growth rates in these cities were respectively 6.89 per cent and 5.9 per cent for Fortaleza, 5.3 per cent and 4.9 per cent for Salvador, 5.1 per cent and 4.5 per cent for Recife. (1)

In studying changes in the northeast, it is important to note that large numbers migrate not only to regional urban centres but also to other regions of the country.

TABLE 2.
Median Annual Percentage Growth Rates of Urban and Rural Population, Northeast and Brazil, 1920–70

	Northeast			Brazil		
Period	Urban	Rural	Total	Urban	Rural	Total
1940/50	3.4	1.8	2.2	3.8	1.6	2.3
1950/60	4.9	1.1	2.2	5.6	1.6	3.2
1960/70	4.6	1.3	2.5	5.2	0.7	2.9

Source: *Censos Demográficos 1940–1950 e Sinópses dos Censos Demográficos 1960–1970*, IBGE, Rio.

During the period 1960–70, 1,344,000 people left the northeast for other states. Of these, 70 per cent migrated to the southeast, 19 per cent to the centre–west region, 5 per cent to the north and another 5 per cent to the south. In fact, in 1970, out of every 100 northeasterners, 4.8 migrated to another region of Brazil.

Table 2 indicates a considerable increase in Brazil's population growth rates after 1940, then declining in the decade 1960–70, even though population growth in this decade is still high. To a large extent the population increases resulted from a decrease in mortality rates, since the birth rates have remained constant. The birth rate in the northeast is higher than the national rate: in 1970 the median birth rate for Brazil was 38.3 per thousand, while in the north it reached 44 per thousand in Pernambuco (the most urbanized northeastern state) and 48 per thousand in Piauí (the least urbanized). (2)

With respect to life expectancy, comparing the northeast with more developed areas, the observed differences accentuate even more the disparities in levels of well-being and health. While in the United States average life expectancy is 73.2 years, in the state of Alagoas it is 46.4 years, and Ceará achieves the highest level in the region with 54.7 years.

The changes in the northeast's demographic structure clearly indicate a tendency towards population concentration in coastal areas, especially in large cities which almost monopolize the region's system of political power and its economic dynamism. In recent decades the government has made efforts to provide the region with an economic infrastructure sufficient to underpin its social and economic modernization. The establishment of "Operation Northeast" (OPENE) in an earlier period and, since then, the Superintendency for the Development of the Northeast (SUDENE), constitute important efforts in this attempt to provide the means and resources for modernizing the region and raising it to the level of the rest of Brazil. Even so, the northeast still remains an immense "pocket of poverty". Between 1955 and 1967 the region's internal income increased from 13 per cent of national income to 15 per cent in 1967, reversing the previous tendency in the Gross Domestic Product. Per capita income in the northeast, which was US$127.00 in 1955—equal to 38 per cent of national per capita income—increased to US$190.00 in 1967—49 per cent of average national per capita income. However, as can be seen in Table 3, per capita income levels in the northeast tend to remain fairly constant at less than half the national per capita income and less than one-third of levels in the southeast.

TABLE 3.
Estimated Per Capita Income in Brazil, by Region, 1950–69 (Brazil = 100%) (percentages)

Regions	1950	1955	1960	1965	1969
North	48,13	46,41	60,89	54,37	53,02
Northeast	42,42	38,52	46,89	49,34	45,40
Southeast	150,99	149,51	143,28	142,48	146,87
South	107,91	112,87	106,35	102,22	103,49
Centre–West	53,63	68,15	58,18	72,34	57,96
Brazil	100,00	100,00	100,00	100,00	100,00

Source: *Manual de Estatísticas Básicas do Nordeste*, Banco do Nordeste do Brasil S.A., ETENE, Fortaleza, 1977, p. 58.

This relative progress is mainly the result of the development of urban activities which, concentrated as they are in the large coastal cities, have also contributed to increasing the disparities between the humid and transitional subregions. Such development, to the extent that it provides large regional centres with new and diversified opportunities for employment and income, also serves to reinforce the traditional economic structure with its centres of power, income and economic dynamism in large urban areas.

However, these urban centres are not linked symbiotically with either the economy or the system of power which have developed in the centre–south of the country. In fact, a large proportion of the new industries being established in the northeast are simply branches of national or multinational companies, which take advantage of fiscal incentives given by federal and state governments to attract industry to the northeast. In most cases they are mere assembly units of parent companies in the south. The resulting industrialization process is highly dependent and tends to the intensification of commercial exchanges and integration with the centre–south, which "dictates" the pattern of urban and industrial development in the northeast according to its own interests.

Thus, the recent partial modernization of the northeast has become a chain of economic and political links connecting unequal parts (in terms of economic, political and natural resources), increasingly subordinating the rural area, its population and economy to the cities. Consequently, economic life and political participation in the "agreste" and the "sertao" are mediated by interests centred on the coast which, in turn, is dependent on groups and interests altogether outside the region. This chain of subordination ends in the international centres which generate the stronger impulses which are subsequently mediated regionally and locally.

This chain reaction is not a mechanical process eliminating regional and local centres having any bargaining power or a limited amount of autonomous political capacity. In other words, there is not one single effective decision centre in the process, but rather various centres of political and economic power which coexist. They interact, though, with unequal capacity to influence and without destroying the weakest, since these are essential for strengthening the more prosperous decision centres. What can be observed then, is a process in which *the stronger links seek to subordinate the weaker ones without eliminating them, but subordinating them through tacit or explicit commitments which draw from them political, economic and human resources and replace them with other resources of the same sort, but of a different quality and with different functions.* With these new resources the subordinated link can and must survive. It may have to transform itself, shedding some of its characteristics and integrating itself into remote and more powerful systems. This process seems to characterize the relations which increasingly integrate unequal parts of the northeast, city and country, coast and hinterland, and the northeast and centre–south (and the latter into a world system). (3)

1.3 PROFILE AND TRANSFORMATION OF THE NORTHEASTERN ECONOMY

In 1970 the active work force in the region totalled 10,717,000 workers, distributed among the various sectors of the regional economy as follows: 73.1 per

cent in agriculture, 20.1 per cent in services and 6.8 per cent in industry. (4) Despite state development policies and the regional efforts to industrialize the industrial sector, is still not very significant in employment terms, while agriculture and cattle-raising are still responsible for more than two-thirds of regional employment.

It is quite significant that, although less than 60 per cent of the region's population live in rural areas, agricultural and cattle-raising activities occupy more than 73 per cent of the work force. This fact may indicate a low level of effective employment among the urban work force. In addition to employing the bulk of the region's labour force, agriculture contributes 95 per cent of the region's exports. (5) Agriculture has an additional important role to play in northeastern society: it harbours those who cannot find another means of subsistence, becoming in effect a "breeding ground" for labour which eventually will be partially absorbed into the urban economy. (6)

After 1920, profound changes occurred in the structures of northeastern agriculture and cattle-raising. For instance, rural establishments numbered 162,000 in 1920, increasing to 2,222,000 in 1970. This dramatic increase in the number of rural production units resulted in the increased fragmentation of agricultural production, generating more and more small family units. Whereas in 1920 the average number of persons employed per establishments was 15.2, in 1970 this average had decreased to 3.52. Fifty years of intense fragmentation of the northeastern land-holding structure has doubtless resulted in greater access to land. In its report for 1970 the Banco do Nordeste do Brasil SA stated that between 1947 and 1967 the average area utilized by each person active in the rural sector increased from 0.98 hectares to 1.94 hectares; that is, an increase of 97 per cent in 20 years. (7) However, the process of fragmentation within agriculture has been accompanied by continued stagnation in the productive techniques employed. This has resulted in continued low levels of productivity, especially in the production of foodstuffs, in which the smaller productive units are generally engaged. Thus in 1970 the number of agricultural tractors in the northeast was 6033, with an average of only one tractor for every 368 rural holdings. The situation is similar with respect to the use of fertilizers, pesticides and other methods of increasing rural productivity. (8)

This low level of productivity characterized by an almost exclusive use of human energy in productive activities, is not common to all agricultural activity in the northeast. Some agricultural sectors which supply large consumer markets (especially those located in the humid areas), employ more sophisticated production methods with continuing increases in productivity. Other crops for regional markets, or for consumption by the producers themselves, have experienced stagnant or declining productivity. This may be due to more intensive use of land (ecological wastage) or heavy migration from the country to the city which deprives rural areas of a large part of their younger labour force (wastage of human capacity). (9)

Agricultural production on small units employing extremely rudimentary methods and techniques has produced a clear dichotomy in the sector: the "agriculture of the poor" and the "agriculture of the rich". On the one hand large rural holdings produce for large national and international markets, employing wage labour and agricultural practices and equipment which both absorb capital on

TABLE 4.
Number of Establishments and Rural Labour Force in the Northeast and South of Brazil, 1920–70

	1920			1940			1950			1960			1970		
Year	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Northeast	162	2.463	15.20	736	4.572	6.21	844	4.327	5.12	1.408	6.657	4.72	2.222	7.835	3.52
South	190	724	3.81	382	1.491	3.90	580	1.950	4.06	1.076	3.194	2.96	1.273	4.256	3.34

Source: Table prepared by the author, based on "Dados Preliminares do Censo Agropecuário 1970 Regiao Sul" and "Dados Preliminares do Censo Agropecuário 1970—Regiao Nordeste", Instituto Brasileiro de Geografia e Estatística (IBGE), Rio de Janeiro, 1972.
A = Number of rural establishments (in thousands).
B = Number of persons employed in agriculture and cattle-raising (in thousands).
C = Average number employed in agriculture and cattle-raising per rural establishment (B + A).

a considerable scale and also permit relatively high levels of capital accumulation. At the other extreme is a mass of small producers—small landowners, tenant farmers, sharecroppers, squatters, etc.—who produce to provide for their own most immediate needs and sell the surplus on local and regional markets. Given the small size of these markets, the inexistence of adequate storage facilities, agricultural credit or transport and also limited control over agricultural marketing systems, these small producers generally receive lower prices for their output. This prevents the spread of more effective production techniques and implements among small farmers, since they produce under conditions which allow no capitalization. In other words, this form of agriculture is reduced to combining the two factors which are relatively abundant in the region: land and labour. Human effort is intensified to obtain a larger output, but there are limits to the quantity of labour employed in each productive unit as well as to the amount and quality of land at its disposal.

1.4 TYPES OF RURAL SETTLEMENTS AND DECLINE OF THE ESTATE

As the number of rural production units increased, the forms of social, economic, political and administrative organization underwent profound transformation. The large estates—the main rural units of production—saw their social, administrative, religious and political functions reduced to almost total insignificance. In the past they had represented advanced commercial centres which organized their own rural population as well as that in the surrounding area. This allowed the colonial power to extend its influence into these rural regions, and later that of national authorities centralized in distant cities. Thus, the estate was often seen as an advanced fortress facilitating the integration of the interior with the centres of political power, economy, religion and culture. (10) The landlord was, in this sense, an agent who could be assured of vast advantages and privileges from the state in exchange for performing a semi-official role. There are numerous examples of writers and travellers since the sixteenth century describing these estates (and the sugar mills of the "zona da mata") as important centres from which power and authority irradiated over the rural areas. (11)

Possibly the most important phenomenon observed in the rural northeast has been the demise of the estate as a unit of organization and control of the rural population. The authority, power and services associated with it were gradually transferred to the small urban nuclei then emerging, and which have multiplied in recent decades. As the estate declined in importance as a centre for the rural population, agricultural activities were expanded through the occupation of uninhabited and unoccupied lands at the agricultural frontier, producing a multiplicity of family production units.

Consequently, the resulting atomization of the northeastern landholding structure removed those functions from the estate, whose decline was also due to other factors. In fact, after 1920 the economy based on agricultural exports clearly began to stagnate due to competition from foreign producers and to the government incentives for industrialization. Fiscal policies even required a deposit on agricultural exports, though this was refundable.

Parallel to these unfavourable developments for the rural exporting sector, the

process of rapid urbanization intensified, encouraging speculation in the real-estate market, because of high returns on capital in urban areas compared to those in the agricultural sector. Capital which remained in agriculture was not only unprofitable but also ran the risk of becoming devalued due to the persistent inflation which has affected the Brazilian economy over the past half-century. It was therefore logical to transfer investments from agriculture to urban developments, as happened in the northeast. This "decapitalization" particularly affected those rural activities with lower levels of profitability, with some crops more affected than others.

During this process, large landowners and their families began migrating to the cities, from where they administered their agricultural business. The functions of absentee landowners were performed by administrators. Since these did not possess the same powers of decision-making or the local political influence of the owners, the functions performed until then by the estate—the socio-economic and political pole of the countryside—gradually diminished, while the influence of cities and towns, which were already multiplying, began to increase. (12) In a few cases the impoverishment or decapitalization of estates resulted in property being abandoned, while in others there was little or no increase in agricultural land values, partly because the land frontier was being pushed back with the construction of roads which more quickly and efficiently integrated the new production units with the cities and towns.

These small new holdings which began to emerge were the result of a spontaneous process of fragmentation of the old estates plus the occupation of new lands incorporated into agriculture by the new means of transport. These generally small, very simply equipped production units represented practically the only alternative for survival for the rural masses in the face of the decline of the estate and the almost non-existent opportunities for urban employment. The new consumer markets for foodstuffs which emerged with the new cities and towns provided some new economic opportunities; but these markets represented very limited alternatives since their small size and limited purchasing power discouraged large-scale production, and provided limited possibilities for capital accumulation among producers.

A large number of the small and medium producers almost exclusively employed family labour and land. They could thus compete advantageously with those production units which had to pay wages to their labour force and/or employ other forms of capital such as animals, machinery, plant protection equipment, etc. Such conditions permitted the emergence of a large number of small agricultural production units in the economy of the northeast. These conditions also made it almost inevitable that food for regional consumption was mainly produced on family production units using very simple technology. Given these circumstances a substantial restructuring of power relations in the northeast was inevitable. Although the group of big landlords still resists, maintaining its high social status, it no longer retains the exclusive command of northeastern society. It is gradually being replaced by other strata, especially by merchants and traders who control the circulation of commodities, as well as those who gained control of the local government apparatus. It is through these, and through politicians and bureaucrats—the agents of the state—that mediation between the rural population and the national economic and political system occurs.

In these circumstances land tenure or ownership no longer results in the advantages which many would think only natural. The ownership of the means of production certainly assures the owner a margin of security denied the non-owner. However, this does not automatically guarantee a just reward for work, since the value of the producer's work is determined by prices established by groups outside the rural sector and which ignore the needs and interests of small rural producers. (13) The price of agricultural produce, especially foodstuffs, is established through mechanisms in which individual producers, isolated from each other, hardly participate. Consequently, a paradox presents itself: as the rural masses achieve their ideal of having their own means of production, they find themselves up against even more powerful chains of dependence which subject them to a new order. As this new order imposes itself in the hinterland, the small producer's responsibilities become heavier. Faced with the greater efficiency of the new "lords", the small producer has only two alternatives: leaving agriculture by migrating or accepting an intensification of their already considerable poverty. Despite being owners, in 1973 the great majority of small producers received a per capita income equivalent to only 26 per cent of the average for Brazil. To summarize: "this population lives on the extreme limits of the state of general poverty which still dominates the Brazilian rural areas". (14)

This rural mass is deprived of the means to accumulate capital, employing the most rudimentary production techniques and remaining unstructured as a group. Their dreams of independence and of wealth from the ownership of the land are frustrated and they are caught in the subtle and powerful trap of an urban economy which annexes them as pliable appendages. Dispersed throughout the immense hinterland, the small rural producers find very few opportunities for establishing links of solidarity or forming collective associations. Face-to-face contact, even among near neighbours—who may be several kilometres apart—is limited to occasional meetings at city and town fairs, or rare moments of crisis, such as sickness or accidents, when neighbours' help is needed. The continued fragility as a group is demonstrated by their limited political participation. The majority of northeastern agricultural workers are illiterate, do not participate in elections and suffer considerable limitations on their access to public bodies and institutions (such as official banks, registry offices, and providers of government technical assistance) with which they have to interact.

In these circumstances the rural worker tries to establish social relations of the "patron–client" type with the urban élites whose access to such official bodies is much easier and on more intimate terms. Therefore, small farmers are not integrated into the economy and national power structure through relations which characterize interchange in so-called advanced economic systems. Contrary to the formality and impersonal character of relations among "modern" groups, exchanges between rural producers and urban élites are those in which relationship networks link individuals and distribute resources in more obvious and personal ways than in more complex societies. (15) Informality more than rationality, loyalty more than impersonality, are what characterize relationships between small producers and their "superiors", especially urban élites.

Farmers who relate to the market both as producer and buyer, face four main problems: (a) competition from a number of similar producers also seeking access

to a market which is usually characterized by the limited buying power of the small urban centres and by storage problems; (b) conditions of isolation; (c) and nonexistence of collective forms of organization and the consequent difficulty, or even impossibility, of influencing the market; and (d) ignorance of the mechanisms which regulate the marketing process. Insecurity is, therefore, a basic factor in the day-to-day life of the small producer, whose natural reaction is then to turn to individuals and institutions which, due to the power they hold or represent, might assure them minimal security and some peace of mind. However, this is only achieved if farm output flows unhindered from the producer to the market. Thus the guarantee of access to the market assumes overriding importance.

When conditions dictate that marketing is controlled by a limited number of agents, continued access to markets will depend upon the merchant or trader who establishes the rules of exchange. In the search for a minimum level of security, small rural producers find themselves obliged to establish exclusive or almost exclusive relationships with traders, transporters and other middlemen, in exchange for regular buying of their crops and sales of other products the farmer may need. This implies a mutual commitment, and this form of commercial relationship is known in many areas of the northeast as *freguesia*. (16)

Freguesia is an informal contract uniting unequal partners—merchants and small producers—in which the weaker side seeks to achieve its aim of access to the market by offering loyalty to one particular middleman. These are essentially dyadic relations, in which the superiority of one party (the merchant) facilitates the fulfilment of functions very similar to those described by Wolf as those of the "patron", while the small producer fulfils the role of "dependent". (17)

The merchant's power and capacity to offer this clients easy market access over long distances, credit and political protections, determine the volume of his business and his range of influence. Therefore the merchant's success is determined not only by his economic capacity, but also by his political power and/or influence.

As the relationship between merchant and small producers deepens, it frequently assumes other dimensions in which friendship and loyalty strengthen even further the links between two individuals who are at polar opposites in terms of interests, economic capacity and political power. They might seem to complement each other, but when market access is exchanged for political loyalty and exclusive economic relations, the small producers are helping to perpetuate the very relations of power which, due to their unequal and discriminatory nature, condemn them to a position of political and economic dependence which precludes any possibility of ascending the social ladder. Deprived of any participation in decisions concerning the distribution of their produce, small farmers have no opportunity to participate, even partially, in the determination of the value of their labour. The monopsonistic position of those who act as middlemen for agricultural output—especially foodstuffs—gives them a privileged position in determining agricultural prices. These result more from decisions by merchants as a group, than from the natural play of market forces. Given their dominant position, merchants can retain a considerable part of the value of output, as can be seen in Table 5. This shows the percentage received by producers in the states of Ceará and Paraíba of the prices paid by the final consumer of these products.

Merchants constitute one of the most privileged social groups in the northeast.

TABLE 5.
Prices Received by Producers as Percentage of Prices Paid by Consumers: Averages for the Period 1959–66

State	Products: Rice	Corn	Beans	Manioc	Castor beans	Cotton	Sugar
Paraíba	53.6	37.2	55.2	49.1	55.0	78.4	40.1
Ceará	48.6	59.1	32.2	25.0	54.0	81.1	23.0

Source: SUDENE — *Estudos Básicos para a Formulacaode Programas de Desenvolvimento Agropecuario nos Estados de Paraíba e Ceará*, 1970.

They share the fruits of production without assuming risk, and can have a decisive influence on local and regional political disputes, deriving support for their own power through command of their client's and dependent's votes. Although not all merchants are politicians or directly involve themselves in political disputes, especially the more important ones, in one way or another they all participate in, and depend on, official or public bodies. Non-participation in politics, directly or indirectly, may result in not sharing the benefits and privileges which only the state, through its agents, can grant. Worse still, it may leave the merchant with no political protection in moments of necessity. When the state imposes taxes, grants subsidized credits or provides free services such as education, public health and technical assistance, it usually results in privileges for those who have more direct access to it. Through the control of votes or helping to obtain these for local and state politicians, the merchant acquires privileged access to and/or control over regional and federal organizations which operate locally.

In most cases the merchant is able to influence the choice of "those whose legal authority will legitimate and reinforce his power, enlarging his economic capacity. This is the case with police officers, clerks, justices of the peace and even federal agents". (18) With such influence and power the merchant—especially the more powerful ones—can render his relations with governmental organizations "official", through the manipulation of public services such as education, health, credit, etc., by which he can retain his "clients" ("fregueses"), "friends" and "electors". These alliances are first made locally, then on a regional level and later at state level, when merchants, large landowners and official administrators organize themselves in order to use the rural and urban votes of their "clientele" for the election of mayors, deputies, representatives and senators who will represent their interests at local, regional and national level.

The connections and alliances established between candidates and local political chiefs continually serve to legitimate national, state and local power and its domination of the rural population. It is thus impossible to separate individuals with political roles from those with economic roles: politics and economics cannot be separated since they are simply two sides of the same coin. Economic activity feeds the political apparatus which in turn legitimates economic practices. Marketing agricultural output thus becomes one of the instruments essential to the preservation and reproduction of the political order.

1.5 THE COMMERCIALIZATION PROCESS

Economic exchanges between middlemen and producers in the semi-arid zone of the northeast occur within the context described in the previous section. Here, to an even greater degree, producers are widely dispersed (and, consequently, so is production), with inadequate facilities, unreliable transport, insufficient agricultural credit, insufficient knowledge about the market on the part of producers, and inadequate minimum price policies and excessive profit margins in the marketing process.

The prevailing agro-climatic conditions and the relative abundance of land (and its low cost) encourages the dispersion of production in small, usually isolated, units. This adds both to the distance between producers and between them and the consumer markets, besides having other consequences such as preventing the cohesion of producers as a social group. This geographical dispersion increases the dependence of the producers on the intermediaries while increasing the cost of production (greater proximity of production units would reduce operational costs).

Traditionally, storage of output is at the production unit, in "paiós", which are rustic storehouses of limited capacity, while on other holdings these are metal storehouses with a storage capacity between 250 and 500 kg.

In recent years regional governments have provided the region with a network of silos and storehouses sufficient to cope with regional needs. Despite the reduced capacity of these silos, which can store about 100,000 tonnes, they have been used to only about 50 per cent of capacity. Such unsatisfactory results are due to the fact that the crops for which in theory non-farm storage is most needed, are precisely those which are most perishable, especially beans and manioc flour. Also, the norms for classification and standardization of agricultural products are based on the characteristics of products from the centre–south, which adds to the general mistrust on the part of producers with regard to public enterprise and its objectives.

The incapacity of northeastern agriculture to utilize even the limited storage network, also helps to demonstrate the power of a local marketing system. The co-opting and resulting dependence of small producers occurs in such a way that not even the stimuli and advantages provided by state initiatives are capable of removing small farmers from the control of the local marketing system.

As already pointed out, the main factors of production for farmers in the northeast are (intensive) land use and family labour. Very few use banks to acquire credit and financing. In fact, the financial needs of small producers are met almost exclusively by the merchants through loans in advance of production or pre-harvest purchase of output.

In recent years there has been a considerable increase in available agricultural credits (145 per cent in the period 1960–70), but almost all of these resources have been absorbed by crops destined for export, especially sugar-cane and cocoa. Moreover, the banking network is concentrated in the large cities, mostly on the coast. At the beginning of this decade only 23 of the 171 municipalities in the state of Paraíba, and 25 of the 142 in the state of Ceará, had local bank branches. (19)

Unable to cope with the legal and bureaucratic requirements demanded by bank credit facilities, the only alternative for the small farmer is to turn to the middleman

who, in these circumstances, can impose highly damaging terms which reduce the price the farmers receive for their output, and which threaten their independence.

The state may intervene in the rural marketing system in other ways, through, for example minimum price policies, technical assistance linked to agricultural credit and road building to help the distribution of output. However, minimum price policies have practically no impact in the semi-arid zone. Minimum prices are fixed and regulated according to rules which make them practically useless for the small producers, and the few operations recorded were with large intermediaries and processors of farm products. Technical assistance, linked to the provision of agricultural credit, employed 955 technicians in the entire region in 1970. Of these, 719 were in the state of Bahia, leaving 136 technicians for the other eight northeastern states. (20)

A recent study in the state of Bahia showed that the recent expansion of technical assistance services in the northeastern rural areas, especially that linked to the provision of rural credit, was "benefiting large producers who tend to be absentee landlords, since the large majority are merchants and those in liberal professions". (21)

Similar discrimination has occurred with regard to government policies in road-building in the northeast. These roads have been located in a way which benefits large producers and intermediaries, who are also the only owners of modern means of transport, such as trucks, jeeps, etc. This gives them an advantage over small farmers whose link with the markets is by roads only suitable for beasts of burden, to rural marketing centres or roads which lead to the cities.

During drought, this agricultural marketing system is forced to adapt to conditions of scarcity, especially in "short-cycle" products such as beans, manioc and corn, which are the most affected by prolonged dry spells. In these circumstances the intermediary's role extends to selling subsistence products coming in from other parts of the country. The small farmer's income reaches its lowest level, and to survive such farmers join the labour force on other farm establishments (though this is rare since these are also suffering the effects of the drought) or migrate to other regions and/or urban areas of the northeast. Alternatively they join the labour force employed on public emergency projects, which were created by the federal government to generate employment. Excepting migration, the possibilities result in increased dependence of producers on intermediaries who, in this situation, tend to expand their power and influence, acting sometimes as mediator between the state and those who have been most affected by the drought. In fact, in 1970, when the northeast suffered one of its most serious droughts, while state food production fell by up to −65.4 per cent, commercial activities in the northeast experienced an increase of up to +3.2 per cent (see Table 6).

As a climatic phenomenon drought does not distribute its negative effects equally. Although the causes are essentially natural, the effects are socially unequal in that the drought affects social structures whose dominant characteristic is inequality. One effect of such prolonged dry spells has been the strengthening of the marketing system described above, which is doubtless one of the greatest obstacles to the socio-economic development of the rural population in particular.

TABLE 6.
Percentage Change in the Value of Food Production in the Northeast at Constant Prices in 1970 Relative to the Previous Year

States	Variation in production of food crops
Piauí	−21.4
Ceará	−52.1
Rio Grande do Norte	−19.2
Paraíba	−24.1
Pernambuco	11.7
Alagoas	−1.6
Sergipe	−9.5
Bahia	−9.4

Source: Brasil-Ministerio do Interior, *Plano Integrado para o Combate Preventivo sao Efeitos das Secas no Nordeste*, Brasilia, 1973.

2. Drought in the Northeast: General Features

2.1 PHYSICAL CHARACTERISTICS OF THE MOST AFFECTED AREAS*

The semi-arid zone of the northeast is characterized by the scarcity and irregular distribution of rainfall, resulting from a convergence of climatic and geological factors, soil characteristics and hydrological influences. (22)

From the climatological point of view the following aspects must be taken into consideration: the rainfall is predominantly convective and orographic, distributed in an annual period of three to five months with average precipitation between 400 and 800 mm, irregularly distributed with variations of over 30 per cent. Average temperatures are relatively high (23 to 27°C) with a daily range of 10° and annual range from 1 to 50°C, while the average annual solar radiation is around 2800 hours per year, and relative humidity is low at an annual average of 50 per cent.

The more important geological aspects include practically impermeable crystalline soils covering around 50 per cent of the drought area (where water accumulation is limited to fractured zones) and sedimentary soils which have been greatly dried out by erosion, which considerably influences the volume of water which can be explored economically. The hydrological character of the area is a network of rivers which are strongly influenced by the pattern of rainfall. In fact all the waterways in the drought area, with the exception of the São Francisco and Paranaíba rivers, run dry in the months following the end of the rains, while in 60 per cent of the rivers studied there is an annual dry period of over 200 days in crystalline soils and 100 days for those in sedimentary soil areas. The northeastern semi-arid zone is characterized by soils of low development, which are shallow, rocky, wavy, and have a low water-storage capacity. The occurrence of soils with a high natural potential for acceptable levels of agricultural productivity are very rare. "The existence of soils with nutrient reserves for all types of crops is reduced increasingly, given the practice of extensive agriculture". (23)

*By G. M. Dias, *op. cit.* (IFIAS).

The area most affected by periods of drought includes part of the state of Piauí, the state of Ceará, and the states of Rio Grande do Norte, Paraíba and Pernambuco, with the area affected reaching from 81 to 100 per cent of the respective surface areas.

2.2 A BRIEF HISTORY OF DROUGHT IN THE NORTHEAST*

Portuguese dominion in northeastern Brazil, starting in the sixteenth century, did not extend to the whole of the present northeastern region. Only after they were firmly established in the coastal regions and the humid "zona da mata" did colonial expeditions venture into the arid hinterland and establish tentative occupation. By the first two decades of the seventeenth century, occupation of the dry zones had not reached more than 20 leagues inland. The Portuguese colonists' first contacts with the arid interior were quite disappointing and the inhospitable soil, rigorous climate and the virtual nonexistence of inhabitants were generally uninviting.

According to Afonso Arinos de Melo Franco,

> "the primitive groups of adventurers remained in the fertile forest land of Serra da Ibiapaba, on the frontier of Piauí, near the sea. The rest of the coastland [of Ceará] was not frequented by these people because the coast was flat, the climate dry and the land arid". (24)

There were, therefore, no large human settlements and the population of existing villages never exceeded about 100. (25)

Thus, what nowadays constitutes the interior of the states of Ceará, Paraíba, Rio Grande do Norte and a considerable part of Bahia, Sergipe, Alagoas and Piauí were, at the time, uninhabited areas whose ecological conditions prevented their incorporation into the economic and political system of the colony.

The first records of periodic droughts date from this period and their effects were already disastrous for the economic exploration of the land. The

> "efforts at occupation failed; the population of these lands occurred later in history, by people born or established in other regions of the country, representing a secondary phase in the formation of the Nation",

according to the historian Capistrano de Abreu. (26)

We owe the first record of a drought to Fernao Cardim:

> "in the year 1583, there was such great drought and sterility in this province (a fact rare and unusual in this land of continued rainfall) that for a long time the water mills did not operate. The farms of sugar cane and manioc were dried out, resulting in a great famine, especially in the hinterland of Pernambuco, causing four or five thousand indians to descend from the arid zone pressed by hunger, seeking help from the white people". (27)

According to Sampaio Ferraz there were four periods of drought in the seventeenth century: 1603, 1614, 1645 and 1692. (28) In the eighteenth century Joaquim Alves recorded five drought periods which affected the northeastern hinterland as a whole (1721–25, 1736–37, 1745–46, 1777–78, 1791–93) while eight other dry spells, although affecting a great part of the northeast, did not affect the region in its entirety. (29)

In the nineteenth century, identical problems arose in the semi-arid northeastern region, but by this time the population had grown from a few thousand in the

*By G. M. Dias.

TABLE 7.
Drought Periods in the Nineteenth Century
(states most affected)

Ceará	Rio Grande do Norte	Paraíba	Pernambuco
1804	—	1803–04	—
—	1808	—	—
1810	—	—	—
—	1844	—	1819–20
1824–25	1825	1824–25	1824–25
1829–30	1833	—	1833–35
1844–45	1845	1845–46	1845–46
1877–79	1877–79	1877–78	1877–79
1888–89	1888–89	1888–89	1888–89
1898	1898	1898	1898

Source: Joaquim Alves, *op. cit.* (29).

sixteenth century to 1,754,000 at the end of the nineteenth century. Table 7 indicates the frequency of droughts in the nineteenth century.

It is also around this time that we have the first accounts of travellers, naturalists and foreign scientists who record a common picture of aridity, natural poverty, climatic inclemency, drought, and the suffering of the northeastern population. In their *Viagem pelo Brasil*, Von Spix and Von Martius, two German naturalists, described the landscape from the northern borders of Minas Gerais to Piauí in the first half of the nineteenth century, and pointed out its main features—dry climate, absence of rainfall and the poverty of a soil covered mainly with vegetation adapted to a hot, dry climate. According to these two naturalists, despite precautionary measures taken by northeastern farmers, especially large farmers who built wells and cisterns in the rock for storage against dry spells, hunger and thirst destroyed "half the flocks and herds of cattle which came from Piauí before reaching the São Francisco River". (30)

Henry Koster, who travelled through the interior of the northeast in the first decades of the nineteenth century, recalled identical impressions of the arid hinterland and scarce rainfall which impeded agricultural activities where large investments were not possible. Penetrating into the interior of Rio Grande do Norte, he wrote in his *Travels in the Interior of Brazil*, published in 1812,

> "The country I passed through from Natal, can never, whatever the state of civilization or the increase in population, be rendered fertile; but without doubt it might be much improved, if proper wells were sunk, reservoirs made for rain water, and trees planted". (31)

In Ceará he recorded extreme aridity and devastating drought. Identical impressions were left by James Henderson in 1821 (32) and by the Frenchman, L. F. de Tollenare, who referred to the drought of 1810 as having affected the northeast hinterland in such a way that "rich families were ruined and many people died so that today it is a sparsely inhabited region; it is not rare to find abandoned villages, whose inhabitants died or moved to other places". (33)

Other foreign travellers registered similar impressions on subsequent occasions, as did George Gardner, who described the 1825 drought in Ceará as having caused 30,000 deaths besides catastrophic losses in agriculture and cattle-raising. (34)

Since then a considerable literature has accumulated about northeastern droughts and their effects. In 1856 the Imperial Government demonstrated its concern to find solutions to the disasters constantly produced by the drought and created a "Scientific Commission of Exploration". This recommended improvements in water storage and transport for which the construction of 30 dams was considered necessary, plus the installation of meteorological stations and the opening of a canal connecting the São Francisco and Jaguaribe rivers. These suggestions constitute the first attempts at a "hydraulic" solution to the challenges presented by drought.

In 1870 and 1880, when there was an extremely long drought with serious social and economic consequences ("The Great Drought" of 1877–79), many studies were published about its causes and effects. Around this time the problem began to gain greater attention from the central government, since rapid population growth in the semi-arid zone of the northeast and the unpreparedness of public administrations had allowed droughts to become immense calamities. In fact, during the two years of the 1877–79 drought more than half the population of the "sertao" died; a major disaster in Brazil's history. It was then that the first scientific studies appeared, analysing the causes of the dry spells, their regularity, their predictability and their relationship with other natural phenomena, as well as more adequate procedures for facing the problem.

But it was still a long time before the government took more effective action. During the Imperial period (1822–89), the government did not undertake any large-scale public works for fighting drought. Ten years after the great drought of 1877–79 the recommended constructions still had not been begun with the exception of the Cedro dam, in Ceará, which was completed only in 1906. Another drought hit the northeast in 1888, and in the following year the new republican regime did little to change the old policy of waiting for the calamity and only then thinking about what could be done to solve the problem and limit the effects.

Only in 1904 were resources allocated through the Federal Budget Law for the fight against drought, and three committees were created to study Dams, Irrigation and Public Construction Works against the Effects of Droughts. Later, these were substituted by the Committee on Dams and Irrigation to prepare studies for the construction of dams and the sinking of wells in 1905 and 1909. In this latter year the "Inspetoria de Obras contra as Secas" (IOCS) was established, which had much greater resources than its predecessors and which could also count on the experience of previous attempts by earlier government agencies at fighting drought.

From the start, IOCS concentrated all its resources on engineering, especially on the building of dams and roads. The approach remained basically the same when IOCS was transformed into the "Inspetoria Federal de Combate as Secas" (IFOCS) in 1919 and it went unchanged until the 1940s. But IFOCS' activities did not evolve in a continuous way. Instead, the occurrence of droughts and their intensity determined the scale and pace of public works. To these pressures were soon added the influence of northeastern representatives in Congress and other regional politicians, who thereby in so doing sought to enlarge their prestige and power.

Parallel to IFOCS, special funds were allocated to assure continuity in the projects, such as the "Caixa Especial das Obras de Irrigacao de Terras Cultivaveis

no Nordeste Brasileiro", in 1920, which continued—with varying levels of funding—under the Constitutions of 1934 and 1946.

The decade beginning in 1940 saw innovations with regard to state efforts to combat drought. In 1945 IFOCS was transformed into the "Departamento Nacional de Obras contra as Secas"—DNOCS—(National Department of Public Works against Drought). The Committee of the São Francisco Valley (CVSF), created in 1948, later became the main agent in the drought zone, that is, the valley of the São Francisco river, extending from the north of Minas Gerais, taking in the state of Bahia and passing through the states of Pernambuco, Sergipe and Alagoas. These agencies were later joined by the Banco do Nordeste do Brašil, which was established in 1952 to develop the regions susceptible to periodic drought and to provide financial support to farmers affected by drought.

Since then the Banco do Nordeste do Brasil has also financed research whose scientific and methodological scope and sophistication has permitted much more efficient government policies. The task force for the development of the northeast (GTON), created in 1956, prepared the pioneer document "A Policy of Economic Development for the Northeast", in 1957, which not only was innovative at the time, but continues to guide government action in the public sector for the economy of the region.

Of all the public organizations created by the government to deal with northeastern problems, none has had as many financial, human and political resources as "Superintendencia do Desenvolvimento do Nordeste" (SUDENE). This body was created in December 1959 for the purposes of

> "studying and proposing lines of action for the development of the Northeast; supervising, coordinating and controlling the elaboration and implementation of projects being developed by federal bodies in the region and which are specifically related to its development; executing directly or through agreements with independent agents, agreements or contracts, those projects relating to northeastern development which may be attributed to it under current legislation; and coordinating national and international technical assistance programme for the Northeast". (35)

During this century there have been eleven serious periods of drought whose duration has varied from one to three years, as can be seen in Table 8. Only the 1966 drought was a partial one.

Until the 1950s, as we learn from Thomaz Pompeu Sobrinho, (36) there were four alternative proposals to fight the drought in the northeast; (a) the solution emphasized by central government—that was essentially hydraulic, recommending irrigation and dams; (b) the solution which proposed reforesting or foresting the affected region; (c) solutions based on a careful use of rainfall (dry-farming); and (d) a composite solution based on adequate adjustment of the physical environment and social conditions to new situations. This involved training the available human resources in "psychological preparation or integration of the country's ruling élites with the knowledge, advantages and economic, political and moral interests of the Northeast in relation to the rest of the nation". (37)

Despite the fact that such proposals have been discussed for decades, government responses in this century have been limited to emergency action through dam- and road-building and through assistance given to the population affected by distributing tools and food and providing employment in emergency work programmes. Already in 1913 the engineer Miguel Arrojado Lisboa, Director

TABLE 8.
Drought Periods in Northeastern Brazil in the Twentieth Century

Periods	Duration (years)
1900	1
1903	1
1915	1
1919–20	2
1931–32	2
1942	1
1951–53	3
1958	1
1966	1 (partial)
1970	1
1972	1

Source: For statistics up to 1970, *Plano Integrado para Combate Preventivo aos Efeitos das Secas No Nordeste*, Ministerio do Interior, Serie Desenvolvimento Regional no. 1, April 1973.

of Drought in IOCS, regarded the solution as being one of rainfall retention through damming. His strategy was based on

> "storing the winter rains for use during the dry spell; storing it in rainy years to be used in the dry one, which are rarely general, rarely continuous, and only exceptionally occur here, as in India, repeatedly in three successive years". (38)

The number of dams built in the northeast by 1973 had reached 849, of which 252 were public and 597 were private property. (39) In 1972 the irrigation canals extended for 1,184,374 metres, (40) reflecting the extent of efforts undertaken by the government this century to give the region a complex infrastructure. Besides dams and irrigation canals, the efforts to meet the challenge posed by drought emergencies include an extensive network of roads.

In recent years there have been increased government efforts to absorb the labour force left unemployed by the drought on an ever larger scale. During the drought of 1970 there were 147 work projects, occupying around 500,000 workers on a temporary basis. Despite increased government action and the sophistication of the agencies which plan and implement the plans to fight the drought, drought continues to be perceived as an unpredictable disaster in so far as public action is limited to fighting its effects and rarely, if ever, tries to prevent its occurrence. Perceiving drought as a climatic phenomenon, or even fatality, helps to reinforce and justify paternalistic welfare politics which have characterized public action throughout the twentieth century, as was the case even in the most remote past.

It is doubtless true that, given the multiple economic possibilities of the Brazilian government, it has been capable of preventing the repetition of disasters similar to that in 1877–79. But the emergency projects, their intermittent character and their temporary effects have helped to strengthen the tendency to consider the northeast hinterland as a disaster area. Here progress is also something irregular and uncertain, and social structures and power structures are organized on the basis of

the uncertainty which dominates economic activity—especially agriculture—and on the basis of dependence on the political structures of the central government.

2.3 SOME CONSEQUENCES OF PUBLIC INTERVENTION*

Among the ambitious plans formulated by SUDENE's founders was the industrialization of the northeast to increase productivity, raise income, diversify its economy and reduce its vulnerability to climate. SUDENE was given authority to make long-term loans and to grant substantial tax advantages to firms willing to locate in the northeast. A priority list was drawn up which was intended to direct development to the less-developed, more drought-prone states, and away from major centres of population. It favoured industries which would generate more employment. In practice, however, most of SUDENE's resources have been concentrated on a few industrial parks near already swollen urban centres on the coast. Relatively few resources have been invested in agriculture.

Among the industries attracted to the northeast are a number owned by multinational corporations attracted by cheap northeastern labour and tax incentives such as the Willys (now Ford) assembly plant in Pernambuco and the Dow Chemical plant in Bahia. Many plants are capital-intensive, bringing skilled workers with them from the south rather than recruiting in the region. Since markets have not expanded commensurately, products are often shipped to consumption centres in the south. Thus, the industrialization programme created a virtual "platform economy" in the northeast with more advantages for the investors than for the regional economy. In the northeast, as in Brazil in general, there is evidence that corporate managers, particularly from the multinationals, have tended to adopt production systems from abroad, rather than adapting to local conditions. This would appear to be the result, in many cases, of a simple failure to examine the possibilities inherent in the Brazililan labour market. In a recent study Morley and Smith lay the final responsibility with the planners of Brazil's growth:

> "if LDC's are permissive and insist on developing industries that are capital intensive by nature—this seems to be the case with Brazil until now—they should not be surprised that multinationals do not employ more labour". (41)

In an earlier analysis, D. E. Goodman (42) shows that the SUDENE industrial development programme based on Article 34/18 had not yielded favourable results for employment or industrial location, nor was it likely to do so for a variety of structural reasons. In 1978 the Brazilian news magazine *Veja* released the contents of a secret internal report from SUDENE. According to the article, the report states that the northeast's share in total industrial investment in Brazil fell from 7.6 per cent in 1960 to 6.5 per cent in 1974, while the proportion of industrial employment in the northeast fell from 12.4 per cent to 8.2 per cent. Since the foundation of SUDENE only 300,000 new industrial jobs had been created while rural–urban migration continues at the rate of about 200,000 per year. The rate of unemployment for the northeast as a whole is 18 per cent of the active population and underemployment is estimated at 26.5 per cent.

* This section draws on *The Political Economy of Drought in Northeastern Brazil*, by Daniel R. Gross and N. Flowers—prepared for IFIAS Drought and Man project.

This SUDENE report goes on to state that while the increase in productivity of labour was greater in the northeast than in the country as a whole, the region's relative share in wages declined, concluding that "the gains in labour productivity were totally transferred to capital" and out of the region. More than two-thirds of the fiscal incentives provided by SUDENE went to firms originating outside the region and 60 per cent of the incentives go to just three metropolitan areas—Recife, Salvador and Fortaleza. (43) If these figures are correct, they would tend to confirm what many northeasterners already believe, that their region simply has not shared in the phenomenal growth experienced by the rest of the country, and that migration remains the only realistic hope of betterment.

The picture is similar if one looks at agriculture. With so much water stored in the northeast, it is remarkable that so little has been done to use this water for irrigation. In his recent study, Anthony Hall (44) shows that official support for irrigation projects has been strong only since the 1960s. During this period, SUDENE and DNOCS adopted a strategy whose goals were: (a) to fix the population of the northeast on the land; (b) to raise agricultural production, and (c) to raise the income of farmers. Hall's study reveals that, in general, none of these goals has been achieved. Many of the irrigation projects were located in relatively fertile, well-watered river valleys where the vulnerability to drought was low. Even the colonists selected to work the irrigated lands were chosen from among sectors of the populations relatively unaffected by the droughts. Moreover, the number actually settled on irrigated land was only about one-fifth the number displaced by the irrigation projects.

The projects are classic examples of technological overkill since they combine very expensive engineering works with extraordinarily inefficient execution and high start-up and operating costs. Many projects have large operating deficits and the rate of amortization is far below the 10 per cent target rate. Among the problems which have beset the projects are waterlogging, salinization and totally inadequate market projections. In short, experience so far seems to condemn irrigation as a solution to the northeast's problems since it appears incapable of providing a satisfactory return in terms of employment generated, income and production which could compensate for the enormous capital investments involved. Again, such investments seem even less advisable when one considers the enormous unexplored agricultural potential of Brazil's north and west where irrigation is unnecessary.

Furthermore, it is well known that many of the public works built during droughts were built for private benefit. Perhaps the most common projects of this sort are the reservoirs (acudes, tanques, etc.) built on private land using federally or state-subsidized labour. These reservoirs are supposed to store water for human consumption, but frequently they are more suitable for watering cattle. The justification for constructing them on private land is that such lands are accessible to the dwellings of tenants and nearby smallholders. Moreover, during drought, there is little time for public expropriation and filing of deeds, and the aim is to provide as much employment as possible as rapidly as possible.

There are other ways of diverting public funds to private ends during a drought crisis. Roads may be constructed to pass near particular estates, adding to their value. Construction projects yield business opportunities to the suppliers of

construction materials. Workers are invariably recruited from among the families and followers of political élites at all levels. The loyalty thus engendered can be turned into profits and other advantages in numerous ways. Foodstuffs imported for distribution to the needy under government and private charity programmes may be diverted to the dining tables of local élites when they are of high quality. Or they may be sold illegally, or used as payment for services in lieu of cash. Finally, there is evidence that, during droughts, public officials simply steal sums of money destined for drought relief through graft, kickbacks or other means. In sum, there are numerous ways of diverting hastily raised emergency relief to private ends.

Perhaps the most important benefit accruing to the élites who manipulate and administer these relief programmes is that they are able to retain a dependent, docile labour force on or near their estates, which might otherwise migrate from the region. It should be noted in this connection that, to an extent. the local élites of the northeast are in competition with labour markets in other regions of Brazil for the strong, undemanding *nordestino* labourers. To the extent that they succeed in their quest for emergency drought-relief funds, the northeastern élites can retain a resident labour force and are protected from full competition from more efficient and productive enterprises elsewhere in the country. There is, then, a disincentive to investing in more efficient production techniques or in economic activities less prone to climatic fluctuations.

The trend in land tenure described earlier for the "sertao" appears to continue in much of the northeast. While large estates are still to be found and there is a high level of concentration of holdings, there is nevertheless a growing number of smallholdings, particularly in the "sertao" and "agreste" regions. Land may be acquired by purchase, inheritance or squatter rights, and owning one's own plot of land is a life goal for millions of northeastern peasants. Landownership, however, by no means confers independence, economic or otherwise. Most of the millions of smallholders in the northeast produce foodstuffs for home consumption plus additional crops for erratically fluctuating markets. They are dependent on shopkeepers for retail credit, on middlemen for agricultural credit, market access and other favours. They are also dependent on landowners for employment, and finally they are dependent on the erratic rainfall for the success of their crops. Most of them are ineligible for help from agriculture extension and other agencies which have a distinctly urban stamp. (46)

In spite of the high infant mortality rates the population grows at about 3 per cent a year. However fast the smallholdings proliferate, they cannot possibly absorb the enormous increase of labour which the next generation contains, especially without modern inputs to raise productivity on these holdings. The local impact of these conditions is devastating. While Brazilian television networks show colour images of tractors, reapers and combine harvesters, the northeastern peasant scratches away at depleted soils with hand tools, and suffers poor health and malnutrition. In fact, some studies suggest that health levels are declining as the incidence of infectious diseases increases, and food consumption drops along with real income. The northeast has by far the lowest life expectancy at birth in the country. (47)

This situation is exacerbated in time of drought. The small-scale, undercapitalized, technologically simple peasant farm is particularly vulnerable to drought. Even in years of average rainfall these peasants have difficulty in making ends

meet. They can rarely accumulate savings in any form, beyond perhaps a pig raised for slaughter. In average years household food stocks frequently run out before the new harvest is in, obliging the peasant family to buy food on credit. When a drought threatens, prices rise, credit is withdrawn even by the official banks, (48) and landlords begin to evict tenants before they can become burdensome dependents.

To sum up, the drought is but one element in a complex social and economic structure in the Brazilian northeast which has important links with the entire nation. The northeast is not simply an impoverished, backward region which has lagged behind the rest of the nation because of its climate, religious traditions and its lack of dynamism. Since the last century the northeast has become a virtual satellite of the more dynamic south and relations between the two regions tend to reinforce the prevailing inequality. The droughts are an important element in reinforcing dependency relations within the region, and between the region and the south. They are also critical events spurring the migratory flows which create the vast "reserve army" of workers so important to Brazil's peasant economy. There is, therefore, reason to believe that the dependency relations between the northeast and other regions and within the northeast itself are equally important factors in understanding the poverty and backwardness of this region.

3. Drought in the Early Seventies

3.1 THE SOCIAL IMPACT OF THE 1970 DROUGHT*

". . . suffer the rich and suffer the poor;
Although the poor suffer more
Even the wealthy are greatly afflicted:
The poor cry for bread
The rich cry for dough."

(from the *Literature de Cordel*)

The most immediate physical consequence of water shortage or drought is a reduction in agricultural output. The effects range from the loss of part of the crop to total failure of the harvest and the rendering of the soil unfit for further cultivation. In the semi-arid regions of the northeast the three main sectors of the rural economy—subsistence crops (manioc, maize and beans), *moco* cotton, and cattle—are each affected differently by the drought. Subsistence crops are usually the most severely affected with lesser effects on cotton and cattle raising. This is often a reflection of economic priorities. Landowners attach prime importance to the preservation of their livestock since this is the most expensive item in their investment portfolio and also the hardest part of the enterprise to replace. Areas planted in subsistence crops and cotton may be turned into grazing lands in the event of drought even if it means the displacement of peasant tenants. Control of land may therefore be the critical factor in determining which parts of the agrarian economy survive the drought.

*This section is drawn from "Social and political aspects of the drought in Northeast Brazil", by Edison Nunes, prepared for IFIAS Drought and Man project.

The fall in output of different agricultural crops resulting from the drought of 1970 are shown in Table 9, which compares production in that year with the preceding year. The fall in supplies led to considerable increases in the prices of cotton and staple crops; thus, the price of manioc more than doubled. These price increases have to be borne by labourers and peasants obliged to work on the work programmes at wages below normal rates. (49)

TABLE 9.
Area Cultivated, Quantity Produced and Prices of Crops in 1970 Compared with 1969 for Farms Affected by the 1970 Drought (1960 = 100)

	Size of cultivated area	Quantity produced	Prices
Annual			
Bush cotton	96	13	124
Beans	99	22	184
Maize	96	14	157
Permanent			
Tree cotton	94	45	309
Carnauba	91	89	102
Castoroil seeds	103	23	162
Manioc	69	39	213

Source: *Carater e Efeitos de Seca Nordestina de 1970*, Recife, SIRAC/SUDENE, 1973, p. 175.

Those who do not own land are the worst hit by the drought. For those obliged to work the lands of others, the drought means "the loss of wages and/or access to small plots of land on which crops essential to family subsistence may be grown; the payment of rents either in money or kind, let alone the sale of any crop surplus, is rendered impossible". (50) The market for wage labour is flooded by persons looking for work while the demand for wage labourers is simultaneously reduced by crop failure.

Small landowners (independent peasants) are in a somewhat better position. The drought may cause the partial or total loss of their crops and livestock but there are often parts of their land which they can cultivate again. To some extent they may be able to live off savings which they have accumulated prior to the drought. It may be possible to secure credit from local merchants and, in a few cases, from banks. Once these resources are exhausted, however, small owners are reduced to the same plight as the landless, having either to migrate or join the work programmes.

In general, the majority of those who leave the area—owners or landless—return after the drought is over, though a sizeable number choose to stay on in the towns to which they have moved, worsening the problem of urban overcrowding. The statistics on the rate of return of drought-stricken immigrants are very sparse. Inter-regional differences in the severity of water shortage and lack of agreement between official bodies as to what precisely constitutes drought make a co-ordinated survey of the problem difficult.

In 1970 the situation of the rural population in the northeast was as follows: 32 per cent of rural families were dependent on income from wage labour, 31 per cent were small owners and squatters, 16 per cent were tenants and sharecroppers and 11 per cent owned either medium-sized or large properties. This last group does not suffer greatly in times of drought, principally because they can live off their savings, have access to credit and benefit from the public works undertaken on their properties. The remaining 89 per cent of the population are potential *flagelados* or peasants displaced from the land by drought. (51) Some idea of the size of this potential army of victims is given by the fact that roughly 14 million people, 48 per cent of the total population of the northeastern people, live in the area susceptible to drought, known as the Polygon. (52) This is an administrative region defined in 1951 as a means of clarifying which state and municipal authorities would bear responsibility for assisting neighbouring areas stricken by drought.

The majority of those enrolled in work programmes do not own land but are mainly sharecroppers or other peasant tenants. The vulnerability of this group in times of drought is directly related to their dependence on landowners. The rights of this group are extremely limited at all times. It is not in the interests of the owner to improve the plot allocated to the tenant or allow him to improve it himself, since this may result in a claim for the payment of indemnity in the event of his dismissal. Also, owners do not normally permit their tenants to plant fruit trees for the same reason; nor do they have a right to retain the root of the cotton bush. While sharecroppers are prevented from grazing their own cattle on the land ceded to them, they are obliged to let the landowner's cattle graze on their stubble. (53)

Wage labourers registered as working on the programmes represent 32 per cent of families employed in agriculture in the northeast but account for less than 10 per cent of those enrolled. This may reflect the selection criteria employed by the large landowners, who largely control recruitment to the work programmes. In order to strengthen their position as political patrons these landowners naturally give first priority to their own tenants—that is, the group which may most easily be mobilized to vote in accordance with the owners' wishes.

3.2 THE ECONOMIC EFFECTS OF THE 1970 DROUGHT*

In 1970 the area affected by the drought comprised 573,469 km^2, that is, 38 per cent of the northeast region, and 7,677,000 inhabitants, that is, 31.8 per cent of the regional population at the time.

The most notable effects of this dry spell included a substantial reduction in regional economic activities, especially in agriculture; a considerable increase in the number of unemployed; a decrease in regional income; governmental intervention, particularly through emergency programmes of the federal government to deal with the urgent needs of the population affected by drought; and considerable social disorganization due to the increase in anti-social behaviour such as theft, assault, assassination, prostitution, etc.

As to the economic effects of the drought on agricultural activities in the four states most affected by the drought (Piauí, Ceará, Rio Grande do Norte and

*Section by G. M. Dias, IFIAS, *op. cit.*

TABLE 10.
Estimate of the Value of Forecast and Actual Output in the Main Cultures in 1970 at Current Prices (in CR$)*

	Forecast			Actual			Losses			
	Food crops	Industrial crops	Total	Food crops	Industrial crops	Total	Food crops	Industrial crops	Total	% "deficit" of predicted production
Piauí	42,931,215	21,163,033	64,094,248	33,743,938	15,533,615	49,277,553	9,187,277	5,629,418	14,816,695	23
Ceará	121,523,298	144,195,602	265,718,900	58,209,742	59,612,650	108,822,392	63,313,556	93,582,952	156,896,508	59
R.G. do Norte	57,054,990	124,310,750	181,365,740	46,100,270	66,754,842	112,855,112	10,954,720	57,555,720	68,510,528	38
Paraíba	103,836,522	224,675,815	328,512,337	78,811,857	174,797,914	253,609,711	25,024,665	49,877,901	74,902,566	23
Total	323,346,025	514,345,200	839,691,225	216,865,807	307,699,021	524,564,828	108,480,218	206,646,179	315,126,397	38

Source: *Plano Integrado para o Combate Preventivo aos Efeitos das Secas no Nordeste*, p. 159.
*Rice, corn, manioc, sweet potatoes, beans, cotton, peanuts, tobacco, castor seeds and sisal hemp.

Paraíba), the statistics available at the moment indicate losses of up to 38 per cent of the agricultural production compared with that predicted for the year 1970.

However, according to official statistics, drought did not affect industry or commerce in any considerable way. (54)

The losses caused by the 1970 drought in the economy of the northeast were estimated at around 0.3 per cent of the Gross Domestic Product of Brazil. (55) Clearly *drought has only a slight impact when it is assessed in overall economic terms*. However, the big drought of 1970 directly affected the lives and welfare of 7½ million northeasterners, who suffered direct economic loss as well as deprivation. This represented approximately 8 per cent of the national population, a fact which clearly demonstrates the importance of drought as a social phenomenon. In other words, its economic "low cost" only reflects the low economic weight of the population affected. In fact there are no other examples in Brazil of millions of people being thrown simultaneously into unemployment, hunger and despair. In 1970 the work programmes created to minimize unemployment created by the drought managed to employ ½ million people.

There are few statistics and little empirical evidence to show the effects of the drought as a factor in the endemic malnutrition in the northeast. The statistics now available do not indicate a statistically significant relationship between drought and malnutrition as cause and effect. However, there are some indications of causality between the two phenomena, and the fact that they do not show up in the statistics may reveal deficiencies in, and lack of credibility of, the statistics themselves.

Drought periods have been accompanied (as was the case in 1970) by an increase in behaviour classified as anti-social, such as prostitution, theft, assaults and threats of invasion of small cities, storehouses, etc. by the hungry population. Such situations reveal that the rural population in the northeast cannot cope with the drought under the existing social and political structures.

The drought of 1970 occurred within a framework of general developmental euphoria, and the dramatic effects and publicity achieved, especially during and after the President's visit to the affected areas, doubtless contributed to alert public opinion to the fact that the nation was far from the desired level of development. Since then, government policies have attempted to approach the problem of drought in a less "hydraulic" and mechanical way, and the reports produced by the Ministry of the Interior, as well as projects in the "Polonordeste" programme, now devote more attention to the social aspects of drought.

3.3 SOCIAL AND POLITICAL EFFECTS OF DROUGHT*

Despite the calamitous effects of drought, the fact remains that they do not have a general effect or affect everyone indiscriminately. A detailed examination of the consequences of drought, especially in the twentieth century, indicates that the economic sector most affected is agriculture and particularly the subsector producing annual crops, especially food: manioc, beans, corn, etc. Thus the first and certainly biggest impact is on these social strata which are less equipped in economic and political terms. By affecting the poorest most drastically, the drought

*Section by G. M. Dias, IFIAS, *op. cit.*

reinforces the already accentuated differences between rural and urban population, as well as the differences between the small producers of subsistence crops, who constitute the great mass of rural producers, and the large-scale farmers who mainly produce export crops (cotton, hemp, etc.) as well as raising cattle. In the recent decades these large landowners have been the main beneficiaries of efforts to fight drought, since by using their political influence they can benefit from subsidized credits and public works such as dams, irrigation channels and roadways which are usually located near and/or serve these large properties. Large-scale rural holdings thus became better equipped to fight the effects of drought. This in turn became a powerful pretext to "justify" the transfer of public resources to privileged groups who take advantage of these circumstances in order to fight the effects of drought, and also to obtain resources at zero cost. This strengthens their economic, political and social position *vis-à-vis* other social groups. Drought thus becomes *a strategic element in the process of accumulation by large rural production units in the northeast.*

This strategy was (and still seems to be) so efficient that, as often as not, large landowners have not hesitated in attempting to encourage government action under false pretexts in order to attract public resources which, in helping the "drought victims", were ultimately encouraging what came to be known as the "drought industry".

Drought cannot be seen simply as an ecological calamity which limits productive capacity and disorganizes and reorganizes the economic and social structures of the arid hinterland of the northeast. Rather the phenomenon must be seen, above all, as a crucial period in which the socio-economic structures of the northeast—especially the agricultural sector—are exposed to severe pressures. During this period the precarious balance in the social fabric of the northeast is threatened by material privation (hunger, sickness, unemployment, poverty, etc.) and the effects of this on society's morale.

TABLE 11.
Changes in Productivity by Crop in the Northeast, 1957–73 (kilograms per hectare)

Products	1957	1958	1959	1960	1961	1962	1963	1964	1965
Food crops									
Rice	1303	1140	1401	1154	1510	1503	1500	1365	1420
Beans	550	435	547	550	542	538	537	470	530
Manioc	11,840	10,689	11,617	11,617	11,500	11,885	12,115	12,122	12,282
Corn	763	626	732	792	786	787	779	727	810
Industrial crops									
Cotton	327	210	319	365	351	321	346	298	323
Cocoa	429	358	386	348	330	304	311	321	344
Tobacco	736	727	768	666	592	716	692	725	774
Castor beans	813	734	680	683	649	710	713	881	852
Sugar cane	39,256	39,274	40,047	41,265	41,312	39,750	42,142	42,678	42,540

Sources: 1957/1959 SEP/ETEA—Ministério da Agricultura, published in "Agricultura no Nordeste" —offprint of the Report of the Banco do Nordeste do Brasil, *SA* Fortaleza, 1971, p. 51. For 1960/73 statistics are from Centro Brasileiro de Estatisticas Agropecuarias (FIBGE), published in *Manual de Estatisticas Basicas do Nordeste do Brasil.* Departamento de Estudos Economicos do Nordeste—ETENE. Fortaleza, 1977, p. 103.

By benefiting the large landowners and higher social strata of the arid hinterland, the drought produces effects which in the long run damage them. The reason is that in manipulating the public resources used in projects to combat the effects of drought, the oligarchies of the northeastern hinterland manage to compensate themselves for the losses resulting from drought and at the same time increase their power and material resources. These resources thus operate as a powerful stimulus to inaction and deter efforts to improve skills and to modernize. Droughts therefore facilitate the continued survival of the northeastern élites, through the transfer of public resources, instead of pressuring them into playing new roles similar to those played by ruling classes in other parts of Brazil. Consequently, *government policies remove from the northeastern élites the necessity to display initiative and enterprise and promote activities which would generate progress in the hinterland similar to that achieved in other regions of Brazil.* This possibly helps explain the gap which exists between the northeast and the other regions, especially the centre–south. The northeast displays the lowest level of renewal or "circulation" of élites when compared with other regions of the country, and the highest level of dependence of regional élites on central government.

As Table 11 indicates, the decline in productivity of some of the main agricultural products of the northeast hinterland has been continued and is independent of the occurrence of drought. This is the case with cotton and hemp, traditionally export products, and this demonstrates the lack of dynamism of the hinterland élites even when there has been an increase in government-provided incentives and facilities. The drought perhaps plays *an inhibiting role in the modernization of agricultural production structures in the northeastern hinterland*, thus condemning the region to continued marginality and backwardness when compared to the rest of the country.

Another important function of drought in the northeast is promoting the "export" of unskilled labour to other regions of Brazil. In the 1950s, when there were three great drought periods, the rural population of the semi-arid zone grew at a rate of 1.2 per cent a year, while in the next decade, when there were no serious dry spells, the annual rate of growth of this population was 4.5 per cent. This shows clearly that droughts are a powerful determinant of population growth rates. The

TABLE 11.
(continued)

Products	1966	1967	1968	1969	1970	1971	1972	1973
Food crops								
Rice	1210	1326	1409	1345	1222	1303	1281	1300
Beans	485	605	568	543	374	603	525	516
Manioc	11,770	12,161	12,470	12,954	12,254	12,541	12,565	11,324
Corn	691	868	800	774	512	785	700	687
Industrial crops								
Cotton	259	294	299	282	175	294	258	276
Cocoa	380	421	350	50	458	507	519	492
Tobacco	730	760	818	773	770	781	771	733
Castor beans	909	912	924	948	775	981	889	722
Sugar cane	43,473	44,073	44,341	44,909	43,026	43,311	45,590	45,788

absence of drought in the 1960s also produced a considerable increase in urban hinterland population growth rates, which increased from 5.3 per cent in 1950 to 5.9 per cent in the following decade.

The northeast as a whole experiences an increasingly negative balance in population movements in relation to the rest of the country, balances which reached −4 per cent in the census of 1940, −5 per cent in 1950, −8 per cent in 1960 and −12 per cent according to the census of 1970. Birth rates in the northeast are similar to those in other regions; whereas mortality rates are slightly higher in the northeast. Population growth in the region has, therefore, been slower and consequently the northeast's share of total population has been declining. In 1940 it had 35 per cent of national population, while by 1970 it had fallen to 30 per cent. *The drought thus contributes to imbalance the northeast's falling share of total population, thereby adding one more element to the process of marginalization of the region* vis-à-vis *the rest of the country.*

The population which migrates, composed mainly of younger and more enterprising people, travels mostly towards the centre–south. These migrants contribute directly to the progress of the areas to which they migrate: they constitute a cheap labour force in whose upbringing and training the central southern regions have not had to invest, while their energies contribute to the economic growth of these regions.

3.4 DROUGHT-INDUCED MIGRATION AND ECONOMIC GROWTH*

People from the northeast have migrated to all regions and have contributed to nearly every major phase of growth in Brazil's "boom–bust" economy. For example, northeasterners, fleeing the disastrous drought of 1888–89, migrated *en masse* to the Amazon region to work as rubber gatherers, as virtual debt slaves to "petty entrepreneurs". Other northeastern migrants worked in the coffee fields of São Paulo during the late nineteenth and early twentieth century. When import-substitution industrialization began in São Paulo in the 1930s, northeasterners served as construction workers and filled the lower-paid industrial jobs, spurred partly by the great drought of 1930–32. In 1955–60 northeasterners were foremost among the migrants who flocked to Brasília to build the new national capital. (56) Again, the major drought of 1957 provided an additional "push factor". More recently, the construction of penetration roads in Amazonia, like the Belem–Brasília highway, and the expansion of the agricultural frontier in the central west have benefited from substantial migrations from the northeast.

Thus northeastern migrants have made major contributions to the growth and development of Brazilian industry, agriculture, and infrastructure over the past 100 years or more. Perhaps the greatest impact has been not their labour contribution, but their impact on the wage structure of the country. Even during periods of relatively high real wages (e.g. the late 1950s) Brazilian workers earned even less than workers in other Third World countries. For nearly 20 years they have stood by passive as the purchasing power of their wages declined drastically. This can be

*Section drawn from D. R. Gross and N. Flowers, IFIAS, *op. cit.*

explained by the existence of a vast "reserve army" of northeastern migrants on the scene, depressing both wages and worker expectations to a remarkably low level. The northeast thereby subsidized the development of other regions of the country by virtue of its high rate of out-migration, and especially its chronic susceptibility to recurrent drought.

There is no reason to believe that the conditions just described have changed in recent years. Since 1955 Brazil pursued a policy of import-substitution industrialization under the aegis of capital and technology imported by multinational corporations. For example the Brazilian motor vehicle industry, now one of the largest in the world, is controlled entirely by multinationals such as Volkswagen, Mercedes, General Motors, Ford, Chrysler and Fiat. Brazil's pharmaceuticals industry, founded and long controlled by Brazilian entrepreneurs, has fallen since 1950 almost entirely into the hands of multinationals such as Bayer, Schering, Pfizer and Merck.

This pattern of industrialization is also part of the development strategy adopted by the Brazilian military who, since 1964, have controlled the government and built a régime based on the dual notions of growth and security. They have favoured industrial development to the detriment of agriculture and export of raw materials. According to the military, Brazil can only develop with large infusions of capital and know-how from outside the country.

So, along with the industrialists the international financiers have poured billions of dollars into Brazil's economy, which during the early 1970s grew at real rates exceeding 10 per cent a year. Brazil has one of the largest foreign debts in the world. The growing debt has been fuelled by annual deficits caused by debt service, royalty payments and capital equipment costs (which are often disguised forms of capital repatriation by multinationals), profit remissions, and a huge oil import bill.

The emphasis remains on industry, even though agricultural exports can make an important contribution to the balance of payments, and the régime has gone to great lengths to encourage production of finished manufactured goods for export. Of course keeping labour costs low is a key aspect of this strategy, since this keeps Brazil's exports competitive on the world market. The government is therefore not likely to adopt policies to dramatically improve real wages to the detriment of increases in foreign exchange earning.

In this connection it is important to point out all the ways in which the drought and depressed conditions in the northeast have contributed to the growth and well-being of other regions. Baer has pointed out that the northeast still produces a substantial share of Brazil's exports, including cotton, sisal, hides, sugar, cocoas, etc, which earn foreign exchange. (57) However, due to the low level of industrialization and low income levels in the region, the northeast imports from abroad far less than it exports. The benefits from its ability to earn foreign currencies are thus transferred to other regions which themselves incur net deficits.

In addition, high tariffs have protected southern industry but they impose higher costs on the northeast and other regions. Poor as it is, the region does import domestic goods on a significant scale from the industrialized south, including foodstuffs, textiles, machinery and many others. Studies have shown (58) that the terms of trade between the northeast and the south have been declining, typical of regions which exchange raw materials for finished products.

3.5 THE RESPONSE OF THE *FLAGELADOS**

Newspapers have given coverage to the response of the *flagelados*, though it has been somewhat partial. While they may capture the emotional force behind individual instances of suffering or protest by those most affected by drought, they fail to pose the question—why do people respond in the way that they do? To answer this satisfactorily, a class analysis of northeastern Brazil is required and, even more, a history of the oppressed. Both of these, unfortunately, are lacking.

The immediate response of peasants displaced from the land by drought is to move out of the immediate area—either to local towns or further afield. The decision to move is essentially that of an individual family, arrived at in response to the pressure of meeting family subsistence needs rather than the dictates of class solidarity. Thus, while the peasants moved off the land *en masse* they generally acted as individuals. While each may have been aware that the immediate objective—getting food and water—was the same as the next person's, there has been no co-ordinated plan of action which united them; neither were there any other objectives apart from these very immediate ones. In most cases peasants responded in a spontaneous and anarchic fashion—namely by looting. This happened in 1970 and again in 1972, as a new drought developed, affecting Ceará state in particular.

As early as April 1972 the governor of Ceará felt obliged to publicly deny popular reports that there had been looting in the state. The vehemence of his denial is suggestive of the governor's concern to avoid admitting evidence of a breakdown in law and order, lest it should encourage other spontaneous actions against the state elsewhere. In fact there probably had been looting. In that month in the *municipio* of Boa Viagen, 1300 *flagelados* were reported to be roaming the streets in search of food. (59) In Inhamus shops were closed and local markets almost ceased as traders feared possible marauding by *flagelados*. (60) The same partial breakdown of commerce occurred in all cities in the northeast which experienced a heavy influx of *flagelados*. Tension between these immigrants and the native populations was caused by their competing for scarce water and food: townsfolk resented having to share scarce water resources with these "intruders". (61) The problem was not confined merely to small towns in the interior. Substantial numbers flowed into the capitals themselves. Fortaleza, the capital of Ceará, was particularly affected by this influx, which resulted in a large increase in the number of beggars on the streets.

It is interesting to note that acts of violence committed by *flagelados* against property and persons tended to be attributed to a distinct minority—the so-called "gypsies". Undoubtedly there were instances where groups of gypsies were involved. Two incidents were reported in the press. In the *municipio* of Palmeira dos Indios, gypsies killed the owners of a farm after they were caught sacking the house and stealing crops. (62) The best-documented account of gypsy looting occurred in Badajos in the interior of Sergipa: "About 40 gypsies invaded the village stealing sheep and goats, killing and eating the chickens they found in the streets and breaking into the warehouses to take the food they needed. No violent acts were committed against the residents but then they put up no resistance." As

*Section by Edison Nunes, IFIAS, *op. cit.*

the local police force was incapable of rounding up 40 marauders by itself, two officers and eight soldiers were drafted in from Aracaju. The gypsies were imprisoned and told they had to pay CR $400,000 for the damage they had caused. At this point the "tribal elders" intervened to declare that the imprisoned were a youthful faction who had flaunted the authority of their seniors, and had lost any respect for other people's property. (63)

The role of gypsies in looting is interesting both in itself—for what it suggests about the cohesiveness of this group in comparison with other peasant groups—and also for the way in which "gypsies" came to be represented in the popular consciousness and to some extent in the press.

One reason for the absence of any significant class solidarity between *flagelados* is the dearth of horizontal, inter-family ties between peasants and labourers before they were ejected from the land. Patronage on the part of landowners—leading to the establishment of exclusive vertical ties between peasant and landowners—served to undermine the development of class solidarity. There was competition between peasants, and also between peasants and wage labourers, for access to land and the means of livelihood which were largely monopolized by the landowner. (64) The lack of horizontal bonds of solidarity mainly applies to *dependent* peasants (that is, tenants such as sharecroppers) and rural wage labourers, but does not apply to peasants who own land for, in the words of Eric Wolf, they possess "tactical mobility". They are more free to try out their political strength than landless groups because they have the security of a subsistence base to fall back upon. Even in times of drought, parched land is better than no land at all. It is the landowning peasantry who constitute the backbone of rural resistance; (65) it was this group that formed the core of the peasant leagues in the northeast in the late "fifties and sixties". It is significant that they were not a majority either on the work programmes or among the unemployed roaming the streets in 1972.

Gypsies, rather than other groups, may have practised *collective* looting precisely because, for ethnic reasons, there was a common bond between them. It remains unclear, however, how many of the "gypsy looters" were in fact real gypsies. As a group which was ostensibly more foreign than the rest of the peasantry, the gypsies seemed to serve as a scapegoat onto which the urban bourgeoisie could project all their fears about violence and social chaos. After the initial reports of looting by gypsies, other reports and rumours appeared in the press in which the image began to emerge of the gypsy as a pathological deviant. Looting was thus seen as an expression of mental disorder rather than a response by the "have-nots" to the polarization inherent in social inequality. (66)

Politically the idea of the looter as a deviant gypsy was extremely convenient—it served both to deflect attention away from the social and economic causes of looting and to further inhibit the development of solidarity among *flagelados*. One indignant reader of the *Estado de Sao Paulo* pointed out in a letter to the editor that the distinction between "gypsy" and "non-gypsy" was relatively unimportant as gypsies had been largely integrated into the wider society. For him the crucial problem was the mass of "gypsified Brazilians" (that is, in metaphorical terms) the downtrodden peasantry. (67)

There were two recorded instances in 1972 of *flagelados* banding together to confront urban authorities. The first was in the city of Queixeramobim, where 300

peasants went together to the mayor to demand food. (68) Some weeks later, on 28 April 1972 in the *municipio* of Solonopole, "hundreds of unemployed peasants gathered together in the main square of the city, demanding food and work". This appeal at least was successful and the mayor was obliged to hand out manioc flour and *rapadura* to the assembled mass. (69) It would, therefore, be wrong to deny completely the existence of any sense of solidarity. By bringing into sharper focus the unequal distribution of wealth and power, droughts may yet serve to enlighten the landless in preparation for future struggles.

3.6 THE POLITICAL RESPONSE*

During the 1972 drought, disagreements arose between SUDENE and the local authorities as to what degree of water shortage constituted a drought. It seemed to be SUDENE's intention to deny the urgency of the situation up until the point that it became uncontrollable; their reaction had been similar during the 1970 drought. The state governments acted to some extent as mediators between SUDENE and prefectures, siding at different times with the former or the latter. In 1972 the existence of a drought was only confirmed by SUDENE in September. It is not going too far to suggest that, since, in the months prior to this, the drought had been confined largely to the interior of Ceará (an area of less than strategic economic importance), the federal government hoped that it could be dealt with at a local level.

It was at the local level, however, that politicians were particularly concerned by the disruptive consequences of the drought. In November 1972 local elections were being held throughout the country; but the exodus of *flagelados* from the land and their movement to other areas was serving to undermine political constituencies: depopulation affected the potential size of the vote and it was this which concerned local politicians. In Parambu it was reported that

> "hundreds of citizens are abandoning the town leaving them [the politicians] without guaranteed votes. The *flagelados* are shifting mainly to Piauí and Maranhao and political candidates must send their emissaries to those states with news of the latest welfare measures taken by the government. So far, however, these cajolings have been without success and no one has returned." (70)

The principal aim of the state government and the prefectures was to keep rural workers on the land, both in order to maintain political constituencies and to prevent mobs forming who might threaten trade. In this respect there may have been a conflict with federal government policy which helps explain the absence of a co-ordinated programme against the drought. If, as it would appear, the sluggish response of federal aid programmes caused an increase in outmigration of the *flagelados*, then one has to ask whether it was in the federal government's interest for such migration to take place.

One of the keystones of the Medici government's agrarian policy was the need to increase agricultural productivity, particularly in the northeast. Medici vowed to "transform traditional agriculture" and, in view of the influence of the ideas of the American agricultural economist Theodor W. Schultz, it is not surprising that rural

*Section by E. Nunes, IFIAS, *op. cit.*

over-population was identified as the major obstacle. The desired increase in productivity could not be achieved without a more favourable man–land ratio which in the case of the northeast necessarily entailed massive removal of people from the rural sector. However, it was not intended that the migrants should pour into the towns—as in fact they did—because the pressures on urban infrastructure were already considerable. The hope was that the displaced population might be co-opted into an ambitious colonization programme involving the newly opened up Amazonian frontier.

In fact, one of the main aims of the government's "national integration plan", and the specific purpose of the Trans-Amazonian Highway which linked the Atlantic coast of the northeast to the Amazon basin, was to redistribute the Brazilian population. Thus, the federal government was unlikely to share the concern of the political candidates in Parambu about the scale of outmigration, given that 1900 *flagelados* moved to Maranhao, which was still a frontier region (on the edge of Amazonia) with land waiting for colonization.

A SUDENE team argued that the *flagelados* should be moved up the newly opened Amazonian highway to the new colonization zones. To keep the *flagelados* in their *municipios* made no sense at all given that, drought or no drought, the rural economy was inadequate to maintain them. SUDENE claimed that more than 80 per cent of the rural population in the northeast faced a continual struggle for survival.

> "In the Northeast and particularly in the rural sector, no one thinks of saving. All that is earned is immediately spent on food and—more rarely—clothes. Without work, without savings, without the possibility of obtaining credit, impoverished farmers (many suffering from illness) flee to other states or to local urban centres only to die a slower death". (71)

SUDENE's suggestion, that *flagelados* join in colonizing the Amazonian frontier, has an economic rationale. A population that cannot save and can afford only to buy food does not constitute a viable internal market for industrial goods, and therefore does not serve the interests of the industrial bourgeoisie of the centre–south. In November 1972 a conference was held in São Paulo to spread information about the scope for development in the northeast. (72) Significantly, the conference host was the Federation of São Paulo Industries. The discussion focused on the need to boost industrial development in the northeast and many of the participants were ministers in the Medici government. The minister, Reis Veloso, stated that further industrialization would provide an excellent market for the industries of the southeast, particularly for machines, equipment and raw materials. (73)

Another "technocratic" solution which also entailed migration was proposed by Senator Dinarte Mariz, who suggested that youth in the northeast should receive better occupational training in order to compete on more equal terms with the local inhabitants on arrival in the industrial centres of the southeast. (74) The Senator was apparently oblivious to the fact that it would not be the northeast which would benefit from this export of human capital.

The avowed interest of the federal government in boosting agricultural productivity is in fact limited to the promotion of crops for export and/or with a high profit margin. Hence the criteria suggested for identifying drought are based in part on the resistances to water shortage of "selected crops", *not* including

manioc and other staples. Thus a drought would only be declared when the "selected crops" were affected regardless of the fact that subsistence crops may already have been wiped out. The peasantry are squeezed by the federal government's criteria (or conspicuous lack of it from their point of view) for defining what constitutes drought. Furthermore, although the demarcation of the "Drought Polygon" in the early fifties served to allocate responsibility for relief programmes to the state and municipal level, the federal government's responsibilities remain poorly defined. (75)

There is therefore an obvious basic conflict between the development plan proposed by the central government and the maintenance of the status quo in the rural economy of the northeast. The policy of favouring the evacuation of the rural sector rests on the objective of replacing peasant agriculture by capitalist farm enterprises. This would hopefully raise farm productivity and create a relatively prosperous farmer class who would form an ideal internal market, thus facilitating industrial expansion. The ultimate effect would be a reduction in the regional diversity of the Brazilian economy, and developing the agriculture and industry of the northeast on patterns similar to those established in the centre–south.

Under this "planned expansion of monopoly capitalism" with SUDENE and other federal agents helping the established industrial–technocratic élite to extend its hegemony, the "cotton–cattle of oligarchy" of the northeast lose out. They are interested neither in increasing productivity nor expelling the peasantry from the land. In agriculture (although not in cattle-raising) they do not appear to involve themselves much in direct management, leaving this in the hands of peasant farmers. "Primitive accumulation" takes place but in the sphere of distribution not production: that is, peasants are not proletarianized but, due to the low costs of reproducing the labour force and the structure of the marketing system, peasants can be paid a low price for the product of their labour. Francisco Sá has illustrated how this serves the interests of industrial capital accumulation by keeping down food prices and thus reducing the pressure on urban wage rates. (76) It can therefore be argued that industrial development need not necessarily entail the restructuring of the agrarian economy—a point ignored by the technocrats of the Medici government.

Policy-making with respect to drought is beset by a number of contradictions which reflect the conflict between central government and local power bases and also the gaps in federal planning. Examining the ways in which drought crises are managed, one is necessarily drawn into a study of political economy. (77)

Conclusions*

One might venture to say that, given the present stage of technical knowledge and economic development in Brazil, the northeastern droughts no longer pose an insuperable challenge but instead highlight the apparent lack of sense in a growth model which delays action until the problem has reached the scale of a tragedy.

The only logical explanation for this apparent absurdity may be found in the interests which guide government action: those of political and economic

*By G. M. Dias, IFIAS, *op. cit.*

leadership in the northeast and especially of the semi-arid region. Periodic droughts certainly benefit those groups who are in a position to exercise and enlarge their power through the control of resources obtained from outside the region for projects to combat drought. Through such projects the government maintains and promotes a political and economic élite whose survival is ensured by concessions and privileges from the government rather than by their own entrepreneural spirit and capacity for leadership and innovation. Their expectation of continued support from the government allows them to be manipulated by it. The northeast is thus deprived—because of government support policies—of those who could, or should, assert and defend regional interests in an adequate way.

Deprived of a leadership which could effectively represent them those who are periodically deprived of their already meagre resources are effectively "orphaned", and adequate solutions to the problems caused by prolonged drought seem ever more remote.

One possible solution among others would be to develop projects which kept hinterland farmers on the land. This requires programmes to support agriculture in semi-arid conditions. It would be necessary to establish channels to provide technical assistance and credit and facilitate marketing without the participation of middlemen and other commercial and political intermediaries. Establishing modern agriculture and cattle-raising on small and medium landholdings would help preserve the traditional character of northeastern society as well as to utilize, on an optimum scale, the two resources which are abundant in the region: land and people. Financial resources do exist, and if properly directed it would be possible to carry out the necessary infrastructure investments for the collection, storage and distribution of water, the provision of subsidized credits for small and medium producers, as well as the introduction of minimum-price policies for small and medium farmers. Such measures should make it possible to create mechanisms which encourage the effective participation and integration of the hinterland farmers into the national political system as a legitimate, active and valuable part of national society, without depending on the mediation of others.

Only in this way will climatic phenomena such as drought cease to perpetuate privilege and inequality. There is no alternative if the northeastern hinterland is to escape long-term dependence and autonomously achieve the desired objective of its people: building their own future.

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CHAPTER 6

Political Will and Disjunction The Case of Tanzania

A. Introduction

LEAVING Latin America for African countries makes us more conscious of time perspectives on a double scale. First, the main disruptions brought about by colonial powers are of a more recent origin. They spread over less than a century, with two periods of acceleration, each after a world war. Secondly, the colonial powers themselves have undergone changes during this time: their economy was not the same when they colonized these two continents. Latin America began to be colonized four centuries ago by preindustrial countries while most of Africa started to be politically and economically controlled by industrialized or rapidly industrializing countries, at a time when Latin American countries had already achieved formal political independence.

The colonization of America partly incorporated, partly marginalized or simply exterminated native populations, while causing some early disruption in African societies through the slave trade. Industrialization of Europe was made possible by what late nineteenth-century Indian economists (Dadabhai Naoroji, R. C. Dutt) conceptualized as the "economic drain" (mainly applied to British India and Dutch Indies in Asia and applicable as well to Latin America), while the out-migration process to the "new lands" helped relieve population pressure in Europe, and therefore to increase, in conjuction with technical innovations, labour productivity.

This sketchy description of the conditions of development of industrialized countries (or, in relation to our narrower topic, their capacity to withstand and absorb climatic fluctuations) reminds us of the specificity and the unique historical nature of these processes. Today there are no new lands to colonize, farm or mine. (If they were suddenly to emerge from the ocean, countries of the "centre" will be first to control them, as they do with ocean bed mineral wealth.) No economic drain will operate in favour of the less industrialized countries (unless the relations between "centre" and "periphery" are revised . . .); no out-migration will help them to relieve population pressure and increase labour productivity (unless total and coherent economic liberalism prevails, which instead of conveniently restricting itself to plead for free trade and circulation of capital, also applies to the free circulation of people . . .) And finally, further industrialization of the periphery will have to compete with the pre-existing industrial structures of the centre, supported by their military and economic power.

The present international economic order is, therefore, such that no significant accumulation process can take place in a country of the "periphery" unless some

"de-linking" process can foster a self-centred development. Eastern African and Sahelian countries are far off the mark. Unlike most Latin American countries, they have not been through a significant industrialization process. Also their much more recent colonization has created enormous distortions, proportional to the economic and social distance between the metropolitan economies at advanced stages of capitalist development and their own pre-capitalist structures. Their quite recent formal political independence has not yet been able to repair this damage. Bureaucratic structures modelled on the metropolitan countries were developed on a scale which the accumulation process could not support, resulting in an increased burden on agricultural producers, and a reliance on foreign aid which further jeopardized economic as well as political independence. The increased burden on agricultural producers does not contribute to the accumulation process and makes them more vulnerable to falling, as well as fluctuating, terms of exchange.

The early colonization process has profoundly changed the land tenure system in some Asian countries, such as in British India where the land revenue fed the economic drain and in most Latin American countries has established new patterns of land tenure (such as latifundia) while destroying local patterns. In both cases settled agriculture developed on a basis of increasing private ownership.

In Eastern Africa, German colonization introduced sisal, coffee, tea and rubber on foreign-owned estates, to which British colonization added tobacco, wheat and pyrethrum. As Adolpho and Ophelia Mascarenhas remind us in the following case study:

> "on independence Tanzania inherited an agricultural sector in which expatriate estate agriculture accounted for 40 per cent of the agricultural output for export. . . . The introduction of the cash crop economy had several repercussions on the food supply:
>
> (a) The introduction of a dichotomy between food production and the cash crop economy brought about dislocation of the traditional agricultural pattern. . . .
>
> (b) The family based production unit was broken through migration of males to areas growing cash crops. . . . Food production became more and more dependent on women and the aged who could not break new land and were forced to use fields which should have been left to fallow. . . .
>
> (c) The attempts to grow both cash crops and food without improved methods of cultivation led to the decline of output. . . .
>
> (d) communities which could produce cash crops without drastically reducing their food production clearly had an advantage. This led to considerable rural differentiation in Tanzania. . . .
>
> (e) Inter-rural differentiation was intensified by the fact that the extremely limited infrastructure was focused to serve the needs of the estate sector and the more "progressive" traditional areas producing cash crops. . . .
>
> (f) in areas where the cash crop economy was based on a single crop and had firmly entrenched itself, traditional communal land rights were manipulated, so that land could be sold, leased or borrowed. . . ."

Dichotomy, family and community disruptions, inter-rural differentiation: we are dealing again with primary and secondary disjunctions. The primary disjunction is still present, in an extreme way, as the industry for which plantation and cash crops are produced is not based in the country itself but in the territory of the colonial power. The secondary disjunctions are of the same general nature as in Latin America: one agricultural subsector is protected firstly by the colonial power, then by the post-colonial state which needs foreign exchange, while the other is made more vulnerable to climatic fluctuations. The stage is set for the drama: a drought might trigger catastrophe for the poorest Tanzanian peasants. We wrote in

the introduction to Portantiero's paper: "The state is not a neutral entity. It has a social base and conducts international relations. According to the composition and mapping of these constellations of social forces, tensions might be reduced or increased."

In the case of Tanzania the post-colonial state was ideologically inclined to reduce tensions. President Nyerere stressed the principles of socialism and equity, national control of the economy and self-reliance in development—all of which were embodied in the Arusha Declaration of 1967. When, in 1974, food shortages developed, "the matter was discussed openly and the decisions which were taken were dramatic", write A. and O. Mascarenhas. They add: "To the credit of the political leadership a nation which suffered such a large food deficit did not suffer any deaths (of starvation). Most of the food needed was purchased from abroad and paid for at prices significantly higher than normal."

In this case political will prevented instabilities from being released. However, the country as a whole was weakened by this drain on scarce foreign exchange. A. and O. Mascarenhas point out in their paper the shortcomings of past and present agricultural policies and suggest remedies to strengthen the agricultural base of the country, particularly in the area of technological choices.

This issue deserves particular attention, as it is often neglected by those who totally dismiss the importance of climatic factors and plead only for social and economic change. In so doing they forget the fact that climatic perturbations, such as droughts, are opportunities for the long-term tendencies suddenly to crystallize and hasten the pace of social polarization and growth in poverty. This does not lead necessarily to revolutionary changes. When it does, as in Ethiopia, social change alone does not eliminate the effects of a drought: more equitable land distribution and better food distribution networks have not as yet eliminated the evil effects of a drought. This is because the production system itself has not been changed to fully use climatic resources. It is striking to realize how little has been changed in agricultural research priorities and productive systems in most countries which have opted for a socialist pattern of society, with the possible exceptions, for well-defined periods, of China and Vietnam.

On the other hand, those who insist on the prime importance of climatic factors, such as drought, should be consistent: if water is the scarcest factor, the productivity of the system should be related to output per water unit used and, consequently, agro-systems should be entirely redesigned. This means changing agricultural research priorities as well as agricultural extension methods and rural credit policies. First and foremost, therefore, the value of vernacular knowledge and peasant know-how needs to be recognized. It is only when scientists and agricultural extension officers cease to despise poor peasants that technological innovations will be geared to the needs of the poorest farmers.

Constant interaction between poor farmers on one side and civil servants and scientists on the other would permit improvements from within traditional agricultural and pastoral systems, through the most sophisticated research required, for instance, to improve pasture land, mixed cropping or agro-forestry. The two latter systems have an in-built heterogeneity which can be used to increase their resilience to climatic fluctuations if priority is given to local circumstances and decentralized management. Decisions taken in Ministries of Agriculture tend to

homogenize and standardize agricultural systems, not only by imitating the agricultural practices of industrial countries to suit vested interests, but also for reasons of convenience with respect to administration and management. Ministers do not like diversity. This is certainly regrettable in the case of agriculture, which is in effect the management of life—that is, the management of diversity.

Instead of destroying local systems without even examining them, scientists should understand their inner workings and improve on them. They should determine through a participatory process with peasants the best trade-off in terms of food security between breeding for maximum yields and breeding for stability. Today, and in the uncertain environmental conditions of the future, it is necessary to preserve genetic diversity and free access locally, nationally and internationally to the largest gene pools possible. Last but not least agricultural input delivery systems, as well as output marketing systems, should be built around the need to ensure resilience. To give but one example: it is easy and gratifying to draw on paper irrigation systems ensuring stable supplies of water. It is more difficult and less rewarding for civil servants to ensure the timely delivery of fuel and spare parts for irrigation pumps.

However, changes in agricultural systems in the developing world which are necessary to make agriculture more labour-absorbent and sustainable in the long term, with a high degree of resilience brought about by diversity, heterogeneity, mixed cropping, agro-forestry, etc., go against the interests of dominant social and economic groups and nations. Agricultural research priorities are shaped by the effective social demand of the minority, not the silent demand of the majority. Affluent groups, internationally and nationally shape agricultural strategies, including technological choice, to their advantage, not according to the interests of the most deprived groups who live in permanent insecurity with respect to food.

The same people who tend to treat drought independently of international and national power relations do not propose changes towards a more self-reliant, ecologically specific, low-energy agriculture. They would rather move in the opposite direction and plead for more "green revolution" type changes. It should be noted in this connection that the so-called "green revolution" has widened agricultural fluctuations in countries such as India. (1) Certainly the minimum output obtained now is higher than the minimum obtained ten years ago. But there is a basic asymmetry between a positive deviation from the trend value and a negative deviation in so far as their respective impact on the economy is concerned—both at the macro- and the micro-levels. For instance, a significant decline (negative deviation) in production resulting in food deficits may require imports, implying a deficit in foreign exchange. This, however, is not likely to be made up through food grain exports even if there were to be an equal and opposite deviation in food grain output the following year. The foreign exchange deficit will tend to be carried over and may thus cumulate. Other asymmetries at the macro-level of the domestic economy may be traced, such as inflationary forces, pressures on budgetary resources etc., generated by a decline in food grain production, which will not necessarily be compensated and countered in equal measure by a commensurate rise in food production in the following year.

Such asymmetries may also be quite sharp at the micro-level. For instance, crop failure in an area due to drought may affect small farmers in an irreversible way,

involving dissaving, loss of assets and ultimate reduction to the status of landless labourer.

Vulnerability to fluctuations in climate will increase if there is no change in the international economic order towards a more self-centred development in developing countries and if the modernization process in agriculture continues to replicate the Euro–North American model, with its drastic consequences for employment and its high energy and environmental costs. Neither industrialization by itself nor "modernization" of agriculture by itself will reduce vulnerability to drought. Everything depends on the nature of industrialization and modernization, the characteristics themselves being related to the way the national economy is integrated into the world economy. This integration depends on political decisions which, through technological choices in industry and agriculture, govern the increased resilience or vulnerability of food systems to climatic variability.

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B. A Background and a Postscript to the Food Shortages in Tanzania in the 1970s by Adolfo Mascarenhas, Ophelia Mascarenhas

In the 1970s there were droughts in many parts of Africa and also in Tanzania, and several African countries including Tanzania suffered from food shortages. It is all too easy to link simplistically these two occurrences and ignore the many factors which are responsible for food shortages. This case study on Tanzania demonstrates that food shortages are a result of past neglect in development, especially in agriculture. In addition, the country has not fully utilized its natural resources and/or the full range of options possible in order to free itself from human calamity. Therefore, food shortages can be regarded as a transitory problem that can be corrected by national policies which intervene in the complex of physical and social factors which account for famines. Although Tanzania avoided a calamity in 1974, the steps taken to avoid the calamity may not be a long-lasting solution.

It does not require too much effort to find examples of drought-induced famines from the history of India, Egypt, China, Ireland, Mali, Tanzania, Russia or even the U.S.A. What is now noticeable is that many developed countries, even despite drought, have given themselves considerable protection and frequently the problem is not one of the shortages but of surpluses. These surpluses have been used to alter food consumption patterns, to provide food aid and form the basis of the grain commodity trade. In contrast many of the developing countries, especially poor countries, are prone to ravaging famines arising from climatic hazards. Clearly the causal factors are varied but in all cases they represent weaknesses in the system of intervention. Problems need to be solved; they are not self-correcting.

The solution to the problem of food shortages can be illustrated by taking

Sweden as an example. In the past Sweden, like Tanzania, suffered from famines because of climatic extremes. Just over a generation ago, hardships including famines led to an exodus of Scandinavians to America. These climatic extremes still prevail. In May 1974, when one of the authors was in Sweden, a local newspaper reported that one of Sweden's longest droughts had just ended, but there was no evidence of famine, which underscores the point that the problem of food shortages can be solved despite the climate. Climatic hazards are not selective, they continue to attack both developed and developing countries.

1. Food shortages in Tanzania before Independence

It would probably be true to state that there is no part of Tanzania which has not suffered from food shortages at one time or another. There is a great deal of evidence to show that, at least during the period for which there are records, famines and food shortages have occurred quite frequently. Table 1 illustrates the point for three areas in Tanzania. The three areas are by no means typical, although Dodoma seems more prone to adverse food situations than the other areas.

Another study by Berry, Hankins, Kates and others shows similar data for Eastern, Central and Tanga Provinces corresponding to the present-day regions of Dodoma, Singida, Morogoro, Coast, Dar es Salaam, Tanga and parts of Kilimanjaro Region. (1)

The occurrence of famines is widespread but, as Mascarenhas has pointed out in an historical study on food shortages in Tanzania, there has been no famine in which the whole of Tanzania has suffered at any one time. (2)

TABLE 1.
Food Situation in Three Districts in Tanzania During the Years 1928–72

	Dodoma District[a] 1928–69/70		Handeni District[b] 1929–70		Gairo (Kilosa District)[c] 1928–71/72	
	No. of years	%	No. of years	%	No. of years	%
Severe famine	9	21.95	7	23.33	3	7.3
Severe food shortages	5	12.19	5	16.6	9	21.95
General food shortages	6	14.63	1	3.33	3	7.3
Local food shortages	7	17.07	8	26.66	11	26.82
Adequate food	14	34.14	9	33.33	15	36.58
	41		30		41	

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[b] S. A. Sumra, *An Analysis of Environmental and Social Problems Affecting Agricultural Development in Handeni District*, Ms. Thesis (M.A.), University of Dar es Salaam, 1975, pp. 26–28.
[c] G. L. Mkunduge, "The Ukaguru environment: traditional and recent responses to food shortages", *Journal of the Geographical Association of Tanzania*, No. 8, pp. 63–84.

Generally the causes of famine and food shortages are given as inadequate rains or rains falling at irregular times. Drought is cited by Mnyawonga as the cause of famines in Dodoma for 21 years out of the 27 years during which the district suffered from famine or food shortages. For Gairo the causes of famine or food shortages are given as follows: 16 years caused by drought, 6 years caused by floods and 4 years when harvests were good but were destroyed by pests. (3) In the study by Berry, Hankins and Kates, 70 per cent of the famines in Central and Tanga Provinces were caused by droughts; the frequency was slightly lower in Eastern Province (53.6 per cent).

The most frequently affected areas also seem to correspond to rainfall distribution. Tanzania has no large areas which could be termed desert but it does have considerable tracts of land with low rainfall, which may be called semi-arid and which are prone to drought-induced food shortages quite regularly. If one regards the areas in Tanzania with rainfall less than 800 mm as semi-arid, the whole of Dodoma and Singida regions, much of Masailand, Mbulu District, lower Arusha and Moshi and Pare district fall into this category. Some 2 million people, or about 12 per cent of the population, live in these areas.

The main constraint to food production throughout this area lies not only in the paucity of rainfall but also in the erratic nature of rainfall in this zone.

However, the attempt to tie the frequency entirely to climatic regimes is to ignore the underlying causes of food shortages. There are enough examples to support this assertion. Dodoma district, which now suffers most from famines, used to be the chief food supplier to the caravans plying between the coast and Ujiji on Lake Tanganyika. H. M. Stanley described how, between Mvumi and the next Sultan's District, there were no less than 25 villages scattered over the clay-coloured plains. Despite the inhospitable nature of the plains, they were better cultivated than any other part of the country. He was forced to admit that as he passed the numerous villages and saw the entire face of the land to be one vast field of grain, he no longer wondered at the grain trade of the Wagogo. (4) Another study asserts that in Mpwapwa district 1.2 million pounds of grain were consumed each year by caravan porters. (5)

In 1890 Baumann wrote that the Wazigua of Handeni District produced considerably more grain than they needed for their own consumption and exported large quantities to the coastal towns of Sadani and Pangani. (6)

Even in more recent times, poor weather did not always mean famines. In 1943/44 there was a bumper harvest in Gairo, despite the fact that rains started prematurely and there was an outbreak of worms. Short rains arrived prematurely in 1944/45; nevertheless, the harvest was good.

In contrast, it is worth noting that food shortages and famines in Mahenge, Ulanga District, in 1942–44 were due to forced sales of food as part of the war effort in Tanganyika, so that at the end of the year people were hard-pressed for food. (7)

Generally, the evidence seems to indicate that food availability worsened during the colonial period for reasons other than natural disasters. One study, for instance, claims that from 1860 to 1918, a period of nearly 60 years, Dodoma had suffered only six famines, whereas from 1920 to 1960, a period of 40 years, there were 17 years of famine or serious food shortages.

The evidence provided by the Leakeys in the last few decades points to the fact that the most ideal sites in the world for early man to live were in Tanzania, particularly in the north which is now semi-arid (8). However, the evolution of human species has been marked by a constant struggle to improve its environment through organization and creativity, marked by the evolution of groups, clans and eventually of states, and the domestication of animals and plants leading to agriculture and the present emphasis on the application of science and technology.

Coming to the modern era in Tanzania, beginning around the sixteenth century and up to the 1890s, one can state that the pattern of food production and population was complex and intricate in its distribution. Food shortages were not rare and the severity of some of these seasonal shortages led people to move to sites where an ecological/technological balance made it possible to control the situation so as to be assured of food. (9) Some population clusters then suffered less frequently from food shortages. In time these clusters began to have a high density of population exemplified by such areas as the slopes of Mount Kilimanjaro, Ukara Island, Karagwe, Rwanda and Burundi. To ameliorate local harsh conditions there were attempts to trade between the different population clusters. (10)

As been summarized elsewhere (11) the main features of food production/population situation in the pre-colonial period were:

(a) an orientation towards sites which offered ecological variety and advantages, for instance, river basins and highland areas;
(b) the communities did not live in splendid isolation but rather there was long-distance trade in resources which existed in very localized sites, such as salt, iron, etc., which were exchanged for commodities of a seasonal or perishable nature;
(c) there was a great variety of food crops, many species of which are now forgotten;
(d) food production was the most important activity;
(e) the family was the main unit of production but in many areas there were divisions based on age, sex, etc.
(f) the agricultural implements were simple.

European colonialism introduced substantial changes, especially in the demographic variables, economic orientation and the capacity to produce food. This era was a period of agricultural diversification and regional differentiation brought about by the introduction of cash crops for export in the more productive and accessible areas of the country. The Germans introduced sisal, coffee, tea and rubber and established foreign-owned estates. When the British took over the administration of Tanganyika they expropriated the German plantations and resold them to British, Greek and Asian owners and encouraged the growing of additional crops such as tobacco, cotton and pyrethrum. When response was not spontaneous, taxation and even compulsion was used, as in the case of cotton in Sukumaland and tobacco in Songea. (13)

The introduction of the cash crop economy had several percussions on the food supply:

(a) The introduction of a dichotomy between food production and the cash crop economy brought about dislocation of the traditional agricultural pattern and this proved fatal in many areas. In Handeni, the introduction of sisal in the low-lying areas of Tanga Province turned a grain surplus area into one that has since been constantly under stress. (14) Mayanda describes a similar situation for an area in Kwimba District, Mwanza Region.

> "With the growth and expansion of cotton crop cultivation, the situation altered. Land which would originally have been put under food cultivation now increasingly fell under cotton. Hence less and less food was grown. . . . Furthermore there was a move from the more useful famine crops of the pre-1950s to the less reliable crops. That is sorghum, millet, cassava, sweet potatoes were gradually abandoned . . . in favour of cotton and maize." (15)

Larson has similar data for Ulanga District, based on missionary and official government reports. (16)

(b) The production unit comprising the family was broken through migration of males to areas growing cash crops. In areas where there were no major cash crops, taxation compelled male members of the family to migrate to work on plantations and large farms requiring paid labour, as well as on public works. In such areas food production became more and more dependent on women and the aged who could not break new land and were forced to use fields which should have been left fallow. The effects of labour migration on the population/food production ratio are documented both in official colonial publications and recent studies. (17)

(c) The attempts to grow both cash crops and food without improved methods of cultivation led to the decline of output even in those areas where there was no migration. The colonial government did attempt belatedly in the 1950s to advocate and even enforce soil conservation and other improved agricultural practices but some, like the Uluguru Terracing Scheme, were poorly planned and executed while others ignored the practical and cultural aspects of certain traditional practices. (18)

(d) Communities which could produce cash crops without drastically reducing their food production clearly had an advantage, and this led to considerable differentiation between rural areas in Tanzania. Where cash crops and food crops complemented each other, tremendous advantages could accrue. Thus bananas for food and coffee for cash, exemplified by Bukoba and Kilimanjaro districts, contrast with Dodoma and Rufiji which had no cash crops and exported labour. (19)

(e) Inter-rural differentiation was intensified by the fact that the extremely limited infrastructure was focused to serve the needs of the estate sector and the more "progressive" traditional areas producing cash crops. (20) The periphery areas thus steadily became subjected to an "involution" process comparable to what Clifford Geertz analysed in Indonesia. Such was the case of the Usambara Mountains. (21)

(f) In areas where the cash crop economy was based on a single crop and had firmly entrenched itself, traditional communal land rights were manipulated so that land could be sold, leased or borrowed. Privatization of land was officially encouraged following the recommendations of the East African Royal Commission, 1953–55, and the government policy paper, *Review of Land Tenure Policy*, (22) which embodied these recommendations. It led to the creation of a group of wealthy farmers and large class of farmers with little or no land (23). Although the proletarianization of African farmers was not as serious as in Kenya or Rhodesia, lack of adequate land was a major cause for migration among some communities, as for example the Myakyusa. In other societies, like the Haya, it led to the exploitative form of tenant-farming. (24) The question was serious enough to elicit the following comment from the President of the Tanganyika African National Union (TANU) in 1958:

> "In a country such as this, where generally speaking the Africans are poor and the foreigners are rich, it is quite possible that, within eighty or a hundred years, if the poor African were allowed to sell his land, all the land in Tanganyika would belong to wealthy immigrants and the local people would be tenants. But even if there were no rich foreigners in this country there would emerge rich and clever Tanganyikans. If we allow land to be sold like a robe, within a short period there would be only a few Africans possessing land in Tanganyika and all the others would be tenants." (25)

2. The Food Situation after Independence (1964)

Conditions which influenced food production during the colonial period persisted into the post-independence period and still influence the country's attempts to achieve an adequate food supply. The country experienced a very severe crisis during the drought in 1974/75. Food imports between January 1974 and August 1975 were one of the major causes (the other being the sharp rise in prices for oil) which turned the country's balance of payments from a surplus of 71 million dollars in 1972 to a deficit of 89 million dollars in 1974. (26)

The food situation in Tanzania is influenced by the following factors:

(a) The great variety of food which existed during the previous period is being phased out for fewer and fewer "international staples" such as maize, wheat and rice.
(b) Some traditional staples have managed to compete because of their relatively high yields per unit of land and low labour demands, e.g. cassava and bananas.
(c) A gradual to rapid decline of crops which were ecologically suitable but low in export value, e.g. millet, sorghum, groundnuts, etc.
(d) The dichotomy between cash and food crops was reinforced. Prices of food have been kept as low as possible and have probably acted as a subsidy for the production of cash crops. In these circumstances it has been easier and cheaper to purchase food from developed countries.

(e) There have been massive disturbances of the population which have affected food production, e.g. about 10 per cent of the population now lives in urban areas and purchases food. If population continues to increase annually by 2.7 per cent and more children go to schools for longer periods, then even more food has to be produced by fewer people. With improved efficiency fewer people could produce much more food than peasants produce at present.
(f) The resettlement programme has upset the production system by assuming that people can be resettled at any time, in any place and in any numbers.
(g) As a consequence of the above, more and more people are dependent on the government making food available, and there has been an increase in demand for convenience food, e.g. packaged staples.

An independent Tanzania inherited an agricultural sector which had two distinct parts: a small modern sector and a very large traditional sector. Great attention was paid to crops required by the metropolitan country, and basic agriculture to produce food was generally an incidental issue. Most of the crops intended for the export market were grown on plantations but other crops such as cotton were grown by peasants. The cultivation of export crops received disproportionate attention in research, credit and marketing to the extent that, in the case of sisal, Tanzania was the world's largest producer. (27) Similarly the inputs of the Empire Cotton Growing Corporation contributed to a multiple increase in cotton output and led to the creation of the largest co-operative society in colonial Africa—the Nyanza Co-operative Union. (28)

In contrast was the traditional sector in which the simple technology was barely adequate to provide food for the individual family. Its main attribute was that it enabled peasants to absorb environmental risks at the price of very low productivity per person and per unit of land. Without the introduction of any major technology most of the increased production took place through expansion of acreage under cultivation. When peasants were encouraged to grow cash crops, such as cotton or pyrethrum, the production of food was put under further strain.

Exports provided the main finance for development and it is therefore hardly surprising that the planners in the initial independent Tanganyika were inclined to continue a pattern laid down during the colonial period. The stated policy in the *First Five Year Plan for Economic and Social Development, 1964–1969 (FFYP)* was:

> "To increase marketed output of primary production by 6 per cent; industrial sector by 14.8 per cent and commercial sector by 8.0 per cent; to obtain by 1980 a per capita income of 45.1 compared to 19.6 in 1960/62." (29)

The FFYP advocated a two-fold approach for primary production which affected about 90 per cent of the population:

(a) the improvement approach whereby farmers were to be assisted in improving crop and animal husbandry;
(b) the transformation approach in which the aim was "the introduction of technical, social and legal systems which allow the exercise of modern agricultural technology based on relatively high productivity and which consequently justify considerable investment of capital". (30)

The transformation approach was to take place in areas of moderate population where climatic and soil conditions were more favourable than in the semi-arid area, and where population pressure was not so heavy as in the area around Lake Victoria or on the slopes of Mounts Meru and Kilimanjaro.

More precisely, 69 highly productive village settlements were to be established in sparsely populated areas having a high potential for agriculture. Each village settlement was to comprise about 250 families, was to be comprehensively planned and economically profitable. Farmers were to be encouraged to work on a co-operative basis. The cost of the economic and social infrastructure was about £250,000 per village (31). The settlers were to embrace one or two cash crops and livestock together with some subsistence food production. (32)

Although agriculture was allocated 27 per cent of the national budget for 5 years—the second largest share after social infrastructure—there was no definite statement on policy for food production except that the aim was "national self-sufficiency in food crops", and that "self-sufficiency of the family unit was to be discouraged and specialization in one or more cash crops urged". (33) If this policy could have been fully implemented it would have completely demolished the pattern of peasant subsistence-food production. This would not have been a bad thing if it had been possible to assure adequate incomes from export crops or brought about national self-sufficiency in food through dramatic improvements in food production. Under the section entitled "crop husbandry", targets were discussed for sisal, cotton, coffee, tea, cashewnuts, tobacco, pyrethrum, groundnuts, seed beans, sugar and wheat. Even the statement on diversification of crops emphasized cash crops, such as cocoa, soft fibres, rubber, palm oil and sheep's wool in suitable areas.

With such a preoccupation to produce crops for export, it is not surprising that food production declined. In fact it appears that this was expected, for the plan had the following remarkable statement to make:

> "It has been assumed that, with the exception of subsistence fishing, the value of rural subsistence activities will grow on the average at the same rate as the population while in the past it has exceeded population growth. This diminishing rate of expansion reflects the turning of peasant producers to production for cash, owing to an increased need for cash income and to improved marketing facilities." (34)

Overall performance of the agricultural sector *vis-à-vis* export crops was satisfactory, with most crop targets being met by the end of the plan period. With the exception of sisal, where there was a slump in market prices, the export crops fetched good prices. However, such reliance on cash crops was risky because of the instability of commodity prices. In addition, imports of food grains (maize, rice, wheat and wheat flour), though not substantial, nevertheless indicate that the goal of self-sufficiency had not been met (see Table 2).

A start was made in dealing with the more pervasive type of food deficiency, namely malnutrition. A unit of the Ministry of Health drew up a nutrition plan to coincide with the Five Year Development Plan. The aim was to establish nutrition services at regional and district levels using mobile teams and supported by the Headquarters unit as well as by a number of specialists and advisors in Dar es Salaam. (35) However, no specific allocation was made for such services in the First Five Year Plan. Nutrition surveys were carried out and services started in only 6 of

TABLE 2.
Imports of Major Grains Into Tanzania, 1965/66–1969/70 (thousand metric tonnes)

	1965/66	1966/67	1967/68	1968/69	1969/70
Maize	8.8	7.9	—	—	46.9
Wheat/wheat flour	21.8	32.1	13.6	36.7	35.7
Rice	11.4	6.5	3.8	—	—
Total	41.8	46.5	13.3	36.7	82.6

Source: Tanzania, Marketing Development Bureau, *Profiles of Tanzania's Major Agricultural Commodities, Dar es Salaam*, 1974.

the 17 regions. (36) A survey carried out in 1973 indicated that 50 per cent of children suffered from one form of malnutrition or another before attaining adulthood, (37) 50 per cent of all admissions were malnourished and, of those who died, over 50 per cent had severe malnutrition or underlying malnutrition. (38) The general food situation and nutritional status can best be summarized in the words of the President when introducing the Second Five Year Plan: "Our present attitude to food is the result of ignorance, indifference and indolence." (39)

In spite of the good performance in the production of export crops, the main objectives of the plan had not materialized. The Tanzania farmers had worked hard but on the whole they had used the traditional *jembe* (hoe) and *shoka* (axe). In 1967 only 8200 ploughs were sold. In 1968 this increased to 9100, (40) but this was a very small number when considered against a force of about 3 million smallholders.

The transformation approach also failed. By December 1965 only seven of the 69 highly capitalized villages were established as pilot village Settlements Schemes. In 1966 the scheme was abandoned. The settlements failed primarily because they were poorly planned, were over-capitalized and lacked adequate managerial skills. (41)

At the same time, the amount of expected external finance in the form of loans and grants needed for the full realization of the plan projects and targets fell far below expectation. In the case of the Central Government, for example, the finance scheme envisaged in the Plan involved 78 per cent of investment being financed overseas and only 22 per cent being raised locally. In practice the outcome was quite different. During the first four years of the Plan, domestic sources contributed some 65 per cent of the finance of the Central Government development programme. (42)

Partly as a result of these two factors, there was a radical shift in policy as outlined in two government policy papers, the *Arusha Declaration* and *Socialism and Rural Development*. (43) The essential components of the *Arusha Declaration* were socialism and equity, national control of the economy, self-reliance in development and socio-economic progress of the rural areas. This last component was explained more fully in the document *Socialism and Rural Development*, the essence of which was "villagization", better production through co-operative effort and improved technology.

These radical shifts in national economic policy were reflected in the Second Five Year Plan for Economic and Social Development (SFYP), 1969–74. There was a

strong emphasis on rural development and an attempt was made to define crop priorities. For food production it stated:

> "It will be necessary to increase agricultural production sufficiently to provide the farmers with a growing income at the same time allowing for a reduction in price to the consumer. Indeed, it should be possible in the long run to increase productivity to such an extent that not only will it be possible for the consumer to enjoy more and cheaper food but it will be possible for Tanzania to sell food profitably in the world's markets. For farmers who grow crops primarily for their own consumption, more efficient production will allow greater effort to be devoted to other crops or livestock enterprises." (44)

Priorities for individual food crops also reflected the growing concern for expanding agricultural production to meet domestic food demand, although definite policies for achieving this goal were not specified. (45)

The government and political party also made some radical moves to bring about institutional changes required to implement rural development. In 1972 the Decentralisation Act attempted to give more power to the regions and districts to plan and implement their respective economic growth within the overall national context. (46)

The emphasis on "villagization" in the 1970s, to be discussed more fully later in this paper, culminating in the Village Act of 1975, (47) gave the country an infrastructure with immense potential for bringing about development from below.

In spite of this shift in attitude and greater attention to rural development, production declined even before the 1973/74 drought. This decline has resulted in Tanzania having to import increasing quantities of food (see Table 3).

TABLE 3.
Import of Major Food grains into Tanzania, 1969/70 to 1975/76 (in thousand tonnes)

	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76
Maize	46.9	—	92.2	78.9	291.1	225.4	106.5
Wheat and flour	35.7	11.612	44.1	—	68.7	28.0	31.2
Rice (paddy)	—	—	—	—	72.6	14.3	20.0

Source: Tanzania, Marketing Development Bureau, and *Bulletin of crop and Livestock Statistics*, 1977, Dar es Salaam, Ministry of Agriculture, 1978.

The food supply of Tanzania is difficult to quantify because the majority of people cultivate and consume their own produce. Even when crops such as rice or maize are sold, the figures for marketed output do not represent a surplus—the producer could sell in order to obtain cash, or because she/he has not properly estimated his or her requirements or because she/he simply did not want to risk storing it. Moreover, quite a few peasants have stocks of such crops as cassava, beans, nuts, pulses, bananas, vegetables and various grains such as sorghum and millet. Cereals are not the only staples. In three areas—West Lake, Kilimanjaro and parts of Mbeya—bananas are the main staple.

However, three grains have become very important: maize, rice and wheat. The last is largely imported and consumed in the urban areas as bread. Therefore, the amount of maize and rice purchased locally only gives a partial indication of production. The stocks stored nationally indicate the previous year's net surplus.

The initial stock and marketed production indicate the food situation, and the commercial purchases and concessions indicate the assumed deficit which may occur. These figures are further complicated by "free food aid". Table 4 gives as good an indication as is possible of the food situation in Tanzania.

In 1973 the total stock available was 291,000 tons compared to 469,000 tons in 1975 when there was a recovery. More telling is the low level of initial stocks and marketed production. The very low commercial imports in 1972 and 1973 reflect extremely poor managerial decisions.

The food shortages which occurred in the 1970s deserve attention not only because of their recency but because of the coincidental overlap of a number of unrelated events which came to a climax around this period.

The national party became concerned about the poor state of agriculture in 1972. In the Iringa Declaration, (48) the national executive to TANU deplored the misuse of land which caused soil erosion and infertility and the lack of interest on the part of the peasants to use better agricultural methods. The document strongly recommended some concrete proposals for agricultural improvement through co-operative farming, better use of land and modern techniques of crop husbandry.

Another event was the intensification of the programme to get people to live in villages. Following *Socialism and Rural Development* in September 1967, there was effectively little change in rural settlements. Large-scale crash programmes to start *ujamaa* villages at district and regional levels were initiated in 1971. These early

TABLE 4.
Status of Food Stocks in Tanzania (in thousand tons)

	1971/72	1972/73	1973/74	1974/75	1975/76
Beginning stock					
(rice)	70.1	57.4	18.9	19.2	48.6
(maize)	37.4	12.2	48.0	46.4	99.4
	107.5	69.6	66.9	65.6	148.0
Marketed production					
(rice)	67.8	28.6	36.0	26.0	–?–
(maize)	48.0	114.0	97.5	25.0	88.8
	115.8	142.6	133.5	51.0	88.8
(Purchase) Commercial transaction					
(rice)	—	—	19.4	67.0	–?–
(maize)	92.3	78.9	161.6	290.1	79.4
	92.3	78.9	180.9	357.1	79.4
Concessional					
(rice–maize)				1.0	36.6
Total					
(rice)	137.9	86.0	57.2	106.8	68.6
(maize)	177.7	205.1	306.9	362.5	311.4
Grand total	315.6	291.1	364.1	469.3	380.0

Source: Ministry of Agriculture.

"villagization" programmes were known as "operations". At first they were confined to areas prone to environmental hazards. The first two districts to experience resettlement were Handeni and Rufiji. In both districts people had suffered severe food shortages induced by drought in the first district and flooding in the latter.

During 1971–72 "villagization" was undertaken on a much grander scale, particularly in Dodoma and Kigoma, both being regions which trailed at the bottom of the list in most indicators including the Gross National Product per capita. 1973 and 1974 saw the big thrust in "villagization" resulting in 80 per cent of the people living in villages.

While the "villagization" programme led to some disruption in agricultural production, and was partly responsible for food shortages in some parts of Tanzania, it must be appreciated that the decline in food production had already started before 1971–72.

Thirdly, there was an unusual pattern of rainfall both in the period in which it fell and in its total intensity. The East African Meteorological Department report on the 1973/74 season (September 1974 to June 1974) showed deficits for 71 per cent of those stations for which records were available. (49)

Fourthly, in 1973, discussions were initiated between the government and the World Bank to increase production of maize. This involved a packaged deal—improved maize seed, fertilizer use and extension services. The implication of the programme will be dealt with later. The programme, however, was adopted with great enthusiasm and became a national programme involving 10 regions out of 20.

Beginning in the 1970s there were already localized food shortages in Dodoma and Handeni, making the government respond through resettlement. By November 1974 it was very evident in the semi-arid areas of the north, particularly Arusha, that the drought was severe enough for the cattle to perish. Rumours about food shortages in certain areas were confirmed in the local newspaper. Soon the urban dwellers who had not experienced food shortages for a long time experienced first a decline in the choice of foods and, later, the need to stand in queues for essentials including bread and maize flour. The matter of food shortages was fortunately discussed openly and the decisions which were taken were dramatic. To the credit of the political leadership, a nation which suffered such a large food deficit did not suffer any deaths.

Most of the food needed was purchased from abroad and paid for at prices significantly higher than normal. There was some supplementary food aid. Once again the country was made sharply aware that national self-sufficiency was a long way off and economists, who hitherto saw food as merely a product of subsistence agriculture, began to consider it in terms of a drain on the country's much-needed foreign aid.

3. Constraints to Food Security

There is no doubt that agricultural production declined considerably in the latter half of the 1960s and in the 1970s. There is also no doubt that bad weather in 1973 and 1974 contributed considerably towards the food shortages of 1974/75.

However, the constraints to food security are more fundamental and go beyond environmental factors.

3.1 CASH CROPS FOR EXPORTS AND FOOD CROPS

It should first be noted that the traditional role of Tanzania has been that of a producer and exporter of raw materials: coffee, cotton, sisal, clovers, cashew nuts, diamonds, tea, etc. Cash generated from such exports is used both for importing materials needed for economic projects as well as for the provisions of the social infrastructure—education, health, rural and urban water supply, housing, etc. In such a situation the country must either be self-sufficient in food or earn enough cash from exports to enable it to buy food in addition to other items needed for its social and economic development. Few countries, apart from the OPEC countries, can rely totally on exports of raw materials.

Generally, agricultural primary products obtain very low prices and real earnings become less and less in the face of the rising costs of inputs, fuel, transportation, etc. as well as in relation to industrial goods imported into the country. Nor can countries like Tanzania do much to control the prices they receive. (50) Successive UNCTAD conferences and UN resolutions have failed to establish a fairer pricing system for primary products although the very countries that fight against better returns for developing countries heavily subsidize production of food and many agricultural crops in their own countries.

In Tanzania the case of sisal is a good example of the precarious position of primary exports. Apart from a small amount produced by smallholders, most of the sisal produced in the country is grown on large estates worked by a sizeable labour force whose livelihood depends on this industry. At the height of the industry Tanzania produced 210,000 tons of sisal and sisal exports contributed to 35 per cent of the export earning. By 1970 Tanzania produced a little over 100,000 tons, due largely to the slump in world prices. Prices dropped from Shs. 2170 a ton in 1963 to Shs. 1018 in 1967 and Shs. 823 in 1970. (51) When prices slumped, sisal estates were neglected; a great number of people were thrown out of work and sisal estates were told to diversify into maize production and livestock. Diversification was made easier because by 1967 most of the estates had been nationalized, but pessimism about the future of sisal was so great that when prices improved again in 1975, the country could not take advantage of the boom.

For the foreseeable future there is no doubt that Tanzania will continue to depend on the export of primary products for its foreign exchange earnings needed to purchase industrial inputs. But this cannot be done at the expense of domestic food supply. The food shortages of the late 1960s and the early 1970s have been caused in part by an agricultural policy that concentrated on export crops and assumed that the subsistence sector could take care of itself. As a recent study points out, in such a situation:

> "When external orientation and structure of commercial agricultural production together with the institutional and technological set-up in the agricultural sector have tended to give the food supply function in particular an inelastic character, i.e. the supply of food has not expanded and its composition not adjusted sufficiently fast to meet not only a rising demand but also a change in the pattern of demand without serious price pressure." (52)

As a result, by 1973/74 the country was not only using nearly 40 per cent of its proceeds from exports to import food, but between 1969 and 1973, the food price index for wage earners rose at about 10.2 per cent per annum whereas non-food prices rose at only 5.6 per cent. (53) The repercussions of the spiralling costs of food on the minimum and the middle-income wage earners, as well as the farmers who spent most of their agricultural effort on growing crops for export, are then self-explanatory. (54) It was in this context that the National Maize Programme was launched. For the first time, official agricultural programmes were concentrated solely on improvement of a food crop for local consumption.

Tanzania still suffers from dichotomy introduced by the Colonial Government, in the sense that some crops are regarded as "subsistence crops" and others are termed "cash crops". This classification is based on whether a crop was grown for export or not. It is irrational because it has created an impression among many people that subsistence or food crops have no value. However, many peasants are involved in the cultivation of both cash and food crops. Should the prices of food rise because of scarcity, production of export crops is affected, as was the case in Sukumaland in 1974/75 where peasants neglected their cotton plots in order to grow food. (55)

The situation is made no easier because at present there are simply too many people involved in producing small quantities of both cash and food crops. The logistics of reaching peasants, especially in the days when population was scattered, complicated matters further.

A strategy in which crop specialization was encouraged, especially with a mix of food crops and crops produced for export, would be beneficial. To be certain of the results, this specialization should be based on an agro-economic classification of land. The advantages of the banana/coffee complex provide a good example of the security which can be attained if there is a proper balance between food production and export crops.

One means of achieving security by peasants in Tanzania was the pattern of growing a variety of staple crops which included bananas, cassava, sweet potatoes, maize, millet, sorghum and rice. Some insurance was taken against environmental risks by paying attention to the different varieties of bananas or rice or millet. The variety of crops grown is now diminishing, causing food shortages in areas where shortages were rare. In Ulanga District, for example, food shortages were rare before the 1930s. Vagaries of rainfall were countered by cultivation over a wide variety of ecological areas and the cultivation of a variety of crops. This practice resulted in the possibility of food exchange between differing ecological areas. However, the marketing of certain food crops and the diversion of land to cotton led to a reduction in the variety of crops. (56)

In Ndagalu, Kwimba District, the crops cultivated related broadly to soil types. They included sorghum, millet, cassava, groundnuts, and sweet potatoes. Of these, the staples were sorghum and millet which have now been abandoned gradually in favour of maize. Millet and sorghum are not regarded favourably because they need more time and energy around harvest time. (57)

The trend towards considering maize as the sole staple over most of Tanzania is a further constraint to food security. Iliffe claims that maize production for the grain trade became important even before the imposition of German and British colonial

rule in Tanganyika, (58) but the trend to consider maize as the country's staple took root during the colonial period. The major part of estate workers' food rations always consisted of "dona" (unrefined maize). In Handeni, for instance, the introduction of sisal plantations required large-scale food supply for the considerable labour force of the estates. The local *Wazigua* who refused to work on the plantation began to grow maize or cotton in order to get cash for paying taxes and buying such items as kerosene and clothes. A recent study on Handeni claims that the adoption of maize in preference to sorghum and millet increased the incidence of famines as maize was more susceptible to rainfall variations. (59)

Famine relief was also provided in maize and this led to changes in the staple food of many people. Thus, in the semi-arid Dodoma Region where the staple crops were millet and sorghum, maize has become a preferred crop within less than a generation. The risk element becomes greater and is transferred to the national level. The assumption is that the regional staple is maize and, therefore, it can produce a surplus. In an exceptional year this surplus is achieved, but the region clearly cannot be relied upon to consistently produce a surplus given the variations in rainfall.

3.2 TECHNOLOGICAL CHOICES, RESEARCH AND EXTENSION

Old habits die hard. Tanzania has had a great deal of experience of unsuccessful attempts at mechanization of agriculture using expensive machinery. The earliest of these, which started in 1947 was the Groundnut Scheme. Three million acres of bush were to be cleared by tractors and sown with groundnuts. The scheme had to be abandoned in 1949. It cost £35.87 million and left a cleared area of 220,000 acres which required still more money to make it arable. (60) The area was then turned into large farms where capital investment was about forty times greater per acre than on traditional holdings, (61) but where yields were so impressive that cultivation by the African farmers using a hoe was more competitive. (62)

In 1964/65 the government attempted large-scale mechanization in two schemes: the Village Settlement Scheme and the Block Cultivation Scheme in Sukumaland. The first of these has already been discussed.

The Block Cultivation Scheme was designed to improve cotton cultivation in Sukamaland. The objective was to use tractors economically by amalgamating cotton fields into blocks instead of the traditional practice of scattered holdings. Initially the government handed over 159 tractors to the scheme and bulk purchases were made for an additional 373 in 1963 and 673 in 1964 (63) for a proposed area of 45,000 acres of which only 13,686 acres were cleared and 7987 planted. (64) Of the 18 million Tanzanian shillings spent on the scheme and 2 million owing in interest only 35 per cent was repaid. (65)

In spite of the failure of these schemes, modernization is still interpreted as using tractors and the use of tractors in some village agriculture is imposing an unnecessary and impossible burden on the peasants' scarce cash. In many cases the inability of the peasant to repay the cost of such equipment threw the burden back on the government.

On the whole, agricultural improvement has been slow in Tanzania. Some 15 years after independence the majority of traditional crops are still being produced

by the same age-old methods where the hoe is the most important tool. There is a definite need to transform agriculture. At present some 3 million households are engaged in producing food for a nation of 15 million. About 90 per cent of these farmers now live in villages and shifting cultivation is not longer possible. Agricultural production can certainly increase with better techniques, tools and husbandry but the uniform transition from hoe to tractor, as suggested by some, is not feasible. (66) In this context the President's statement on the issue is very relevant:

> "If I were given enough combine harvesters for every family in Tanzania what would I do with them? . . . But we still have to give the people better tools, tools they can handle and can pay for. . . . If two million farmers in Tanzania could jump from the hoe to the oxen plough, it would be a revolution. It would double our living standard, triple our product." (67)

In a country with 14 million cattle it does not make sense to ignore the prospects of expanding and improving agriculture through increased use of oxen, particularly in view of the rising price of tractors. Several studies have also shown that the return to capital investment on mechanization in arable crops is higher for small than for large farms. It is possible to use ox-ploughs on small farms whereas tractors have to be used on large farms. (68)

Some authorities blame slow development on the character of the Tanzanian peasant. The peasant is supposed to be a traditionalist, avoiding risk by clinging to traditional cultivation practices which have ensured his or her survival in the past, and unwilling to experiment with new techniques which involve an element of risk. The assumption here is that all farmers have refused to experiment with new techniques, yet there are areas in Tanzania where the smallholder peasant farmer has experimented successfully with new techniques, for example, in the cotton-growing areas. (69)

After the fiasco with the Village Settlement Schemes the government tried to emphasize the use of ox-ploughs and provision was made for several oxen training centres. Nor are the Tanzanian peasants averse to using ox-ploughs. In 1967 some 8250 ploughs were sold; this increased to 9100 in 1968 and 15,000 in 1974. However, the fact that the two organizations entrusted with manufacturing agricultural tools, namely the Tanzania Agricultural Machinery Testing Unit (TAMTU) and the Ubungo Farm Implement Manufacturing Company Ltd (UFI), are not able to meet local demand is a constant setback. Thus, animal-drawn equipment has not been given a chance to prove itself even in those districts where there is an acceptance of, and aptitude for, its employment.

On the other hand, ox-drawn implements may not be the answer everywhere. In some areas the tsetse fly and East Coast fever may restrict the use of oxen. Tanzania needs a mix of technologies ranging from the simple to the sophisticated and drawing on the financial resources and skills of the rural areas. It cannot afford to be rigid, nor hope for innovation on "empty shelves".

On the whole, the indiscriminate extension of the National Maize Programme has all the symptoms of inappropriate technology. The National Maize Programme was launched in 1975 in 13 out of the 20 regions, with overseas assistance from IDA/IBRD and USAID as a continuation of the earlier programme started in 1974. Its aim is to make Tanzania self-sufficient in maize production by 1980 by

increasing peasant production of maize. The project consisted of supplying production packages including subsidized inputs and insecticides—as well as supporting extension services.

The National Maize Programme (NMP) appears to be handling the logistical problem of supplying villages with inputs in a reasonably organized and efficient way. (70) Yet on closer scrutiny the programme has problems. The first problem relates to the use or misuse of capital. A recent evaluation of the programme in Iringa makes the following telling comment: "In summary it is difficult to see how the NMP can continue to accumulate losses the way it has done every year to date in Iringa". (71) The evaluation for Arusha and Morogoro Regions claims that at the end of the first year of the programme the crop was a near failure in three of the 21 project villages surveyed. (72)

The major faults seem to stem from the inappropriateness of the recommendations and the weakness of the policy of implementation. Recommendations were made on a blanket regional or district basis.

In the case of fertilizers, for instance, the recommended levels were too high for the dry areas and too low for the high-rainfall areas. (73) The original aim had been to place the project in villages in the best maize-growing areas but this was not always followed. In Mwanza Region, after repeated failures, the President had to advise the people that they had better resort to the traditional drought-resistant crops such as sorghum and millet. (74) The introduction of packaged technologies without adequate trials has to be condemned. Even the price of careless technology has to be repaid by the peasants. It has now been recognized that corrective measures must be taken in such areas as extension services, repayment of credit, use of fertilizers and other management practices.

Another inherent danger of package deals is that such deals involve single-crop cultivation whereas the traditional food crop practice has involved intercropping. Intercropping has several inherent advantages, such as complementary use of soil nutrients, less need for weeding, an insurance against failure of one crop, etc. New techniques and technologies can only be successful if they can be worked into local conditions and practices.

As has already been stated, until recently most of the inputs such as extension, research, fertilizer, marketing and, above all, transportation have been mainly related to export crops. The competition for resources calls for long-term planning, for priorities to be established and for co-ordination. Too much of the research has tended to remain in the archives of the research station and a significant amount of research is simply "lost".

The current agricultural extension services include some 3000 Assistant Field Workers (AFW). (75) These agents are expected to serve about 7000 villages with about 1.75 million farm families, a ratio of about 600 farmers per extension worker. Almost half of the AFWs were assigned to crop authorities responsible for the production of the five major export crops (coffee, cotton, cashewnuts, tea and tobacco), (76) so that the ratio is closer to 1200 farmers per field agent. The past emphasis on cash crops is responsible for the inadequate extension services. A great deal has also been written about the poor quality of the service. (77) A dynamic, well-informed and dedicated extension service is essential if agriculture is to be radically transformed at village level.

The role of women in this respect has not been fully appreciated. Most of the advice in agricultural matters is generally oriented towards men and yet the drudgery of agriculture, particularly planting and weeding, is left to women. Dissemination of information to women pertaining to crop cultivation and management and the reduction of drudgery would help a great deal. Since women are so heavily involved in food production attention will have to be paid to the design of tools which are ergonomically sound and also to extension facilities for women. An attempt to encourage the cultivation of soya beans in a protein-deficit area failed, partly because women were not instructed how to prepare the beans for consumption. (78)

3.3 STORAGE, TRANSPORTATION AND MARKETING

There is first need for innovative thinking in terms of storage at household and at village level, building up to the district and national level. Damage and destruction resulting from bad storage can result in a loss of almost 100 per cent of the crop. Rats can destroy about 15 kg of grain a day, maize and sorghum poorly stored can be completely decomposed. (79) Food storage facilities are necessary at village level because most of the food produced does not come onto the market but is consumed by the producers themselves. In the case of maize, only about 17 per cent of the total production was marketed between 1963 and 1967. (80)

Here again, an understanding of the local situation is necessary. Peasants in Bwakiri Chini village, in Tanzania, rejected air-tight concrete or burnt brick silos because they were expensive, time-consuming to build and required masonry skills not readily available in the village. In addition, the grain had to be thoroughly dry before it could be placed inside such structures or else the grain would "sweat" and turn mouldy. (81) The peasants tended to harvest grain when it was not adequately sun-dried for two reasons: maize grown in December matured in April, the rainiest month of the year, so it had to be harvested wet; that grown in February matured in the dry month of June but had to be harvested when not quite dry for fear of it being destroyed by pigs. (82)

The major obstacle to food security is the lack of infrastructural support, particularly with respect to transportation and marketing. It is not difficult to find cases of crops rotting in one region because the crop authorities concerned have not collected the harvested crop, while one or more regions in the country were experiencing food shortages at the same time. The machinery for handling and redistributing seed, fertilizers, etc., as well as the organization of marketing agricultural crops, are sometimes unnecessarily complicated and expensive, thus increasing food prices without comparable benefits to producers. (83)

Efforts should be made to reduce needless administrative interference and redistribution. This implies that there is need for very careful appreciation of Tanzania's inherent strength and weaknesses. Multi-crop purchasing authorities make much more sense than single-crop bodies, given that most farmers grow a range of crops.

Prior to 1974 it was official policy to play down the role of prices, partly to discourage unequal rural incomes (84) and partly to restrain rising urban food prices. Thus for several years producer prices were held fixed in spite of increases in

costs of inputs. At the same time the food price index spiralled at the rate of 10.2 per cent per annum between 1969 and 1973. (85) Dissatisfaction with low prices was by far the main reason why farmers would not sell maize to the co-operatives, and led to a substantial amount of illegal marketing, thus causing artificial shortages. (86) Since 1974 the government has increased producer prices in order to encourage output and sales to the marketing corporation, but there has been less improvement in marketing and processing costs.

4. Food Shortages in 1974/75 and the Possible Choices for Food Security

It will be recalled that during the two five-year plans which have elapsed, only marginal attention was given to food production. It was assumed that peasants would continue to produce food and there was little appreciation of the fragility of Tanzania's food situation. Warning signs of an imminent shortage such as the ongoing calamity in the Sahelian zone, famine horror in Ethiopia and shortages next door in Kenya, and even the localized shortages in Nzega and Mwanza districts in Tanzania, were not taken seriously. Late in 1974 Tanzania awoke to the fact that there was a serious food shortage. The mobilization to face the threat was dramatic. The President addressed the nation to describe the situation and launched the *Kilimo cha Kufa na Kupona* (Agriculture for Survival) programme. (87) Both formally through official institutions, and informally through countless individual efforts, the challenge to cultivate food was accepted. Emergency purchases of grain were made on a substantial scale and some food assistance began to arrive. These were sold without restrictions or distributed free. These measures psychologically gave the people the confidence that things were under control. There was no panic, though there was the inevitable chaos and wastage as well as glaring weaknesses of past neglect. These ranged from unnecessary restrictions on food moving between districts to poor transportation and some corruption.

It was obvious that Tanzania was prepared to pay the price to avoid a catastrophe. Most of the grain which came to Tanzania was purchased at a time when there was an upswing in world prices. Each ton depleted the foreign exchange reserves and the country came perilously close to bankruptcy. Security had to be purchased. A parastatal organization, the National Milling Corporation, replaced the National Agricultural Products Board and slowly assumed a leading role in the purchase and distribution of food grains. There was some attempt to co-ordinate information about stocks and distribution. These were emergency steps but the path to food security is long and the alternatives which Tanzania has still have to be developed. The success of national food security is a multi-sectoral issue even though the concept's goals are quite specific. Food security will depend on advances made in a number of other fields which are not directly related to food, as for instance systematic collection and use of data, encouragement of basic research and its application, etc. In this respect, while it is difficult to predict what will be the long-lasting influence of the 1974/75 food shortages, there are indications that interest in the food issue has been substantially revitalized in several fields.

There is much greater awareness of, and sensitivity to, food issues since the food shortages. In part this can be expected because many viewed the shortages as a near

calamity. (88) But this type of concern has only a short-term impact. For instance, in the Central Province of Tanganyika, grain silos of 50 tons capacity which were constructed in the late 1940s, (89) because of famines, were abandoned in 1961 because of administrative problems and lack of interest by those who would have benefited. The area where there has been an important increase in awareness due to the 1973/74 famines has been with respect to the influence of food shortages on institutional structures. Thus, the value of a centralized purchasing and distributing body like the National Milling Corporation has become apparent. This body is responsible for the purchase of both locally grown and imported grain, and for the distribution of food. Given autonomy and support, commensurate with the responsibilities bestowed upon it, it should provide decision-makers with an indication of likely trends and, therefore, of the corrective measures which need to be taken. A related body, the Marketing Development Bureau, after a slow start, has accumulated considerable expertise in the collection of data which can be used for agricultural decision-making. However, the collection of agricultural intelligence has to be more systematic and has to operate at a decentralized level. The former East African Meteorological Department also began to take an interest in topics which had national relevance. An agrometeorology division was established and a bulletin called *Agrometeorological Bulletin for Tanzania* was launched.

Finally, after years of debate, a Tanzania Food and Nutrition Centre was created in 1973. (90) Its main functions are:

—Planning national food and nutrition policies.
—Carrying out surveys as a basis for policies and planning nutrition activities.
—Identifying the equipment and teaching aids needed for the national nutrition education campaign.
—Developing a low-cost and balanced weaning food, using locally available food items (mostly for urban areas).
—Spreading nutrition research findings.
—Making sure the foods developed in the country and those imported are good for human consumption.
—Advising Government on nutrition affairs.
—Teaching at nutrition schools. (91)

To enable these institutions to function properly, there is a need for a correct mixture of empirical and theoretical research to be integrated with the activities of other similar institutions.

One of the obvious areas which will bring food security is the development of communications, and improvement in the way in which these systems are used. Despite improvements in the road and rail network it is still easier to obtain supplies from thousands of miles away than to shift food even a few hundred miles within Tanzania. The Uhuru Railway running from Dar es Salaam to Kapiri Mposhi in Zambia has penetrated the southern part of Tanzania but it has to be linked properly with the road and the major ports in order to function efficiently. Optimistically, the management and efficiency of the railways will improve with experience. There are a few areas of glaring weakness in the development of the transport network. The absence of a reliable north to south link is now demanding

attention. Given the latitudinal spread of the country with the potential physical resources in the south and the bulk of the population in the north, there is need to link the complementary parts of Tanzania. There are problems involved in the link of the Uhuru Railway with the Central Railway line because of the different gauges of the two systems.

With nearly 700 kilometres of coastline much more could be done to develop ocean transport. Similarly, some of the largest lakes in Africa—Lake Tanganyika, Lake Nyasa and Lake Victoria—all of which form part of Tanzania, could be used. Improved water communication would also lead to improved fishery development. There is need for less emphasis on large ocean ports and more on the opening up of several smaller and strategic ports.

The storage of food is now being given the attention it deserves. There are four large silo complexes which are in various stages of completion or use. The large silo in Dar es Salaam is more useful if large-scale imports of grain continue, or it could function for the export of grain. The Dodoma and Arusha complexes are more strategic for distribution and production, respectively. However, even more urgently needed is a range of intermediate-sized silos for regional use, and numerous even smaller storage facilities appropriate for village use.

In the more intermediate time span, agricultural production could be increased by continuing with the present mix of staple food crops but increasing the per capita output through better management practices. In addition, there is little room for an "empty shelf" policy, nor for the other extreme—the massive import of technology. What is needed is a mixture of the sophisticated and the simple. In the longer term, basic research more orientated to indigenous food crops and land-use management is required. Briefly, there is a need to increase output per capita, output per unit of labour and land.

On the issue of land, there is a need to redirect population movement into promising areas, such as the Rufiji Basin which covers one-fifth of the country, into parts of Rukwa and Kigoma regions. Increased population in these areas would also remove the obstacles to their development. Given the size of these areas and the logistics which will be involved, consistent modernization and incentives to move population into this area will be necessary. Push factors alone will not be sufficient.

Finally, it is clear that national food security is a complex issue in which short-term solutions can well be a hindrance to the long-range goals. Even more difficult is the choice between the various competitive demands for resources. Following the food shortages of 1974/75 Tanzania's response has been closer to the UN food strategy in that:

> "It should combine a sense of immediate urgency with long term optimism that the developing countries, with assistance from developed countries, can achieve the necessary increases in food output while meeting more adequately the goals of rural development and social justice."

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86 Temu, *op. cit.* p. 156. The low produce prices resulted in low sales of maize to the marketing corporation and speculation in illegal marketing and smuggling across the borders is also supported by Maro, *op. cit..*, pp. 113 and 14. For more detailed analysis of the price structure and its consequences see Tanzania, Marketing Development Bureau, *Price Policy Recommendations for 1976/77*, Agricultural Price Review, Dar es Salaam, 1975, 3 vols.

87 *Daily News*, 16 September 1974. Main elements in the campaign included price increases to farmers for grain as well as cash crops; the free supply of seed, fertilizers and herbicides particularly to Ujamaa villages; mobilization of Party and Government officials in the production of food crops, especially maize. Townsfold and government business enterprises were also expected to participate in growing food.

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CHAPTER 7

Colonial Disjunction in the Sahelian Countries

A. Introduction

IN THE case of Tanzania we could have referred to a "colonial disjunction" between metropolitan industry and local agriculture, itself subjected to a disjunction between the plantation economy and peasant agriculture. Similarly in the Sahelian countries, there is very little industrialization. But the colonial and post-colonial demands of French industry for cash crops (cotton, peanuts, etc.) had similarly weakening effects on the local peasant economy.

In the Sahelian countries colonization has disrupted communal forms of agricultural production as well as the related communal and social structures, without eliminating them completely and without replacing them by a new productive organization which ensures both higher productivity levels and better social harmony and stability. Bonte, in the following section, shows how the commercialization introduced by colonization has made agro-pastoral systems more vulnerable to economic fluctuations as well as to climatic fluctuations. Following the UNRISD/INRA study of the 1931 Niger famine, he points out how the colonial requisitions (in kind, in cash and in labour) as well as taxes, have made the peasants of Niger more vulnerable to drought. In the post-independence era, not only have governments failed to devote their best efforts to enhance food production, but, under the compulsions of the development model chosen in accordance with the best interests of the industrialized countries (and particularly the former metropolitan countries), they have stimulated the production of cash crops, the main source of financing national bureaucracies. In low-productivity systems—with hoe cultivation still dominating—fiscal measures, agricultural credit and market organization are at least as important as weather conditions. Their influence was marked by good rainfall conditions following independence. Good years are taken for granted; only bad years make headlines. That "normal" climate is made of good and bad years is conveniently forgotten by governments. When drought struck it revealed the vulnerability of the whole socio-economic system. It should therefore have been an opportunity to make the necessary changes, and, to a limited extent (more attention given to food crops) some changes were made.

However, the pastoral systems suffered more than the agro-pastoral systems. For this reason we have chosen only those sections from Bonte's contribution—far too long to be included here *in extenso*—on the agro-pastoral and pastoral systems, of which he is one of the best specialists. It is on these systems that the colonial disjunction has operated in full. Bonte shows how drought conditions were

integrated into the highly complex pastoral societies as in-built regulators. Colonial policies weakened this system through their impact on long-distance trade which formerly enabled pastoralists to recoup losses (changes in the territorial inter-ethnic and social organization; changes in livestock market: deterioration of the terms of exchange between livestock products and grains, etc.) and thus prepared the ground to make the 1972–73 drought, no longer operating as a built-in regulator, but as a real perturbation which could threaten the very future of pastoralism itself.

In the pre-colonial Sahelian nomadic pastoral systems potential instability stemmed from fluctuations in the relations between animal population and disposable pasture and water resources, as well as between herd sizes and the sizes of human groups in charge of them.

Pastoral nomadism developed as a rational use of arid areas, having a high level of rainfall variability. Consequently, pasture and water resources were reduced periodically in a rather erratic and certainly not cyclical manner.

When the decline in pasture and water resources extended to the space used in good rainfall years, and threatened the equilibria referred to above, the potential effects of such localized "droughts" could be dissipated by extending the usual migrations over a larger spatial area. We have put drought between quote marks to remind the reader that drought can be defined only in terms relative to the production system.

When the use of a larger space did not suffice to maintain previous equilibria, because reduction of rainfall was also prevalent in the extended usable space, we can speak of generalized droughts. A situation of generalized drought resulted in reducing herd sizes so that a new equilibrium could be reached while human groups were restructured. Drought was, therefore, an inbuilt regulator of nomadic pastoral societies.

Within this general strategy of space use, other subordinate processes were taking place, contributing to the possibility of reproducing the system. The following processes may be mentioned:

(a) Space use in the search for pasture, water and salt was regulated by inter-ethnic reciprocal relationships eventually modified but not suppressed by local wars. Barter exchange of livestock products against grain was conducted with settled agriculturalists, eventually in the form of tribute exacted from them.
(b) Within the same ethnic group, slaves were farming for their masters, thus contributing to the food balance of the community. Other food products were obtained through hunting and gathering certain grass-type species. Additional income derived from long-distance trade, particularly across the Sahara, taking advantage of the spatial discontinuity between supply and demand of certain goods, as well as of spatial price differentials.
(c) Herds were diversified, each animal species (camels, cattle, goats, sheep) grazing particular plant species and vegetation strata, thus reducing, through this in-built heterogeneity, the impact on vegetation of year-to-year climatic variability.
(d) Herds were always oversized in relation to the food needs of the human groups exploiting them (up to the point where their size was eventually

reduced as pointed out above), not only as a reserve for bad years but as a reserve on which to draw to maintain and reproduce social relations. Extremely complex exchanges, gifts, loans were made within and between groups, ensuring social reproduction as well as social and spatial distribution of the risks linked to drought, epidemics, wars, etc.

Pre-colonial nomadic pastoral societies were not idyllic societies. Slavery, military domination of agricultural societies, wars, raiding expeditions (ensuring a redistribution of livestock and wealth) and epidemics took their toll. Nevertheless, as a production system, nomad pastoralism was able to reproduce itself and persist, whatever climatic variations occurred; drought itself being a factor of homeostasis.

Under colonial domination the general strategy concerning spatial use of arid zones did not change but became increasingly less effective to the point that its future is now at stake. This is because the subordinate processes described above have moved dramatically *in the same direction* and more or less simultaneously. All the mechanisms contributing to the homeostasis of the system have weakened. Drought ceased to be an in-built factor contributing to equilibrium, but has become a disturbance which threatens the system itself.

The brutal insertion of the nomadic pastoral system into the sphere of an industrialized capitalist country such as France, actively participating in the world economy made itself felt through a considerable increase in commercialization and monetization with the development of new markets, accompanied by a political restructuring. This resulted in the reduction of the bargaining power of nomadic pastoral societies (no longer able to be sustained by their military power) in relation to settled agriculturalists. The declining ratio of livestock to grain prices is evidence of this loss of power.

Increased commercialization and monetization brought about by taxes and levies produced social tensions which reduced solidarity and increased economic polarization between large and small herd-owners. Social relations and the attendant rules governing the social and spatial distribution and circulation of animals, which helped to spread risks, were thus modified.

The size of the herds of the more powerful owners tended to increase in response to commercialization and monetization rather than to the traditional forces described above. At the other end of the social spectrum, freed slaves could not take advantage of the new conditions, while the security offered to them previously in the kin dependence relationship disappeared.

Increased tension and polarization were reinforced by the changing role of traditional leadership, whose regulatory functions were weakened within their own group as well as in relation to the inter-ethnic relations governing the use of space.

The establishment of political borders, strengthened with the emergence of nation-states on independence, tended to restrict the mobility of nomadic pastoralists and their traditional use of space, thereby weakening their strategy in coping with year-to-year variability in climate. This made it more difficult for them to recoup losses through traditional long-distance trade which, in addition to the obstacles created by the borders, was weakened by the competition of new goods and new transport facilities, as well as by the new trade routes which the growing urban demand for beef, particularly in high-income coastal areas,

encouraged. The possibility of finding alternative sources of meat in wild game was also reduced by indiscriminate slaughter. In turn, changes in the population of wild game have had an effect on the composition of vegetative cover.

The growing urban demand for beef (as opposed to camel or goat meat) has changed the composition of herds in favour of cattle, the latter also having benefited from priority attention with respect to veterinary care. This has reduced the herd's heterogeneity and therefore its capacity to use different species and vegetation strata. The consequences were a reduced adaptability to climate-induced vegetation changes on the one hand, and a change in the composition of the vegetation cover on the other, with a new equilibrium establishing itself between the extension of vegetation formerly eaten by animals now given up (especially bush species browsed by goats) and the reduction of species grazed by cattle. This overgrazing was further aggravated by technocratic decisions on the spacing and water-delivery capacity of new wells.

Moreover, the growing urban demand for beef, particularly by the high-income groups in coastal countries, did not benefit nomadic pastoralists because they were unable to control the trade. They sell when they get close to the markets, and therefore at certain times of the year supply suddenly increases. With pressing cash needs—and no time to wait—they have to accept whatever prices are offered them. We referred earlier to the declining ratios of livestock to grain prices. This declining ratio is a result of the processes referred to above contributing to the increased vulnerability of nomadic–pastoral system and, at the same time, this declining ratio itself contributes to the increased vulnerability by means of a positive feedback. Thus the future is bleak for nomads. Those who cease to be nomads lose their previous know-how of animal husbandry (except in the limited case of when they settle). They have no choice but to become at best mine workers (in Mauritania for instance) and by their sheer numbers keep wages down, or to become the *lumpen proletariat* of African cities or migrant labour in France (as long as it is feasible). The only hope is that livestock exports are so important to the Sahelian countries that their governments might realize—after having tried and failed to "rationalize" meat production in, for instance, large capitalist ranches—that they need them and their know-how, and devise *with* them new forms of organization, if it is not too late.

What made the 1972–73 drought a disturbance which could not easily be absorbed by the system was not its climatic characteristics but the changes in the socio-economic system itself which made it no longer able to cope with conditions that not only have been known for centuries, but which were also an integral part of the system. Pastoralism, a rational system of spatial utilization of resources in arid conditions, seems to be condemned in the long run by present government policies.

Unless political changes occur, the drought conditions at the time of writing and future droughts will assist in executing the death penalty pronounced against pastoralism, a sentence for which, again, nature pleads not guilty.

B. The Sahel: Transformation and Drought* by Pierre Bonte

It is for convenience that the Sahel has been chosen to exemplify the zone hit by the drought which has struck western Africa since 1973. In fact the zone affected by the

*Translated from the French.

drought is much larger than that customarily referred to as the Sahel, the Arab term meaning "border" of the desert. Strictly speaking, the Sahel represents an intermediary zone between the Sahara Desert and the Sudan.

The Sahara and the more southerly equatorial zone are each dominated by the almost exclusive action of a single mass of air—the dry continental air in the north and the humid monsoon air in the south. The intermediary zone—the Sahel—is influenced by the periodic alteration of the northern and the southern air masses. Fluctuation between two air masses creates a climate with highly contrasting characteristics: contrasts between wet and dry seasons and between hot and cool seasons (one quickly reaches an area where the aridity index is very high for several months in the year). There are also contrasts from year to year in response to changes in the humid air front.

These contrasts become all the more pronounced as one moves toward the north, with the limited influence of the humid air mass during part of the year. Seasonal variations are a feature of the climate throughout the entire Sahel. This whole region was subjected to the effects of the drought, the direct climatic cause being the limited progression of the humid air front in successive years. In fact it is possible to distinguish several subzones between the north and south. The contrasts between cool and hot seasons increase with the climate, becoming increasingly stabilized into a continental-type pattern. The rainy season is shorter and shorter, and in the Sahel the rain falls on average only three months out of the year. The drought produced its most typical effects in the actual Sahel region where the annual rainfall varies between 200 and 500 mm. The Sudan—an intermediary subzone where rainfall varies between 500 and 1500 mm—was also struck by this drought but in a less general way.

Soil types vary across the region according to the level of rainfall, which directly influences the contribution of soils. The vegetation reflects the climate to an even greater degree, changing from savanna to forest canopy, to wooded savanna, then to steppe which is most typical of the Sahel zone.

Thus, an identical "climatic regime", but with an increasing aridity, produces different effects which reinforce the existence of two systems of production which are partly distinct in space: one based on livestock, the other on crop cultivation. The existence of these two systems of production delineates clearly two ecological zones, which are not only the product of natural conditions but, in particular, the result of a specific historical process of evolution. Failure to analyse precisely the linkages between the system of production and the ecosystem has led to numerous errors which attribute the transformation of the conditions of production purely to changing climatic conditions.

1. Pastoralism, Agriculture and Pre-colonial States

Around 1000 BC both agricultural and livestock raising populations lived in the northern Sahel zone. Neolithic villages in the region of Tichitt in Mauritania were occupied by agriculturalists while cattle raisers roamed at the foot of sandstone cliffs, which tended to encourage a sedentary life. Several centuries later this region was overrun by the camel herders. Between these two periods the climate became

drier, although this fact alone is insufficient to explain such a drastic change. In fact, occupation of the land by these nomads permitted a more efficient use of the ecosystem and transformed it into an exclusively pastoral ecosystem. The social and political drive of these nomadic populations led to a progressive extension of this pastoral ecosystem, fostering the use of potentially cultivable land as pasture.

The fact that this evolution corresponds only partially to climatic variations is attested to by the strong upsurge of agriculture beginning in the twentieth century—that is, since the time when the colonial powers felt it necessary to quell the expansionist political capacities of the nomadic population. (The nomads often constituted a major obstacle to colonial conquest.) This spread of an agricultural zone under colonial rule, and which occurred during conflicts between pastoralists and agriculturalists, extended some 50 to 100 kilometres, depending on the region.

However, the conditions under which these newly opened agricultural regions were established ensured a certain fragility in these new systems of agriculture, contributing to the catastrophic effects of the droughts over the past several decades. It was, in fact, the need to develop subsistence production, for reasons which include both the growing commercialization of agriculture, and the need for subsistence products on the market, which extended agriculture into regions devoted to pastoralism and which resulted in the extensive and destructive exploitation of these lands. This point will be developed later, but it is important to note here that the fragility and vulnerability of the ecosystem are directly determined by systems of production.

With respect to farming in zones which historically specialized in pastoral production, during the nineteenth century there was in fact extensive cultivation of millet in the Ayr Region (Niger) where the rainfall scarcely exceeded 250 mm. This crop often depended on water from temporary streams or from heavy localized rains. The yield was low but labour productivity was high since these crops required little care. The abandoning of cropping in favour of growing pastoral specialization resulted from the development of caravan traffic (which included cereals) between the Hausa farming country and the pastoral nomadic zone in the nineteenth and twentieth centuries.

Between these two systems of production—pastoral and agricultural—there existed a strong complementarity, indeed a direct association between ecosystems. Those who raised livestock obtained vital products from the agricultural zone. More importantly, they procured not only the cereals necessary for subsistence but also a number of other essential products: farm products such as cotton, dyes, henna, and tobacco and raw materials such as metals and wood from Mauritania, for use as tent frames. In the past these agricultural regions were also a source of slaves whose labour power reinforced the productive capacities of pastoral society.

The flow of goods in the reverse direction was no less important; the livestock breeders traded their own primary products. Live animals constituted the most important exchange item, and secondary products such as cheese, hides, and artisan goods made from other parts of the animals were also traded. They also supplied high-quality artisan goods such as jewellery and wood carvings and also salt and dates, the last two being products specific to the Sahara. Finally, those who raised livestock fulfilled an essential role within the actual agricultural division of labour. They organized caravans and tended herds which belonged to the sedentary

farmers, providing an important service since the annual migrations permitted the livestock to graze in the northern pastures during the rainy season.

The differences and complementarities between the pastoral and agricultural ecosystems thus formed the basis of complex social structures which included very important inter-regional and inter-ethnic networks. This aspect is of fundamental importance in both historical and contemporary analysis of the drought-stricken societies.

The introduction many centuries ago of the domesticated camel into the Sahara was a decisive development which brought about the specialization of nomadic herders in the Sahara and the Sahel. From about AD 1000 a growing social and political dynamic culminated in the rise of states and empires, based on ethnic, economic, and political differences between agricultural and pastoral–nomadic societies in the Sahel–Sudanese region. The political heritage of these state systems survived until suppressed by European colonization. The development of states was in fact the result of a threefold process revealing the complexity and complementarity of Sahelian social structures.

First, most states were built upon an initial phase in which pastoral groups dominated the more sedentary agricultural populations. For example, the dominant group in the Bornu Empire, which arose around the tenth and eleventh centuries, is related to the present-day Tubu pastoralists. In the sixteenth century Tuareg peoples assumed the dominant role in organizing the Sonrái Empire. Finally, in the eighteenth and nineteenth centuries the Fulani herders were involved in a series of states stretching from Senegal to the Cameroons (Macina, the caliphate of Sokoto, Adamawa, etc.) where they comprised an aristocracy which dominated various ethnic populations.

A second dimension of state formation, illustrated by the more recent and thus better-known Fulani examples, is that of inter-ethnic relations (and, by extension, the degree to which these ethnic groups have territorial or inter-regional domain). To the extent that these inter-ethnic relations are encompassed by a state network, they create a new dimension. As the Fulani aristocracy began to dominate the caliphat of Sokoto and the entire Hausa country, they came to be distinguished from the actual Fulani herders. This was as much from the political viewpoint where the difference is evident, as from the economic (involving differences in breeding methods), or the ideological (Islam as the ideology of domination). Fulani domination was not consolidated until the end of the eighteenth century when these processes had already matured. In sum, the dominant group evolved its own ethnic category as distinct from its pastoral origins.

Thus within these social state formations, inter-ethnic and inter-regional relations structured networks of labour specialization and of circulation of products (either through exchange, or through tribute levied by the aristocracy). In destroying these states, European colonization disrupted these productions and circulation networks. This spatial disruption was a major contributing factor to the drought which began in 1973.

Thirdly, besides constituting the historical form of the relations of production and the circulation of products, these social state structures arose out of efforts to control and organize international relations of exchange between the Sahel and outlying areas, the most important being those established between the Sahel and

the Mediterranean basin. Relations of exchange were also established between the Sahel and the equatorial or sub-equatorial zone of Western Africa. Thus Sahelian states developed as channels for trans-Saharan exchange and constituted important exchange networks. They supplied products bound for the Mediterranean basin (artisan products such as hides, leather products, textiles, clothes, ostrich feathers, etc.), and they served as a relay chain for products coming from places further south (the two most important products being gold and slaves). In exchange, they received products from the Mediterranean basin, Europe, and the Middle East.

The trading routes and caravan traffic had a direct influence on the development of towns in this region. The main cities owed their status to the presence of Mediterranean Arab merchants (also serving as centres for the spread of Islam). The only notable exceptions were the Hausa cities in the nineteenth century which acted both as trade centres and also highly important centres of artisan production and even quasi-manufactures, though these were partially directed toward trans-Saharan networks (for example, leather products and tanned hides).

The importance of each of these trans-Saharan routes varied over the course of centuries, changing with the political situation. The rise and fall of Sahelian states was influenced by their internal evolution and the shifting of routes, the two being dialectically related. A rising power would attract caravan traffic in order to increase its strength; political and economic activities in the Mediterranean basin would contribute to consolidating or weakening one or other of the different states. In the eighteenth century the combined effects of the shift of western Sahara traffic toward the Atlantic coast and the Turkish domination on the Mediterranean coast (the principle centres of which were Tripoli and Tunis) tended to favour the central Saharan routes and help explain the power of the Hausa states and those of the caliphate of Sokoto.

Thus it can be said that the social structures which have developed over time in the Sahel have to be related to the building process of a state whose relations—inter-ethnic, inter-regional, and inter-national—were continually being redefined and developed.

One cannot, of course, explain the formation of Sahel societies only in terms of the establishment of states. Certain agricultural populations, such as those which took refuge in mountainous or other inaccessible areas, remained outside of the framework of the state, the best-known example being that of the Dogon of Mali. There were numerous other examples of pastoral and nomadic populations who, except for brief historical periods, remained outside these states, and had their own autonomous political organization. The nomadic Sahelian populations were, in fact, the same as the Saharan populations (Moors, Tuareg, Tubu). Their organization in tribal form was not incompatible with considerable social stratification nor even with eventual constitution of states (e.g. the emirate Moors in Mauritania). However, these states were very different from the Sahelian states described earlier. They were founded on a dynamic which was unique to these nomadic societies, being characterized not only by the development of social stratification and political centralization stemming from tribal organization, but even more by periodic expansionist waves. When directed towards regions occupied by sedentary agricultural populations, nomad expansion resulted in the

domination of the settled agriculturalists, and facilitated the formation of the Sahelian states.

The Fulani are an exception to the historical development of Sahelian societies just outlined. Unlike other nomadic peoples of this region, the Fulani herdsmen were not nomadic camel herders but cattle herders, directly associated with and sharing the same territories as the Sahelian agriculturalists. It appears, moreover, that this particular form of division of labour between farmers and herders preceded the specialized task of camel raising. (This is specially true if the existence of ancestral ties between the Saharan cattle herders, the neolithic herdsmen of Tichit and the Fulani is accepted.) Fulani herders and sedentary farmers evolved simultaneously within the same social structure and not in the framework of two distinct social formations as was the case for the Moors, Tuareg, and Tubu.

In the Sahelian states, therefore, the Fulani herders were a group specializing in livestock raising and had the status of a quasi-caste. Their status varied, however. The Bornu Fulani had a very low status, while in the caliphate of Sokoto and in Hausa they were a dominant ethnic group. This last example suggests that the role of nomadic populations in the development of states in the Sahel cannot be reduced to that of simple conquerors but instead depends upon the interplay of roles among all (the Fulani) or part of the populations (Moors and Tuareg) within "agricultural society". This "agricultural society" should in fact be seen as an agro-pastoral society which, in the case of the Fulani, can be divided into two groups: one specializing in livestock raising, the other in farming. In the case of the Serer, the Tukulör, the Soninke and others, there was no such division. Table 1 provides an historical summary of the occupation of the Sahel.

It is important when analysing the Sahelian societies, and the effects of the 1973 drought, to bear in mind both the diversity and complementarity of the systems of production and social formations.

2. Systems of Production and Climate

The diversity and complementarity of systems of production and social structures referred to above, allows for the wide range of adaptive responses common to all Sahelian societies. The chief difference between Sahelian societies is the level of rainfall, which is much less abundant in the north and consequently limits the

TABLE 1.
Historical Summary of Occupation of the Sahel

Ecosystem	System of production	Social formation
Grazing ecosystem with pastoral specialization	Nomadic herding (Moors, Tuaregs, etc.)	Tribal and state formation of the Sahel–Sahara region
	Specialized pastoralism (Fulani)	Pre-colonial Sahelian states
Grazing ecosystem with agro-pastoral specialization	Agro-pastoralism (Serer, Suninke, etc.)	
	Specialized agriculture (Mossi, etc.)	

ecosystem to an exclusively pastoral form of production. Spatial mobility of herders, differentiation between groups who exploit different areas, and systems of inter-regional exchange represent adaptive responses to the common and widespread climatic variability—in particular, the variability of rainfall which fluctuates from year to year and from region to region. These pre-colonial systems of production have survived to the present, notwithstanding severe climate fluctuations and drastic changes in their environment. Climatic factors alone cannot therefore be held responsible for the disastrous events of 1973. The proponents of the climatic explanation follow the tradition of the "desertification" theory of the Sahel, initially elaborated in 1937 by English geographers which also found many proponents in France. The Franco–English Forest Commission subsequently examined the facts supporting this desertification theory and rejected the theory. It was learned that the much-publicized "shifting sand dunes" were caused by deforestation, and even though the increase in palm trees seemingly testified to increased aridity, it was discovered that, during the same period, the rivers of the area were swelling and flooding the valley basins (*fadama*). The commission noted that these two divergent consequences resulted from one single process: that of extensive reclamation of land in the upper valleys for the cultivation of cotton and groundnuts.

It has already been noted that during the early twentieth century, instead of deserts encroaching there was a general upsurge of agriculture. In fact, just as 50 years ago supporters of the theory of desertification (recording the evident deterioration of the soils and vegetation) attributed the causes to climatic trends, ignoring the changes in production systems since colonization, so those who explained the effects of the 1973 drought simply in climatic terms, excluded factors relating to economic and social change. This approach is exemplified by G. Poursin who remarked that "the arguments drawn from colonization, and especially its errors, can explain only with difficulty the desertification of the Sahel. The principal cause of this drought is, in fact, of a purely climatic order." (1) Nevertheless, while climatic fluctuations cannot be ascribed to colonization, the fact that the effects of climatic fluctuations are not always identical cannot be ignored. The temptation, consequently, is to put forward the changing-climate (desertification) hypothesis to explain these more recent consequences of the drought. Further discussion of this hypothesis is required in order to find the real explanation.

The information available for studying the climatic evolution of the Sahel is scarce: statistical series are available for only short periods and not for the pre-colonial years. Nevertheless, there was no lack of data or hypotheses at the various conferences held in 1973 when the effects of the 1973 drought became evident. (2) In *Drought in Africa*, R. J. Jenkinson (3) assembled all the available information on the variation of winter rainfall in central Sahel. From his data he situated the 1973 drought in a series of more or less regular climatic fluctuations. He concluded that "taken as a long-term deficiency—from 5 to 10 years—the present deficiency was much less severe than those which occurred 30 or 60 years ago, but more severe by two or three years than the 1912–1914 drought." In the same work the French geographer, M. Roche, obtained identical results by means of a different method: the driest periods were those between 1910–16 and 1949–48. Nevertheless, the

1973 drought was almost as intensive. In addition, the latter drought was more generalized and extended further southwards.

If there were no drastic changes in the course of the last century, is it possible to assert that these droughts belong to a long-term "drying" trend? All depends upon the time horizon selected. It is possible to discern substantial, long-term fluctuations, specifically the existence of a more humid phase in this region of Africa between 12,500 and 700 BC (corresponding to the glacial retreat in the northern sections of the globe). Afterwards there was a trend towards dryness punctuated by several brief periods that were more humid than the present (most of the subterranean waters date from this Lacustrine Period).

The present climatic trends are said to have begun around 3000 BC. In contrast to these lengthy periods, the variations occurring over the last few centuries appear insignificant. Using records dating back to the nineteenth century, A. J. Grove and M. Roche deduced that there was nothing really specific to the Sahel in terms of insignificant rainfall variations during this period, periodic cycles, or even phases of insufficient or abundant rainfall. For example the 1890 period corresponds to a peak in rainfall noted for the entire continent (swelling of the Nile, rising level of lakes, etc.). A clear-cut decline in the level of rainfall followed until just after 1914.

All these preceding facts tend to point to the same fact: that climatic fluctuations are an age-old and basic factor in Sahelian systems of production and social structures. The available date do not allow conclusions to be drawn about climatic deterioration in either the short or medium term. However this is not to deny that important changes have resulted from the effects of drought, due to the continual interaction of climatic phenomena with economic and social factors, within the dynamic of the systems of production. These systems of production displayed a certain efficiency in coping with drought. For example, the pastoral economy of the nomadic camel herders, who made their appearance a little more than 1000 years ago, was more efficient than that of the Neolithic agro-pastoralist who inhabited the central Saharan region. Other things being equal, a year appearing as a drought to the Neolithic agro-pastoralist would not appear as such to the nomadic camel herders. There was a degree of control, a "domestication" by man of the climatic factors, like all other "natural" factors of production, which vary from one society to another and which contribute to their lesser or greater degree of vulnerability.

Thus climatic facts are not facts in themselves; they assume importance only in relation to the restructuring of the environment, within different systems of production. Here Marx's comment in the Introduction to the *Critique of Political Economy* takes on its full meaning: "Production has specific conditions and its own premises which constitute its factors. At first these factors appear as natural or historical givens and for a particular period they seem to be the natural premises of production, while for a different period, they appear as the results of an historical process." If we accept that climatic conditions have not undergone any appreciable changes during the last several centuries, then the essential issue is that of their incorporation into a given system of production. More precisely, and in terms of the 1973 drought: to what degree did the colonial transformation of the system of production change the way in which climatic factors could exert their influence?

In all systems of production which have succeeded one another in history, the "domestication" of climatic factors is quite relative: this involves not a trans-

formation of nature (a climate is never transformed) but an adaptation. Particular climatic factors set limits to the system of production which in turn determine the effects of abnormal variations which he cannot absorb. The limit between the exclusively pastoral and the agro-pastoral use of the pastoral ecosystem is a good example in the Sahel zone. The annual cultivation of cereals is possible only within certain climatic limits which are measured by the amount of rainfall. The area devoted to cereal cultivation can be extended in the event of a series of years of good rainfall, but may have to be drastically reduced at any given moment, in case of droughts.

This is what happened following the increase of cultivation during the colonial period; the 1973 drought confirmed the fact that there had been an over-extension of the cultivated area. Thus, even a minimal change in climatic conditions—say a drop in the average rainfall by 12 cm—can have a substantial impact upon the systems of production located in surrounding areas. Because of the historic inter-relationship between nomadic herding and sedentary farming in the Sahel region, the surrounding areas are highly significant in that they are sensitive to variations in rainfall: variations in climatically permitted limits are attested to by the ruins of cities found in what are now arid regions (Kumbi-Saleh, Audaghost in Mauritania) and evidence of formerly exclusive herding groups in what are now agricultural districts on the right bank of the Senegal River.

These general factors relating to droughts in the Sahel zone can be summarized as follows:

(a) Geographically, the Sahel represents a zone bounded in the south by a region dominated by an equatorial climate and another in the north whose climate is continental and arid. Both regions, however, share the same general climatic conditions: a dry season and a relatively important rainy season, with rainfall varying according to the year and place.

(b) The Sahel region exhibits historical unity. It is an area where nomadic and sedentary populations live together and where social states emerged and eventually spread into the Sudan and, to a certain extent, into the southern Sahara.

(c) Exploitation of the Sahelian ecosystem (a pastoral one) occurs within the framework of several different systems of production, the main systems being exclusively pastoral or based on agro-pastoral activities. Their differentiation and complementarity over time form the basis form the real unity of the Sahel zone.

(d) The available evidence does not indicate a transformation of production systems due to short- or long-term-climatic conditions, even if minor climatic changes have triggered local disasters (in particular on the frontiers of pastoral and agro-pastoral systems of production).

The complementarity and differentiation of these systems of production signify an elementary form of adaptation to these climatic conditions and determine the effects of variations too large to be absorbed by these systems.

(e) The theory of "desertification" attempts to explain the deterioration of production systems in terms of climatic changes instead of analysing the

changing effects of climatic conditions as a function of the deterioration of the systems of production under colonial and neo-colonial domination.

(f) In contrast to the "desertification" theory, I will attempt to show how changes in the different Sahelian systems of production, which occurred in the context of imperialist rule, themselves determined the catastrophic effects of climatic conditions.

(g) Therefore, the question as to whether the 1973 drought was more or less severe compared to those preceding it, is of little relevance. The data do not allow us to assess precisely the comparative severity of the climate; the periods of 1910–16 and 1940–46 seem to have been almost as dry. The remarkable features of the 1973 drought were its broad scope, in that it extended beyond the Sahel zone, and its development into a famine, which also extended into other areas and lasted for several years. Also, it so undermined the Sahelian systems of production that it hindered the reproduction of Sahelian societies. Moreover, perhaps the important and exceptional feature of this drought was not as a natural phenomenon in the strict sense of the word, but rather its consequences for the transformation of the Sahelian systems of production, whereby merchant and capitalist relations became more generalized, as will be seen later.

3. Vulnerability and Adaptability of Sahelian "Pre-Colonial" Systems of Production: The Case of Pastoral Systems of Production

The Sahelian pastoral systems of production include the exclusively pastoral systems (grazing ecosystems used solely by pastoralists) as well as methods of pastoral specialization within an agro-pastoral system. The former system of production is typical of that found among the Moors the Tuareg, and others. (4) Typical of the latter method of pastoral specialization within agro-pastoral groups are the Fulani in the Sahelian zone.

There are crucial differences between these two types of systems, including the level of pastoral production itself. Thus, Fulani production is based mainly on cattle, whereas the Moors or the Tuareg have more varied production. Furthermore, the role of exchange differs; among the Fulani, complementarity with the agricultural population is a matter of daily necessity, their society producing practically no transformable goods outside of those derived from herding. In contrast, exchange constitutes one branch of economic activity among others for the Moor and Tuareg organizers of caravans, who in certain circumstances engaged in commodity production.

Nevertheless, the convergences between these two forms of pastoral systems are striking, being linked to the nature of pastoral production and to the method of organization of production. The two forms can therefore be treated together.

3.1 ORGANIZATION OF PASTORAL PRODUCTION AMONG SAHELIAN HERDSMEN

Sahelian herdsmen carry out pastoral production under similar natural conditions and according to almost identical techniques. The populations are nomadic

due to the required mobility in grazing the animals. By moving their herds from place to place they obtain optimal use of pasture-lands. Throughout the Sahel region there is an annual displacement of population and livestock, the distance depending on the location of a given population: those further to the south are faced with the longest move (for the Kel-Gress Tuareg located on the Niger/Nigerian frontier the distance ranges from 600 to 700 km, while the Iullemenden Tuareg of Azawak, situated just to the north of Kel-Gress, travel only around 300 km).

The sub-Saharan pastures are exploited during the rainy season, as they have high nutritive value and offer during that season only enough water for the cattle, which also can take advantages of the salted water and the salted plants typical of the Sahara. In the dry season the herders' problem is to ensure their herds' survival by finding adequate pastures and sufficient water. The difficulty of this last task increases in proportion to the increasing degree of aridity. They may travel either to known and traditionally used perennial water sources, or near to large rivers which cross the Sahel (the Senegal, the Niger, the Lake Chad Basin—the best example being the swamp-lands of the interior delta of the Niger River used by the Macina Fulani). Alternatively they may travel to the fields of sedentary farmers, where the herds feed on stubble and simultaneously fertilize the land—a widespread practice and the object of exchange contracts between these two kinds of populations.

Other features of the pastoral techniques and practices need be mentioned only to underline that, while they are similar among different groups, they also show various traits which correspond to certain differences between these pastoral systems of production. Fulani specialization in herding has already been cited; they are essentially cattle breeders and in some instances sheep raisers. Different methods of herd organization have developed according to the particular end products—the production of milk, cheese, etc., versus the production of meat; breeding of riding animals versus pack animals. Different types of pastoral production and various animal species will dictate the extent and character of the labour requirements.

In all Sahelian pastoral societies labour is organized on the basis of social relations within the family of domestic group. (The term *domestic* is preferred because it implies relations beyond those of kinship and alliance, and emphasizes residential and economic functions as opposed to the reproductive functions of the *family*.) Generally the social relations of production can be classified in one of two organizational groups: the domestic and the community production group.

In Sahelian pastoral societies the domestic group is the basic unit of herd ownership. (5) Accordingly, it is possible to speak of domestic property, which is managed by the head of the family and where different family members have non-exclusive rights over the livestock, the domestic herd resulting from a combination of these rights. It is also the domestic group which furnishes the labour necessary for both pastoral production and the reproduction of the herd (essentially the work of the herdsmen). Furthermore, the domestic group is the main production and consumption unit.

There are two types of family or domestic group among Sahelian pastoralists: one centred on the polygynous family found among the Fulani, the other on the

monogamous family found among the Moor and Tuareg. Although tending to limit the internal development of the domestic group's labour capacities, the monogamous structure is most often found in populations where the labour requirements are most advanced—a result of the several varieties of livestock species and different methods of breeding. This paradox is explained by the existence of forms of dependent labour among the Moor and Tuareg, in other words slavery, which augments the labour capacity of the domestic group.

Forms of co-operation and co-residence are less well-developed among the Fulani and this is mainly due to their specialization in cattle breeding. Here each domestic group is potentially autonomous, a situation made possible because labour requirements are relatively low, and also because the acquisition of wives raises the capacity to increase the amount of domestic labour. In comparison, Moor and Tuareg herdsmen are usually organized into camps including several co-operating and co-residing domestic groups. This is in effect the only structure which allows a diversification of economic activity.

Whether it concerns the Fulani, the Moor, or the Tuareg, the camps or co-residential groups are remarkably unstable, not just over long periods, but also during the course of the year. With respect to the long term, co-residence is maintained or dissolved according to the varying needs of the domestic groups which compose a camp. In the shorter term it is more a question of the degree of dispersion imposed mainly by the condition of pastures during the dry season, which permits only a limited density of human occupation. Such units regroup during the rainy season or when the pastures can accommodate a higher density of animals.

The instability of these residential rules reflects the autonomy of each domestic group with respect to its property, while their membership in a larger community is also rooted in the overall reproductive needs of the society. This "opposition" has a material basis. In order to reproduce, each herd must have access to natural resources which are spatially very dispersed. In addition, annual fluctuations can produce unexpected bad years; consequently the natural resources will be even more diffused than in normal times. Thus the pastoral community is built to ensure a common exploitation of territory, pastures, and water resources.

The difficulties involved in interpreting the mechanics and dynamics of these pastoral societies revolve around the notion of territory or, more precisely, around the specific ways in which the domestic and community organizations inter-relate. Here one can make two essential observations:

(a) This territorial organization corresponds to modes of collective management of natural resources—space, in a more general sense. There is little or no centralized or codified organization with respect to space as is found in certain agricultural societies. The one exception for the Sahel is the code regulating access to pastures on the banks of the Niger River (*dina*). This rule was established by the Macina Fulani who live in a truly agro-pastoral society.

More frequently, if rules pertaining to territorial access exist, they are determined by other means and are respected only upon collective agreement and result from an equilibrium of forces. For example, in the

segmentary lineage systems which are sometimes found in the Sahel, it is membership of a kinship group which determines the more or less exclusive rights of access over a certain expanse of territory. In differentiated and stratified societies this access is distributed according to political rank. In Mauritania, for example, the *emir* symbolized the dominant aristocracy's pre-eminence in territorial matters. He controlled access to the emirate lands by foreign groups and those of lower rank within the emirate. An identical situation existed among the Tuareg. Noble tribes (*imajeghen*) controlled the territorial access of vassal tribes (*imghad*) and other dependents.

In fact the existence of exclusive usage rights for natural resources would be inconsistent with the material conditions of production, which demand access to an extended range and variety of natural resources for each production unit, and with the "autonomous" characteristic of herd-owning domestic groups with respect to production. In other words, only social membership of a domestic group can guarantee access to the land belonging to the community.

There are, however, limitations on these rights of access—for example privileged access to a particular section of the territory or hierarchical control defining producers' rights to usage. However, contrary to what is seen in many agricultural societies, it is never membership of the community which determines the conditions for using such means of production as pastures, livestock etc.; rather it is membership of a domestic group which gives direct access to the means of production—livestock—and which allows the appropriation of collectively exploited resources. Understanding this is essential when later analysing the dynamics of Sahelian pastoral societies.

(b) Furthermore, the notion of a collectively exploited territory can disappear entirely. The Wodaabe Fulani of Niger, herders who arrived quite recently in the lands they exploit, have only precarious rights over the pastures they use throughout their continual migrations. Such rights are relevant to a society in constant change where highly fluid social groups frequently coalesce and then split off. This flux pertains not only to residential and co-operative groups, but also to temporary political groups which organize the migration of different production units.

The largest migratory groups assemble several thousand people divided into numerous chiefdoms or segments. They pass through phases of dispersion and concentration, a technique which promoted the "non-conquering" expansion of the Fulani in West Africa. Within this political context property rights can never appear; the community, as user of the resources in an area, determines its territorial base. Thus the community which is formed by such a migratory group can be defined at three levels:

—as a unit of nomads collectively organized by section chiefs (*ardo*) and by all adult males;
—as a unit in which the exchange and circulation of women and livestock takes place;
—as a ritual and ceremonial unit. The annual meeting of the group on rainy-

season pastures is an opportunity for cementing relations between the groups and individuals who constitute the community.

Thus the community is well-defined at two levels. At one level it represents a collective utilization of certain natural resources which are in effect developed by the community who digs the wells, and allocates pastoral routes. This collective activity takes place only through the effective appropriation by individual domestic groups, without any formal appropriation at the community level for there is no community-owned land. At the other, the community represents the organized aggregation of a number of domestic production units. One should not confuse the two levels by using the existence of the community to deduce rights of usage for domestic groups and by assuming a juridical definition of the community from the property rights it holds over an area.

In concluding this rapid introduction to the organization of pastoral production in the Sahelian systems of production, several points should be mentioned concerning social relations based on the exploitation of labour. Slavery occurs exclusively in the domestic unit, and serves to expand the labour supply, thus facilitating the accumulation of livestock. Slavery also widens the possibilities for the division of labour within these domestic units.

Another form of labour exploitation is the tribute system. A social group which controls the political management of space and natural resources (the conditions of reproduction of the entire community) can profit by extracting the output of other domestic units in the form of tribute.

Both slavery and tributary relations are specific features of Sahelian systems of pastoral production, which influenced the unique evolution of these societies.

3.2 THE INTERNAL DYNAMIC OF THE SAHELIAN SYSTEM OF PASTORAL PRODUCTION

A preliminary analysis of the internal dynamic of these Sahelian pastoral systems focuses attention on the relation between the animal population, the human population and natural resources. Any change in one term in the equation—for example, a drought which reduces the water level and the available pastures—is deemed to require an adjustment in the others. This approach is not entirely wrong since such adjustments do occur in pastoral systems. But it is based on two premises: one that each producer tries to maximize his or her production in order to compensate for any possible adverse conditions; and two, that a human group will always tend to maximize the productive means which are at its disposal. To the extent that pastoral production takes place exclusively through autonomous domestic groups, these adjustment mechanisms can be interpreted in two ways: first as adjustment of labour resources and needs within each domestic group, and second as an adjustment of strategies by each herder to the possibilities offered by his environment. Although the two premises are false they have nevertheless made their mark and deserve a closer look.

An important step in the analysis of the relation between natural resources, animal populations, and human populations was taken with the systematic study of the simultaneous fluctuations in family and herd size among the North-Nigerian

Fulani by D. Stenning. (6) He noted that at each point there was a precise relation between natural conditions and the size of the pastoral family and its herd. The dimensions of the herd vary between a minimum, which corresponds to the owners' basic needs, and a maximum, which is determined by the labour capacity of the domestic group.

Accordingly, each herder seeks to accumulate the largest possible herd in order to maximize his production capacity. Thus human and animal population levels are supposedly determined by a set of economic decisions and limited only by the carrying capacity of an area. Since nomadic herdsmen are deemed to operate on the basis of an economic rationality in which they maximize their profit, it is then only a short step to describing them as capitalist entrepreneurs, as is very often done. Another consequence of this approach leads to a belief in the normal existence of a state of equilibrium between a given pastoral society and its environment. States of disequilibrium which are observed are thus considered to be periods in which the proper functioning of the society is upset, by causes external to the social order.

However, contrary to the above, rational action can be attributed to the herder, but it is something different from the mini-max rationality just discussed. It must correspond to the integral characteristics of pastoral production which we have been describing.

On the one hand, the simultaneous reproduction of families and herds is not achieved solely within the framework of the domestic group. It also involves relations between domestic groups, not only to obtain wives, animals, and work—all of which are necessary at different phases of reproduction—but specially to reproduce the conditions for collective access to natural resources. These needs force herders to maximize their production in relation to the *needs* and *capacities* of their own *group*.

On the other hand, this attachment to the community, understood here as the community of production with the collective use of the means of production, is mediated by membership of the community "in itself" according to Marx's expression, and thus requires the reproduction of the social relations which define it. These social relations may be essentially ritual, as among the Wodaabe Fulani, or political, as among the Moors and the Tuareg. For each producer it is the need to produce that amount necessary for the reproduction of this community membership that is paramount, and not production to achieve the immediate reproduction of the domestic group.

Anthropologists studying other nomadic pastoral societies as well as Sahelian pastoral groups have long noted that it was the social value attached to animals which dominated all other value attached which these animals could yield, such as means of production, consumption, or exchange. For example, herders expand their pastoral production in order to fulfil obligations linked with loans of animals, including those contracted or granted by the previous generation, to facilitate the necessary sacrifices accompanying rituals or to pay marriage fees or tribute. In fact, such production is essential if the herder is to be able to produce within the domestic unit. It is only within the framework of necessary community relations that the herder can satisfy the needs of his own domestic group and that he can contribute to its eventual reproduction.

The social value attributed to livestock, surpassing all others to the point where one can speak of "cattle-mania" among the Fulani, is directly related to the production within each domestic group of a surplus to be devoted to the reproduction of the pastoral community. (Whether or not this surplus is partially extracted through hierarchical relations is another question.)

Three central points can therefore be made:

(a) The level of surplus and, in a more general sense, pastoral production within each domestic group are not evaluated in terms of the specific requirements of this group but are more broadly socially determined.
(b) The productivity of pastoral labour, and, more generally, the use of production capacities cannot be deduced from the direct relation between available work and the means of production, any more than from the optimal capacity of the ecosystem.
(c) Maximization of pastoral production in each domestic group takes place in conditions of non-equilibrium and, in some cases, disequilibrium, with the environment.

The basic goal of livestock production is not to satisfy the immediate needs of the domestic group, but to reproduce, while creating social value, the totality of social relations—both those within domestic groups as well as those between domestic groups. In addition, livestock production does not require adherence to the rules of family/herd size. On the contrary, by producing livestock each herder seeks the means to widen his social relations and eventually to expand his own domestic group and his capacity to production. The maximization of the domestic production part of the production of a surplus needed for the reproduction of the community—the productivity of social labour—appears to be a function of a socially determined level of surplus. The realization of the surplus by each domestic group stems from the autonomy and the equal access of each domestic group to the resources collectively exploited, but takes place in a context of unequal levels of accumulation and of intense competition between the productive units. The ideology of the Sahelian pastoral societies expresses this context of competition in terms of status, honour, rank, and prestige.

However this unequal accumulation, resulting from the necessity for each domestic group to produce a surplus, in fact constitutes an unequal accumulation of the means of production. This is, in effect, the principal mechanism of change in Sahelian pastoral societies. But there are two qualifications to be made. When this process occurs in a classless society (as is the case for some of the Fulani), the total surplus is devoted to the reproduction of the whole community, unequal accumulation as between domestic groups makes uncertain their reproduction on an equal basis in the community. This situation leads to a rising average level of surplus. Thus unequal accumulation within the community changes into a rising accumulation for the community as a whole.

However, pastoral societies with class structures experience a very different evolution, although ultimately the results are identical. Among the Moor or the

Tuareg, part of the surplus intended for the reproduction of the community is appropriated in the form of tribute by one part of society. In extreme cases, such as that of the Moors, part of society is "liberated" from productive work. Domestic slavery is found almost exclusively in dominant social groups. This situation guarantees unequal accumulation between domestic groups, and perpetuates it, particularly between different social classes. Regardless of whether class relations develop as "relations of tribute" (which requires increased production by those groups paying tribute) or as "relations of personal dependence"—that is, slavery (which reinforces the capacity to accumulate on the part of the dominant social groups) their development results in rising pastoral production for the entire society.

Both cases (both classless and class societies) eventually lead to a situation in which there is overproduction, and which is out of equilibrium with the environment. This disequilibrium is represented by an increasing density of animals (as well as an increasing density of human populations in societies where the direct use of human labour-power predominates and where all economic growth depends on and encourages a demographic increase). Droughts (or epidemics, wars, etc.) do not produce these disequilibria, rather they reveal pre-existing disequilibria.

It is important to point out a seemingly fundamental error in ecological and anthropological studies of pastoral societies. This error involves a theoretical and practical confusion between the productivity of the ecosystem and that of labour. In the case of the ecosystem, productivity is determined by the relation between, in this case, a pastoral ecosystem and the different kinds of "consumers" who exploit this system, the primary "consumer" being the animal; the secondary "consumer" being man. In the case of labour, labour productivity expresses an attribute of human labour-power which is related to complex social and material conditions under which work is performed. The mistake is to fail to distinguish between two such different types of productivity, since it is evident that one can decrease while the other increases. For example, production at full capacity in a given state of the ecosystem can accompany diminishing labour productivity where labour-power produces less than in times when natural resources are more plentiful. Inversely, in a situation where fewer people still produce the same total amount, labour productivity has increased while the productivity of the ecosystem may diminish.

3.3. ADAPTABILITY AND VULNERABILITY OF SAHELIAN PASTORAL PRODUCTION SYSTEMS TO DROUGHT

Within the Sahelian pastoral systems of production, droughts, and other events such as epidemics, reveal the potential for disequilibrium inherent in these systems. From the preceding analysis a number of conclusions can be drawn.

(a) The effects of droughts, and of climatic factors in general, will differ according to the phase of development reached by these pastoral systems of production. The effects are likely to be most severe (famine, massive destruction of animals, high human mortality), when pastoral production is at its maximum.
(b) Droughts can be seen as a means of resolving periodic crises of pastoral

overproduction. They enforce a drastic reduction of production capacities and of the productivity of pastoral labour. Droughts also require the deployment of all the community internal and external relationships in order to reconstitute the herds and the decimated social groups. They therefore contribute a "cyclical" dimension to the functioning of these pastoral systems of production. Historically they have provoked political restructuring, mass movement of human groups, and the establishment of new local hegemonies.

This does not mean that droughts perform a necessary function. In the Sahelian zone, due to the importance of inter-ethnic and inter-regional changes, a high level of pastoral production can be oriented towards exchange, thus maintaining a relatively high level of pastoral labour productivity. It would seem that this explains the high productivity of the Fulani herders. Also, the diversification of economic activities, in permitting transfers from one branch of activity to another, favours the maintenance of high levels of production. Among the Moor and Tuareg herders, the production of transport animals for caravans allows such a transfer to take place. The internal development of agriculture in the more southern pastoral societies has a similar effect. Among the Kel Gress Tuareg this development within a pre-existing framework of dependency relations permitted the pastoral aristocracy—with the help of numerous slaves—to sustain a particularly high level of pastoral production.

This process just described is not a necessary one, but does constitute one element contributing to the internal dynamic of these pastoral systems of production.

(c) Nevertheless, there is a paradox which must be explained. One notes that the Sahelian zones where aridity is the highest, and droughts are most frequent and the longest, are also characterized by an extraordinary human dynamic in both the economic and political fields. This is the case for example in the western Sahel in the region of Tiris-Zemmour in Mauritania where human migrations and new political hegemonies have occurred over the past 1000 years.

This paradox can be explained by the effects of repeated and persistent droughts. In dramatically reducing the productivity of pastoral labour, droughts also create the conditions for a rapid development of labour productivity and for a demographic and economic explosion. The most recent example of this is the Rgeybat expansion in the region of Tiris-Zemmour where the people, after becoming camel breeders at the beginning of the eighteenth century, underwent surprising economic and demographic growth, culminating in their political hegemony over this entire region at the end of the eighteenth century. Their political and military hegemony, and control of exchange, reinforced their capacity to accumulate capacities. At the start of the twentieth century they possessed the largest herd of camels in all the western Sahara, and extended their influence to the north of Mauritania and to the central Sahara up to the banks of the Niger River.

Pastoral regions in other parts of the world underwent the same experience. It can, therefore, be argued that large fluctuations and, in general, low productivity of the ecosystem in these arid regions, trigger substantial variations in the cycles of

pastoral production and set in motion the most dynamic processes of economic and social transformation.

Thus droughts, far from appearing as unforeseen catastrophes, constitute central factors in pastoral production.

The capacity of Sahelian pastoral systems to respond and adjust to drought can be summarized as follows:

(a) The material organization of pastoral production is itself a first response to climatic fluctuations. The ability of nomads to shift rapidly is a most efficient means of avoiding droughts since these droughts rarely extend over a very wide area, the exceptions being the 1914 drought and the present one. Such migrations are the general rule among the great camel nomads who will travel nearly 1000 km in order to find water and pasture (area of Rgeybat of transhumance covers 500,000 km^2). However, most Sahelian herders limit their regular migrations to around 200 km a year, and only during bad years are herders forced to move over great distances to reach better pastures. This presupposes reciprocal agreements between groups, allowing them to settle temporarily on "foreign" territory, avoiding war and political conflicts. Such agreements exist for example between the Adar-Iforas Tuareg and the Iullemenden and between the Tagant Moor and the Mauritanian Adar.

Another feature of pastoral production is that the livestock is the main source of food. Other food sources are difficult to organize in these societies. The techniques for producing consumption products derived from herding (butter, cheese, dried milk) do not yield more than a few months' supply. In addition, a nomadic lifestyle prevents stockpiling and proper conservation of more than small amounts of agricultural products. One consequence of this inability to maintain a constant source of cereals and dates is the organization of supply caravans.

The need to maintain livestock reserves is another reason for building up large herds even if they are not immediately usable by those who exploit them. But whatever the end-products of this process, the essential feature of pastoral production is that accumulation is in the form of livestock. This is often a feature among agro-pastoral societies also, and thus plays an important role in relations between pastoral and agro-pastoral societies, due to the fact that the sources of accumulation in agro-pastoral societies are controlled by the herdsmen. This helps explain the role of nomadic herdsmen in the foundation of Sahelian states and their dominance over sedentary farmers.

In periods of droughts and famine, livestock provide an essential food reserve if they can be kept alive. Generally, pastoral production as a form of agriculture is the most effective guarantee against climatic fluctuations. In particular, the mode of community organization assures an equal access to natural resources for all herders and in times of drought permits them to use the resources available to the full. Meanwhile, the autonomy of each domestic group enables them to construct a variety of economic, residential, and social relations in order to adjust their needs to changing historical and climatic circumstances.

(b) At the level of the pastoral community, livestock circulates continually between the producers. A single herder rarely has all the livestock which are legally his in one herd. The animals are distributed among other camps; some are lent out for milk; others given in reciprocal exchanges. Under certain types of kinship relations a herder can distribute his livestock to the herds of his kin, which helps consolidate social relations in the community. Above all, however, this dispersion serves to minimize for each producer the risk of droughts, epidemics, and poaching, while he can quickly reassemble his wealth.

One particular form of dispersion is linked to client relationships in pastoral class societies. For example, among the Rgeybat, livestock can be "lent" (*menha*) in a transaction which binds a poor herder to a rich man. This rich producer lends his camels for an indeterminate period but continues to maintain proprietary rights over the camels and their offspring. This is a case of exploitation of the labour provided by the "clients" who care for the herd, which allows the rich herd-owners to amass several thousand heads of livestock. Dispersion into smaller herds avoids risk involved in over-extending the size of their own production unit.

Livestock dispersion can also be interpreted as part of the mutual aid and co-operative relations which link herdsmen. Both mutual aid in labour and different forms of the circulation of livestock contribute to community cohesion in crises such as droughts, by relaxing tensions that might otherwise lead to the break-up of the pastoral community.

(c) Finally, direct responses to drought conditions are practised between pastoral communities; for instance through reciprocal relations contracted between two groups and governing access to pastures. Added to this are the many forms of livestock circulation between communities, the most important type being poaching (*ghazw*), which gives rise to a large traffic in products from groups rich in livestock to those having less.

Many other examples could be cited to emphasize both the use of climatic factors by the systems of pastoral production and the adaptability of these systems to the effects of drought. The range of adaptations which emerged with the development of the productive forces (the mastery over nature) over time cannot be exaggerated. However, the cost of such adaptations can be particularly heavy; in the pre-colonial era, for example, droughts decimated herds and populations. But in contrast to the present drought, previous ones never endangered the capacity of pastoral societies to reproduce themselves. This seems to indicate that, although droughts helped to reveal the contradictions within these systems, Sahelian pastoral production was not as fragile as outward signs would lead one to believe.

Nevertheless, the transformations which occurred during the colonial period, and which contributed to the present situation, originated outside of these systems and profoundly modified their ability to act.

4. The Impact of the Growth in Markets on Agro-pastoral systems

The introduction of commercial crops started very early in the colonial era, but was mainly confirmed to the two geographical extremes: Senegal—where groundnuts had been cultivated since the second half of the nineteenth century—and Chad—where large-scale cotton cultivation was introduced between the two world wars. Elsewhere the introduction of commercial crops was limited and more recent.

The production of crops for exports *ipso facto* did not give land commodity value any more than did the production of subsistence crops that were marketed. Neither did it generate investment in the sector of agricultural production.

It did, however, create several disruptions in Sahelian economy and society resulting in a general weakening of the Sahelian agro-systems. It rendered them more vulnerable to, *inter alia*, climatic incidents such as drought. We will deal below first with spatial disruptions, then with some of the economic and social disruptions.

4.1. THE SPATIAL DISRUPTIONS

The market for agricultural and pastoral products emerged early in the colonial period and under conditions which rendered the producers doubly dependent—both *vis-à-vis* the world capitalist system and the social groups, traditional or new, who dominated the market. This dependency played a very specific role in the African colonial situation, and is clearly seen in the Sahel zone due to the existence of the complex trade systems of the pre-colonial era. The development of markets in the colonial era prolonged the deep-rooted tendencies in Sahelian societies—tendencies that were accentuated by the impact of mercantile taxes on the African coasts. In the period 1820–50 exchange between Africa and Europe increased, bringing about a multiplication of warehouses and trading posts. (7) This led to an increase in the level of internal trade in merchant products, such as cola, dried fish, ivory, etc. and developed exchange based on livestock and grains.

Groundnut cultivation began in Casamance and Senegal during this period; one author notes that, "from the beginning of the last century Moslem Hausa and Wangara were already coming to Kumasi [a city in present-day Ghana] to trade livestock". (8) The author's own fieldwork has provided evidence of Hausa livestock trade in this period: their armed caravans often covered long distances, procuring livestock at the limits of the nomadic zone and reselling it in Hausa cities. If this trade diminished in the second half of the nineteenth century it was due less to internal causes in Sahelian societies themselves than to the new influences exerted by capitalism. As already emphasized, military expeditions in the second half of the nineteenth century advanced colonial conquest and profoundly upset the Sahelian systems of production. Nevertheless, the development of trade re-asserted itself under colonial rule due to a series of factors.

The first and perhaps principal point to note in the development of trade in the colonial period was the systematic destruction of former trading networks and their replacement by a new network based on the supply of urban industrial products.

Existing trade based on ethnic and professional specialization—pre-colonial metallurgy and textiles—was reduced to a supplementary role before the onset of the tourist market. The Hausa tanneries producing leather goods either disappeared or were reduced to appendages of European business.

The same applied to regional and inter-regional commerce which had covered the region with a tight trading network. The arbitrary divisions of colonial frontiers and concentration of certain administrative centres contributed to the total isolation of some regions, which later became defenceless against the ravages of climatic fluctuations. For example, the Niger/Nigerian frontier isolated an entire region of Hausa country from its traditional attachment to Hausa cities in the south (present-day Niger): the establishment of custom barriers between the countries caused a serious crisis and famine which struck the Hausa country in Niger from 1914 to 1918.

Finally, colonialism had a similar effect on trans-Sahelian and Sahara–Sahel trade. This was systematically dismantled in order to redirect exchange toward the south and to block the opening of Sahel trade to any but the colonial maritime powers. (On the other hand, the same factors had the opposite effect in further developing trade from the Sahel toward the forest zones, including products such as cola, dried fish, etc.)

One exception confirms this rule: the livestock trade actually grew in response to urban growth. In effect the livestock trade networks were also largely restructured to meet these new urban markets located on the African coasts.

In addition, credit systems began to appear in the nineteenth century and thereby expanded the possible limits for commodity production.

The exchange of agricultural subsistence products also evolved. From the beginning of the century groundnut production increased in Senegal. In the coastal area the scale of plantation economy (cocoa and coffee) increased spectacularly, particularly in Ghana. The resulting human migrations and the needs of administrative and military personnel contributed to the growth and reorientation of the grain trade.

4.2. ECONOMIC AND SOCIAL DISRUPTION

Political constraints and administrative extortion also played a role in the development of markets for agricultural and pastoral goods. A variety of levies and taxes were imposed on the output and labour of peasant communities, as shown in study done for UNRISD under the direction of Pierre Spitz (9) by Egg, Lérin and Venin.

Levies in kind were directly related to the needs of passing administrators or soldiers, which were fixed at a low level (one-third to one-quarter of the normal price), and their total amounts determined before the harvest according to the total surface area cultivated. Levies of this sort led to speculation, encouraging farmers to buy back the levied grain at a high price.

Levies on labour were very heavy and difficult to estimate because they partly depended on the discretion of the local administrator who secured as much manual labour as he needed on the pretext of handing out penal sentences. This had serious implications because it was often in competition with agricultural labour. In other

regions forced labour was deported en masse to coastal plantations (e.g. the Mossi of Upper Volta).

Financial levies were also imposed, and bordered on the absurd when one considers that the Sahelian populations had to contribute to the financial reconstruction of France after 1914–18 or even to disaster relief in southern France in 1930 at a time of famine in Niger.

Taxes were raised on the basis that each French colony should be self-reliant. Following the 1931 famine the report of the Inspector of the Colonies, Harranger, revealed that from 1924 to 1928 the amount of taxes had almost doubled; in 1928 it represented around 40–50 kg of millet per inhabitant (compared with an average annual consumption of about 150–200 kg per person). Moreover, the taxes had to be paid regardless of the circumstances—even in drought or famine. Producers were thus forced to sell millet and livestock in order to pay their taxes, leading to increasing indebtedness.

In addition to direct administrative impositions there were obligations imposed by the colonially transformed chiefdoms. In many regions the administration gave its chiefs quasi-property rights over the lands they supervised for the collectivity. The chiefs also demanded royalties for the opening up of new fields. Generally the taxes were levied by an intermediary who received a percentage, thus encouraging him to collect from as many people as possible. In addition he levied supplementary taxes for his own personal account.

The size of these various taxes, of which a large portion was demanded in money, directly led to the growth of a monetary economy and commodity sector of production. The producer was not only forced to give up a part of his crop to raise cash to pay such taxes, etc., but he also had then to buy back at higher prices a portion of the grain he had sold in order to survive the lean months.

Famines also made a direct contribution to the development of commodity production. These famines wrought havoc in the Sahel on various occasions, and were as much the consequence of the levying of taxes as of the periodic droughts which aggravated the extent of economic depression. The 1914 famine (called *kakalaba* by the Nigerian Hausa) was among the most devastating and to this day is engrained in the collective memory apparently even more than the 1973 famine in the same region.

The INRA/UNRISD analysis of the 1931 famine in Niger is particularly instructive in relation to the effects caused by the incorporation of subsistence production systems into the world market. A similar crisis occurred in Mauritania at the same time, and for like reasons. The immediate cause was the world-wide crisis in which the prices of raw materials collapsed and the value of agricultural and pastoral labour fell drastically while the prices of imported manufactured goods remained stable. Attempts by the administration to cope with the crisis aggravated the situation, in their attempt to maintain the system of deductions and the resulting enforced trade. The authors of the INRA/UNRISD study estimated that while taxes were rigorously levied, there were up to 150,000 famine-provoked deaths in eastern Niger (Hausa country)—about 25 per cent of the population. The price of millet rose steeply but the traditional market which regulated grain production was replaced by a totally speculative market, fuelled by administrative requisitions and large commercial deals, often sanctioned in an underhand way by

colonial administrators. Simultaneously the price of livestock, the form of accumulated value for the rural population, fell and the smaller commercial enterprises were almost totally abandoned.

The damage inflicted upon Niger by the international crisis of 1931 reveals the new ways in which Sahelian systems of production functioned. It is remarkable that the development of commodity production and of the control of agricultural surplus (thus the reproduction of agro-pastoral society) were achieved indirectly by direct deductions or extraction of surplus. This process advanced by subordinating the realization of surplus to the imperatives of commodity circulation, and in some ways is similar to the experience of Sahelian agro-pastoral societies of integration into states: the indirect control of agricultural surplus without intervention in production, through control of the accumulation of surplus in the form of livestock, and the realization of this surplus in the process of exchange. But subordination to capitalist circulation is different in nature from subordination to simple commodity circulation (of the type prevalent in medieval Sahelian states). As Marx emphasized, the former tends to subordinate the whole of production to the imperatives of commodity production (including the production of labour-power as a commodity). Far from stabilizing the community structure (which results on integration into a state) subordination to capitalist circulation leads to deep-seated tranformations in the community, and even its destruction.

Within the domestic group itself, deep transformations took place in relation to the respective role of men and women. For instance, it was the women who actually disposed of the agricultural surplus and who controlled the marketing of grains, mainly outside of the market, under the form of transformed food products. In cases where the domestic group lacked seed, the women lent, but never gave, them to their husbands. By controlling the surplus they also controlled accumulation; in particular they were proprietors of two-thirds of the livestock. Tensions within the domestic group became high, frequent divorces manifesting strategies of feminine autonomy, the masculine counterpart appearing in the developing practice of cloistered women, based on the most orthodox Moslem dogma.

Consequently considerable tension pervaded the domestic group, which would be increasingly reduced to the conjugal family. In general, the break-up of the domestic group was directly linked to commodity circulation, and these fissures widened in proportion to the intensification of commodity circulation. Such difficulties were more notable among the Hausa than among the Mossi because here the tension arose in matters concerning inheritance. This link between commodity production and the break-up of the domestic group was not invariable. In some circumstances the tendency to break up was halted by the very nature of the domestic group, i.e. its form of descent and alliance. For example, among the Serer, who had been groundnut cultivators since the beginning of the century, the bilineal structure of descent promoted group unity because the functions of production, which were carried out within the patriarchal group, were radically separated from those of accumulation, which took the form of livestock and was within the matrilineal group.

This reduction in the size of the domestic group, accompanied by the collapse of the community structure of land management, presented serious labour problems. In this type of agrarian system, the nature of agricultural labour is such that it

requires relatively short but intensive periods of work (clearing and weeding and harvesting). The fragmentation of labour units brought about a diminishing productivity of labour and, in certain cases, a reduced crop yield.

New forms of collective labour appeared as a response. However they were no longer founded upon community structures but rather on the free choice of producers and upon reciprocity. In Hausa country these new forms of *gaya* were solicited with neither ceremony nor the promise of food. They grouped together teams of about 10 to 20 neighbours, each one of whom would benefit from the same help.

Another consequence of the disintegration of domestic units was, as we have seen, the "liberation" of the labour-power of a certain number of producers, children and "juniors".

These developments contributed to the appearance of wage-labour within peasant society.

Another important aspect related to the accumulation and storage of agricultural surpluses. Granaries had been an integral part and, without doubt, the cornerstone of pre-colonial agricultural systems. The disintegration of community structures and the development of commodity circulation led to changes in all collective forms of realization and management of surpluses (collective granaries and fields, community forms of redistribution, etc.). This created serious problems with respect to that part of the accumulated surpluses which were to be stored in case of drought or famine.

The 1931 famine in Niger was partly the consequence of the failure of collective accumulation in the form of family and community granaries, which had been replaced by administrative granaries. Certain social classes confiscated these granaries to the detriment of the producers. (11)

Among the administrative measures adopted to resist these continuous famines were a number of plans apparently designed to revive or strengthen the defunct or dying systems of storing surpluses. This was the case of the SIP (Indigenous Provident Societies) whose specific task was to replace the seeds which had been consumed during a famine. In reality this system of obligatory contributions and loans of seeds (which had to be paid back) functioned as a supplementary tax, the proceeds of which were often diverted by colonia bureaucrats. Nevertheless, this system did not guarantee the accumulation of reserves as planned. The same can also be said of the disaster granaries established in 1933. Initially the quantity of reserve was set at 50 kg per person; in 1937 the stocks reached 100 kg and the target was revised to 150 kg. In fact the quantity of current output withdrawn was too large and badly redistributed. The disastrous and irregular management of the stocks rendered them almost useless to those who needed them, while they were diverted and wasted by other parties.

The introduction of new processes, involving taxation and monetarization, undermined the prevailing system of grain and livestock reserves. This situation was further complicated by the colonial need to accumulate which hindered (at least temporarily) any attempt to revive the granary system. Finally, solutions more in character with the new economic system were still impossible. The authors of the INRA/UNRISD study quote the journal *Agronomie Tropicale*, which summarized the lessons of experience:

> "In the present economic conditions of Niger, it would be impossible to use any means, to avoid famine other than family granaries: there is no money to buy seeds or construct silos. The centralization of these reserves in several places would lead to the unjustifiable and burdensome problems of transportation at the moment of redistribution." (12)

The only recourse left for the colonial administration was to revive or reinforce the traditional granaries, when in fact they did not correspond to the emerging new economic system.

The other form of accumulation of agricultural surplus which also served as a valuable source of food was livestock. But as accumulated value, livestock was heavily affected by the devaluing of agricultural and pastoral labour. Over the long term the price of livestock fell in comparison to that of grains: in the period 1936–66 the ratio of the livestock to grain prices fell from 1:10 to 1:5.

This tendency operated in the short term also; from 1968 to 1975 the price of grains quadrupled, while the price of livestock only tripled. (13) Moreover, during periods of crisis the prices of livestock (accumulated value) collapsed while those of grains (immediate use-value) actually rose. During the 1931 famine the price of millet increased from 0.35 francs in December 1929 to 0.85 francs in December 1930, to 2.20 francs in March 1931 and to 5.00 francs in June 1931, while the price of livestock fell. The same occurred during the 1973 drought at Kano (Northern Nigeria) where the price of livestock dropped from 60–100 pounds per cow to 4 pounds, while the price of grains quadrupled.

There were two main results. On the one hand, herders were faced with increasingly difficult circumstances and were forced to increase their production in order to obtain the same quantity of grain. On the other hand there was a crisis relating to accumulation in the form of livestock: while retaining its social value (as a matrimonial payment) it gradually lost its capacity to act as form of realization of agricultural surplus in the framework of commodity circulation.

Agricultural surpluses could now be transformed directly into money as they entered into commodity circulation. But the surpluses diminished, since the monetary needs and the deductions by way of taxes and levies grew, while the value of agricultural and pastoral labour deteriorated continuously in relation to the social value of labour.

This contradiction between the diminishing productivity and an increasing need for surplus was resolved by changes in the agrarian system.

First, the opening of new fields, by extending the area under cultivation, permitted a greater surplus to be obtained, without increase in productivity. The main impetus to colonize new land occurred between the two world wars, in spite of the fact that open territory was neither very abundant nor excessively fertile. Nonetheless, this expansion moved in two geographical directions.

Firstly to the north, where penetration sometimes extended 100 km into nomadic and sedentary areas, where cultivation was risky since rainfall was limited to less than 400 mm. There were, however, certain advantages to this zone because the combination of sandydune soils and low rainfall required only a limited amount of labour. The task of weeding was greatly reduced, for example. In this way an increase in labour productivity balanced the tenuous conditions of low-yield agriculture.

Secondly, there was also a general movement towards regions which had

formerly served as the frontiers between the old social states, which had remained "no-man's land" and others where human population density was previously low.

These land colonization movements were very wasteful in that cultivation was often shifting, always striving for a maximum yield and with the area being quickly abandoned as soon as soil conditions deteriorated. This was a particularly damaging situation when the land was intended for commercial crops. For example, in Senegal, groundnut cultivation encroached upon the Ferlo desert and caused very considerable soil deterioration.

Other lands brought under cultivation included bush zones which had formerly separated pastures. In Hausa country the recently cleared bushlands adjoined the inhabited territories, thus creating a patchwork of village lands (which were concentrated) and dispersed and semi-dispersed areas, which replaced the old "rural" zones.

In the Ader Dutchi (central Niger) the introduction of cotton cultivation on the *fadama* (alluvial plains regularly subject to flooding) resulted in the development of the adjacent plateaux which had been considered marginal up to that time.

This rapid expansion of the area under cultivation was also due in part to the break-up of the old community structures. Evasion was often considered a way out of a marginal or dependent position in the domestic group. Hamlets designed as temporary bases for agriculture became bonafide villages. Lacking the political means to regulate intra-community tensions, the people turned to large-scale migrations as a general solution. This generated and sustained demographic movement, but the ultimate impact on the viability of these agro-pastoral systems was detrimental. There was no longer fresh land to replace the exhausted soils. The existing relationships between agriculture and livestock rearing broke down; and the marginal lands just brought under cultivation were the first to suffer the effects of the 1973 crisis.

Another solution to the problems facing Sahelian agrarian systems was to increase production and surplus by increasing the application of labour, though at the expense of labour productivity. Increased output could be obtained by discontinuing the established practice in numerous Hausa regions of lending the land fallow and replacing it with rotation systems, a change which required more labour. Likewise an increase in the number of crops planted and maintained, and an increase in the number of weedings, would increase output, but more labour was necessary.

Under present conditions, increasing yields have been achieved without chemical fertilizers, and with a limited use of animal dung, the traditional source of fertilizer, on certain soils. Thus while crop yield increased it did so at the expense of the ecosystem, another factor which considerably accentuated the effects of the drought.

A further more original solution consisted of an improvement in production due to changed techniques. (In this context the discontinuing fallow is not considered as a technical innovation.) This raises the interesting question as to what extent the productive forces of these Sahelian systems of production were really blocked. The capacity for technical innovation suggests that in one sense they were not blocked. One of the best examples was the re-introduction of the hoe in the 1930s in a large area of the Sahel, central Niger and eastward. The *iler*, employed previously, is a

tool used in extensive agriculture to clear numerous fields. In contrast, the hoe allows higher yields by cutting deeper into the surface soil, thus permitting a better reconstitution of the soil which enables the discontinuation of fallow.

However, this example is interesting for it also demonstrates why the productive forces of Sahelian societies could not develop further even though these societies were obviously capable of technical innovation. The efficiency of this particular technical change must be compared to the general difficulties encountered in the spread of the plough in agriculture. In fact, owing to the fall in the value of agricultural and pastoral labour, none of these innovations could be really adopted if they economized on labour; that is, if they allowed an increase in labour productivity. This is sometimes the case with plough agriculture but not the case with the hoe, which, far from economizing on labour as did the *iler*, actually required increased labour.

Hence, if the productive forces in these Sahelian zones could not develop, it was not due to internal causes, but was rather a result of their situation of dependence in the colonial context.

The droughts corresponded to periodic crises, in which the value of agricultural and pastoral labour declined, characterized by the collapse of livestock prices (accumulated value), and by a rise in the price of grains which the peasants could obtain only on a speculative market. Nevertheless these crises, as the 1931 famine in Niger showed, were not related to drought alone.

Droughts facilitated the perpetuation of this double dependency by limiting anti-colonial resistance—in a more efficient way than repression—(the total deaths were in the thousands or ten thousands), and by reinforcing the power of those local social classes benefiting from the speculative market.

Droughts helped delay the long-term contradictions presented by the ossification of the productive forces, by eliminating a large number of producers, and by permitting, after the events, a temporary increase in labour productivity and surpluses.

Finally, droughts "liberated" wage-labour on a large scale by precipitating massive migrations.

In short, the effects of future droughts were wholly conditioned by these systems of production which reproduced themselves by becoming increasingly integrated in a dependent way into the capitalism system, while creating the very conditions for their own demise.

5. New Conditions of Vulnerability of Saheliann Systems of Production

It has been pointed out that droughts were endemic to the Sahelian region and that their intensity was sometimes comparable to that of the 1973 drought. But the 1973 drought was exceptional in both the severity and the scope of its effects. Its exceptional character has to be linked to the new conjuncture prevailing prior to 1973.

With the independence of the Sahelian countries (1959–61), the contradictions inherent in the Sahelian social formations of the colonial period developed under new circumstances. In the realm of politics there were increasing demands from

social groups whose growth had been hindered by the colonial system—in particular from peasants and those groups who accumulated at the local level. Groups who had managed to accumulate capital during the colonial period as entrepreneurs were tranformed into local capitalists. This was more the case for traders than for the chiefs, who had been strictly dependent upon the colonial administration and now encountered certain difficulties in adapting to the new political context. (The old organization of chiefs was often replaced or at least paralleled by a new political and administrative system.) A national bourgeoisie was thus created.

The period before 1973 was marked by capitalist growth but also by a declining rate of profit in the world economy. Even before the drought crisis, the Sahelian bourgeoisie tried to fight the fall in the profit rate in various ways which had a direct influence on the transformation of pastoral and agro-pastoral systems of production. In this context there are three important points to note.

First, there was increasing pressure on the price of raw materials and fuel resources. There was also an effort to find new sources of supply. For instance, during this period the exploitation of iron and copper began in Mauritania, as well as that of manganese in Upper Volta and uranium in Niger.

Second, industrial production was transferred to regions where wages were low. With the exception of Nigeria, the process of local industrialization figured only marginally in the Sahelian area. There was therefore an increasing supply of labour on the market and an increasing amount of labour began to migrate to Europe.

Third, following the anti-colonial struggles which led to the defeat of the old colonial powers and the dissolution of their empires, imperialism changed its form. One outcome was the increasing dependence of Sahelian countries on external food aid, which began well before 1973.

The years which preceded the 1973 drought were also marked by an acceleration of several changes already noted. The most important were as follows.

The commercialization of livestock increased due to urban growth. However commercialization was also accompanied by a change in the size and structure of the herds since small herders were forced to sell young animals while the large herders sold only the adult cattle. (14) In central Niger there was a clear-cut trend toward larger herds: between 1960 and 1965 the average herd of cattle increased by 10–20 per cent, that of sheep by 20–50 per cent. Some figures indicate that during this period the pastoral ecosystem was approaching its saturation level.

The growing of commercial crops for export was also increasing. Above all, the ten years which preceded 1973 were marked by a vast extension of cotton cultivation under the auspices of the CFDT (the French Company of Textiles) in the new countries such as Upper Volta, Niger, etc. Groundnut production, on the other hand, began to decline—a trend which was later accentuated by the drought. While groundnut production was declining there was also a considerable fall in its price (in Senegal the price fell from 21 to 17 francs per kg paid to the producers between 1960 and 1970). Simultaneously taxes rose by almost 35 per cent and consumer goods became more and more expensive. As a consequence cash income fell, which in turn accounted for the temporary attractiveness of crops such as cotton, whose prices were artificially sustained. This fall in cash income is illustrated in Table 2.

TABLE 2.
Amount of Export Crop Production Required to Obtain 100 Units of Food, Clothing and Other Basic Manufactured Goods

Senegal	Groundnuts	100 kg (1961)	148 kg (1969–70)
Niger	Groundnuts	100 kg (1964–65)	130 kg (id.)
	Cotton	100 kg (id.)	135 kg (id.)
Chad	Cotton	100 kg (1964–65)	115 kg (id.)
Mali	Groundnuts	100 kg (1961)	174 kg (1964–65)
	Cotton	100 kg (id.)	161 kg (id.)
Upper Volta	Groundnuts	100 kg (1962–63)	126 kg (1969–70)
	Cotton	100 kg (id.)	118 kg (id.)

Source: Qui se hourrit de la famine en Afrique" Cahiers Libres 292–293, Maspero, Paris, 1974, p. 151.

The aforementioned tendencies involved an increasingly monetarized economy: increasing sales counteracted by the ever-growing requirement to purchase manufactured goods and food. As a result peasants were without money most of the time, and it can be argued that the famine which came after the 1973 drought was linked just as much to the lack of money to buy grain on the speculative market as to the drought itself.

Large-scale labour migration began to develop partly in response to the growing demand for labour in the old "mother countries" and in the African coastal regions.

Another feature of the situation prior to 1973 was that, a considerable amount of investment took place in agricultural and pastoral production. There was investment not only in export crops (especially with a political programme sponsoring small and medium irrigation works linked to the expansion of cotton) but also subsistence crops (rice), although to a lesser degree. The first attempts to develop subsistence crops occurred just after the war as a response to the widespread poverty in western Africa during this period. (14) The Niger Office sponsored these projects, for which it received the aid of FIDES ("Fonds d'investissement et de developpement economique et social des Territories d'outre-Mer", which became FAC "Fonds d'Aide et de Cooperation"), the first time from investments that often surpassed the limits of individual colonial budgets, in contrast with the previously respected limits imposed by the principle of equilibrium and self-sufficiency in each colony's budget. Since independence, similar projects have been introduced and integrated into the development plans of various Sahelian countries, often using the same personnel and similar financial resources to achieve the same goals. (16) These investments—which were much higher than those of the preceding colonical period—corresponded to the double necessity (from the capitalist point of view) of increasing food output which was progressively insufficient, and increasing the production of export crops whose proceeds were limited by low productivity and by price stagnation.

In retrospect, these investments clearly reaffirmed the stagnation of the forces of production, especially the productivity of labour. This raised questions about the profitability of investment in the agricultural and pastoral sectors. In other words, the contradictions internal to the Sahelian systems of pastoral and agro-pastoral production were sharpened and accentuated to a degree which would also reveal

the growing vulnerability of these systems to a climatic fluctuation of the sort occurring in 1973.

6. Conclusion

Two levels of contradiction in Sahelian pastoral and agro-pastoral production became evident. First these systems of production were increasingly incapable of maintaining their relationship with the natural environment. Second, the systems of production were subjected to the necessity to develop capitalist forces of production and the corresponding organization of the relations of production.

The difficulties in reproducing their relations with the environment can be seen in the process of degradation of the flora and soils, greatly aggravating the effects of the 1973 drought. Numerous technical studies on this subject conclude that the clearing of new lands for cultivation—increasingly marginal from the point of view of climate and fertility—and the abandonment of fallowing practices in the absence of technical progress, led to a decreasing yield of the ecosystem. The lack of fertilizers and rotation techniques (except in a few areas) brought about a rapid deterioration. Furthermore the extension of commercial crops accentuated the impact of these processes. Such crops exhausted the soils and made livestock grazing increasingly impossible, thus preventing one of the traditional ways of reconstituting the soil. Deforestation accelerated, not only as a result of land reclamation, but also as a consequence of urbanization. In central Niger, for instance, the forest belt, which at the beginning of the century still covered the *fadama*, had almost disappeared. The result was increased soil deterioration and erosion in some areas where the soils were heavily washed out during several months of the year. Finally, in the pastoral zone the excess grazing and the concomitant political strategies (irrigation, which was not only insufficient but also increased locally pressure on the pastures) engendered considerable changes in the flora: generally the number of annual plants diminished and certain useless plants proliferated (cram-cram, *cenchrus biflorus*).

There are many examples of the deterioration of the natural environment, but the essential point here is that they all reflect the freezing of the productive forces in the Sahelian systems of production. Furthermore, the resulting conditions would be difficult to reverse. The non-development of the productive forces was the general rule in all areas; with several minor exceptions, technical changes did occur but did not increase labour productivity (introduction of the hoe, better seeds, rotation). On the other hand these changes did improve the yield of the ecosystem. Freezing of the productive forces was one aspect of an internal contradiction relating to the fall in the value of agricultural and pastoral labour: the fact that capitalist relations began to develop (commodity production, capitalist circulation) did not affect the actual production sector (labour remained subsumed under non-capitalist relations of production), because the value of labour was so low that the commodities destined for capitalist markets were sold below their costs of production. The consequences of this situation, as outlined earlier, were extremely low labour productivity, that wage-labour as a source of surplus value could not compete with non-capitalist labour, and the means of production, especially land, were not transformed into capital and did not even acquire a commodity value.

Furthermore, the productive forces did not obey the laws of capitalist development in this respect, which require labour productivity to increase in order to allow a rise in surplus value. This rise in surplus value counteracts the tendency of the rate of profit to fall.

While the 1973 drought precipitated a total crisis in Sahelian societies, it had neither the effects of transforming production relations substantially not of unleashing a new development of the productive forces which would provide small peasants and herders better protection against future economic crises or climatic shocks.

References to Section B of Chapter 7

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C. Proposals for Research-Action Concerning West African Societies which have been the Victims of Drought* by Fabrizio Sabelli

Introduction

This chapter is the result of reflections on the various analyses of drought in the Sahel and particularly on the previous section by Pierre Bonte. It offers broad proposals for research action to determine possible ways of dealing with the weaknesses in those societies which fell victim to the disastrous events of 1973. The proposals suggest a possible research programme rather than measures for immediate implementation. Moreover, they should be regarded as flexible and, in particular, they need to be adapted to the specific characteristics of each region under consideration.

An initial word of warning is necessary. The questions concerning the weaknesses in societies which were victims of the drought and famine cannot be approached from a position of sociocentric prejudice, which sees disaster as a consequence of "lack of technical knowledge", a "lack of rationally organized economy" or of the "conservative attitude" of the population towards change.

The vulnerability of the social structures is the result of enormous social, economic and demographic upheavals which occurred during the colonial and post-colonial periods until the present time. In other words—and this can never be stressed too much—it is not "inadequate modernization" (a quantitative concept) which is the principal cause of deteriorating conditions of social and economic reproduction, but indiscriminate modernization imposed from outside.

Some of the proposals may seem utopian; but there are utopias founded on an historical and anthropological basis of factual data collected and analysed according to a rigorous methodology. If we detach ourselves from the official theories (e.g. "Theory of climatic hazards", "Theory of social irrationality", etc.) which, all too often, are impregnated with sociocentrism and suffer from direct and mechanistic evolutionism, we become aware that what is called, with some contempt, "utopia", merely lies within the previously undreamt-of and unexplored realm of what is possible.

1. Climate as a Factor of Production

The apparently paradoxical hypothesis that climate can be regarded as a factor of production is set out in very lucid terms, in the first part of the work by Bonte, and is of the utmost importance in any analysis of the drought in the Sahel and in launching any further programmes of action. What are the operational consequences if this hypothesis were accepted?

"Droughts", say Bonte, "far from being unexpected and disastrous phenomena *are in fact pastoral production factors*".**

This gives rise to two questions which must be answered before tackling the problems of research-action:

*Translated from the French.
**The emphasis is mine.

(a) Can the ideas of drought as a factor of production be applied equally to pastoral societies (Bonte), to agro-pastoral societies, and to societies which are more markedly agriculture-oriented, such as those in the savannah, which are also afflicted by periodic disasters?
(b) This hypothesis was formulated by the author on the basis of information relating to pre-colonial times. Is it still applicable when analysing the present situation?

As a result of my research among the peoples living in the savannah in northern Ghana (Dagari) and in Upper Volta (Bwa, Bobo, Lobi) (a moderately sized but, nevertheless, significant sample), I am inclined to reply in the affirmative to the first question. The verbal evidence collected agrees in broad outline with the information Bonte provides on pastoral societies, allowing, of course, for enormous differences in situations and in the mechanisms by which natural disasters are integrated into the overall process of agricultural production. The response and adjustment mechanisms in situations of drought are not the same. For example, agricultural-based societies do not shift when unfavourable climatic situations arise, and are thus unable to benefit from varying climatic conditions in different regions. On the other hand, sophisticated techniques for storing grain and very efficient methods for agricultural land utilization—the "survival" fields (*siman* in Dagari) situated around the compounds—have been thoroughly thought out by the farmers, bearing in mind the effects of a possible drought. The same may be said with regard to safeguarding bush areas, which constitute real food reserves (mainly wild fruits and game) and which are so often neglected in official statistical calculations of the food resources of these peoples. Further examples indicating the adaptability of these agricultural systems to the effects of drought include complex operational techniques for wells, and methods for making use of night-time moisture in hollows. All I can do here is point out factors which may possibly guide research into channels different from those followed by the vast majority of agricultural development projects and, at the same time, show that the hypothesis set up by Bonte, concerning drought as a production factor, is not just limited to pastoral societies.

One further point is worthy of mention. The reports of the British colonial administrators mention a "disastrous" drought which hit northern Ghana in 1927–28. But, comparing this written information with evidence given verbally, my informants surprisingly gave little prominence to the vicissitudes of that period, which they certainly regarded as difficult but no more so that others which either preceded or followed it. On the other hand, with tears in their eyes they recounted, in great detail, the events associated with the forced labour (particularly the building of the highway linking the Bobo-Dioulasso region with Kumasi) imposed by the colonial authorities. To the old Dagaris this had been a total catastrophe, not only because of the victims of the hard working conditions, but more particularly because of the after-effects: inter-tribal conflicts broke up the community structure, thus endangering the organizations for mutual aid; a period of famine followed, due to decrease in agricultural activity during the rainy seasons when labour was devoted to road-building.

This evidence appears to me to confirm the remarks made earlier. The people

themselves distinguish between random phenomena (droughts) which are part of a system possessing the means to re-establish the conditions for reproducing it, and others which completely escape control, for they are outside the logic which governs the conditions which allow the system to reproduce itself. It has taken several years for the society to overcome, on its own, this alien "disturbing" effect.

The reply to the second question is much more complex. We have no empirical studies to provide a satisfactory reply. Nevertheless, even in this case I would argue that most of the pastoral, agro-pastoral and agriculture-oriented societies in West Africa possess, in spite of natural disasters and in spite of the effects of outside economic and cutural domination, the aptitudes and necessary techniques to make use of immense regions where environmental conditions are so hard and where a knowledge of the environment is so complex that it is difficult to see who else could do it. (1) This is based on an optimism derived entirely from a series of observations, unfortunately too superficial to have acquired the status of "proofs".

Most people who have lived for a long time in these regions of West Africa, and particularly those who have entered into the lives of the local populations, are usually struck by two factors: the enormous *flexibility* and the immense *creative capacity*. This may not sound very convincing and any generalization is dangerous. It is my belief, however, that this human dimension has all too often been neglected when analysing questions concerning economic "under-development" by focusing attention on local technical deficiencies as compared with the technical development which has taken place in the agricultural sector in western countries. Nevertheless, re-incorporating drought as a factor of production cannot be regarded as an automatic process set off by endogenous factors, without progressively eliminating the "disruptive" elements which where clearly responsible for the 1973 disaster.

2. Proposed Action

Policies for action should clearly be conducive to achieving the main objective, namely that of *regaining the material conditions for social reproduction*. Without this the re-adaptation of the productive structures to climatic hazards cannot be achieved. This general proposal for action goes against "fashionable" strategies prevailing at present, in particular the "development" programmes designed to achieve fulfilment of what are called "basic needs". In my opinion such programmes are carried out with complete disregard for policies which take account of the need to restructure the local economies so as to allow people once again to control their environment.

By acting mainly on structures and on *consumer behaviour*, "basic needs" strategies which correspond to the logic underlying many colonial programmes and most of the aid projects in the 1960s do nothing but increase the weaknesses of the societies concerned. If we accept the hypothesis that the true causes of the 1973 disaster are to be found in the effects of policies of domination, and very often in the pernicious results of indiscriminate modernization programmes, it follows that it is absolutely essential to draw up programmes for action which will progressively eliminate these factors.

One could also suggest measures which would begin to overcome new problems, about which the inhabitants know little since they are the consequence of the present historical contradictions. In short, it seems difficult to conceive suitable solutions for the weaknesses in West African societies faced with periodic droughts, which do not involve each group (depending on its specific character) being responsible for the whole range of questions concerning its future. But there is no longer-term future other than one built on a solid foundation of long-standing practices based on knowledge of environment, and on the social knowledge essential for any form of reproduction or maintenance of an intra-regional, inter-regional or inter-ethnic exchange system. If this is valid for any social development (a discussion on the evolution of the industrial system would lead us too far), then it is even more so for societies rooted in an extremely difficult and very hazardous environment such as the Sahel and the African savannah.

The nature of the action to be taken must therefore be adapted to the nature of the problems to be resolved and to the general characteristics of specific situations. It therefore seems necessary to undertake research on a reduced scale, based on theoretical presuppositions previously verified empirically. One could then study the different kinds of action needed according to specific regional characteristics and constraints of a political nature. The following are a few examples of possible research-action relating to specific problems and which take into account the theoretical approach just outlined. They concern mainly sedentary agro-pastoral societies and agriculture-oriented societies, the societies among which I have conducted my research during recent years.

3. Progressive Reduction in the Number of Producers Subject to Market Economy

This proposal is in radical opposition to the principles on which present policies and actions in rural societies in Africa are based. It is necessary to reverse completely the strategy which aims to adapt local productive structures to the world market and which is based on wrongly identifying "progress" with capitalist-type "economic growth". It is well known that the dynamics of prices of local products for export and of imported goods nearly always disadvantage the rural populations. The historical study by Bonte and others indicates that dependence on the market and its fluctuations constitutes one of the main factors increasing the vulnerability of social structures of Sahelian societies. In this connection the notion of *destructive dependence*, referred to by Jean Copans, in the introduction to the works of the "Sahel group", is not exaggerated.

Thus a radical restructuring of the regional economies in the Sahel cannot be envisaged without also effecting a reduction in the degree of dependence. It would be wrong to think that such a process would inevitably condemn the societies concerned to "economic stagnation" or to total freeze in the development of their productive forces. A comparative analysis of the evolution of pre-colonial and colonial societies shows us that quite the contrary takes place.

In a general way the prevailing concepts are based on the idea of irreversibility in the process of disintegration of pre-colonial social structures, in order to follow a

policy of action which does not differ logically from that of the colonial power. But there is no proof that, during the last few decades, the structures for production and exchange everywhere have been the victims of a process of disintegration of an irreversible nature. In fact, no theoretical work is available in which valid criteria have been elaborated which are capable of establishing the presence, or otherwise, of conditions of irreversibility. Incidentally, very little field research has been designed for the explicit purpose of verifying such an hypothesis.

Thus the way is open for further experimental research with a view to proposing new solutions. Clearly any really alternative proposal, such as that which postulates a gradual reduction in dependence on the market economy comes up against enormous obstacles of a political nature. I shall examine this question briefly later.

4. Revalorization of Agricultural and Pastoral Work

4.1 REAL WORK

The concept of devalorization of agricultural and pastoral work often gives rise to confusion. Depending on the context in which it is used, this word assumes very different and sometimes contradictory meanings. This concept is most frequently used in its most abstract sense, both as an obstacle to the development of a capitalist-type agriculture and as one of the causes of vulnerability with respect to climatic hazards. The confusion clearly arises from its being taken out of context.

In my opinion it would be appropriate to place the concept of "work" among the problematics associated with the historical evolution of societies in West Africa. In this context valorization may also mean re-appropriation of the material conditions of production, and so acquires a qualitative and all-embracing dimension. Thus conceived "work" differs with respect to its product and becomes the principal factor in the process of reactivation of social structures, taking part in this process as a *creative* activity, capable of both providing things of actual value as well as meeting external constraints, such as those caused by droughts ("real work").

Devalorizing work may, therefore, mean reducing "real work" to abstract work, which only creates an exchange value and which, in my opinion, is a factor capable of weakening the resistance of African populations to unfavourable climatic conditions. Extensive research could result in retaining the material and ideological components of the productive structures known as "traditional", which leave plenty of room for the "real work" mentioned above. This would provide the basis for a programme of real revalorization of work which could be spread over several years and which could be co-ordinated with a parallel strategy of gradual reduction in dependence on the market economy. This revalorization of work would open up the way to developing the productive forces. In many cases such development was interrupted as the result of colonization. In the context of the Sahel or of the savannah, development of the productive forces does not mean replacing the hoe by the tractor or replacing the camel by the lorry, but continuing to harness the natural resources. African societies were obliged to abandon such work in order to devote themselves, against their better judgement, to increasing the industrial profits of the rich countries.

4.2. STRUCTURAL PRODUCTIVITY

A serious programme of re-valorization of agricultural work should be based on a concept of agricultural productivity beyond that normally adopted for the analysis of a capitalist enterprise. I suggest here the concept of *structural productivity*. It is not a matter of evaluating the productivity of work in terms of quantifiable output (relative productivity), but mainly in terms of the *concrete realization of measures to re-create the conditions for a decrease in the degree of vulnerability of the social structures*. Increases in the indices of agricultural output can thus be interpreted as indices of economic regression or, at the limit, of potential destruction of the productive units, if the work devoted to production is not included in a process of continuous reconstitution of the structural conditions of resistance to periodic climatic disruptions.

5. Encouragement of Productive Auto-organization

If we tried to make an overall assessment (selecting significant samples of the populations in Africa) of the process of dissolution of social relations following European penetration, we would probably be surprised to find that the most unyielding field—that which has best resisted the destructive effects of the slave trade, then the trading economy and, after that, the policy of "wild" investment—is that of co-operation or of mutual aid in agricultural work. I say "probably", for at the moment there is no significant assessment of recent social transformations. However, a certain number of works in the field of economic anthropology give a glimpse of the relevance of such an hypothesis, finding, for example, that among agro-pastoral and agricultural populations in a tropical environment, *collective organization* of work continues to be a principal factor in the process of social and economic reproduction. Collective organization of work is generally based on social structures, and functions in accordance with the system of relationships. Certain forms of co-operation are of a baffling complexity and their effectiveness cannot be denied. In many cases they are based on principles of reciprocity and on rules which correspond to the specific characteristics of the relationship system. They are often the result of constraints imposed by the natural environment.

In northern Ghana (Dagari) and in Upper Volta (Lobi, Bwa, Bobo regions, etc.) I have observed the continued existence of these "traditional" forms of agricultural organization, in spite of some disintegration of the former production units, and also in spite of the process of individualization of the productive structures which has already begun. In particular there is a re-creation of forms of mutual aid depending on the new conditions imposed by causes lying outside the communities.

The technical effectiveness of these collective organizations is the result of the eager search for new solutions, undertaken by farmers who have been subject to the disruptive effects of a foreign nature. Here we have, as it were, the functional equivalent of a technical innovation suggested by development agencies, but with the advantage, on the one hand, of being designed as the result of climatic and ecological constraints (e.g. short time for tilling the soil, weeding and ridging, on relatively extensive estates), and, on the other, with a view to the reproduction of an internal valorization of the work, thus encouraging emulation, or even structure

productivity. Paradoxically, although it can be asserted that this kind of collective work organization possesses a very high degree of efficiency with regard to the difficulties of the natural environment, it is not at all adapted to the logic of a capitalist-type market economy. This provides us with a further proof of the need to seek "endogenous" solutions to the problem of famines without placing too much reliance on "models" imposed from the outside.

Specifically it would involve promoting studies which throw light on this kind of "social creation" which encourage collective approaches to making rapid strides forward on a reciprocal basis which revitalize the shattered productive units. It is not a question of suggesting a return to the past, nor of thinking in terms of reconstituting the "primitive community". This proposal aims both to thwart the disintegration caused by the organization of agriculture on capitalist lines, and to make use of the enormous social wealth (knowledge) accumulated as a result of the experience of farmers.

Conclusion

Insufficient research on the lines suggested here prevents one from providing further examples of proposals for action in order to find a solution to the serious problems of famine which have afflicted societies in West Africa. It would be both improper and pretentious to draw up a plan for action without first having information capable of providing a firm foundation for the working hypotheses.

However, on the basis of what has already been said in the preceding pages, a few additional proposals are listed which could be considered later, and form the starting point for a coherent research programme:

(a) Gradual and well-balanced reduction in the areas of agricultural land to be used for commercial crops.
(b) Restriction of areas allocated to cereal crops to the limits set by climatic conditions.
(c) Encourage the development of mixed farming for food production and create the material conditions for stepping up such farming in regions where it has been almost completely eliminated by the expansion of commercial crops.
(d) Reduce the rate of taxation (personal tax and "market tax") to an almost symbolic level.
(e) Encourage the creation of structures capable of allowing a reproduction of technical knowledge tried and tested by the population, while at the same time progessively reducing their dependence on technologies designed in the industrialized countries.
(f) Consider inter-state customs agreements which would reduce the "perverse" effects of the arbitrary and often absurd demarcation of frontiers.
(g) Encourage the creation of economic units for exchange on a regional scale, taking into account the specific character of each unit and the history of inter-ethnic relationships.
(h) Break the present buying and selling monopolies operated by purely commercially oriented groups, thus limiting their control over the chains of rural markets.

(i) Encourage the creation of an infrastructure of information centres in market villages in order to re-establish the conditions necessary for the development of exchanges of products and information.

This list is not a plan for action, nor an exhaustive list of proposals. Its sole purpose is to clarify the end objective discussed in this section. It is clear that such an objective will come up against many obstacles of a political nature. European producers (and not only European) of finished products need consumers, and the industries of the rich countries require basic products; they also need new sources of energy and cheap labour. The urbanized élite in Africa are increasingly strengthening their ties with the major economic powers, particularly with multinational concerns. This is often done through programmes launched by the major international agencies. An enormous programme of agro-industrial projects accompanied by vast financial operations is just starting in the Sahel as a result of the "shock" caused by the 1973 drought. In addition, there are the problems of military strategy, of spheres of influence of the super-powers and of the control of mineral wealth as yet untapped.

In the face of this strategy of powerful political and financial forces, resistance is beginning to be organized and the level of violent reaction by African farmers is beginning to increase. (2) Those who have lived for some time among rural African populations will know that farmers do not wait to achieve the status of wage-earners before reacting to systematic exploitation. Here, too, it is necessary to be better informed, to have a better understanding of the forms of passive resistance adopted, regarded by many experts as phenomena resulting from an economy which is not organized rationally!

This state of affairs has certainly not yet come to an end. In fact the process of disintegration of the West African social systems could be very slow and the number of disasters which are called "natural" could increase until the social structures still existing are completely destroyed. The strategy of the existing "development" programmes seems to be leading in this direction, in the total absence of radical alternatives.

The time has therefore come to evaluate seriously the political implications of strategy which, in the long term, is "genocidal" and to consider a change in course before reaching the point beyond which no reverse process is possible.

Notes and References to Section C of Chapter 7

1 Cf. the interesting work by Jeremy Swift, "A nomad Sahelian economy in the face of disaster", in *Sécheresses et famines du Sahel*" (ed. J. Copans), Paris: Maspero, 1975, pp. 87–101.

2 See the article by Jean-Louis Ormieres in *Sécheresses et Famines du Sahel*, Vol. 1, Paris: Maspero, 1975.

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