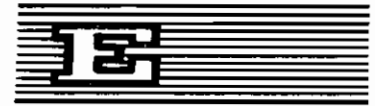


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**UNITED NATIONS  
ECONOMIC AND SOCIAL COUNCIL**

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Distr.  
GENERAL

E/ECA/ENV/13  
December 1983

Original: ENGLISH

ECONOMIC COMMISSION FOR AFRICA

UNEP Multidisciplinary meeting  
on the effect of drought on the  
social and economic system in Africa

Nairobi, 13-16 December, 1983

**SOME SOCIAL AND ECONOMIC ASPECTS OF THE  
IMPACTS OF CLIMATIC VARIABILITY AND DROUGHT IN AFRICA:  
A DISCUSSION PAPER**

(For technical reasons, this paper has not been edited).

## I. INTRODUCTION

1. Climatic variability and drought are known phenomena in Africa. However, the very severe spells of these early 1980s particularly in those countries bordering the Sahara and Kalahari deserts brought to a head this problem which has been around for decades and which has so far been taken for granted. The governments of the region suddenly realised that these dry climatic conditions and drought were threatening, more than before, the social and economic resource capabilities on which their governments and political structures rest.
2. Determined to tackle the problem with the urgency it required, the Conference of Ministers of the Economic Commission for Africa (ECA), at its eighteen session adopted resolution 473(XVIII) in April 1983. This resolution, among other things, called on the ECA, in collaboration with sister agencies to mobilize the resources of the scientific community and organize a Scientific Round Table on the subject. This Round Table Conference would discuss the social and economic impacts of the present dry climatic situation in Africa and the consequent severe drought so as to come out with ideas for immediate action to alleviate the situation.
3. The present multidisciplinary meeting, in preparation for the Scientific Round Table, intends to review and evaluate the effects of drought on the socio-economic systems in Africa, with particular reference to food production, land and water management, ecology and the environment; it was also to evaluate the contribution of population pressure to the problem particularly in terms of agricultural production.
4. In order to provide food for thought at this multidisciplinary meeting with regards to action oriented programmes to help alleviate the social and economic impact of drought in African countries, this paper attempts to highlight some of those areas of the social and economic impacts of drought where data/information is lacking. This would provide a deeper understanding of the underlying issues for operational research and development planning programmes. The paper will therefore attempt to place the issues of climatic variability and drought, as one of the elements of the desertification process, into the fabric of social and economic interactions by analysing, with the help of examples, some of the impacts as they are manifested in the Sudano-Sahelian and Kalahari desert regions, and placing them within the context of agriculture and food production, land and water management, ecology and the environment. An attempt will then be made at discussing researchable areas and possible action at national, inter-governmental and inter/multi-national levels to see what remedial measures can be taken to meet the spirit of operational paragraph 1 of ECA Resolution 473(XVIII).

## II. GENERAL SETTING

5. Climate is a geographical concept depicting the totality of prevailing weather conditions; these include variables like precipitation, humidity, isolation temperatures, winds, relationship between land and water mass, relief, latitude and so on. The prevailing weather conditions are the average of a variety of meteorological conditions specific to a given area.

Variations in climatic conditions from one place to another, result in climatic types which in turn determine the spatial characteristics of physical and human environments. Weather variations within a year provide a seasonality which in turn determines the seasonal rhythm of those productive activities - food production, forestry activities, fishing etc. - that are influenced by climatic conditions. The intensity of each type also varies from one land mass to the other depending on its latitudinal position and the conditions of adjacent water masses.

6. Since there is a definite relationship between climate and the characteristics of the physical as well as the human environment, variations in climatic types will result in variation in human adaptability to it. Although biotic life might be slow to adapt to differing climatic conditions, the human species has a remarkable ability to adapt to the variability of climatic types 1/ depending on the carrying capacity of the environment involved.

7. Resolution 473(XVIII) is concerned with the hot and dry climatic zones of Africa which are the largest in the world, surrounding two large desert areas, the Sahara and the Kalahari. These two subregions have been experiencing severe dry weather spells over the last few years. The situation has aggravated the impact of the desertification process in the adjacent areas, bringing a great deal of pressure on the lives of the people involved. The situation becomes more serious when it is considered that the countries affected are among the least developed in the region. This has made the situation more desperate as there are very limited resources to cope with food shortages arising from reduced agricultural production and the decrease in the area of land under cultivation.

8. Desertification, the encroachment of desert condition on areas which hitherto were less arid, as a result of the paucity in the amount and seasonal spread of precipitation, is mainly due to poor and unscrupulous land use practices. Consequently, measures can be taken to control desertification if the management of resources are available, but dry variations in climatic conditions and drought are beyond human control as they are natural phenomena.

9. On the African continent, seasonal climatic conditions are largely determined by the periodic movement north and south of the Inter-tropical Convergence Zone (ITZ) and the atmospheric conditions that go along with it. North of the Equator, how far south the dry winds throw their influence and for how long, tends to depend on the configuration of the high pressure developed over the Sahara. Similarly, South of the Equator, the characteristics of the high pressure over the Kalahari will determine its influence over neighbouring areas.

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1/ WHO (1972), Health hazards of the human environment (WHO, Geneva)

10. If the effects of diurnal (daily), seasonal and regional variability in weather and, eventually, climate were uniform within national boundaries, it would have been easier to mobilize resources to cope with the adverse conditions that sometimes occur, but this is not the case. Most often than not, the variability in micro-climatic conditions is so great within some national frontiers, in terms of time and space, that the adaptation of land use practices is also considerably varied. However, since the micro and even subregional climatic types have appeared to be relatively stable and relatively predictable for long periods, sudden and severe adverse changes are embarrassing phenomena both to the population and governments concerned because despite the persistence of harsh climatic conditions, no strategies had been developed to cope with them.

11. It has been noted earlier that there is a fairly close relationship between climate and the characteristics of the physical and human environments and that more specifically, the human population is capable of remarkable adaptations to a given native climatic conditions. It is therefore important to exploit this "adaptability syndrome" as an important resource to cope with the impact of dry climatic and drought conditions so that production can be maintained at such a level that the populations concerned can live above the risk of famine and the local environments protected from degradation.

12. It is common knowledge that agriculture is the mainstay of the African economy and it is this sector that is always hard hit by any drought and the process of desertification. Needless belabouring the point that drought results in diminishing agricultural production including that of food. Persistent drought conditions lead to consistently diminishing quality and quantity of agricultural production. The situation is worsened by the high degree of food losses during harvest and storage. Famine, malnutrition, disease and, in many cases, death are the result.

A. Some aspects of the social impacts of drought in Africa

13. The social impacts of deficient agricultural production can be very far reaching and devastating. The family and traditional social structures are built around the agricultural production system. Subsistence is the main purpose of production unlike in the market economy where production location might be determined by the location of the market. Consequently in traditional societies, like the African ones that are now stricken by drought, the conversion of family and lineage structure is greatly determined by the stability of the agricultural system including animal husbandry and pastoralism. The culture of the people is also built around this production system: the whole concept of existence - birth, growth, maturity (initiation), death, medicine and medical care; rituals and rites related to all these and those that have to do with the weather and its seasonality, climate and its variability, are all based as the biotic and ecological support capabilities of the given environment.

14. Although drought is largely a natural phenomenon, social responses and poor land use practices greatly amplify its impacts. In fact, it has been strongly suggested, basing on a review of the situation in the Sahel over the last century, that "drought may be the consequence of the breakdown of traditional, social and economic practices" 2/ and, as is true of the rest of Africa, following the colonial period. 3/ Colonialism introduced a drastic change in the situation where cultural groups had hitherto evolved "a symbiotic relationship with other groups" as well as with the methods and environmental management in these harsh zones. 2/ The areas that have been hard hit have been those of arable farming systems, pastoralism and demographic trends.

15. The determining impact that rocks the fundamental fabric of the society involved is that which has to do with arable farming and the level of food production. Evidence from the Sahel and the Kalahari subregions is unanimous in revealing how greatly shaken the social and cultural structures have been reduced by food production. 4/ In Botswana, there has been great variability in the quantity of agricultural production and area under cultivation. In 1970 the quantity of maize and sorghum production fell far to 9,900 tons from the 1969 figure of 42,600 tons despite a slight increase in the area under cultivation. The situation worsened during the period 1976-77 when the arable area was reduced from 401,000 hectares to 233,000 hectares bringing crop production from 118,227 tons (1976) to 68,428 tons 5/ (1977). The situation in Mauritania is a clear example, where,

"After a satisfactory growing season in 1981-1982 during which Mauritania produced 78,000 tons of diverse grains, 49,400 tons of meat and 2500 tons of milk, the dearth of rainfall during the 1982 hibernage has provoked widespread desolation..... Low rainfall throughout West Africa meant that the annual flood of the Senegal River..... was the lowest since 1972-1973, a particularly parched year, (resulting) in a sharp drop in the amount of land planted in flooded depressions: from 57,000 hectares in 1981-82 to only 12,000 hectares this year (1983)..... In these conditions famine is a spectre haunting Mauritania, as well as several other Sahelian countries especially Mali and Chad". 6/

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2/ L. Berry et al: (1977) "Trends in Man-Land interaction in the West African Sahel" in Drought in Africa: 2 (International African Institutes, Africa Environment Special report No. 6 - London).

3/ LIU, p. 85 and K.K. Prah (1977) "Some sociological Aspect of Drought" in Botswana Drought Symposium (Clark University Press, Massachusetts).

4/ B.B. Jones (1977): Drought and Arable Farming. ibid. p. 235.

5/ D. Ealby and R.J. Harrison Church (ed) (1973): Drought in Africa: Report on the 1973 Symposium (Centre for African Studies, S.O.A.S. University of London).

6/ West Africa (21 February, 1983, "Drought Strikes again in Mauritania") pp. 457-459.

16. The consequences of food shortages are famine, malnutrition, disease and death. The health hazards from water borne disease like malaria, schistosomiasis and onchocerciasis persist because of water scarcity and consequent irrigation and general water management problems that exist in these areas.

17. To aggravate the situation, the livestock support that gives social and economic standing in these societies that are pre-dominantly pastoral is devastatingly reduced 60-70 per cent in certain cases. 7/ Although cattle can stand prolonged periods of drought if their "minimum requirements for food and water are met either consistently or frequently". 8/

18. This resistance is fairly restricted to the cattle between the ages of one year and four years, as Dahl and Hjort 9/ have demonstrated in this table indicating cattle mortality rates (%) with age:

<u>Age</u>	<u>Severe drought</u>	<u>Less severe drought</u>
0 - 1	90	60
1 - 4	40	20
4 - 8	60	40
8 - 13	90	60
13	100	100

Herd fertility is also affected and calving rates even drop to zero during severe drought periods, with a resurgence to 90% during the favourable year following the drought before stabilizing to the normal 70% thereafter. 10/ The high loss of calves (90%) and female animals (60%) during severe drought situations is the impact on human population dynamics.

19. Although little work has been done specifically on the demographic dynamics problems in the Sahelian and other areas with similar conditions in Africa, 11/ the impact of severe drought on population morbidity, and general

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7/ Ibid. p. 457.

8/ J.H. Topps (1977): "Adaptation of cattle to drought conditions and their requirements for food and water" in Drought in Africa No. 2 (1A: 1 - London

9/ Dahl and Hjort (1979): op. cit., p. 15.

10/ Ibid. p. 15.

11/ J.C. Caldwell (1975): The Sahelian Drought and its demographic consequences. (Overseas Liaison Committee, American Council on Education).

population movement, is considerable. Data on human mortality due to direct climatic drought is usually difficult to ascertain although the monitoring of deaths resulting from increased malnutrition and subsequent susceptibility to the risk of death from diseases which might not be fatal under normal circumstances. Caldwell (1975) has suggested the explanation for the relatively low mortality in these conditions as being the

"age-old methods of adaptation: the eating of plants known to have food value but little used in good years, the killing of wild animals even though these have diminished in number markedly during the present century, the eating of one's own animals, and the movement to better places". 12/

Population mobility as a result of the pressures arising from the impact of climatic variability and drought has been one of the crucial problems to handle. This mobility has not respected national boundaries and has been more within the context of geographical regions than political frontiers.

20. In most areas in Sahel and Kalahari desert regions the history of population migration has been linked with the occurrence of severe bouts of drought, as Webster (1977) has indicated in the case of Malawi whose littoral region provided a region of refuge for drought victims even from outside Malawi. 13/ Boutrais (1977) recounts a similar situation in the plateau region of Cameroon which provides unlimited grazing areas for the herds. 14/ Caldwell (1975) has documented the situation where the 1970-74 drought produced large-scale population movement of Tuaregs and Fulanis arriving in Nigeria and neighbouring countries from as far as Mali. 15/

21. Most of the movements during recent drought years has been from rural areas to urban centres both within national frontiers and outside them. The other foci of population movement has been to refugee camps where it hopes to have subsistence in the form of international relief provisions. 16/  
The movement to cities as,

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12/ Ibid. p. 27.

13/ J.B. Webster (1977): "Drought and migration: The Lake Malawi Littoral as a Region of Refuge" in Symposium on Drought in Botswana, op. cit, pp. 148-157.

14/ Jean Boutrais (1977): "Une consequence de la secheresse: Les Migrations d'Elevenos vers les Plateaux Camerounais", in Drought in Africa NO. 2 op. cit, pp. 127-139.

15/ J.C. Caldwell (1977), op. cit, pp. 27-29.

16/ Caldwell, op. cit.

"The exacerbation of drought ..... is likely to further accelerate the disaggregation of the pastoral society and place the mass harratine in an even more delicate position. A large number have also drifted to the towns in search of employment or joined the armed forces. The activist .... movement(s) or urban-based education harratine has been pushing the government for holder reforms .... Nevertheless, the persistence of drought in Mauritania has touched off the dynamics of social change". 17/

This is a representation of a general situation which is not only true of the pastoralist societies of the arid and semi-arid regions, but also of the sedentary farmers communities.

22. When the family, the society and the cultural ensemble can no longer exist as before, supporting themselves on the resources its environment was endowed with, it begins to breakdown. Migration at all levels increases; people begin to fend for themselves and not support other family members or their community. 18/ The African principle of the interdependence of the members of the family, society and the community can no longer function. The community as basis for most development activities in most traditional societies ceases to function as economic production is hampered.

#### B Some aspects of the economic impacts of drought in Africa

23. The economic impacts of diminishing production in the quantity and quality of the agriculture and other sectors are well known to be, among others, an increase in the cost of living and a decrease in the income from agriculture and livestock raising. 19/ This puts a serious stress on peasant incomes and livelihood. When this is further complicated by drought conditions and consequent desertification, the situation becomes embarrassingly untenable.

24. Drought and desertification lead to the drastic reduction in the area of arable land. This means that, even if the labour were there, there is no land to cultivate. Rural unemployment and rural exodus are the result. The urban centres cannot also offer employment to most of them as the secondary and tertiary sectors of the economy are also not developed to cope with this influx. Agro-industries are also seriously affected as they no longer have the raw material resource base to function profitably.

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17/ West Africa Magazine, op. cit, p. 459

18/ J.B. Webster (1977): op. cit.

19/ See section A above and documents E/CN.14/802 PARTS A and B.



25. The debilitating economic effects on the labour force in the countries affected by drought are lamentable. Starvation, famine, malnutrition and disease and the increased death rate have dramatically reduced the quantity and quality of the labour available for all the sectors of the economy. The resources of the health and welfare services are under stress to cope with these areas of relief and rehabilitation. In short, scarce national resources are being diverted into famine relief operations and despite international help the situation is deteriorating. The cyclical effects are low incomes, poverty, lack of capital for investment, low production, under-development.

26. The following figures (1979) represent a general situation in the majority of the countries that are now suffering the impacts of drought. <sup>20/</sup> The situation has been worsening. Levels of inflation have been soaring higher and higher and the economic growth rate has been either zero or negative. The population growth rate in most cases has been more than 2.5%, while the index of food production per capita has been decreasing. There is therefore a general situation of rapid economic regression.

27. Since the agricultural sector is the principal one that contributes the greatest share of the GDP and is the main source of employment and income generation, severe drought slows down the rate of growth of the GDP and per capita income. It will also reduce the level of personal incomes and exacerbate the problem of rural unemployment and under-employment.

28. To alleviate the serious impact of severe droughts, there have been traditional responses to these conditions. <sup>21/</sup> In a nutshell, these responses have been in the area of land and water resource management as well as those aspects of the conservation of the ecology and the general environment to cope with the economic impacts of drought and desertification.

29. The amount of water available for domestic, agricultural and industrial uses is determined by the amount of precipitation in a given place during a given period of time. Drought or conditions where rainfall for a given place over given periods is persistently below normal, results from a situation where the amount of precipitation is less than the amount of water lost by evaporation. Underground water resources in these zones might appear to provide one of the solutions, but the exploitation is hampered by inadequate financial, manpower and technical resources.

30. The problem of water management would therefore appear to be that of reducing the amount of evaporation and increase the amount taken up and maintained by the soils for agricultural production. Irrigation, the main agricultural water management technique in these zones has to be carefully planned.

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<sup>20/</sup> World Bank: World Development Report, August, 1981, pp. 134-135.

<sup>21/</sup> R.K. Hitchcock (1977): "The traditional responses to drought in Botswana" in Symposium on Drought in Botswana, op. cit.

	Population in millions (mid-1979)	Area(000 km <sup>2</sup> )	Average annual growth rate % (1960 - 1979)	Average annual rate of inflation % 1960-70	Average annual inflation % 1970-79	Average index of food production per capita (1969-71) = 100 1977 = 75
1. Algeria	8.2	2,582	2.4	2.3	13.3	75
2. Benin	3.4	113	0.6	1.9	9.2	97
3. Chad	4.4	1,284	-1.4	4.6	7.9	91
4. Ethiopia	30.9	1,222	1.3	2.1	4.3	84
5. Ghana	11.3	239	-0.8	7.6	32.4	82
6. Guinea	5.3	246	0.3	1.5	4.4	86
7. Kenya	15.3	583	2.7	1.5	11.1	92
8. Mali	6.8	1,240	1.1	5.0	10.0	88
9. Mauritania	1.6	1,051	1.9	1.6	10.1	75
10. Morocco	19.5	447	2.6	2.0	7.3	83
11. Niger	5.2	1,267	-1.3	2.1	10.8	89
12. Nigeria	82.6	924	3.7	2.6	10.0	87
13. Senegal	5.5	197	-0.2	1.7	7.6	88
14. Somalia	3.8	638	-0.5	4.5	11.3	85
15. Uganda	12.8	236	-0.2	3.0	28.3	90
16. United Republic of Tanzania	18.0	945	2.3	1.8	13.0	94
17. Upper Volta	5.6	274	0.3	1.3	9.8	93
18. Zambia	5.6	753	0.8	7.6	6.8	99

Some economic indicators of some of the countries affected by drought

31. Land use planning and management has been a serious problem in this area. There has been the problem of adapting the old methods to the new situation; rhythm and intensity of agricultural practices, variety of agricultural production, range and pasture management under these severe conditions.

32. It has been earlier indicated that the dynamism of the ecosystem and the exuberance of its life-support capacity will influence the ease with which the human population inhabits it.

33. In African societies much of socio-cultural and socio-economic institutions are built on the ecological environment and particularly the vegetal life. Specific vegetal species are used in traditional medicinal practices, rites and rituals, lineage and genealogy, chronology and economic transactions. Apart from the degradation of the physical environment - soil erosion and so on -. The destruction of the vegetal cover contributes to destroying the history and culture of a people and destabilization of social and cultural institutions on which most African politico-administrative systems are built.

34. A degraded ecology and environment directly affect activities in all the sectors of the economy: reduced agricultural production both for food and cash crops; problems of industrial location due to the depletion of support resources of raw materials (agro- and forest industries) and quantity and quality of labour force due to migration; stress on the service sector as communications might be rendered difficult as it becomes more difficult to raise financial resources or community labour to maintain lines of communications in usable state.

35. It can be seen from the above sketch that droughts, particularly those of the dimensions of the 1970-74 and 1982-83, exert devastating constraints on the fragile African economies. The seriousness of the situation will be understood when it is noted that over 95% of the countries affected are among the least developed even by African standards. Even with resource inputs from international humanitarian assistance and services to the drought stricken groups, only a very small minority is reached due to the fact that the political and administrative structure are not organized and managed in a manner that the service infrastructure can facilitate the flow of these inputs, no matter how small, to trickle down to the affected masses.

### III. RESEARCHABLE AREAS AND POSSIBLE ACTION

36. In looking at climate and drought within the context of Resolution 473(XVIII), the concern is to provide possible strategies for handling social and economic problems resulting from prolonged spells of drought conditions in the Africa region. The concerted action of the collaborating agencies for this Scientific Round Table was meant to avoid the duplication of some of the programmes to combat the impact of drought and desertification now being carried out by organizations like UNSO, FAO, UNESCO and UNEP (UNCOD).

Many programmes geared towards improving methods of land husbandry to improve food production as well as stop the advance of the desert are being carried out by these agencies. However, most of the lack of adequate social and economic data and information as a sound basis for the conceptualization of these programmes, has been due to an equal lack of the understanding of the fundamental issues that provoke or enhance adaptation, which should be used as basis for data collection. As Caldwell (1975) clearly points out, this has been because of the absence of an infrastructure at national level to collect systematic data. 22/ The problem is further complicated by the situation where most governments, while soliciting food aid, still come out with data showing favourable increase in food production or do not provide any data to support the request.

37. To attempt answers to the issues raised by resolution 473(XVIII), researchable areas for data/information collection and analysis of social and economic impact of drought would include (a) national weather and micro-climatic types and variability, (b) drought and native vegetal species behaviour and possible adaptation of exotic species to specific local micro-climatic condition, (c) human responses and socio-cultural adaptations to drastic dry climatic changes such as local techniques, (d) economic activity and severe climatic variability, (e) development of early warning systems, methods of effective awareness campaigns and (f) modalities of multinational co-operation and manpower training.

38. A data/information bank on the areas aforementioned could easily be diffused through ECA's Pan-African Documentation and Information Service (PADIS).

(a) Drought, national weather and climatic types and variability: their social and economic implications

Although much is known about global, regional and subregional types of climate within which countries fall, very little work has been done on micro-climatic variations, particularly in Africa. Studies of micro-climatic changes and variability would require an elaborate data collection infrastructure for variables like daily precipitation, winds, insolation, temperatures, humidity and so on. These variables greatly influence the rhythm and dynamism of social and economic activities in traditional societies, particularly during periods of drought. Besides the local meteorological services and organs of the World Meteorological Organization (WMO), educational and similar institutions should also be used for climatic as well as social and economic data collection so that every primary school, secondary school and university should have a weather observatory to collect the types of data mentioned above. The department of geography at national universities would carry out analysis of such data and in collaboration with the national meteorological service should be able to provide information on which precautionary programmes can be set up.

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22/ Caldwell (1975), op. cit.

39. The issues there would appear to be the resources and the modalities for setting up such a network and making it work efficiently. How could WMO and national meteorological services use local, social and economic institutions in collecting and, in collaboration with FAO, plan an information diffusion system that would help farmers and those in allied industries to plan their production activities in a manner to cope with the severe conditions?

40. Inter-Agency activities could help national governments in enhancing such programmes as suggested above. 23/ ECA's social and economic surveys should include some of the current information at national level. However, the fundamental question would be that of the agencies developing practicable modalities of collaborating with national governments in developing or enhancing such a data/information collection infrastructure.

(b) Drought and native vegetal species

41. Vegetal species that are adapted to their environment will not stand severe climatic stress for a long time. Within the framework of the social and economic impacts of the variability of climatic conditions and drought at national level, discussed above, what is the feasibility of collecting data to determine the critical survival points? Are there woodland management techniques that could develop resistance species from native ones? What exotic species including economic ones, can be introduced and what would be the modalities of introducing them within the physical as well as socio-cultural environments involved? How can ECA, UNEP, FAO, UNSO and UNESCO collaborate with national governments to find possible practical responses to these questions, if they are relevant, with regards to specific micro-climatic conditions.

(c) Human responses and socio-cultural adaptability

42. It was stated above that the human population has a remarkable ability to adapt to different climatic types, but how much is known about the observed and recorded information on the adaptability to critical and severe variations within each climatic type? It would be useful to develop, maintain and update a data/information bank on questions like:

- (i) Local practices and human response to severe climatic variability;
- (ii) If some of these practices alleviate the impact of such climatic variability, how do the agencies concerned, national governments and related institutions collaborate in enhancing them?
- (iii) Is it necessary to introduce new/exotic practices, what is the potential of popular acceptability in the short and long run? What would be the impact on the socio-cultural and socio-economic environments?

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23/ Elizabeth Wily; R.O.R. Keakope; J. Kroysles (1977): Symposium on Drought in Botswana, op. cit. pp. 208-220.

43. When these types of information are gathered, what would be the modalities that ECA, UNEP, UNESCO, UNSO, FAO and other agencies could adopt to enhance the acceptability of those changes in local practices that will alleviate the impact of climatic conditions that result in drought and increase the risk of desertification in the area concerned?

(d) Economic activity in drought conditions

44. The approach in evaluating the impact of drought on economic activity and the overall economic development would be to monitor production patterns, particularly at micro-level. There might be some co-relation between the varying family income levels and the rhythm of the drought cycles. It will definitely be useful if governments develop machineries for keeping cost-of-living indices which could be compared with agricultural production and other related data.

45. The collaborating agencies could work out a data collection matrix to collect climate-economic information for the region.

(e) Early warning systems

46. Using the data/information gathered as suggested in (a), (b), and (c) above, FAO, WMO, who have been working with meteorological satellites like METEOSAT, and UNSO could come out with an early warning system developed, 24/ or enhanced where they exist, for African countries within the context of resolution 473 (XVIII). The crucial issue here is how the agencies can mobilize resources to develop and effectively maintain such a system for this purpose.

(f) Manpower training

47. For the activities in the researchable areas, for information gathering and dissemination, mentioned above to be fruitfully carried out, a corpus of climatic variability and drought data/information collection personnel must be developed to handle the functioning of any infrastructure that could be set up. This corpus would include daily weather condition technicians, rural sociologists and support manpower drawn from local grass-root institutions and economists specialized in peasant production systems under such conditions with support data/information collecting from local sources.

48. The collaborating agencies should think of ways and means of finding the resources and institutional infrastructure to do this.

#### IV. FRAMEWORK OF A PROGRAMME OF ACTION

49. Resolution 473(XVIII) implicitly requests the development of a programme of action in the short-, medium- and long-terms for remedial measures to alleviate the impact of all aspects of drought. This programme of action would be a follow-up to the Scientific Round Table Conference. The programme of action would appear to be within the context of data/information collection and dissemination, the development of an early warning system and manpower capability training.

#### 50. (i) Short-term activities:

##### (a) Data collection and dissemination

The first activity here would be to identify national and multi-national focii that could be used for climatic and related social and economic data/information collection and dissemination as well as a detailed inventory made of them. These would include:

- (i) national meteorological service infrastructure;
- (ii) educational institutions;
- (iii) national farmers co-operative or other similar institutions;
- (iv) agricultural stations and related extension service posts;
- (v) other institutions whose activities depend on weather/climatic conditions;
- (vi) national data processing facilities.

For any firm action, the existing institutional resources have to be known.

##### (b) Development of an early warning system

Since this activity might depend, to a large extent, on the data to be gathered, the existing institutions should be sensitized as to the possibilities of the application of such a tool.

##### (c) Manpower training and institutional capability development

Manpower availability and existing areas of needs should be identified and a national directory, if possible, maintained of them. National institutions specialized in arid land management training should be identified.

#### 51. (ii) Medium-term

##### (a) Data collection and dissemination

A timetable should be set for data processing and dissemination and roles allocated for national governments, multinational and international agencies.

(b) Early warning systems

A medium-term evaluation programme should be laid down and programmed into the activities of all parties concerned.

(c) Manpower training and institutional capability development

A programme of institutional strengthening should be agreed upon and an evaluation programme for the effectiveness of output initiated. Workshops should be held as refresher courses.

52. (iii) Long-term activities

Tools of measurement and a long-term programme of evaluation should be set up for re-assessing methods of data collection and dissemination, the functioning of any early warning system that might be developed and the needs for manpower and institutional capability development.

IV. CONCLUSION

53. The above areas of discussion could guide deliberations at the Scientific Round Table to come out with possible answers and programmed action for Africa within the context of ECA Resolution 473(XVIII) namely:

- (a) Causes of the present dry climatic and resultant drought situation;
- (b) Periodicity of these climatic variabilities and drought in order to understand the cyclical behaviour and the significance in their differences;
- (c) Effects of drought on the African economy; and
- (d) Remedial measures that can be taken in the short-, medium- and long-terms to deal with the situation.