

PERCEPTION STUDIES IN GEOGRAPHY: A SURVEY OF FARMERS' PERCEPTIONS OF THE DROUGHT HAZARD ON THE KEDAH PLAIN

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Ahli-ahli geografi telah lama terlibat di dalam kajian-kajian tentang alam sekitar. Sejak baru-baru ini, persepsi alam sekitar, terutamanya tentang bencana alam, telah menjadi satu aspek kajian geografi yang semakin penting di dalam negara-negara maju. Di Malaysia, kajian-kajian di dalam aspek ini adalah amat jarang. Kajian ini mempunyai dua bahagian. Bahagian pertama memberikan latar belakang dan kajian-kajian yang telah dijalankan di dalam aspek persepsi. Ia meninjau tentang perkembangan dan evolusi kajian-kajian persepsi di dalam bidang Geografi dan juga bidang-bidang lain. Bahagian kedua adalah berasaskan kepada satu survei berbentuk soalselidik tentang persepsi bencana kemarau oleh petani-petani di Dataran Pamah Kedah di bahagian Barat-Laut Semenanjung Malaysia.

The Geographer has always been pre-occupied with studying the environment. Until recently, the perception of the environment, particularly on environmental hazards, has become an increasingly important aspect of geographical research in the more advanced countries. In Malaysia, studies on this particular aspect is scarce. The present study is divided into two main sections. The first section provides the background and literature as it traces the development and evolution of perception studies in Geography as well as in other disciplines. The second section is based on a questionnaire survey on farmers' perception of the drought hazard on the Kedah Plain in Northwest Peninsular Malaysia.

INTRODUCTION

Since the very beginning of man's existence some five billion years ago he has constantly tried to adjust his ways of life to the environment that nature has offered him. Webster defines the environment as "the aggregate of all external conditions and influences affecting the life and development of an organism".¹ In the past, the environment has been viewed as the controlling factor and man could only hope to understand and live according to its widely fluctuating fortunes. This was the time of the school of "Environmental Determinism" (see Haggett, 1972). This school of thought focussed on the idea that environmental factors were all-powerful, that they determined what happened and that man really had no choice regardless of what he may think or do. With the advancement of technology man, however, was able to adapt better to the environmental hazards. This was the stage of "Mild Environmentalism" which differed in that although Nature was still perceived as being all-powerful, man could choose, at his own peril, to disregard the environmental directives. As man advanced further, he was able to master more and more knowledge of the environment and a whole new range of possible choices were opened to him. This opened up a new chapter in man's history and gave rise to the school of "Environmental Possibilism" where

"There are no necessities, but everywhere possibilities; and man,

as master of the possibilities, is the judge of their use. This, by the reversal which it involves, puts man in the first place - man, and no longer the earth, nor the influence of climate, nor the determinant conditions of localities" (Febvre, 1932).

Man was now viewed to be a more active component of the physical world. He was now able to not only shelter himself from the vagaries of nature but also change or to put it mildly, modify the course of some environmental phenomenon. The extent to which man can alter the environment to suit his life depends on how much he understood it, and the way he perceives it.

THE STUDY AREA

The area of study is located in the northwestern portion of Peninsular Malaysia (Fig. 1), and lies approximately between latitudes 5°N and $6^{\circ}40'\text{N}$ and longitudes $99^{\circ}5'\text{E}$ and $101^{\circ}10'\text{E}$. It covers an area of approximately 9425 km^2 . Its widest dimensions from Perlis in the north to Mainland Penang in the south is approximately 160 km. From the coast in the west to the inland areas in the east it is about 80 km wide.

A large portion of the Kedah Plain is less than 76 m above sea level. The region consists mostly of flat alluvial plains and gently sloping topography towards the coast on the west. The highland areas are found in the eastern and northern parts of the plain. From these highland areas which include the Nakawan, Kedah - Singgora and Bintang Ranges, the network of rivers have carved out wide and deep alluvial plains (Fig. 2). The depth of some of these plains are about 137 m. Because of its flatness and fertility, wet rice cultivation has evolved to be the single most important agricultural activity in the Kedah Plain. In fact, this fertile alluvial plain is commonly referred to as the 'rice bowl' of Malaysia.

^{latitudinal} The maritime nature of the Kedah Plain and its exposure to monsoonal effects have given rise to an equatorial climate characterised by high and uniform temperatures, high humidity and abundant rainfall. By uniform temperature is meant the absence of large temperature variations throughout the year; the annual variation is not more than 2.2°C . The mean annual temperatures are, however, high around 26.7°C . The mean annual humidity is consistently high from year to year. In the Kedah Plain, it has a value of about 81 per cent with the highest values occurring during the wet months from April to July and August to November. The early mornings and nights have the highest value of more than 90 per cent as compared to the afternoons which have values of about only 65 per cent. The Kedah Plain has been depicted by Dale, 1959 and then Chia, 1975 as one of two driest areas in Peninsular Malaysia in terms of rainfall (Fig. 3).

The driest areas are in the northern, south western and eastern parts of the plain where less than 1500 mm of rain is received annually (Fig. 4). The wettest areas with annual rainfall of more than 2600 mm are found in the central and south-eastern parts of the plain. On the whole, the annual rainfall distribution suggests that there should be no problem in terms of water supply for the cultivation of crops deemed suitable for this part of the world. However,

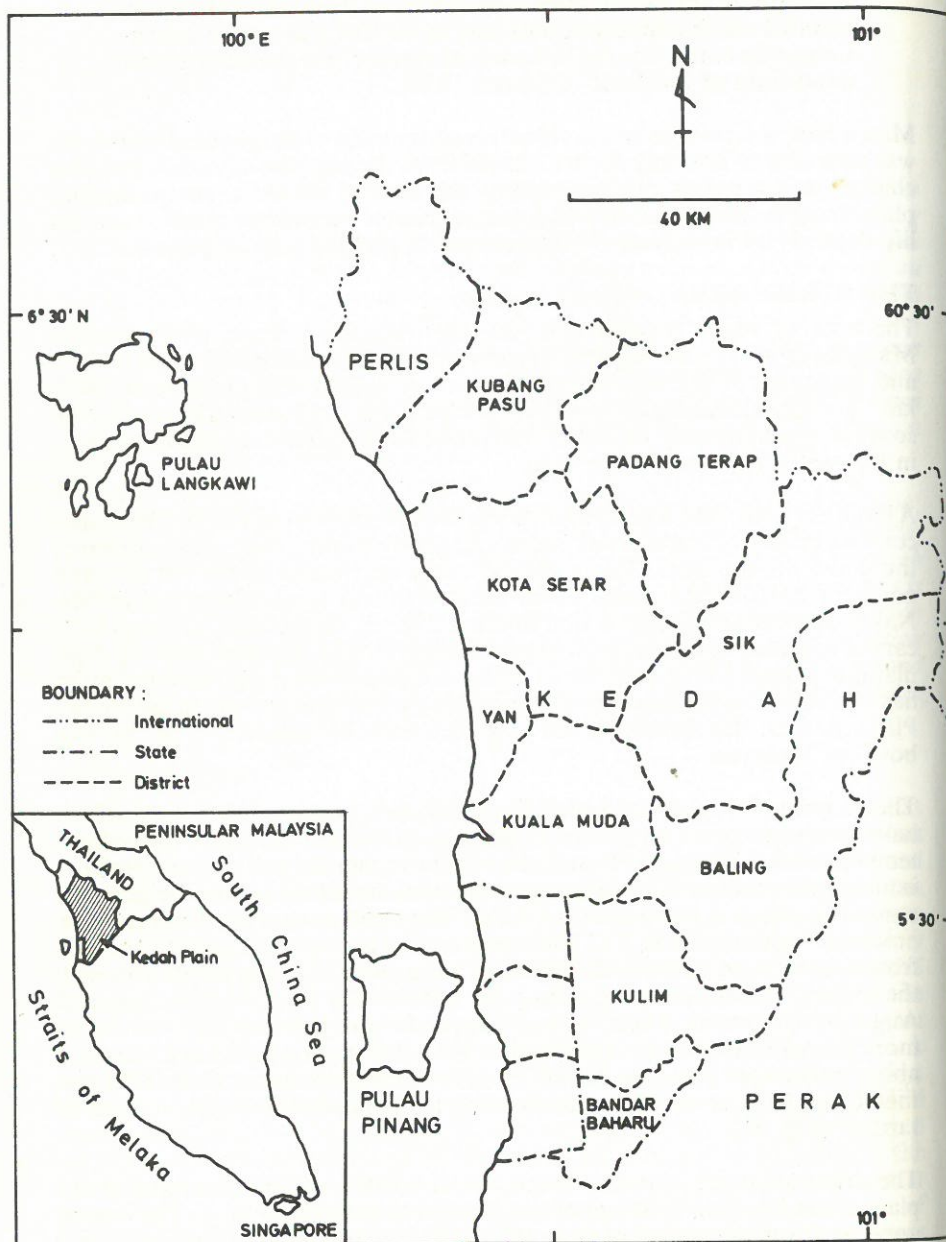


Fig. 1 : THE STATE OF KEDAH IN MALAYSIA BY DISTRICT
(Insert : Location of the Kedah Plain in Peninsular Malaysia)

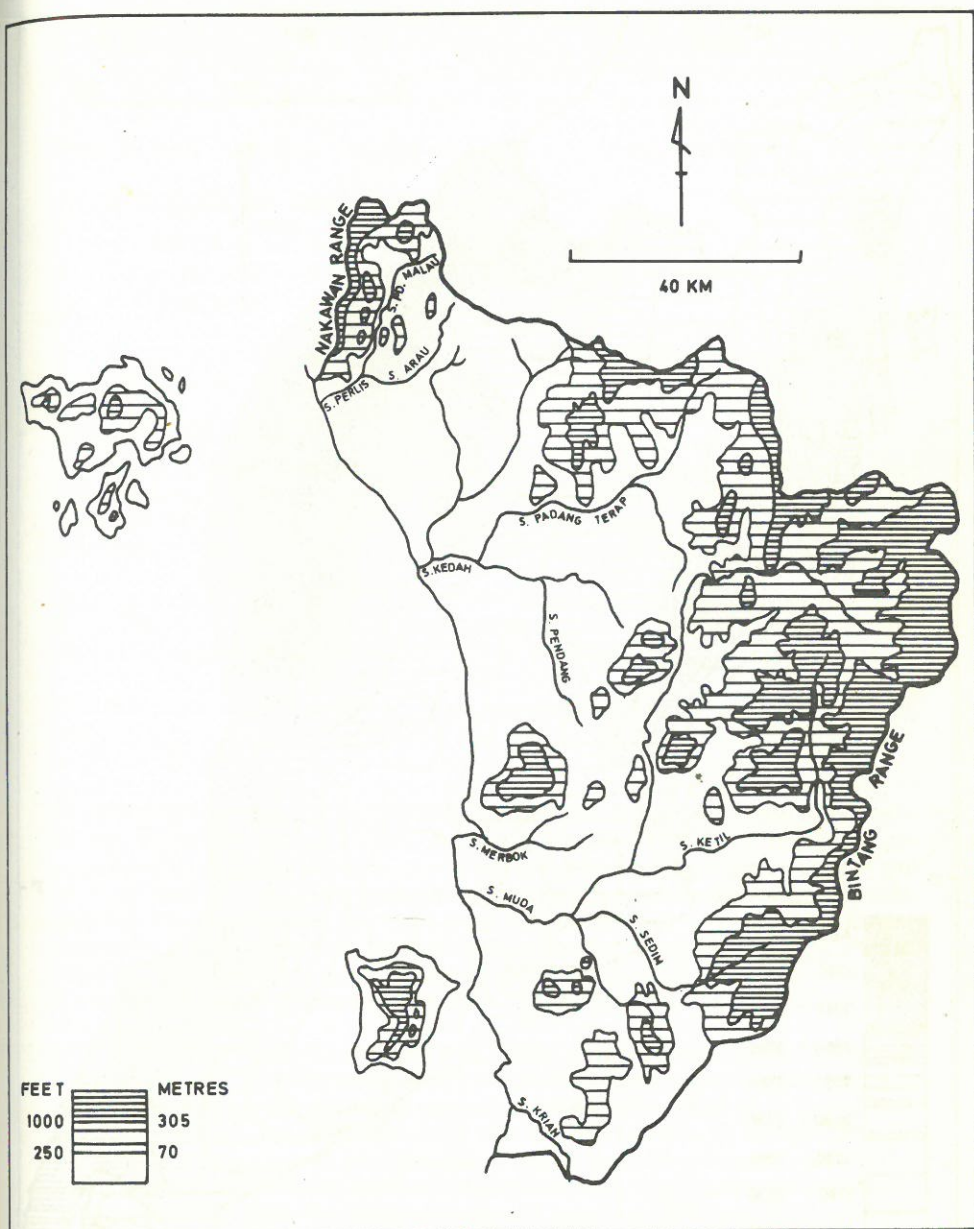


Fig. 2: RELIEF AND DRAINAGE OF NORTHWEST PENINSULAR MALAYSIA. AREAS LESS THAN 70 METRES MAKE UP THE KEDAH PLAIN ON THE MAINLAND.

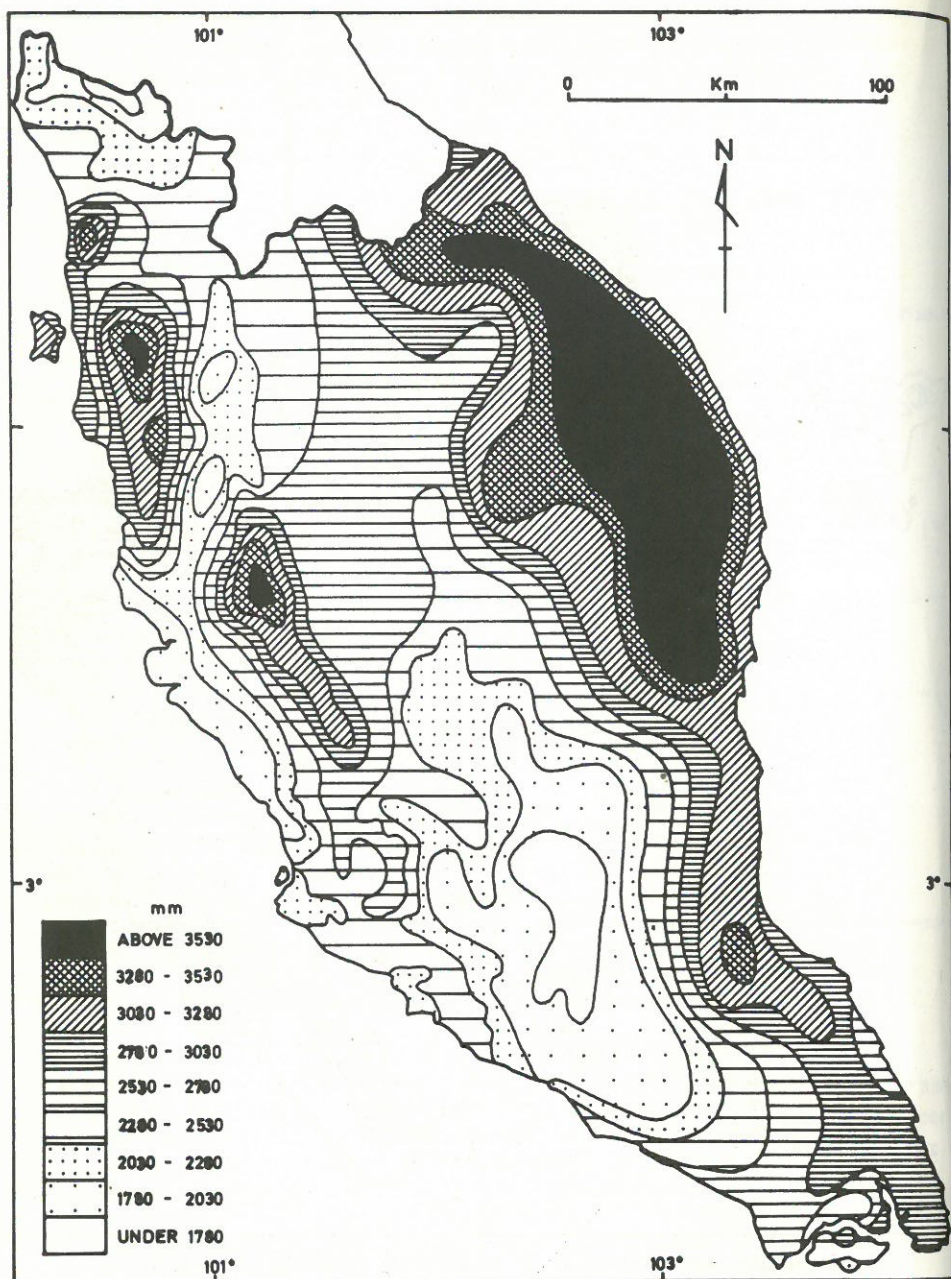


Fig. 3 : DISTRIBUTION OF MEAN ANNUAL RAINFALL IN PENINSULAR MALAYSIA (After Dale, 1959)

incidences of rainfall deficiencies and their impact on farmers' life in recent years have demonstrated that this is indeed a misconception. As one of two driest areas in Peninsular Malaysia, the Kedah Plain has been traditionally vulnerable to periodic dry spells and droughts. The recent severe droughts of 1977, 1979 and 1980 have severely crippled the rice based economy of the Kedah Plain and caused widespread suffering to affected farmers.

OBJECTIVES OF THE STUDY

The objectives of this study includes:

1. To evaluate the problem of perception studies on environmental hazards in Geography; and
2. To determine the range of perceptions and adjustments of padi farmers towards the drought hazard on the Kedah Plain.

METHODOLOGY

To attain the first objective of the study a critical literature review of the development of perception studies in other disciplines and subsequently in the field of geography was carried out. This objective merely form the background and introduction to the main (second) objective of this study.

To attain the second objective, a questionnaire survey was carried out from December to March in 1981, just immediately after the severe drought of 1980 on the Kedah Plain. University students were employed as interviewers.

The selection of the sampling points was made so as to include areas which differed along a moisture gradient and which reflected some of the broader regional differences within the study area. This was done to test the hypotheses that farmers' perception of the drought hazard varied according to the degree of wetness or dryness and the frequency and magnitude of drought in their respective farming areas. Initially, the mean annual rainfall map was employed to delineate the wet, moderate and dry areas in order to stratify the sample. Arbitrary grid lines (northings and eastings) were drawn on this map and the spaces between the lines were numbered 0 to 9. By using random numbers, four sample sites were chosen with two areas having high annual rainfall, one with moderate annual rainfall and one with low annual rainfall. By using this method the sample selected was stratified as well as random.

Of the two high rainfall areas one was a fully irrigated area within the Muda Scheme around Kota Sarang Semut and the other was a non-irrigated area in Kulim. The area with moderate rainfall was centred on Baling in the eastern part of the region and the low rainfall area chosen was that of North Perlis. In the course of selecting the sample sites drought frequency was also taken into consideration as it affects farmers' perception. Fig. 5 indicates the frequency of obtaining less than the minimum rainfall required by a long term crop² in the main season. Thus, a drought would occur with the following frequency at the four sample sites:

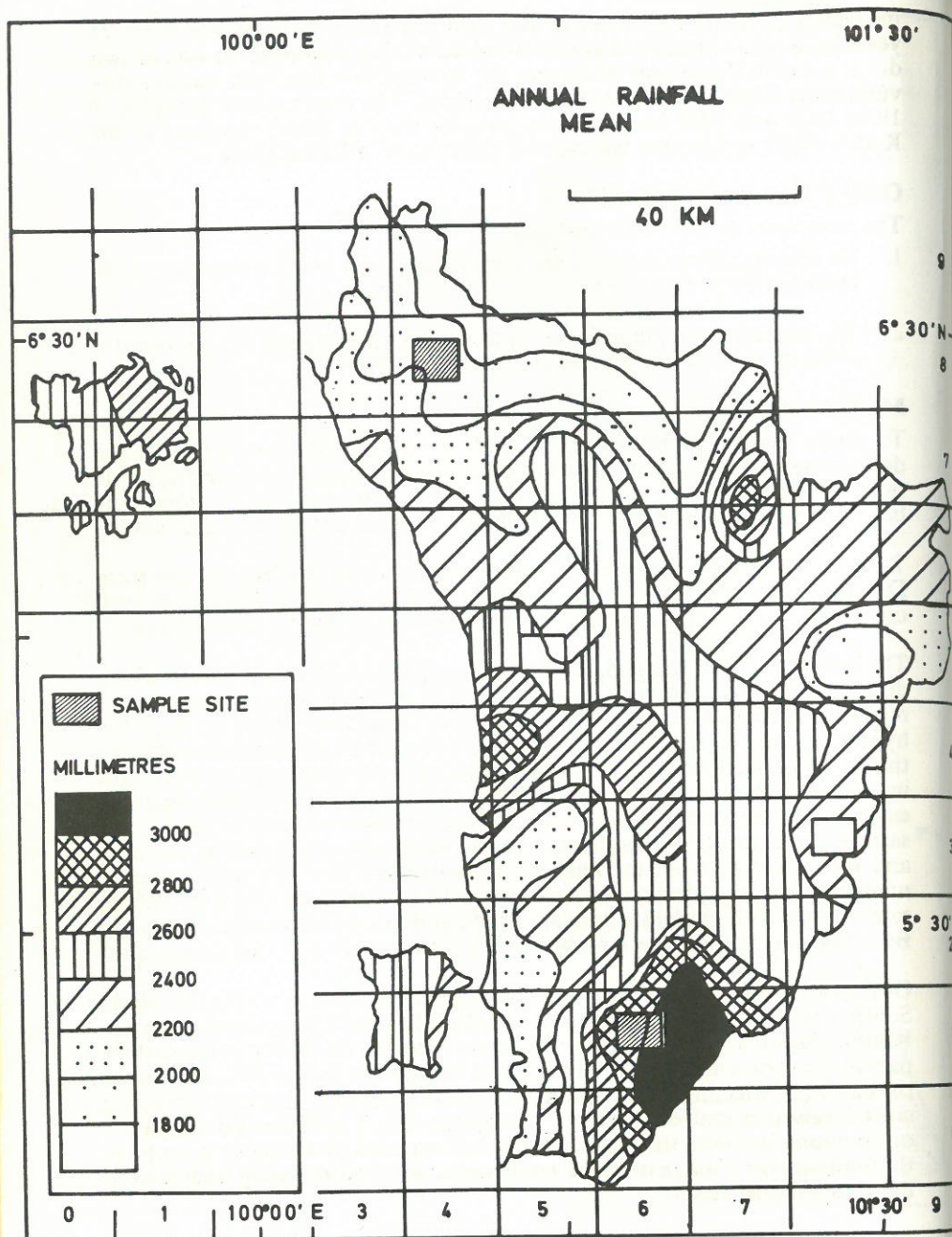


FIG. 4 ; Distribution of Mean Annual Rainfall in Northwest Peninsular Malaysia. (Based on data of 41 main stations and 18 subsidiary stations from 1948 to 1977).

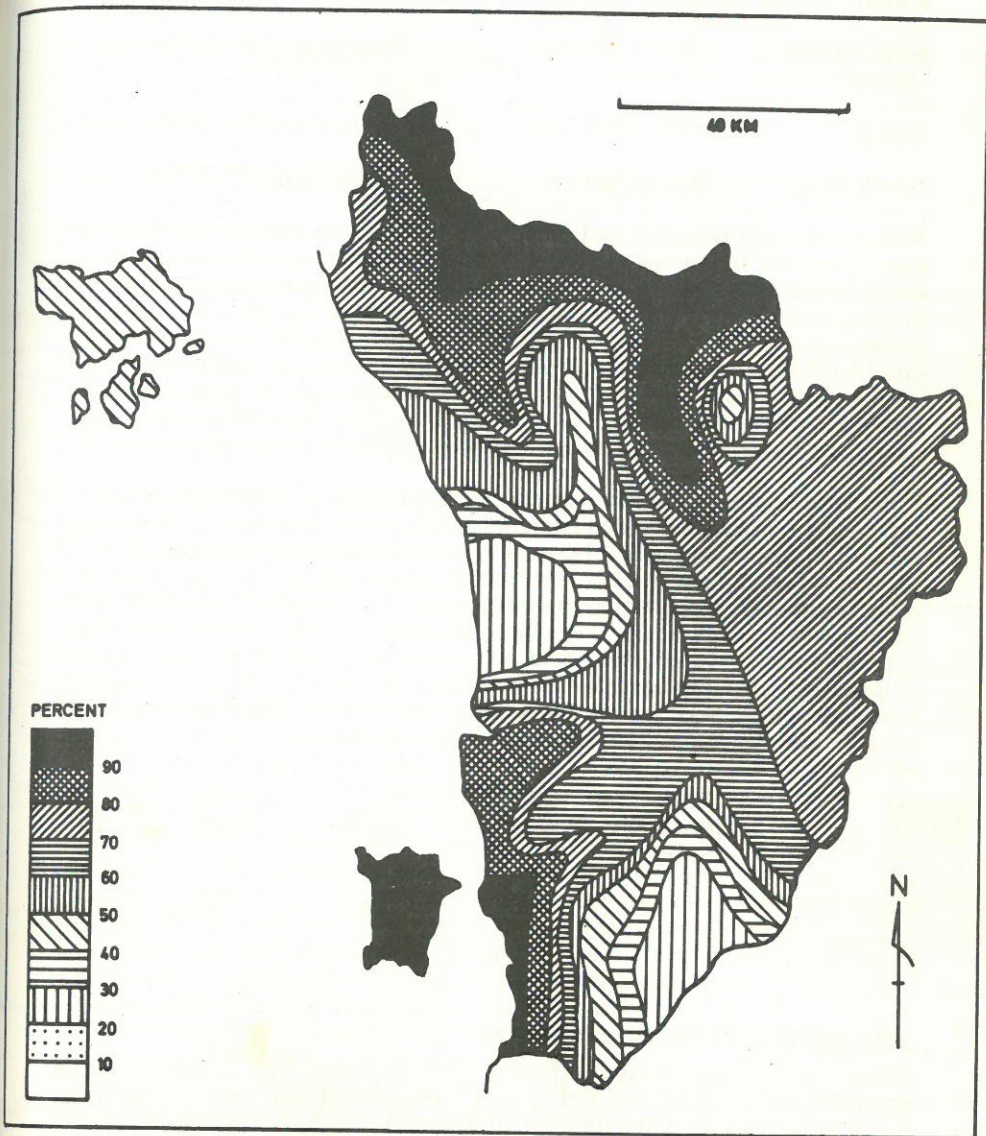


Fig.5: PERCENTAGE PROBABILITIES OF OBTAINING LESS THAN 1400 mm OF RAIN DURING THE MAIN SEASON. (Source: Chan, N.W. (1981), A Quantitative Analysis Of Rainfall Patterns And Drought Occurrences In Northwest Peninsular Malaysia)

Sample Site	Mean Annual Rainfall	(Main Season Crop)
Kulim	2800 - 3200 mm	Less than 30% of the time
Kota Sarang Semut	2400 - 2800 mm	Less than 30% of the time
Baling	2000 - 2400 mm	More than 70% of the time
North Perlis	Below 2000 mm	More than 90% of the time

With the sample points already secured, the next step was to determine the sample size for the present study. It was obvious that since farming was the main occupation of the Northwest, even taking a small percentage of the total farming population could result in a very large sample size. The 1970 census³⁰ showed that there were 425,020 farmers in Kedah, 49,137 farmers in Penang, and 13,155 farmers in Perlis. Taking five per cent sample would already entail interviewing 21,251 farmers in Kedah, 4,914 farmers in Penang, and 1,316 farmers in Perlis. As this was not feasible within the scope of the present study, only the villages within the sample sites were chosen for enumeration.

Initially, it was hoped that a listing of the addresses of all the farmhouses in each village could be obtained from the district office. However, such a listing was not available from official source. A preliminary survey was carried out to locate the farm houses in each village at all the sample sites. The total number of houses and their respective locations in each village at the sample site were then entered on a map. The final selection of the houses was done systematically in which every fifth house was surveyed. In this way, all the villages in each sample site were covered by the survey. Only the heads of households who were padi farmers⁴ were interviewed. The total number of farmers interviewed at each sample site were as follows:

	Kulim	Kota Sarang Semut	Baling	North Perlis	Total
Number of Farmers Interviewed	35	44	35	49	163

THE PROBLEM OF PERCEPTION

Perception is an extremely complex concept to define. Yet, its relevance and application in scientific research is widely recognised and used. For instance, the explanation and understanding of migration to the behaviour of farmers in areas of climatic hazard, can be greatly increased by consideration of the individual's perception of his environment. Perception can be envisaged as a factor which is present in all human activities. According to Cox (1972), "Perceptions are pieces of knowledge which are acquired by the individual as a result of his visual tactile, verbal and auditory contacts with the environment about him. They are not necessarily accurate by scientific standards; rather

they are more or less accurate". Yi-Fu Tuan (1974) has noticed that the ways in which people perceive and evaluate the environment are varied and different. No two social groups make precisely the same evaluation of the same environment. According to him, a person's perception depends on his ability to feel and understand certain stimuli offered by the environment. This he does with the help of his own perceptual equipment - vision, hands and tactile sense, hearing, smell, and the combination of all these senses.

On the whole, there appears to be much debate among psychologists⁵ and other researchers over the definition of perception. Saarinen⁶ argues that perception depends on more than the stimulus presented by the environment and the capabilities of man's sense organs. It also varies with the individual's past history and present "set" of attitudes acting through values, needs, memories, moods, social circumstances, and expectations. In attempting to discuss the principles of perception, Bartley (1958) wrote, "Nowhere in the literature can we find in concise and adequate form a well-rounded account of what perception is, what its characteristics are, and for how it relates to other aspects of behaviour". Yet, it has not stopped investigators from all disciplines in trying to define it. Allport⁷ said

"We can include all the senses and can interpret perception as covering the awareness of complex environmental situations as well as single objects things can and do look differently from the way they "are"; and when we realise this fact and begin to explore the reasons for it we shall have gained some light of the meaning of perception and the problem it presents".

Geographers seem to be mainly concerned with the individual's perception of his environment, how the individual's culture and experience affect this perception, how the individual's perception affects his behaviour and with the effects which differing perceptions can have on the appearance of the landscape. The man/environment relationship has for long been a focal point in the field of geography and the realisation of man's ability to adapt to, or even modify, that environment according to the way he perceives it has opened a rich frontier for geographic research. In their concern to understand the spatial and landscape manifestations of human life, geographers recognise the fact that in some areas of the world social man is the dominant "in-put" into this man-land relationship (Wheeler, 1976). The main problem in studying people's perception is that of measurement, since people often have difficulty articulating the conscious or unconscious feelings, attitudes, or ideas associated with perception. This, however, can be overcome by acquiring new techniques and methods of data collection (see White, 1975; Berry, 1971; and Burton, 1978; among others) and making use of current techniques employed by psychologists and scientists from other fields (Henry, 1956; Lindzey, 1961; among others).

THE LITERATURE ON PERCEPTION STUDIES

Most work on the development of studies in perception has been done largely by psychologists and was based initially on the premise that one's knowledge of the world was derived from the senses and the stimuli acting upon the

senses. Subsequently, the theme was changed and work on perception stressed the importance of past learning and motivation. Despite the clinical nature of these early works, one development was the acquiring of many new techniques for the examination of perception. From psychology, the awareness of the man/environment relationship filtered into geography and other behavioural sciences. In 1947, the American geographer Wright (1947) proposed a discipline called "geosophy" in which the content would be man's sense of terrestrial space as well as the geographical ideas of all types of people. Very soon other geographers began to pick up the subject with enthusiasm. Many attempts have been made to fit ideas of perception into a geographical framework. Kirk (1953 and 1963) became a pioneer in the field of environmental perception when he divided geography into two broad categories - the Phenomenal Environment and the Behavioural Environment. It is within the later division that the study of perception of the environment evolved. Geographical perception studies have been classified in various ways by different investigators. Downs (1968) proposed three classes of perception studies based on,

1. the analysis of structure - what is the nature of the perceived world?
2. the analysis of evaluation - what are the major features of the perceived world which affect decisions?
3. the analysis of preference - how are the objects evaluated with respect to each other?

Goodey (1968) also recognised three types of perception studies, viz,

1. environmental perception which deals with man's awareness of the features of the immediate environment;
2. extra-environmental perception which deals with man's awareness of the features outside the immediate environment; and
3. preferential perception which deals with man's preferences for movement towards particular places.

Bordessa (1969) on the other hand, listed four categories of perception studies. They are:

1. environmental perception,
2. attitudes and responses to environment,
3. environmental space preferences, and
4. environmental perception and behaviour.

Wood (1970) has recognised six headings for perception studies, viz.,

1. landscape studies,
2. hazard studies,
3. recreation studies,
4. urban studies,

5. movement studies, and
6. space preference studies.

Although all these classifications seem to be logical it is often difficult to fit any single study into any one category. For instance, many individual works fit simultaneously into two or more categories. Despite this discrepancy, the classifications above serve to illustrate the potentially wide range of topics that have been examined and the wide range of techniques that have been employed to gather data for the various studies.

THE DEVELOPMENT OF PERCEPTION STUDIES ON ENVIRONMENTAL HAZARDS IN GEOGRAPHY

Two decades ago there were practically no such studies in the literature of geographic research. The study of environmental hazards, and people's perception and adjustment to them, has been one of the most remarkable development in the field of geography. It has also opened up a completely new and fertile area of research in which geographers may apply their expertise. Geographers should for several reasons be able to make many valuable contributions to the development of theory on perception of the environment. Firstly, as a group, geographers have probably devoted more time to thinking about man-land relationships than any other discipline. Secondly, their skill in using the map as a basis for the assessment of the spatial extent and magnitude of environmental hazards has put them far in advance of others. Thirdly, geographers have always worked in the "real" world and are, therefore, admirably qualified to conduct research in the field where conditions can often be trying.

Because of the wide range of varied topics currently being explored by geographers, there seems to be no accepted theoretical base to perception studies in geography. Most of the studies are still of an explanatory nature, but recently attempts have been made from the Chicago school to apply the perception approach to schemes of resource management (Burton and Kates, 1964b; Burton and Auliciems, 1972; and White, *et. al.*, 1972). These studies indicate that a heightened understanding of the perception levels of people occupying various hazard zones is essential for the development of comprehensive and efficient measures to help reduce the damage caused by hazards. Finally, the study of perception in geography has a unifying value among the various social sciences. Since psychology has been the pioneer in perception research, geographers and others stand to learn a great deal from it both in terms of theory and methodology.

Most of the work by geographers on perception has been done on environmental hazards and the reaction and attitudes of people towards them. This is understandable because geographers have devoted more time and thought to man/environment relationships than any other discipline. The painful experience of loss of property and life in the past, and its alarming frequency of occurrence in recent years have induced geographers to look into problems associated with such extremes of the environment as droughts, floods, frost, storms, to name a few. The problem of perception is not an entirely new idea within geography. A field of research similar to perception

studies called cultural appraisal has long been the domain of cultural geographers (Spoehr, 1956). It has been, however, only in the last two or three decades that the geographer has fully applied his talents to the study of natural hazards and the attitudes, perception and response of people affected by them.

Much of the pioneering work on hazard study has been done by White of the University of Chicago. As early as 1945, he was aware of the width of "Choice" in decisions on the use of natural resources, but it was not until considerably later that these ideas were developed and amplified. In his earlier works White had stressed the distinction between the theoretical range of choices and the range of practical choices available to hazard-hit residents. Although there may be a wide range of theoretical choices available, the ignorance and lack of total awareness of the residents may limit them to a small range of practical choices. His other works to date in this particular field are numerous (see Burton, *et al.*, 1978). The unquestionable influence of White and the Department of Geography, University of Chicago in the field of hazard study was highlighted by Saarinen (1966) when he wrote, ".... the single strongest organised research tradition leading toward perception studies in natural resources is the series of flood plain studies at the University of Chicago and their derivatives".

The early works by White have been concerned mainly with the variety of physical factors affecting the adjustments. However, later studies conducted by him (White, 1961, 1974 and 1975) and other writers have been concerned with the costs of damage and the disruption caused by various hazards. Many of the later studies stressed the importance of gauging individual perceptions of hazards as an essential to the formulation of more meaningful programmes of control.

One of the notable investigators who took up the subject after White was Kates (1962). While studying the conditions of knowledge under which flood plain decisions were made, he investigated the nature of information on flood hazards available to flood-plain occupants, the kinds of choice to adjustment which flood-plain users perceive and the relationship between the perception of the hazard and the choice of action to reduce flood damage. He collected the data using a sixteen-page questionnaire, and concluded that past knowledge and experience are related to the perceived probability distribution of floods. Besides his other works on the perception of flood hazards, (Burton and Kates, 1964a; Burton, Kates and Sneed, 1969), he has also written a number of books on topics directly related to perception (Burton and Kates, 1964b; Sewell, Kates and Phillips, 1968; Berry, *et al.*, 1971). Another person who has done much research in the same field is Burton (Burton, 1962; Burton and Kates, 1964b; Burton, *et al.*, 1978).

Although the early literature on flood hazards is enormous, there seem to be no proportionate amount of work done on drought hazards. Only in the past decade has the perception of drought hazard been widely explored by researchers. The most prominent figure to have attempted a thorough study in this particular aspect is Saarinen (1966) who based his hypotheses on those of the earlier flood hazard studies. He acknowledged this fact when he wrote ".... the theme of those studies (flood hazards) is directly relevant to the

investigation of perception of the drought hazard for it seems likely that the way in which people deal with the natural catastrophe of floods may be similar to their behaviour vis-a-vis droughts". Saarinen's paper essentially dealt with the way wheat farmers of the Great Plains perceived the problem of drought, and to what extent this perception affected their adaptation to the environment. He based his research on a long questionnaire and a Thematic Apperception Test. Among other things, he concluded that Great Plain farmers were overly optimistic and they tend to underestimate the actual frequency of drought occurrence.

Following the impact of the study by Saarinen many investigators in semi-arid to arid areas all over the world took up the topic looking upon it as a new frontier in geographical research. In Australia, Heathcote (1969) undertook a general survey of the problem of drought perception in that country. In another study in 1974 he looked into the drought hazard in Australia in greater detail and found that while most of the farmers had experienced the last major drought in 1967, only a small percentage were overly concerned with it. He concluded that the farmers had adapted themselves well to the drought hazard. Others who have investigated the problem of drought perception include Rusell (1970), Parra (1971), Berry *et al.* (1971), Kates (1972), and many others have published their works in White (1974).⁸

PERCEPTION STUDIES ON ENVIRONMENTAL HAZARDS IN MALAYSIA

No research on farmers perception of the drought hazard has been done in Malaysia. The geographical research conducted has been on the flood situation in the peninsula rather than on drought. The Malay Peninsula has a long history of floods, especially in the east coast States of Kelantan, Trengganu and Pahang during the Northeast Monsoon (Diah Mohammed, 1972). The high frequency of floods in the peninsula and the general reluctance of flood plain inhabitants to migrate elsewhere have prompted Leigh and Low (1972) to study the hazard in the peninsula in detail. This prompted a study of the attitudes and behaviour of the occupants of the Pahang flood plain by Chua (1972). In the latter study the author discovered that despite their knowledge of the high frequency of flood (almost once every year during the Northeast Monsoon season) the flood plains occupants persisted in staying on. She sought reasons for this in the occupant's attitude of accepting what nature has bestowed upon him and looking upon it as a challenge. The data for the above study were collected by means of a thorough questionnaire survey. Another study which has some applicability to the study of climatic hazards is that by Monteiro (1962). The essence of this study was concentrated on the influence of climate (both favourable and unfavourable) on man and his activities on the east coast of the Malaysian Peninsula. Despite the implications offered by this study on human responses towards the climate, the author did not in any way mention man's perception of the climatic elements.

DROUGHT PERCEPTION ON THE KEDAH PLAIN - THE FINDINGS

On the Kedah Plain, a total of 156 farmers (95.7 per cent) perceived drought as a disadvantage to their operations. Of these, 64 farmers mentioned drought as

the greatest disadvantage to farming on the Kedah Plain. Drought was normally cited as the first and most emphatic disadvantage. It was found that 75 per cent of farmers from areas with higher rainfall and irrigation facilities did not perceive drought to be the greatest disadvantage. Instead, these farmers perceived pests and disease as the greatest disadvantage. On the other hand, more than 90 per cent of farmers from the drier and non-irrigated areas perceived drought as the greatest disadvantage to padi farming.

In the analysis of farmers' perception of recent moisture conditions, more than 50 per cent of the farmers interviewed perceived moisture conditions in the past few years to be drier than normal. Farmers from the drier areas were more perceptive of actual moisture conditions (drought had occurred during the 1977/78 season preceeding the study). Almost 86 per cent of these farmers perceived actual conditions to be much drier than the normal. On the other hand, farmers from the wetter irrigated areas were not so accurate in their perception. Although actual conditions in these areas were normal, almost 60 per cent of these farmers perceived conditions to have deteriorated towards the drier side. Their perception could have been influenced by the publicity created after the drought of 1979 and 1980.

In their perception of the definition of drought about 82 per cent of the farmers regarded it as a form of water deficiency. The remaining 18 per cent perceived drought in terms of crop losses. Of the former category of farmers, about 75 per cent regarded drought as a condition where little or no rain fell for a period of several months. The remaining 25 per cent of the farmers insisted that a shorter duration of a few weeks would lead to drought. The above analysis indicates that the majority of padi farmers in the Kedah Plain perceived drought as a condition of water deficiency. Although the perceived duration of this deficiency varied considerably, most of them agreed that a period of 2 to 3 months with insufficient rainfall would lead to drought.

In their perception of the frequency occurrence of drought, it was hypothesized that farmers from different areas with differing moisture conditions will show a marked difference in their accuracy of perception. This was found to be true. In general, most farmers from the wetter areas perceived actual drought frequency correctly but farmers from the drier areas tended to underestimate the frequency of actual drought occurrence. Thus, while farmers from wetter areas can be described as 'perceptive', those from the drier areas can be classified as 'optimistic'. The latter category of farmers are perpetually hoping for the best. To many of them, water deficiency is a normal condition that occurs almost every year. As such it is an accepted fact that the region under farming is perpetually dry. Thus, it would take a severe water deficiency of several months or more before these farmers would consider a drought to have occurred!

In perceiving the causes of drought, 107 of the 163 farmers regarded it as an act of God. This could be attributed to the fact that more than 90 per cent of the farmers interviewed were very religions Muslims. Most of the farmers in this category were also the older ones with little formal education. Of the remaining farmers, 14 of them attributed the cause of drought to adverse weather phenomenon or natural cause. This group of farmers were the

educated ones with at least 6 years of primary education. In fact, 10 of them reached the lower secondary level of education. Another 3 farmers perceived drought as the cause of human activities like deforestation and industrialisation. All three farmers here had received secondary education. The remaining 3 farmers considered drought as the cause of evil spirits. Obviously they were all illiterate.

When it came to perception of possible measures to overcome drought, most farmers in the Kedah Plain believed that nothing could be done as it was beyond man's control. Of the 163 farmers interviewed, 65 had no idea as to how drought could be overcome, another 76 farmers firmly believed that nothing could be done while 22 farmers mentioned irrigation as the answer. The analysis revealed that the majority of the farmers who believed that drought could be overcome were the younger and more educated farmers. Of the 22 farmers who mentioned irrigation as the method to overcome drought, 14 of them were under 40 years of age and 17 of them had at least primary education.

Finally, the farmers were asked to mention the range of practices (adjustments) and strategies for reducing drought losses. Results from the survey indicated that the most common practice was to seek other forms of employment elsewhere. Most of the younger farmers mentioned this adjustment as they were quite flexible in adapting themselves to all sorts of employment like rubber tapping, working as labourers in factories, fishing, cottage industry like making batik or other forms of handicraft and even repairing irrigation canals for the Government. The older set of farmers, however, were not so flexible in seeking alternative employment. As such, most of them mentioned praying to God for the rains to come. These farmers also resorted to borrowing money from friends and relatives. Thus, while more than three-quarters of the younger farmers sought other forms of employment during times of drought, only about one-third of the older generation did so. Another form of practice mentioned by the farmers include the planting of other crops which require less water such as chilli (*Capsicum Minimum*), tobacco (*Nicotiana Tabacum*) and long beans (*Vitna Catjang*). However, only less than 5 per cent of the farmers did so. This could be due to the fact that during times of drought even such dry season crops may not survive. The other common practice was the rearing of livestock such as poultry. About slightly less than 10 per cent of the farmers did mention this practice as an alternative to reduce drought losses.

CONCLUSION

The results of the analysis of the questionnaire survey on farmers' perception on the drought hazard in the Kedah Plain showed that most farmers were aware of the drought hazard and perceived recent years to be drier than normal. Most farmers also perceived that drought was the most serious disadvantage to their farming operations. The farmers from the wetter areas, however, indicated that pests and diseases were the most serious threat. Results also showed that farmers from different moisture zones perceived drought occurrences with different frequencies. In general, farmers from the wetter areas were more accurate in their perception of actual drought

frequencies but farmers from the drier areas were generally 'optimistic' and tended to underestimate actual drought frequencies. While the majority of the farmers attributed the cause of drought to God, the better educated farmers were, however, more inclined to suggest weather changes or other natural causes. On the whole, the majority of farmers in the Kedah Plain do not perceive a wide range of possible measures to reduce drought losses. Most farmers either believed that drought could not be overcome or had no idea as to how it could be overcome. The better educated farmers, however, mentioned irrigation as a solution. During times of drought, the most commonly perceived action was to seek employment elsewhere. In this aspect the younger and more energetic farmers were more versatile than the older ones. The other common alternatives to reduce drought losses include planting other crops which require less water, borrowing money and food from friends and relatives, seeking help from the Government, rearing livestock and even selling property. On the whole, it can be acknowledged that the younger and better educated farmers were more versatile and would perceive to adopt a wider range of actions to reduce drought losses than the older and less educated farmers.

It is hoped that more research of this nature will be undertaken in future, not only in terms of drought but other environmental hazards as well. As Peninsular Malaysia is frequently subjected to vagaries of the weather such as droughts, floods, storms, winds and others, there is a lot of scope for geographers to concentrate their expertise on this particular aspect of research in the future.

NOTES

1. Quoted in Saarinen, T.F. (1969), "Perception of Environment", *Resource Paper*, No. 5, Ass. Amer. Geog., p. 5.

2. A long term padi crop has an approximate maturation period of between 4 1/2 to 6 months and requires a main season rainfall of not less than 1400 mm. In the Kedah Plain, the main season stretches from July to January with varying commencement and harvesting timing depending on the arrival of the Monsoonal rains.

3. Department of Statistics (1972), *1970 Population Census of Malaysia by Occupation* (Kuala Lumpur).

4. Padi farmers were defined as those who are responsible for the operations of cultivating wet rice and for the profit and loss therefrom. Only the following categories of farmers were interviewed:

- (a) Those who own land and cultivate themselves.
- (b) Those who own land and cultivate part of it themselves and rent out the rest.
- (c) Those who own land and rent out or hire labour to work on their land and have no other form of business or income.
- (d) Those who rent land to cultivate.
- (e) Those who are full time employees who get paid for planting the crop and have no other occupations. See Wilson, T.B. (1958), *The Economics of Padi Production in North Malaya, Part I*, Ministry of Agriculture, Federation of Malaya, p. 2.

⁵. Psychologists have probably spent more time considering the problem of perception than any other group of investigators. This is reflected in the wide variety of different theories of perception. (See Allport, F.H. (1955), *Theories of Perception and the Concept of Structure* (New York).

⁶. Saarinen, T.F. (1969), *op. cit.* p. 7.

⁷. Allport, F.H. (1955), *op. cit.*, p. 14. 1976).

⁸. Wisner, B., and Mbithi, P.M. (1974), "Drought in Eastern Kenya: Nutritional Status and Farmer Activity", in White, G.F. (ed.), *Natural Hazards: Local, National and Global* (New York), pp. 87-97.

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