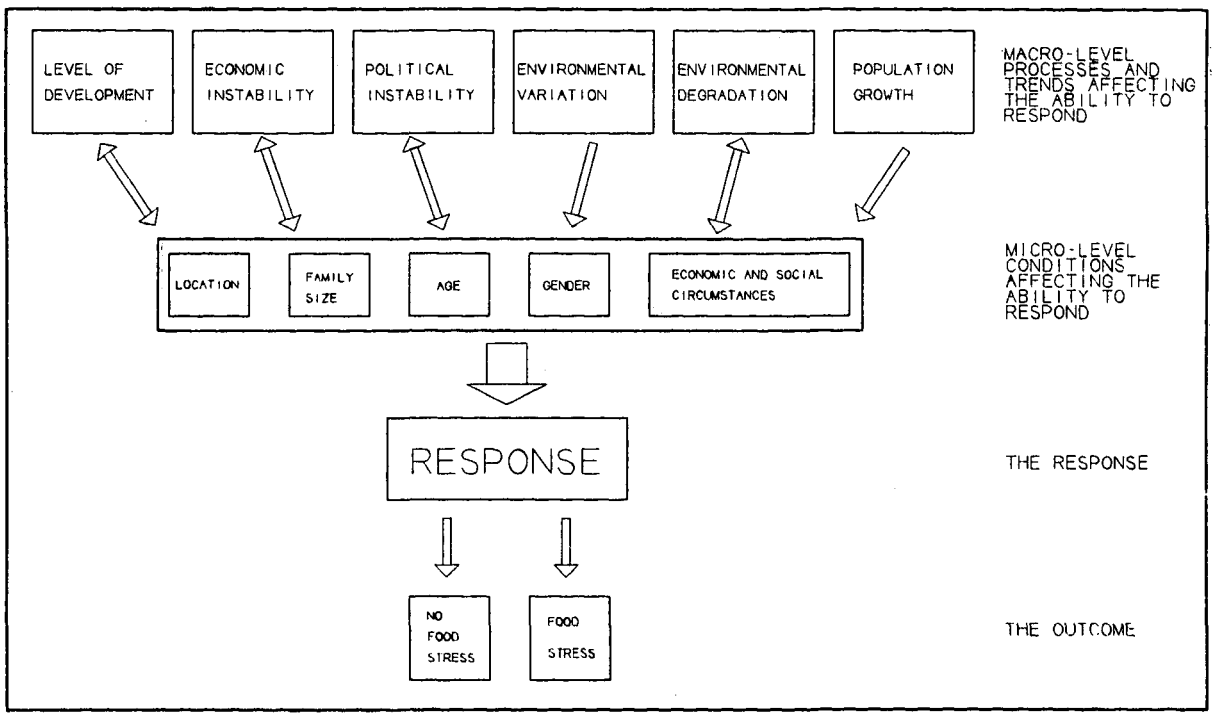
11. Conclusion

In the present collection of papers we have presented research results (and have discussed the results of others) on a variety of research topics conducted in Red Sea Province including environmental variation, environmental degradation, economic instability, political instability and the regional economy at the macro level, and age and gender in relation to malnutrition and drought-coping strategies at the micro level (see Figure 11.1 on the next page).

Figure 11.1. Macro trends and processes and Micro conditions that affect the ability of an individual or group to respond to adversity.



The figure above illustrates the interaction and feedback from the micro to the macro levels. By Level of Development is meant the level of development of the transportation infrastructure, the level of urbanisation, the availability of urban employment, the presence of opportunity associated with agricultural schemes, et cetera. By Economic Instability it is meant economic inflation, the highly variable performance of local and international prices, and the general economic condition at the national and regional levels regarding employment and economic investment. By Political Instability, war, banditry, and lack of national political integration if that lack of integration has destabilising effects at the regional or local levels are meant. By Location (at the micro level), the degree of isolation is meant; distance from towns or agricultural schemes. By Economic and Social Opportunities, personal or family wealth, special group membership, education, and skills are meant.

More research needs to be done at the micro level to contribute to our understanding of the impact of all of the variables mentioned above. Continued macro level monitoring of the economy and the environment are necessary as are studies of environmental change in order to help us understand more fully the wide mix of variables that condition the ability of individuals and groups to respond to adversity. Some of the papers have provided new tools and frameworks of analysis that could be useful in other studies.

Although the research presented in the present collection of papers has contributed much to our understanding of drought, drought response, and recovery in Red Sea Province, many questions remain. It is hoped that the research currently planned, underway, or nearing completion by the Environmental Research Group Oxford and the Universities of Bergen and Khartoum will add more to our understanding of the area.

The general picture that emerges from our studies is positive in some respects but negative in others. People are recovering from drought in Red Sea Province. The nutritional status of children is getting better. Rains and floods have been good and even exceptional over the last few years and livestock populations are increasing. Greater links are being forged between the rural and urban areas and drought-coping strategies are becoming more diversified. A worrying problem, however, is the impact of people on the environment of Red Sea Province and the costs to the pastoral and agricultural economy that this represents. This may increase the vulnerability of people who depend on these resources in the future.

Some Comments on Oxfam and Research

The research conducted by Oxfam Port Sudan over the past two years has been very much an experiment. The Research Section at Oxfam Port Sudan was created to fill the gaps in our knowledge about the Beja, drought, response, and recovery. Synchronic views were avoided in all of the studies that make up this collection because without a clear understanding of the past there is no means to interpret the present or future. It is this point of view that has been at the heart of the research programme in Oxfam Port Sudan.

Oxfam's research experiment in Red Sea Province has produced rewarding results. Research is essential if Oxfam is to make sound policy decisions and evaluation is

necessary to maintain a credible level of accountability. It has been useful to have one person continuously present to organise and coordinate the research. It would have been more appropriate, however, for a Research Officer to have been appointed at the beginning of Oxfam's involvement in Red Sea Province to give continuity and consistency to the work.

There are two types of research that Oxfam can support: programme research and relief related research. These two types of research may be conducted by local nongovernmental organisations, government, or by Oxfam itself.

At the programme level, three types of research are necessary in development to help ensure a successful outcome. The first type is conducted before a programme begins. The second type is ongoing. The first type of research is generally termed programme identification or needs assessment. Ordinarily this work is done in a cursory fashion. Identify the place, what can be accomplished there in general terms, who benefits, and some guidelines on how to go about accomplishing the identified objectives. The second type of research is designed to augment the knowledge of the programme team after the programme has begun and enable the team members to accomplish the objectives articulated in the programme identification paper or to tailor those objectives to something more realistic. The third type of research at the programme level is more properly termed evaluation. This evaluation determines if the programme itself achieved its stated objectives in the manner intended. This evaluation can be ongoing (formative evaluation) or occur at the end of the programme (summative). Ongoing evaluation is more desirable because it modifies the programme as it develops and should be incorporated at the planning level. Oxfam programmes should not be approved if they do not provide for ongoing evaluation at the planning stage.

Research in relief programmes is and has been more problematic than that associated with development programmes. Usually, emergencies are such that a quick response is called for rather than lengthy consideration about the merits of involvement; evaluation has rarely been considered as a priority, although there is evidence that this is changing. When outside intervention moves from the camps to the general population research must be conducted to determine the necessity and the economic, social, political, and environmental impacts of such action. In relief programmes professional evaluation is of the greatest importance. It is essential that Oxfam require an ongoing research and evaluation component be incorporated at the planning stage of every relief programme.

A final point is whether Oxfam is the right organisation to be doing research. It may be more appropriate for the national government, local government, local universities, or local nongovernmental or professional organisations to conduct research. Local institutions may be able to conduct research in greater harmony with local people, local institutions and government than is possible by an outside organisation. A possible role for outside organisations may be in training researchers. This type of effort will enhance a country's human resources and strengthen institutions rather than create parallel structures on a temporary basis.

Technical Glossary

There are two kinds of statistics:

1. Descriptive: used to organise and summarise data.

2. Inferential: based on probability theory and used to make educated guesses about a population based on information obtained from a sample of the population.

A brief description of each statistical method used in the reports is given below.

Descriptive statistics.

1. Average, or measure of central tendency.

The average is a general term used to describe where the central or most typical value of a data set lies. There are three measures of centrality, or the average.

i. The mean. The mean is the sum of the data divided by the number of pieces of data. It is the preferred measure of central tendency for continuous (metric) data providing there are not large numbers of very big or very small values. This is the most commonly used measure of central tendency.

ii. The median. Defines a number which is the dividing point between the top 50% of the data and the bottom 50% of the data. Used mostly with ranked or ordered data on a scale (ordinal data).

iii. The mode. The value that appears most often in the data set, which might not be the middle in any sense. Used most often for qualitative data.

2. Measures of dispersion.

A measure of dispersion is a number used to show how much variation exists in a data set around a central point.

i. Sample standard deviation (s or sd). Deviation refers to deviation from the mean (an individual value minus the mean value). The average (mean) of these deviations is then calculated. The more variation there is in a data set, the bigger the standard deviation. In any data set, almost all the values fall within three standard deviations either side of the mean.

ii. Coefficient of variation (CV). This expresses the standard deviation as a percentage of the mean.

Inferential statistics.

Inferential statistics are based on probability theory. A brief description of each of the statistical terms used in the report will be given here. Details of the theory and calculations involved can be found in several basic textbooks (see below).

1. Statistical significance. A level of probability which is set as a cut off point for determining if differences between two populations are due to some determining factor, or whether they are due to sampling error or chance. The conventional level for this probability (p) is 0.05. The differences are accepted as being due to some determining factor only if the same results would happen by chance less than 5% of the time. We are 95% sure that the results are <u>not</u> due to chance.

2. Z scores (zee scores!). Z scores are calculated by subtracting an individual value from the mean value for the sample, and dividing the result by the standard deviation for the sample. Z scores are standardised scores. Raw data are transformed into a form in which many different types of data can be directly compared on the same scale. This scale is expressed in terms of standard deviations from the mean, and can also be used for calculating the probability of certain scores or proportions of scores occurring by chance. In the population 68% of z scores will be between -1 and 1. 95% will be between -2 and 2, and 99.7% will be between -3 and 3. The closer a Z score is to zero, the closer it is to the mean.

3. Confidence intervals. A confidence interval is a range of values around the sample mean within which we can be reasonably confident that the true population mean or proportion lies, based on information taken from a sample of the population and probability theory. "Reasonably confident" usually is taken as 95% confident. A confidence interval can be constructed for the differences between means or proportions also. If this confidence interval includes zero, it is probable that there is no true difference between the populations. If the confidence interval does not include zero it is probable that differences between the populations are due to some determining factor other than chance.

4. T-tests. Tests the (null) hypothesis that two samples come from two populations with the same mean and differ only because of sampling

error. Requires the sample size, mean and variance to be known. T-tests assume that the variances in the two populations being compared are equal.

5. One way analysis of variance (ANOVA). Used to test for simultaneous equalities between groups of means, based on two variance measures: one to measure variance within the groups being compared, and one to measure the variance between the groups being compared. These two measures are compared using the F-test. It answers the question "is the variability between groups large enough in comparison with the variability within groups to justify the inference that the means of the populations from which the different groups were sampled were not the same?" If it is determined that the groups being tested are not simultaneously equal, further tests are required to pinpoint exactly where these differences occur (post hoc tests). ANOVA can tell us how much of the variation in one variable is explained by its interaction with another.

6. Simple correlation. Measures the degree of linear, or "straight-line", relationship between two variables. It may be positive (direct) or negative (inverse). It is expressed as a correlation coefficient (r) which is between -1 and 1. If the correlation coefficient is 1, all data points lie on a straight line with a positive slope. If the correlation coefficient is -1, all data points lie on a straight line with a negative slope. A correlation, however strong, does not imply causality. Inferences about correlations in the population can be made from the sample correlation. Significance testing can tell us whether the correlation coefficient is too big or too small to provide useful information. Different methods of calculating correlation coefficients can be used depending on the characteristics of the data being investigated.

7. Regression.

    a. Simple regression. Where correlation describes the strength of a linear relationship between two variables, simple regression describes the form of this relationship and allows us to make predictions about how values outside the sample will behave. Using simple regression it is possible to determine to what extent change in one variable influence change in another variable.

    b. Multiple regression. An extension of simple regression which is widely used for determining the relationship between one outcome variable and a combination of two or more predictor

variables. This technique is particularly useful for examining complex data sets where one outcome variable (such as percent weight for height) may be influenced by many other predictor variables (ranging from age to mother's education, for example). A model of how all these predictor variables best fit together to explain changes in the outcome variable is produced.

8. Factor analysis. A complex technique for analyzing patterns of common variation, or intercorrelation, among many variables and isolating the dimensions to account for these patterns. Factor analysis describes the patterns of correlation between many variables in terms of a relatively small number of common factors. It is particularly useful for generating new hypotheses about the relationships between variables.

Suggested reading:

Weiss, N. and Hassett M. (1982) Introductory Statistics. Addison-Wesley Publishing Co. Inc. Reading, Massachusetts.

Isaac, S. and Michael W.B. (1983) Handbook in Research and Evaluation for Education and the Behaviourial Sciences. EdITS publishers, San Diego, California.

Sage University Paper Series on Quantitative Applications in the Social Sciences. Sage Publications. Beverley Hills, California.

Concepts and Techniques in Modern Geography (CATMOG) series, Geo Abstracts, University of East Anglia, Norwich.

World Health Organisation (WHO) (1983) Measuring Change in Nutritional Status. WHO, Rome.