

The

Ecologist

Journal of the Post Industrial Age

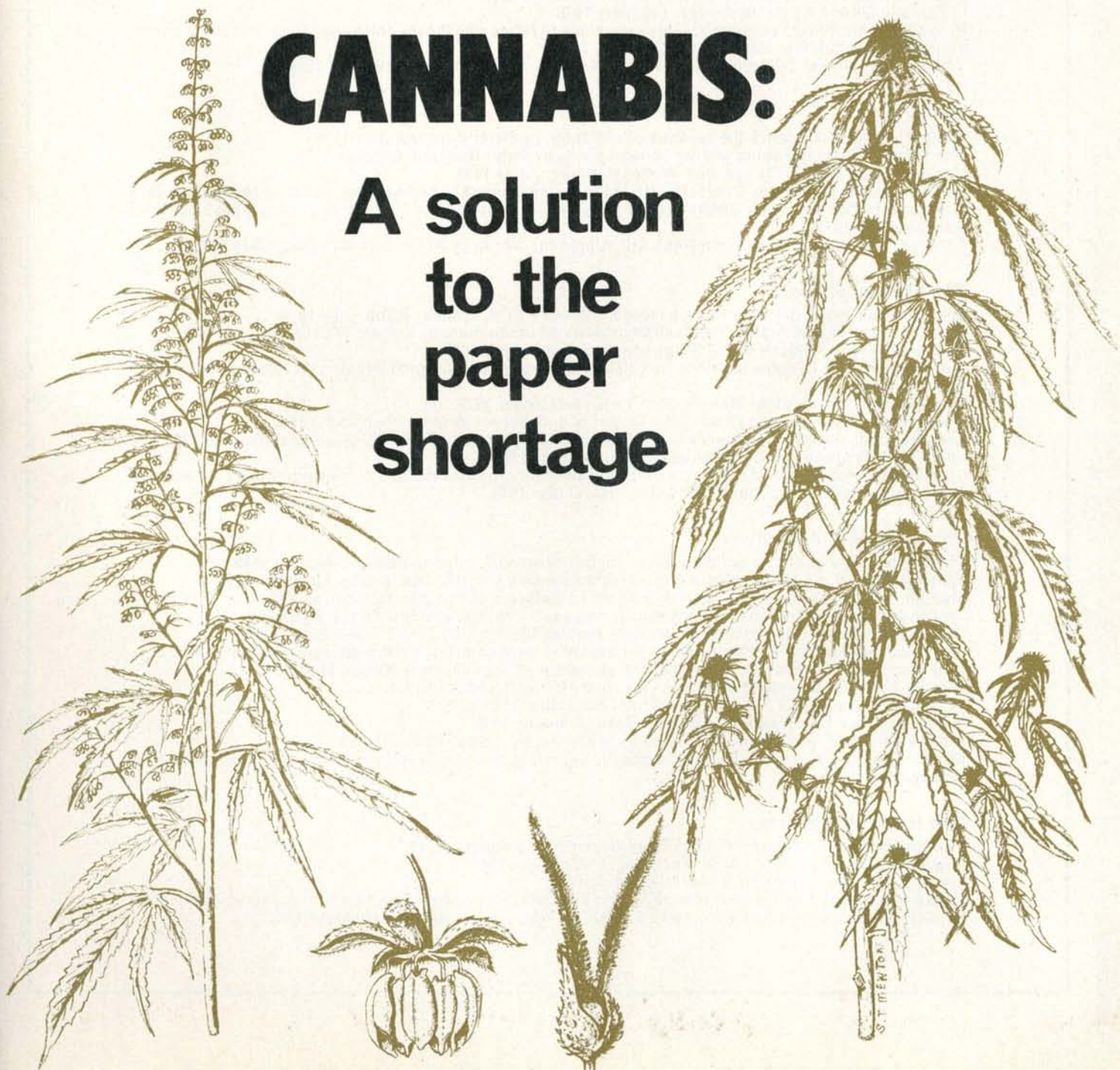
Vol.4. No. 5

June 1974 30p

**DIAGNOSIS OF A FAMINE - FAMINE: The cost of development
THE ORIGINAL AFFLUENT SOCIETY**

CANNABIS:

**A solution
to the
paper
shortage**



Back numbers of the *Ecologist* are available containing the following important articles :

Consequences of Development

A Second Look at Volta Lake by Stanley Johnson. November 1971.
Britain's Dying Chalk Streams by D. S. Martin. April 1971.
The Swansong of the Clyde: plans for development at Hunterston, by Peter Bunyard and Charlie Maclean. May 1971.
Has Oxford a Future? a city menaced by the car, by Helen Turner. July 1971.
Rock-bottom: nearing the limits of metal-mining in Britain, by Friends of the Earth. May 1972.

Ecology and Economics

The Economics of Hope: a leading economist questions the dogma of economic growth, by E. J. Mishan. January 1971.
Population and Inflation: demographic growth the cause of inflation, by W. M. S. Russell. February 1971.
Common Market v. Environment: environmental reasons for staying out, by Brian Johnson. May 1971.
Economics and Entropy: economics is also bound by scientific laws, by Nicholas Georgescu-Roegen. July 1972.
The Stationary State Economy by Herman Daly. July 1972.
How to Stabilise the Economy by Herman Daly. March 1973.
Is Ecology Elitist? by David Pearce. February 1973.
Propaganda for What? economists refuse to come to terms with the muddleheadedness of their assumptions, by John Adams. May 1973.
Towards a Policy of Zero Energy Growth by Kenneth A. Dahlberg. September 1973.

Energy

Is there a Peaceful Atom? the ravages of radiation, by Peter Bunyard. July 1970.
The Power Crisis: galloping energy consumption, by Peter Bunyard. October 1970.
Nuclear Power and its Dangers by Walter Patterson. July 1973.
Canada and the US Energy Crisis: the US is looking to Canada to provide fuel, by Geoff Mains. May 1973.
In Search of Bonanza: can Britain supply a significant proportion of its energy requirement? by Peter Bunyard. May 1973.
Energy Crisis or Crunch? oil shortage will cripple the West, by Peter Bunyard. December 1973.

The Ecology of Health

Medicine and Agriculture: is there a merger needed? by R. Lindsay Robb. July 1970.
The Diseases of Civilisation: the declining health of urban man, by Robert Walker. August 1970.
Affluence and the Elderly by W. Ferguson Anderson. April 1972.
Development and Disease in Africa by Charles C. Hughes and John M. Hunter. (1) September 1972. (2) October 1972.
The Medicine of Industrial Man by John Powles. October 1972.
Should We Forbid Smoking? by Allan Chatelier and Robert Waller. December 1972.
Evolution and Health: man evolved into a natural environment within which he was healthy. Then he altered his environment, by Stephen Boyden. August 1973.
The Delaney Amendment: a defence of the US law that prohibits the use of food additives suspected of being carcinogenic, by Samuel S. Epstein. November 1973.

The Ecology of Agriculture

The Farm Drugs Scandal: antibiotics and factory farming, by Joanne Bower. August 1970.
Where Have All the Hedges Gone? the prairie obsession, by Michael Allaby. October 1970.
Man-made Plagues: return to natural controls in Malaysia, by Gordon R. Conway. October 1970.
The Green Revolution: genetic backlash. A discussion by four experts. October 1970.
Spanner in the Soil: destruction of Britain's farmland fertility, by L. B. Powell. December 1970.
The Pesticide Fallacy: a critique of the principles of pest controls, by Roy Bridger. February 1971.
How Boophilus Tricked the Tickcides: the victorious tick, by Michael Allaby. May 1971.
Factory Farming: a passing aberration, by Ruth Harrison. October 1971.
Who Cares about DDT? by Goran Lofroth. November 1971.
We Need these Soil Tillers by Cleeland Bean. February 1972.
Integrated Pest Control and the Human Environment by Walter Ryder. March 1972.
Miracle Rice and Miracle Locusts: the genetic vulnerability of the world's major farm crops, by Michael Allaby. May 1973.

Low Impact Technology

The Sailing Ship in a Fuel Crisis by Basil Greenhill. September 1972.
Low Energy Housing by Andrew MacKillop. December 1972.
Living Off the Sun by Andrew MacKillop. July 1973.
Unravel the Grid! The national electricity grid is inefficient; energy could be saved and environmental impact reduced, were we to adopt alternatives, by Andrew MacKillop. November 1973.

In this issue

Vol. 4. No. 5. June 1974

COMMENT

Edward Goldsmith	The Suntan Diversion	162
------------------	----------------------	-----

FEATURE ARTICLES

Ian Campbell	Diagnosis of a Famine	164
--------------	-----------------------	-----

The African countries bordering the Sahara are suffering from one of the worst droughts in their history. It is likely to cause millions of deaths and might permanently change the ecology of the area involved. What are its causes?

Randall Baker	Famine: The cost of Development?	170
---------------	----------------------------------	-----

To what extent is the Sahelian drought the inevitable outcome of development programmes?

Jack Frazier	Cannabis—A Solution to the paper shortage	176
--------------	---	-----

Indian hemp was once widely grown for making paper. Could it, today, take the pressure off our forests?

Marshall Sahlins	The Original Affluent Society	181
------------------	-------------------------------	-----

It is assumed that the only way to achieve affluence is to produce more material goods. The study of hunter gatherers reveals that there is another way—to reduce the *need* for them.

	Information for survival	190
--	--------------------------	-----

REPORTS

Joan McIntyre	Whaling: The slaughter continues	192
---------------	----------------------------------	-----

	Books	194
--	-------	-----

	Friends of the Earth	197
--	----------------------	-----

	Letters	198
--	---------	-----

	Classified Advertisements	200
--	---------------------------	-----

Note: While every care is taken with manuscripts submitted for publication, the Editors cannot guarantee to return to their authors those not accepted. Articles published in the "Ecologist" do not necessarily express the views of the Editors.

Design by Mewton, Lees-Barton, Bodmin, Cornwall. Cover Shirley Mewton.

Publisher: Edward Goldsmith; Editors: Peter Bunyard and Edward Goldsmith; Associate Editors: John Davoll, Jimoh Omo-Fadaka, Gerald Foley, Lawrence D. Hills, Brian Johnson, Andrew Mackillop, John Papworth, Graham Searle, Robert Waller, Richard Willson. All communications should be sent to The Editors, Ecologist, 73 Molesworth Street, Wadebridge, Cornwall PL27 7DS. Telephone Wadebridge 2996/7. Business and Subscription enquiries to: Ruth Lumley-Smith, Editors' assistant. All advertising enquiries to Interpress 19 Anne Boleyn's Walk, Cheam, Surrey. Telephone 01-642 5826

Published by Ecosystems Ltd., registered office, 73 Molesworth Street, Wadebridge, Cornwall PL27 7DS. Subscriptions to the Ecologist, 73 Molesworth Street, Wadebridge, Cornwall PL27 7DS. Printed by The Garden City Press Ltd., Pixmore Avenue, Letchworth, Hertfordshire SG6 1JS

© Ecologist, June 1974



Comment

"The Suntan Diversion"

Scientific research has just revealed that battery eggs are as good as free range ones. Measurements published in *Nature* have shown that they only differ in their vitamin B 12 content. Any difference in taste, we are assured, is without scientific basis and must therefore be purely imaginary.

This is a perfect illustration of both "The Lamp Post Lark" and "The Suntan Diversion"—associated variants of the same basic fallacy.

Let us start with the "Lamp Post Lark". It is a particularly dark night. A number of people are clustered round a lamp post frantically searching for something on the pavement. "What are you looking for?" asks a passer-by. "My wallet", answers a rather desperate searcher. "Are you sure you lost it here?", asks the passer-by. "Not at all", answers the searcher, "but this is the only part of the street that is lit up".

Our scientists proceed in precisely the same way. They have been taught to look at things which are measurable to the exclusion of those which are not. Hence, they rationalise, the latter do not exist.

"The Suntan Diversion" carries things a stage further. Its effect is to divert attention from the important factors involved in a given situation which may, or may not, be measurable, or whose measurement deludes people into accepting a particular thesis, usually as in the case of the battery eggs, that the mechanisms designed by our scientists and technologists are as satisfactory as those designed by evolution, into which have gone three thousand million years of evolutionary research and development.

Anyone but a fool must realise that if measurements have revealed that battery eggs are as good as free range ones, *then these measurements must be wrong*. In the same way, if you introduce a stick into your petrol tank, and find that it is empty, and you then get into your car, turn on the ignition, and lo and behold it runs perfectly smoothly, you do not conclude that your car has learnt overnight to function without the help of petrol. On the contrary, you will assume, quite rightly, that you didn't put the stick in deep enough, or didn't look at it sufficiently carefully. In other words *you are not going to accept the results obtained from a measurement if these are incompatible with all the information which you have built up on the subject in question*.

This is precisely the case with the measurements reported in *Nature*. They are incompatible with the *information built into the human tasting process*.

Let us consider this a little more closely. It is reasonable to suppose that, to an animal, living in its natural environment, things that taste good are good. The mechanism of taste can only be regarded functionally as a device to enable animals, including man, to distinguish between edible and non-edible things, or more precisely to select the correct constituents of their diet. It is as a result of the functioning of this mechanism that dung-beetles, fiddler crabs and also primitive men, know what to eat and not to eat. None of them require nutritionists to advise them on this score. It follows that there must be a vast amount of information built into this mechanism—*information which clearly reflects the experience of the species over many millions of years, and the ethnic group over many thousands*.

It is in fact surprising that people have never asked themselves why we, the most sophisticated of creatures, should have lost the ability to feed ourselves correctly. The answer, of course, is that this mechanism cannot work once our environment has been too radically modified, and no longer resembles that in which we have evolved. For instance, in the artificial conditions in which we live, we can only imperfectly distinguish between real food and its better imitations, and possess no means whatsoever for detecting contaminants of which we

have had no phylogenetic experience, such as DDT, or radio-isotopes, which may find their way into our porridge, let alone predict the damage they can cause us. Our environment, in fact, has become counter-intuitive. *That is why we need science to provide us with the information that we can no longer obtain by normal means*.

It is my thesis that even with the best possible Science, we cannot adapt to a counter-intuitive environment. As it is, our Science is far from being the best possible one.

For instance, it is divided up into a host of watertight compartments between which there is little or no communication, whereas the real world which it purports to represent is a single integrated system whose evolution was a single integrated process.

Its practitioners consider it their function to examine its parts in isolation from each other in the totally artificial conditions of a laboratory, whereas systems are not just the sum of their parts but also of all the interrelationships between them, which can only be understood by looking at a system as a whole.

Our scientists, as a result, are incapable of isolating more than a fraction of the relevant factors influencing a given situation, nor of determining how they are related to each other.

The tendency is thus to ascribe undue importance to isolated factors, chosen, either because they happen to fall within the field of study of the experts involved or because they are simply fashionable.

Thus, to return to our eggs, they are considered good for one if their protein content is high, whereas nutritionists would once have been more specifically concerned with their caloric content. The fact that cow's milk contains more protein than human milk is used to support the thesis that it must be better, whereas, in reality, all it means is that human babies at birth require less protein than do calves, for the simple reason that they don't grow so quickly. On the other hand, there are more structured of polyunsaturated fats (required to build up nerve tissue), in human milk than in cow's milk because a child's brain grows, at birth, much more quickly than does a calf's.

Incidentally as Michael Crawford points out, these fats are probably as important as protein, yet we ignore

them in working out the desirability of different foods, as we do the very large number of trace elements our bodies probably require, many of which we have not even identified.

But then perhaps these are not measurable with conventional equipment, nor perhaps are they obtainable in the diet of industrial man, which means that a substitute must be found for them. Now, if this substitute is not perfect, as it can be predicted, on purely theoretical grounds, then the tendency must be to try to prove to oneself and to others that its imperfections are illusory—as with the battery eggs.

The “Suntan Diversion” is a means of promoting this illusion. Let us consider a few examples.

Lord Zuckerman assures that the

nation's rivers are cleaner than before. This, of course, is only true, if we measure the cleanliness of rivers in terms; of their oxygen content, while ignoring the thousands of industrial pollutants which are being poured into them in ever increasing quantities, and which are very difficult if not impossible to remove.

Lord Zuckerman and others insist that the air in our cities has never been cleaner, which is only true if we measure this in terms of smoke and sulphur dioxide levels. It means taking no account of pollution by nitrogen-oxides, hydrocarbons, lead, carbon monoxide, and asbestos particles etc, which can only grow with the increasing number of motor cars on the roads.

Lord Zuckerman tells us that the seas are in excellent shape, since

“catches of fish in the waters in question have never been higher”; thereby applying a totally false criterion, since the health of a marine ecosystem can only be judged by its stability, which involves maintaining the requisite variety and number of trophic levels, which will have the effect of reducing production. The latter, in fact, is never higher, for instance, than before a population crash.

And so it goes on.

Indeed, it is by deluding ourselves by means of such expedients as the “Lamp Post Lark” and the “Suntan Diversion” that we are made to accept the false criteria applied by our experts and those whom they advise, to judge the processes of the biosphere and to justify their increasingly counter-productive efforts to control it.



Visiting Relative: . . . “He’s very suntanned isn’t he !”

Widow: . . . “Oh yes these two weeks on the Costa Brava have done him no end of good.”



HUMAN MISMANAGEMENT AS A MAJOR FACTOR IN THE SAHELIAN DROUGHT TRAGEDY

Last October and January we published two articles, one by Professor Bryson and the other by Professor Lamb, indicating that global climatic changes were in all likelihood bringing about the widespread and continuing drought which is ravaging the Sahel, Ethiopia and other areas of the world.

In this issue of the *Ecologist* we publish two more papers relating to the drought, but in these the emphasis is on those aspects of human mismanagement—including some misguided “aid”—which have contributed to the present disastrous state of affairs.

DIAGNOSIS OF A FAMINE by Ian Campbell

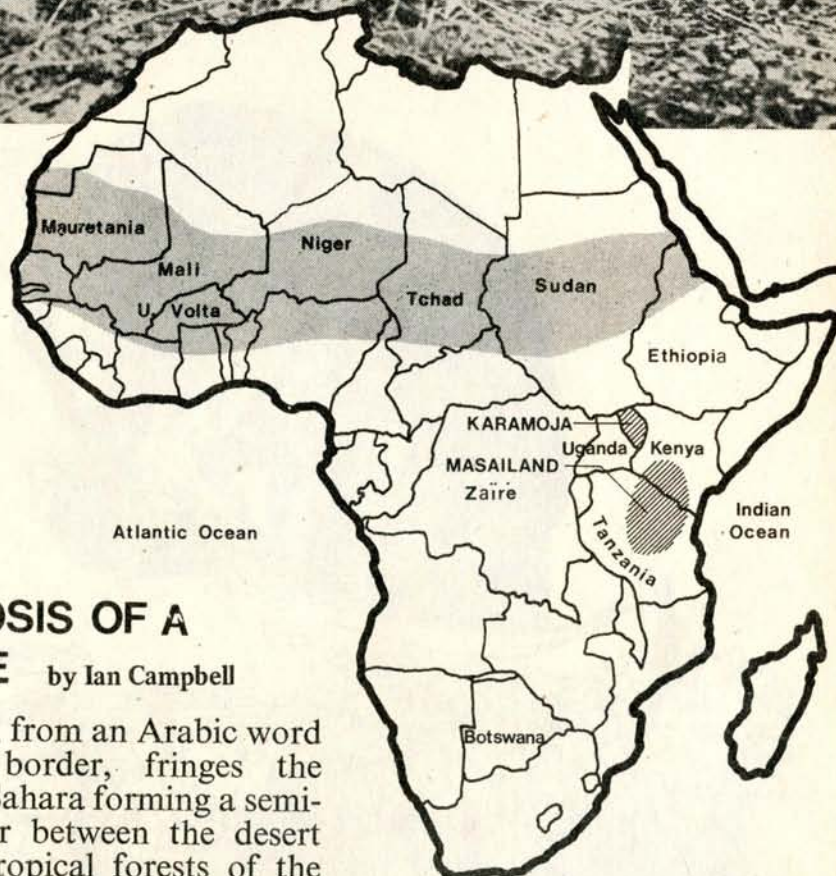
The Sahel, from an Arabic word meaning border, fringes the southern Sahara forming a semi-arid buffer between the desert and the tropical forests of the West African coast. It is a region about 300-500 kilometres wide stretching from the Atlantic Coast to the Lake Chad area. Further eastwards it gradually merges with the Sudan and finally the Ethiopian Highlands.

Environmental controls

Topographically the Sahel is a region consisting mainly of flat clay and lateritic plains interspaced with low plateaux, sand drifts of varying size and occasional rocky outcrops. Being semi-arid for most of the year rivers

are few and there are only three major drainage systems. In the west is the Senegal; in the centre, the Niger with its vast inland delta in Mali, and in the east the Komadugu Gan that flows into Lake Chad. In addition to these perennial rivers, myriads of intermittent or ephemeral wadis and drainage channels may flow during the wet season, hampering ground transport and flooding the lower lying plains.

Although the Sahel is often described as savanna a wide variety of vegetational types are found. Generally the vegetation reflects the north to south



increase in rainfall to which it responds by increasing density and stature (Keay, 1959). In the Northern Sahel, desert steppe predominates with occasional low, widely spaced *Acacia* and *Commiphora* species. Farther south, and occupying most of the Sahel, is a belt of wooded steppe in which thorn bush and shrub types become common. This increases in density until the moister woodlands of the Southern Sahel mingle with a more continuous tree canopy in which the open grassy areas become of very limited extent.

Agriculture

Land use practices in the Sahel also broadly conform to a series of north to south divisions. In the more desertic conditions of the north, nomadic herding of camels, sheep and goats, and some cattle reflects the sparse vegetation conditions with the mobility of the animals compensating for the low density natural fodder supplies. South of this zone the pastoralists are less nomadic and more cattle are herded (Whyte, 1966). In like manner, from an agricultural viewpoint there are two distinct zones.

In the northern region, bordering the Sahara, cereal monoculture using an alternating cereal—fallow sequence is dominant. The cereal is sorghum, the only grain crop that can be successfully grown there, which is planted following inundation of the fields after the summer rainwaters recede. The northern boundary of this zone is not precisely defined, as it shifts in accord with the precipitation patterns, but generally it is limited by the 250–300 mm isohyet. Agriculturalists take advantage of wetter years to extend their plantings and crop less land during drier cycles. In the southern Sahel is a region of “extensive polyculture” (Cochemé and Franguin, 1967). In this region millet, sorghum, groundnuts and maize are important food crops. Rice may be grown where irrigation can be undertaken along permanent streams.

These changes in the agricultural landscape, as with the natural vegetation, occur gradually with much inter-mixing and inter-tonguing of types. The critical limit for settled cultivation in the Sahel is a mean moist period of about 55 days, for this determines the season during which annual crops of millet can be grown using dry farming techniques (Arnon, 1972). The

key factor governing the distribution of natural vegetation and agricultural practices is the amount and dependability of precipitation. This, in turn, is determined by the seasonal atmospheric conditions over West Africa.

The seasonal climates of the Sahel are controlled by southward migration of the Saharan sub-tropical anticyclone during the winter and incursions of moist tropical air associated with the Intertropical Convergence Zone during the summer.

Much of the precipitation falls in sudden downpours as tropical storms or disturbance lines accompanying the advancing moist unstable air move on land from the Gulf of Guinea (Eldridge, 1957). Such conditions produce great spatial variation in rainfall totals over relatively short distances. Eldridge (1957) gives an example from northern Ghana where 80 per cent of the mean annual rainfall is from such storms and where individual storm rainfall totals varying from 0 mm to over 40 mm took place within a distance of 30 km.

Should the seeds not receive this crucial rain they will not take root but will simply bake in the ground. If this happens the farmers wait for the next heavy rains and try again.

The difference between the Saharan (Harmattan) air and that brought in from the Gulf of Guinea is one of the few significant air mass differences within the tropics (Forsdyke, 1960). Rainfalls in the Sahel, their totals, distribution, and reliability, correspond entirely to the change between these air masses (Flohn, 1960) and the timing and amounts are critical to the Sahelian peoples.

Life follows a seasonal rhythm imposed by the precipitation regime. The main season of activity corresponds to the period June to September, the rainy season when crops may be sown. The length of the rainy season corresponds generally with latitude, perhaps four months long in the southern Sahel, perhaps three months or less in the northern borders of the region. As much as 50 per cent of the mean annual rainfall may be concentrated in August and the result is a dramatic change in the regional vegetation.

Apparently lifeless plains are transformed as plants come into bloom (Buxton, 1935), and the seeds sown by farmers following the first rains of the wet season get their main moisture supply. Should the seeds not receive this crucial rain they will not take root but will simply bake in the ground. If this happens the farmers wait for the next heavy rains and try again. Crops generally must be sown, raised and harvested within a three-month growing season that ends with the re-establishment of Saharan conditions, as the ITCZ retreats southwards with the overhead passage of the sun, when relative humidities may often fall below 10 per cent.

Drought

If the rains are light, or come at the wrong time, the result is a drought, the severity of which is determined by the variance of rainfall totals and distribution from expectations based on rainfall regimes of former years. Drought is one of nature's most persistent phenomena (Namias, 1960) and it is especially prevalent in semi-arid areas like the Sahel. As the mean annual rainfall amounts become less the probability of droughts becomes greater and their effects more disastrous. A 30 per cent decrease from 600 mm of rainfall will still leave an area with enough moisture to produce a crop, but a 30 per cent decrease from 300 mm will produce a drought. The lower the rainfall the less the negative deviation an area can endure (Whyte, 1963). In the truly arid zone where rain is always a rare occurrence the inhabitants gear their existence to minimal water supplies. But in semi-arid regions the climate may show considerable fluctuations in terms of rainfall totals creating almost sub-humid conditions in one year, or in a cycle of wet years, and alternate periods of full aridity. The ability to predict such variations would be of immense value but the required observational data on which to base such predictions are often unavailable or heterogeneous. At present, very little is known about the causes of these regional climatic changes (Flohn, 1960; Raikes, 1969) that are associated with large scale anomalies of the general circulation of the atmosphere. Whatever their cause they result in a new distribution of moisture amounts in some areas while producing no apparent effect in global water

balances. Namias (1960) has examined in detail the occurrence of droughts in the Great Plains of North America. He has produced evidence of a "feedback" mechanism in which warm dry spring weather leads to desiccation of the soil that subsequently favours development of persistent upper level anticyclones with their associated droughty conditions. Evidently the lodgement of the Sahara anticyclone beyond its expected seasonal position inhibits the penetration of the moisture bearing air from the Gulf of Guinea. Desiccated ground conditions could assist in this lodgement, and it may be that extensive clearance of tree cover by burning to encourage grass growth for grazing, and other similar practices which have increased as the population has grown, has led to a more widespread ground desiccation. Kokot (1961) believes that similar events have led to increased drought conditions in South Africa. Whether or not the present drought is part of general deterioration of climatic conditions in the Sahel, and the degree to which human influences are involved are questions of fundamental importance. They have also been the subject of considerable debate and controversy for over fifty years.

The climatic change controversy

Serious droughts occurred in the Sahel during the early part of the twentieth century with the period 1915–1918 being characterised by extreme drought conditions (Jones, 1938). Comparison between that situation and the present would be difficult if not impossible. Lack of statistical data, the small number of accounts available, and the probability that fewer people were affected because of the then lower population totals, all combine to make an exact assessment of that drought's severity improbable. However, in 1918, the British Resident in Sokoto, northern Nigeria, E. J. Arnett, reported on the expansion of desert conditions in the region (Bovill, 1920). In the same paper Bovill makes a detailed analysis of the trend of desiccation in the southern Sahara. From study of the progressive loss of surface drainage, the drying up of wells and the migration of nomads southwards, Bovill finds evidence of the "inherent tendency of deserts to expand". Nomads then were replacing the sedentary agriculturalists in a general

move southwards and the desert was encroaching in the region south of the Bend of the Niger. That is, in present Mali. In Timbuktu (sic) streets stand above the level of ancient mosques because of blown sand deposits. To Bovill, these all indicated increasing desiccation and he placed much of the blame on man's deforestation activities. Climatic oscillation did occur and wetter phases alternated with drier ones, but always with the total effect of ever-increasing aridity (Bovill, 1920).

Previous checks on the native population growth had been removed with the introduction of medical and veterinary skills and political stability. The result had been an increase in human and animal populations with consequent deforestation, overgrazing and insufficient fallowing of cropland.

Possibly because of the widespread unsettled conditions following World War One, the subject of desiccation seems to have faded from scientific reports and journals, at least so far as the Sahel region was concerned. But in the 1930s and 1940s the whole topic was re-examined. Stebbing's (1935) paper on desert expansion near Lake Chad noted that the population of the area was growing rapidly while the means of supporting it were visibly decreasing. Overgrazing and deforestation led to silent, invisible encroachment of the Sahara at a rate of up to 1 km per year for the past 300 years (Stebbing, 1935). As a result the cities were faced with emigrating peoples from areas no longer able to support them. Whilst Stebbing's views were supported in the discussion that followed his paper (Stebbing, 1935), Buxton (1935) published contrary views. By stating normal seasonal changes in the vegetation cover were so great that a casual observer might well believe at the onset of the dry season in desert encroachment, Buxton thought the problem was one of perception. This position received further support in the findings of the Anglo-French Forestry Commission (1936–37). They also felt Stebbing's pessimistic views were unjustified. Nevertheless, Stebbing continued to press his case (1937; 1938) to a sympathetic audience, but Jones (1938) produced

a strong rebuttal. He particularly took issue with the idea of dune sand encroachment yet, curiously, admitted that shifting cultivation in northern Nigeria and Niger was causing deteriorating conditions. Jones cited reports from the Geological Survey of Nigeria to the effect that water level tables were more or less stationary. It was true that minor climatic oscillations took place but there was no reason to fear that desiccation through climatic causes would impair the habitability of the area for many generations to come (Jones, 1938). This avoided the problem of man-induced changes which Stamp (1938) recognises as becoming serious since white colonisation of the area. Previous checks on the native population growth had been removed with the introduction of medical and veterinary skills and political stability. The result had been an increase in human and animal populations with consequent deforestation, overgrazing and insufficient fallowing of cropland. He indicated (Stamp, 1938) that in northern Nigeria all these evils were present and that they were capable of transforming the whole northern belt into desert in a short time. Thus, the desert was not invading from without, the land was deteriorating from within, and the cause, according to Stamp's (1940) analysis of the entire problem, was man-induced.

Long-term trends

Major changes were occurring in the ecosystem of the southern Sahara. The causes of these changes were variously ascribed to man or climate. Keay (1949) criticised the earlier "alarmist" views expressed by Stebbing, but simply re-iterated the Anglo-French Forestry Commission's findings as contrary evidence to desert encroachment. Climatically, Dubief (1947) could find no definite secular trends towards aridity since the early nineteenth century, though he recognised several periodic droughts. Lysgaard (1949), however, reported a trend towards negative rainfall anomalies over West Africa. This observation has been supported by Butzer (1957) who gives comparisons between the period 1881–1910 and period 1911–1940, showing that summer rainfalls in North Africa diminished.

In the case of the Sahel region this amounted to perhaps a 15 to 20 per

cent decrease. He has since integrated these findings in a more comprehensive discussion in which he notes that as far as can be seen the trend to greater aridity in North Africa is continuing (Butzer, 1961). There may well be significant climatic changes, or at least profound cyclic weather changes, in the Sahel, and these may produce an extension of Saharan conditions. But, they are greatly augmented by agricultural practices which destroy the initial vegetation cover, and reduce what is an already ecologically poor region to an even lower level through uncontrolled burning and overgrazing. The rate of deterioration may well have equalled the 300 km advance over the last three centuries estimated by Stebbing (Whyte, 1963). Seen in these terms the present drought may represent one of a number of periodic accelerations in the overall trend to greater aridity however induced.

Man, Land and Drought

The Sahel is a marginal area in terms of large-scale human occupation. The success of agriculture is greatly determined by relatively slight variations of climate in terms of rainfall totals where a sequence of seasons falls below a critical level. Both farmers and, perhaps especially, the nomadic and migratory peoples of the desert fringe exist in a delicate balance with their environment. While the nomad can take steps to cope with irregular rainfall, indeed his whole life style is conditioned by such eventualities, he is powerless against drought. The balance between animals and forage resources on the Sahel is always precarious, even accepting the mobility factor. Droughts may well eliminate the majority of the animals, especially the youngest. In Algeria a combination of overstocking and drought led to over 8 million head of stock being reduced to 2 million head in 1945 following a few drought years (Droughin, 1962). In periods of favourable climate the stock numbers may grow out of all proportion to the normally available forage. Severe overgrazing is probable before a balance is re-achieved by increased stock-mortality. Such tendencies are exaggerated by the nomadic attitude to the stock, which are rarely slaughtered for food and are regarded as a form of non-expendable capital. Herds are rarely culled to keep their

numbers in balance with the regional carrying capacity.

Overgrazing is a particular problem around waterholes, of which an increasing number have been installed by various national and international agencies, where widespread trampling and soil erosion have developed. As human populations have grown so have the numbers of animals. It is difficult to estimate exactly how many nomads there are in the Sahel today. Capot-Rey (1962), roughly estimated that there were perhaps one million in the Sahara, but Brémaud and Pagot (1962) give a figure of 1.5 million pastoralists in the Sahel alone. Likewise, Capot-Rey estimated 12 head of stock per nomad, whereas Brémaud and Pagot give Sahel totals of 12 million cattle, 22-25 million sheep and goats, and 1 million camels. It is probable that many pastoralists are either non-nomadic, or semi-nomadic and this makes accurate statistics difficult to obtain. If figures quoted recently in various journals and newspapers are accurate, by December 1972 Mauritania had lost about 1.6 million cattle (80 per cent of its total), 240,000 camels (30 per cent of its total), and about 3.4 million sheep and goats (about 50 per cent of its total), (*New York Times*, Dec. 3, 1972). In June 1973, Niger's President Hamani Diori gave a figure of a probable loss of 2 million cattle (*New York Times*, June 17, 1973), and in September 1973, *Time Magazine* (September 3, 1973) estimates that in the six Sahel countries 60 per cent of their cattle may be lost as drought victims. Possibly then, 6 to 8 million cattle have died already, along with unknown totals of sheep, goats and camels. Whatever the exact count it is evident that vast numbers, perhaps hundreds and thousands of nomads and pastoralists, have had their livelihoods utterly destroyed. This is a double-disaster for the Sahel because extensive stock-breeding is probably the most rational form of land use in the region (Monod and Toupet, 1961), providing a strict ecological control is exercised. Furthermore, the flight of the nomads to the urban centres places a severe strain on their already inadequate facilities.

All these countries have an urbanisation problem in spite of the fact that even before the drought over 70 per cent of the Sahel population was rural. Twenty years ago less than 10 per cent

lived in urban centres. Today, nearly 30 per cent do, and that is 30 per cent of a considerably larger total. This has caused drastic changes in their economies. Most of the Sahel countries find it impossible to create additional employment, or to provide municipal services, schools or medical facilities.

The influx of large numbers of nomads, particularly those who have been most adversely affected by the drought, and in consequence are ill-equipped or destitute, may completely overload the urban systems. Additionally, once established in the cities, however poorly, it may prove difficult to get them to return to rural areas.

Thus, the desert was not invading from without, the land was deteriorating from within, and the cause, according to Stamp's (1940) analysis of the entire problem, was man-induced.

Many of those nomads and pastoralists who have not gone directly to urban centres, but who may well end up there, have moved to grazing areas far removed from their traditional ones. Officials in Niger are worried that displaced Tuareg are moving south from Fulani cattlelands and Hausa farming areas. Confrontations as a result of these migrations, possibly the largest in the region's recent history, could bring politically explosive results.

The sedentary agriculturalists are also in a hazardous position. Soil drought is inseparable from atmospheric drought and after prolonged desiccation the soil may be unable to absorb water unless it is supplied in copious quantities. Many farmers faced with the impossible task of raising crops under such conditions ate their seeds stocks and also moved to the urban areas to seek relief.

In the Sahel, two principal crops are grown, sorghum and millet. Traditionally a period of fallowing followed each year of cropping. Increased food demand has led to decreased fallowing and as a result soil fertility has progressively diminished. Cereal monoculture, and continuous cropping in soils that are naturally low in organic matter, and slow to build it up as practically no organic returns are available, means that after a relatively short time yields become too low even for subsistence farming. The land

is abandoned and it may take years before the soil regains its original level of fertility (Gillier, 1960). In some instances this level of fertility may be a legacy from former much moister climatic periods. So, even in normal years the farmers faced suffering and possible malnutrition in the pre-harvest season. Wide scale droughts render their position desperate indeed. With practically no wholesalers or storage facilities but hosts of middlemen, prices for traditional products like seed fluctuate enormously. Merchants in Ouagadougou were selling sorghum and millet in early June 1973 for about 25 cents (US) per kg. (*New York Times*, June 10, 1973). The normal price is about 10 cents per kg. Given such prices it is difficult, if not impossible, for small farmers to return to the land and re-establish themselves and their families even when climatic conditions become favourable.

There is an additional factor that needs consideration when discussing possible returns to rural areas by both farmers and nomads. As the economic well-being of an individual rises so does his level of expectation and his level of tolerance to adverse conditions is likely to decline. Should the displaced rural inhabitants find either economic advantage in remaining in the towns or, if they return to the fields following the drought and prosper, their future adversities may prove in the long-run progressively worse to their nation's economies. It is evident that more thought, other than solutions to the immediate drought problem, needs to be given.

In a great number of areas expensive irrigation projects have been developed but the results have often been disappointing. In the middle Niger an area larger than that irrigated in Egypt could be developed (Cochémé and Franquin, 1967). But in Mali, where substantial investment had been made, yields of rice and cotton were so low, and could only be increased by bringing more land under expensive irrigation that expansion of irrigated areas was stopped until cultural practices could be improved (De Wilde and McLoughlin, 1967).

Yesterday, today and tomorrow

It is evident that certain social customs handicap programmes devised to increase productivity in agriculture. At

Table 1

Population trends and economic growth

Country	1973 population $\times 10^5$	Area $\text{Km}^2 \times 10^3$	Population density per Km^2	Natural increase (%)	Life expectancy (yrs)	Gross National Product \$ per capita	Growth rate per cent
Chad	3,791	1,284	3	2.3	31	80	0.4
Mali	5,257	1,240	1	2.3	35	70	4.4
Mauritania	1,119	1,030	4	2.2	40	140	4.5
Niger	4,243	1,267	3	2.9	37	90	-2.0
Senegal	3,780	197	17	2.3	41	230	0.0
Upper Volta	5,384	274	19	2.0	32	60	-0.6

Sources: 1971 UN Demographic Yearbook and 1973 World Bank Atlas, Population, Per Capita Product and Growth Rates.

Table 2

Sahel food production (1961-1965 average = 100)

Country	Food production per capita, per cent 1967-1971	Agricultural production per cent 1967-1971
Chad	+3	+2
Mali	0	+2
Mauritania	-2	-2
Niger	-12	-11
Senegal	-16	-14
Upper Volta	-9	-6

Source: FAO, *The State of Food and Agriculture 1972*, Rome, pp. 112-113

least until 1961 most of the available arable land in the oases and seasonally flooded areas of the Sahel was owned by Berber or Arab nomads. But the land is worked by share-croppers of negro-slave origin (Haratin) or impoverished Berbers. They receive about one-fifth of the crop as pay for their work. The system is hardly conducive to good land management practices (Monod and Toupet, 1961).

For these and other social and cultural reasons and the effects of often marginally valuable development schemes (*Guardian*, September 17, 1973) imposed on a generally unfavourable and unforgiving environment, the Sahel has not produced food at the rate of population increase. The present drought has brought matters to a sudden catastrophic state. Instead of a gradually worsening situation, the crisis is here. The economic rates of growth, typically between 2 and 3 per cent, have lagged behind the rate of population increase. The labour force has increased faster than jobs can be provided and the young structure of the population, almost half of whom are below 15 years of age, is seriously distorting the ratio of dependants to workers and is putting a massive strain on the educational and social services. Twenty-three million people, of whom

perhaps a third are facing famine or malnutrition, and so weakened that they easily contract and die from diseases they normally would have survived, are facing a problem that only massive international aid can cope with. Before the drought the Sahel zone imported over 37 per cent of its total purchased food (Economic Commission for Africa, 1970). Table 2 shows the food producing situation as it was in each of the Sahelian countries for the period 1967-71. Production of food has not only failed to keep pace with the population increase, it has actually decreased.

Over \$135 million in food has been given to the area by various agencies. Without it there would have been mass famine. The total costs for relief will be enormous, probably \$600 million for food and transportation and perhaps \$1000 million if protracted assistance is necessary. This now seems likely. Many nations have given aid including Britain, Belgium, Canada, the United States, Spain, West Germany, China, the Scandinavian countries and the Soviet Union. Much of the food is airlifted at \$400 a ton. Canada alone has had 3 Hercules transports deliver over 4 million pounds of food from Lagos to the drought-stricken areas.

What the future holds for these people can only be guessed at. It is evident that only a regional plan can make the best use of the Sahel's relatively small and uncertain water supplies and its limited agricultural possibilities. Hamani Diori, President of Niger, has called for a "Marshall Plan—for Africa". A re-appraisal of the attempt to extend dry-land crops and to develop improved herds of animals is required. Even if the rains this year are sufficient to allow good crops—and any rain now will be a mixed blessing for it will hinder relief distri-

bution—next year and the year after they may not be.

Addeke K. Boerma, Director General of FAO, in reviewing the latest United Nations statistics on food production has noted that the developing countries are not growing enough food for their needs even with foreign aid. The world production maintained its long-term annual increase of about 3 per cent but this was due to substantial increases in the developed countries. Even before the drought took its toll the animal and human population of the Sahel was outstripping its food production. The heavy demands for cereals, especially wheat, by the USSR and China have not only reduced the Canadian and United States reserves to minimal amounts, but the price rises because of heavy bulk buying have meant that needy nations must buy at international market levels. Some US senators have requested their Government to divert part of the Russian purchased wheat to the Sahel (*New York Times*, June 26, 1973).

The current situation cannot be viewed as a temporary misfortune. As Robert McNamara, President of the World Bank, noted in his opening address at the October meeting in Nairobi, unless urgent attention is given to the under-developed world now widespread famines will occur. That is why in order to understand the full impact of the present disaster in the Sahel it must be seen not only in terms of its immediate effects, serious as these may be, but in its historic antecedents and its eventual results.

References

- Brémaud, O. and Pagot, J., 1962, Grazing Lands, Nomadism and Transhumance in The Sahel, in, *Arid Zone Research*, XVIII, UNESCO, Paris, p. 311.
- Keay, R. W. J., 1959, *Vegetation Map of Africa*, Oxford University Press, 24 pp.
- Whyte, R. O., 1966, The Use of Arid and semi-arid Land, in, *Arid Lands*, E. S. Hills (ed.) Methuen, London, p. 309.
- Cochemé, J. and Franguin, P., 1967, *A study of the Agroclimatology of the semi-arid Area south of the Sahara in West Africa*, FAO Tech. Rep., Rome, 325 pp.
- Arnon, I., 1972, *Crop Production in Dry Regions*, v. 1., Leonard Hill, London, p. 15.
- Solot, S. B. 1950, *Amer. Met. Soc. Bull.*, 31, p. 90.
- Eldridge, R. H., 1957, *Quart. Journ. Royal Met. Soc.*, 83, 303-314.
- Forsdyke, A. G., 1960, Problems of Synoptic Meteorology in the Tropics, in, *Tropical Meteorology in Africa*, D. J. Bargman (ed.), Munitalp, Nairobi, Kenya, p. 4.
- Flohn, H. 1960, The Structure of the Intertropical Convergence Zone, in, *Tropical Meteorology in Africa*, D. J. Bargman (ed.), Munitalp, Nairobi, Kenya, p. 251.
- Buxton, P. A., 1935, *Journ. of Ecology*, 23, p. 139.
- Namias, J., 1960, Factors in the initiation, perpetration and termination of drought, in, *Internat. Assoc. Sci. Hydrol.*, Helsinki, Pub. No., 51, 81-94.
- Whyte, R. O., 1963, The Significance of Climatic Change for Natural Vegetation and Agriculture, in, *Arid Zone Research*, XX, UNESCO, Paris, 381-386.
- Flohn, H., 1960, Climatic Fluctuations and their Physical Causes, Especially in the Tropics, *op. cit.*, p. 270.
- Raikes, R. L., 1969, Formation of Deserts in the Near East and North Africa, in, *Arid Lands in Perspective*, W. G. McGinnies and B. J. Goldman (eds.) Amer. Assoc. Adv. of Sci. and University of Arizona Press, Tucson, 147-154.
- Namias, *ibid.*
- Kokot, D. F., 1961, Desert encroachment in South Africa, in, *Africa, Continent of Change*, P. R. Gould (ed.), Wadsworth, Belmont, Calif., 117-122.
- Jones, B., 1938, *Geog. Journ.*, 91, p. 411.
- Bovill, E. W., 1920, *Journ. Roy. Af. Soc.*, 20, p. 182.
- Bovill, *ibid*, 174-185, and 259-269.
- Bovill, *ibid*, p. 261.
- Stebbing, E. P., 1935, *Geog. Journ.*, 85, 506-519.
- Stebbing, *ibid*, p. 515.
- Stebbing, *ibid*, 519-524.
- Buxton, *op. cit.*, 134-139.
- Nigerian Government, 1937, *Sessional Paper No. 37*, Lagos.
- Stebbing, E. P., 1937, *Journ. Roy. Af. Soc.*, 39, Extra Supplement.
- Jones, *op. cit.*, 401-423.
- Jones, *op. cit.*, p. 421.
- Stamp, L. D., 1938, *Geog. Rev.*, 28, 32-45.
- Stamp, L. D., 1940, *Geog. Rev.*, 30, 297-300.
- Keay, R. W. J., 1949, *Journ. Ecol.* 37, 335-364.
- Dubief, J., 1947, *Travaux de l'Institut de recherches Saharienne*, IV, Algiers, 7-21.
- Lysgaard, L., 1949, *Folia geogr. dan.*, 5.
- Butzer, K. W., 1961, Climatic changes in arid regions since the Pliocene, in, *Arid Zone Research*, XVII, UNESCO, Paris, 31-56.
- Whyte, 1963, *ibid*.
- Droughlin, G., 1962, The possibility of using minor water resources in Algeria, in, *Arid Zone Research*, XVIII, 371-380.
- Capot-Rey, R., 1962, The present state of nomadism in the Sahara, in, *Arid Zone Research*, XVIII, UNESCO, Paris, p. 302.
- Brémaud and Pagot, *ibid*.
- Monod, T., and Toupet, C., 1961, Land use in the Sahara-Sahel region, in, *Arid Zone Research*, XVII, UNESCO Paris, 239-254.
- Gillier, P., 1960, Oléagineux, 15, 637-643 and 699-704.
- Cochemé and Franguin, *ibid*.
- De Wilde, J. C., and McLaughlin, P. F. M., 1967, *Experiences with Agricultural Development in Tropical Africa*, Johns Hopkins Press, Baltimore, v.2, 466 pp.
- Monod and Toupet, *ibid*.
- Economic Commission for Africa, 1970, *Econ. Bull. for Africa*, X, No. 1, 76 pp.

Ecologist binders

Keep your copies of the *Ecologist* in a special binder

Each binder is in dark green library fabric, stamped in gold leaf on the spine

Binders for Volumes

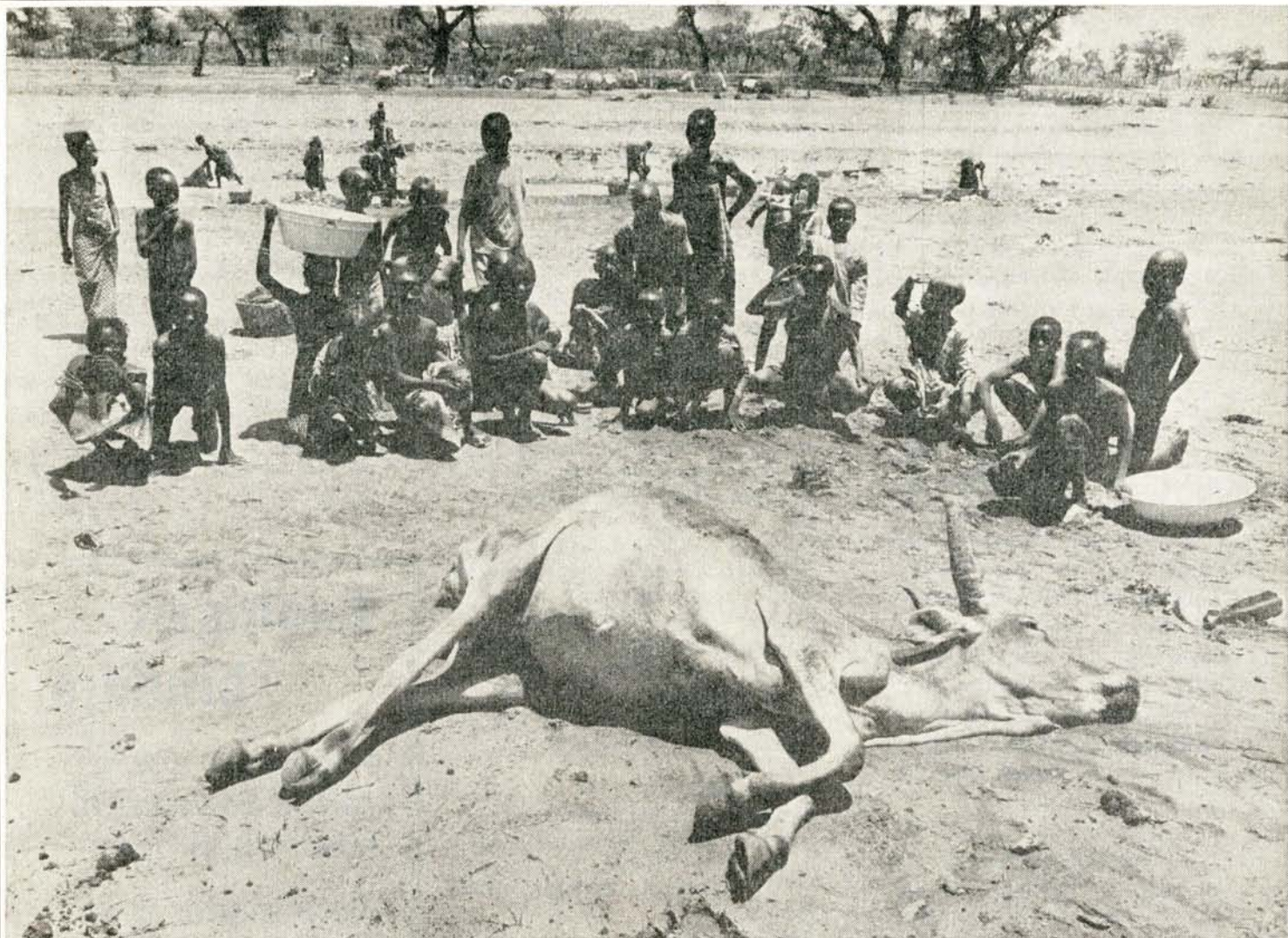
1 (1970-71),
2 (1972)
3 (1973) and
4 (1974)

now available

£1.50 each, inc.
postage and
packing

Order from the

Ecologist,
73 Molesworth Street,
Wadebridge,
Cornwall



FAMINE: the cost of Development ?

by Randall Baker

Over the last decade the severe hardships experienced by those communities living in the Monsoon areas or in semi-arid belts between the Desert and the Sown have forced an international interest in a zone which has been undergoing radical environmental deterioration. Several detailed and well documented studies¹ have been presented to account for the worsening situation in terms of climatic change, whatever its cause, and there now seems to be an impressive volume of evidence to substantiate the view that climatic change is a major contributory factor. On the other hand, the pace of destruction and the advance of increasingly desertic conditions outward from the Tropical High-Pressure zones, is frequently accelerated rather than retarded by the introduction of advanced technology. Whatever the overall climatic prospects for these marginal areas of production there seems little doubt that 'planning', inappropriate technology and administrative weaknesses have undermined their resilience in withstanding drought and have seriously disrupted what was previously a long-term balance between Man and Environment. The implication of this is that, whatever long-term strategy emerges from the research into climatic parameters, the basic errors of environmental mismanagement must not be perpetuated. There is disturbing evidence that this may happen unless we recognise precisely what the problem is and what steps are necessary to make planning more appropriate to the total situation.

Photo: Keystone

This paper will examine, briefly, what has happened in the past from the point of view of the participants. The first part describes the situation as perceived at the time by the colonial officers. In each section the evidence is the same and it is only the interpretation of the circumstances which

varies; for that reason, the principal generalisations made by the colonial officers are in italics. It is these generalised conclusions, rather than what actually occurred, which account for much of the inappropriateness of many of the induced changes.

The second part of the paper will

present a different interpretation of the same evidence, this time from the point of view of the pastoralist, and will highlight the causal processes arising from the confusion between the two interpretations, which encouraged desiccation. A final part considers the implications for the future and

what remains to be done.

Some generalisations and their consequences

Drought, famine and starvation are the stuff of history in the Monsoon belts, so much so that several groups record their chronology relative to years of great loss, disaster or suffering. There is nothing new about droughts; Joseph saw Egypt stricken by "seven lean years" and gained prestige from his foresight in handling this calamity. In the marginal areas of cultivation and in semi-arid range-lands a small deficiency in an annual rainfall total or a variation in the timing of the onset and sequence of rainfall can have consequences far beyond those associated with such small changes in rainfall in humid regions. It is in these areas also that, as a general rule, variability (percentage deviation from the mean) is at its greatest.²

Early contact between colonial administrators and pastoral nomads very often followed the pattern I shall try to outline here. The casual colonial observer saw a community *wandering aimlessly with their herds in an eternal search for pasture*, often concentrated in a specific circuit of rangeland whilst considerable extents of grassland nearby remained unoccupied, as for instance between the tribal groupings in Karamoja, N.E. Uganda.³ At first it was thought necessary to limit this *needless movement* in order to tax the inhabitants, utilise their labour on public work schemes to establish the roads network, government buildings etc., and to prevent hostility, especially across the new colonial boundaries. Attempts to commercialise the economy met with little success as the inhabitants did not respond *rationally* to market forces operating through the price mechanism offering only a few scrub animals from time to time and using price increases as an opportunity to reduce the number of animals put on sale.

Sooner or later in these climates a natural drought occurs and the administration is horrified by both stock and human losses: a problem Europe had conquered earlier through *superior technology*. It was evident that one of the overriding problems of the moment was to utilise this superior technology and eliminate the *problem of drought* by modern hydrological techniques. These, after all, were being *proven* in

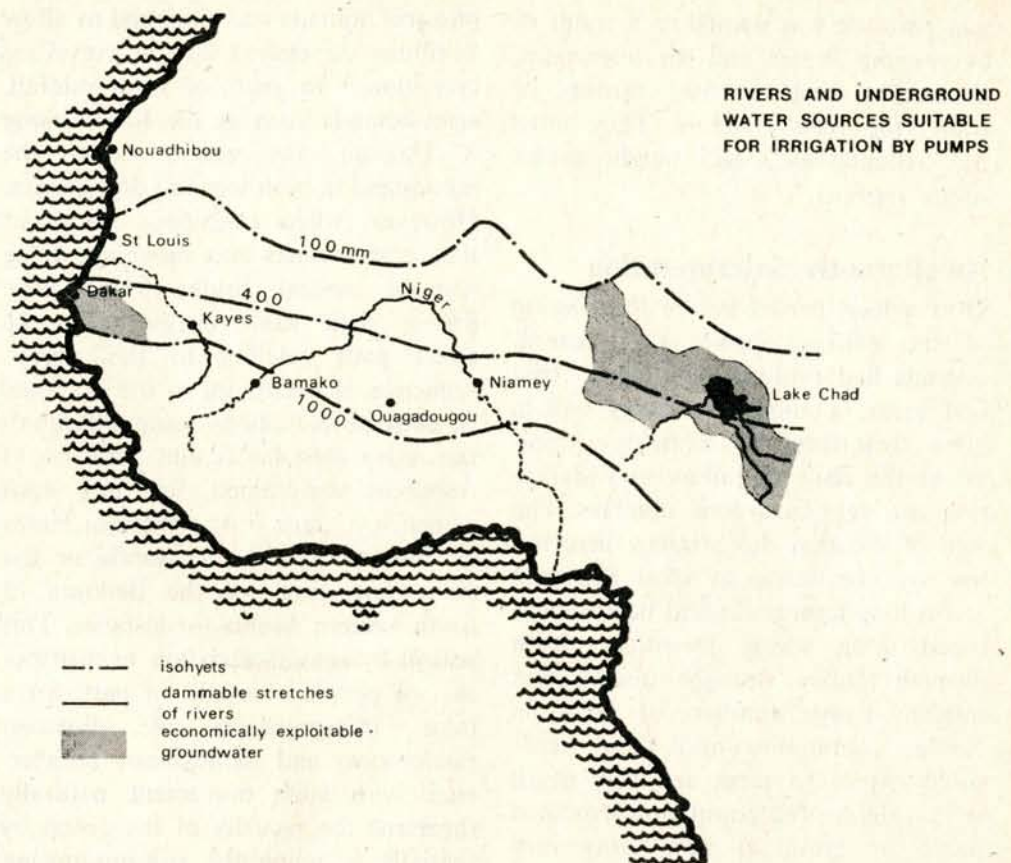


Fig. 1

similar semi-arid or extensive range-land environments in Australia and the USA.⁴ Wells were drilled, tanks excavated and so the droughts, previously manifested as a shortage of water, wreak less havoc than before. Appalling losses still result from diseases and here refinements in veterinary medicine were able to effect radical improvement in the survival rate. It was *encouraging to see the awakening of pastoralist interest in better management* and the herders adopted both innovations very rapidly with an almost immediate effect on herd size. A new problem however began to emerge and capture the attention of agricultural advisers during the 1930s and 1940s: soil erosion and a general *drying up* of the area leading in some regions to an advance of the desert.⁵ The "reasons" for this seemed to be:

1. The area was undergoing a *period of desiccation based on climatic change*, illustrated by the increasingly xerophytic characteristics of the vegetation as time passes. In the Sahel there was the frightening prospect of the rangeland being *swallowed up by an advancing desert*;⁶
2. This trend could be countered only by reducing the number of animals, for the area was no longer able to support such large and

rapidly increasing herds and flocks as a result of the *drying up*. However, despite the *obvious necessity*, people, through their *sentimental attachment* to their cattle would not sell and, when offered a better price, showed their irrationality by offering fewer animals in the market. As conditions worsen their lack of even the *basic principles of scientific management* was revealed by an overwhelming desire to increase herd size and, after a drought, to sell nothing at all... and they would keep goats, the *most* destructive of all stock. Thus *they* accentuate the destruction and helped turn the area into a desert.

Drought now appears in a new guise as starvation, for now, a shortfall in precipitation caused heavy losses in the ever diminishing vegetation or a failure of annuals to appear. Perennials where, as in Karamoja they previously dominated, disappeared and the spectre of erosion encouraged by the exposure of the soil now haunted the corridors of the local administration. Raiding, the *local sport*, reached alarming proportions and the whole area became a "disturbed district", the security forces took over and nothing ever got any better. All that investment, technology

and patience was wasted as a result of a *creeping desert* and an *ungrateful, destructive palaeotechnic* group of *wandering troublemakers*. They must be "sedentarised" and taught to be *useful citizens*.

An alternative interpretation

Over a long period before the coming of the colonial power the pastoral nomads had evolved, possibly by trial and error, a survival strategy which, given their level of technology, minimised the risks of failure and starvation in a very hazardous situation. The way of life that this strategy involved was by no means an ideal existence for its long term ecological balance was based upon severe privation, death through famine, drought, disease and warfare. Large numbers of both the human community and their herds could expect to meet an early death so that the overall population remained stable or grew, at best, only very slowly.

To keep risk down to a minimum a series of options was evolved by each community in relation to the range of environmental opportunities and based on an extraordinarily detailed knowledge of the type, distribution and value of natural grazing resources. The options were limited by technology but, accepting that, they represented superlative adaptations which modern game theory would be hard pressed to improve upon. The details of the strategies have been covered elsewhere but the point that needs to be made is that many of the outward characteristics of these strategies, perceived as symptoms of "backwardness", "savagery" or "perverseness" by the colonial administrators and their successors, have a very respectable interpretation in the context of staying alive in the face of considerable odds. Sadly, much of the anthropological work done during the colonial period failed to deal with the herds and flocks as survival mechanisms: that was "taken for granted" and attention was focused on the extra dimensions of livestock in pastoral society. Thus a vital field of information on the subsistence strategy was absent and planners either worked blind or assumed pastoralists would respond like the ranchers of Texas.

Initially, the controls on movement instituted by the colonial authorities often failed to recognise that the pattern of grazing and migration of

pastoral nomads was designed to allow flexibility depending on the prevailing conditions.⁷ In years of good rainfall, semi-nomads such as the Karamojong of Uganda may remain around the homestead in both wet and dry seasons. However, when conditions are drier then communities may move out along one of several routes which have proven their value in the past: the exact path relating to the precise sequence of events up to the decision. In extreme conditions some communities move their flocks and herds on to resources maintained for just such exigencies: parts of the Western Plains or Eastern hills of Karamoja or the *hema* enclosures of the Bedouin of south-western Arabia for instance. This season by season variation in distribution of people accounts, in part, for a false interpretation of disorder, randomness and aimlessness. Interference with such movement naturally threatens the security of the group by spatially reducing the risk-minimising options and this also helps to explain why the seizure of "unoccupied" land did so much to engender the bitter wars which typified the early days of colonialism in pastoral areas. The annexation of the dry season reserves of the Masai of Kenya and their distribution to European ranchers or the settlement of Suk on reserves of the Karamojong provide good examples of such action. The colonists' early perception of these tribes as "aggressive and unreasonable" is better explained by their response to this theft of their land and the threat to their survival than by any mystical characteristics attributed to the tribe's outlook or attitudes.

Commercialisation

To the foreign masters of an expanding and increasingly urbanising territory the obvious attraction of the semi-arid areas was as a storehouse of cheap protein either for the domestic market (eg Karamoja to Buganda in Uganda) or for export to a neighbouring territory (eg Niger to Nigeria). Attempts at commercialising the pastoral economies proved frustrating and largely unsuccessful, principally because in a society where herds and flocks not only form the basis of survival, but also symbolise wealth and are the mainstay of social interchange there is almost no incentive to convert them into cash, goods or services. Retail penetration amongst a moving

community such as the Bedouin is necessarily difficult because the retailer is tied to his shop whilst the pastoralist group is mobile and the amount which may be bought is limited by the problem of transporting the purchases once acquired. If the pastoralists are forced to part with animals or kind, for instance, through the institution of taxes payable in cash then it will be those of least value which will go: the sick, the barren and the immature in time of drought or other hardship. What the market wants and when it wants it are of limited consequence under these circumstances. Though higher prices during a demand peak elsewhere might produce a sudden surge of selling, the total number of animals sold over the year might fall as the limited requirements of the pastoralists may be realised by selling fewer head. In early days this type of "economic perversity" did much to encourage the view that the pastoralists were simply not pulling their weight in the development/modernisation stakes and were set against change.

The price of innovation

This critical misunderstanding really explains almost all that followed. The pastoralists live in a high risk situation, they have evolved a risk-minimising strategy proven over time and based on holding the maximum number of productive animals in the face of heavy losses. They never keep all the animals together but spread them over different grazing areas and keep a range of animals able to utilise various niches in the ecosystem. The price of an innovation may well be death for, if it fails, there is no reserve capacity. A reluctance to change is only natural under these circumstances, especially when the social implications of possessing animals are added to the function in survival.

However, any generalisations which suggest a universal refusal to change are patently false and some innovations have been widely and rapidly adopted—though not always with beneficial results in the long run.

In this light, the introduction of water resources based on deep drilling, and the diffusion of veterinary prophylaxis form a potential threat to the ecological balance of enormous proportions. Where such innovations reinforce the traditional survival strategy

herd building for subsistence
social preference for numbers

war and raiding, drought
human/bovine disease

Equilibrium 1

The diagram shows a horizontal dashed line representing the equilibrium point. A solid line, representing the seesaw, is tilted upwards from left to right. A downward arrow is positioned on the left side of the dashed line, and an upward arrow is on the right side. A triangle, representing the fulcrum, is located on the dashed line. To the left of the fulcrum, the text reads "herd building for subsistence" and "social preference for numbers". To the right of the fulcrum, the text lists "peace and stability", "water development", "disease control", and "reduced mobility". The label "Equilibrium 1" is placed at the far right end of the dashed line.

herd building for subsistence
social preference for numbers

Equilibrium 1

Equilibrium 2

raiding to make up losses
overgrazing & starvation

Position of equilibrium 2 movable relative to stocking rate and management

Although it seems callous to look for any beneficial aspect to the Sahel drought and so much suffering it is fair to say that the wholesale destruction of herds and flocks does provide a brief respite for pastures to recover and in which to plan to control herd numbers and re-establish ecological balance. As yet it is not possible to say with any certainty whether the cause of the drought is (i) an equator-ward shift in global pressure systems limiting the incursions of more humid monsoonal conditionals in the wet season;

This is the origin of the spectacular overgrazing which can be seen to radiate from the boreholes where animals congregate in huge numbers, in the Sahel, the Sudan, Botswana and other African drylands. It is also a major factor in the advance of xerophytic vegetation, soil-erosion and

Fig. 2

(ii) a shift in local pressure systems due to higher temperatures in the soil and lowest atmosphere following a reduction in vegetation; or (iii) a rapid spread of desert conditions because of the overgrazing of perennial grasses and their replacement by annuals which cover the ground for only a short part of the year and expose the land to desiccation by the sun in the dry season.

The answer, if it is ever clearly discerned, will probably incorporate all three elements. However, the relationship between environmental degradation, overstocking and the introduction of watering and disease control is indisputable. The immediate priority is that we *should not* look upon the end of the present drought as the end of the "problem" and then, when the next crisis comes, go back to the same type of technological "dyke-lugging" as before. If this is the outcome then the situation can only worsen.

Some optimists frequently ask, "But surely all this arises from the Colonial presence, false comparisons with the temperate mother-land and an arrogant disregard for traditional cultures? Things are different now that these countries have governments composed of people of local origin." Unfortunately, this is not true because the new elite which forms the government is often drawn from the settled agricultural portion of the population as in Tchad, Uganda and Mali and rarely contains people of a nomadic background. These governments show a disturbing faith in the automatic benefits of western technology: the President of Niger for example has called for a "Marshall plan" of recovery for the six drought-stricken nations, in which wells play a central part. He wants the international aid community to drill 2,500 wells across Niger, to an average depth of 900 feet—an enormously ambitious project that would cost upwards of £100,000,000.¹⁰ At the same time there is a growing interest in damming the Senegal river at an estimated cost of another £30,000,000. Both these projects have been presented as simple "once and for all" solutions to the drought problem and the question of the multiplying effect of overgrazing that they may produce seems hardly to have been considered. It is quite essential that a solution is found for, over most of the land area of the Sahelian states, there is no ob-

vious alternative to extensive pastoralism nor is there any readily discernible alternative export. Each year some 700,000 animals are exported to the Urban markets of coastal West Africa providing half of Mali's export earnings and 65 per cent of those of Upper Volta.¹¹

... a disregard of traditional technology which... is equated... with savagery... results in a tragic loss of centuries of expertise and knowledge.

Since mismanagement is contributing substantially to the increasing desiccation of the semi-arid areas, what prospects are there on the one hand of slowing down or halting the impact of change or, on the other hand, of restoring a long term equilibrium? Ultimately the final decision on what happens must be made by the governments of the afflicted countries and so the "solution" has a powerful political dimension. An International Labour Organisation study¹² revealed that all the countries concerned were committed to a policy of encouraging settled agriculture or ranching even though movement is the basis of the pastoralist's strategy for survival, and no clear, viable alternative has been put forward. Again, many of the governments regard moving populations as a nuisance (cf the gypsies in Britain), a security threat and an embarrassment to a modern image. Moreover, there exists what may be best termed an "administrative trap" which effectively prevents decision-makers from either perceiving or dealing with the situation in all its aspects simultaneously. Briefly, government departments are limited by their policies, fields of operation, budgetary constraints, so that, often the overall problem of ecological imbalance in pastoral communities is split up between six or more ministries each dealing with separate aspects such as water, veterinary services, marketing, communications, security, agriculture and so on. Frequently no one is responsible for considering *social* aims, objectives and constraints. If foreign expertise is brought to bear then it is usually bound by the terms of reference of the responsible ministry and given almost no time—even if the desire is

there—to study socio-cultural factors. Swift has remarked, "At the present time the largest UN project ever undertaken in Mali is getting under way to develop the whole of the country's livestock industry, but it contains no pasture specialists, no ecologists and a derisory amount of sociological expertise".¹³ Additionally, the short-term political rewards to be derived from investment in a spectacular well sinking programme is likely to prove far more attractive to governments than vitally needed interdisciplinary research into planning. There is no long term in politics. Lastly there is, largely as a legacy of colonialism, a disregard of traditional technology which has the taint of "primitiveness" and is equated in many minds with savagery. This results in a tragic loss of centuries of expertise and knowledge.

Alternatives

It is clear that, for many, a return to pastoralism is likely to be difficult and destructive. A large scale return should be prevented at all costs, by developing other opportunities perhaps through irrigation near the great exotic rivers, or based on *nappes fosses* or retreating flood waters. A recent estimate places the irrigation potential of the Sahelian rivers at 1 million hectares. The only alternative is migration, which is now more difficult with numerous independent states warily protecting their own unemployment figures. There would seem to be very few alternative sources of employment within these economies except where minerals occur (copper in Botswana, uranium in Niger, iron in Mauretania). Work must begin in earnest on defining a methodology to build on the expertise and ecological adaptation of traditional nomadism. A mechanism must be found to preserve the traditional ecological balance, through researching into the attitudes of pastoralists and discovering possibilities for commercialism which could transfer security away from livestock. Eventually, if the social structures and attitudes can adapt it may be possible to reintroduce practices of basic pasture management. In view of the limited range of economic opportunities in many of the stricken countries, the rising world demand for beef, the shortage of protein foodstuffs in the Third World and the centuries of traditional knowledge encapsulated in the

pastoral societies, it seems little enough to ask that an attempt be made to build on a basis of understanding.

In conclusion it may be true that the present situation is partly due to long term fluctuations in the climate. But there is much which can and should be done to reduce the impact of these fluctuations and to prevent their disastrous results from being exaggerated and distributed over an even greater area than is absolutely necessary.

1. See the accompanying paper by Prof. Campbell and also: Bryson R. A., 1974, "Drought in Sahelia, who or what is to blame?", *Ecologist*, Vol. 3 No. 10, p. 336-371; Winstanley, D., 1973, "Recent rainfall trends in Africa, the Middle East and India", *Nature*, 243, p. 464-465 and; Winstanley, D., 1973, "Drought in the Sahel zones:

severity, causes and prospects", a paper presented to the symposium on Drought in Africa, S.O.A.S., July, 1973.

2. It must be stressed that the aridity/variability relationship is pronounced only at the macro level and, in more local circumstances the situation may be reversed—see Gregory, S., 1969, "Rainfall Reliability", in Thomas and Whittington's: *Environment and Land Use in Africa* p. 57-82.
3. Baker, P. R., 1968, "Environment and cattle marketing in Karamoja." Occasional paper no. 4, Geography Dept., Makerere University Coll., Kampala.
4. It is salutary to recall that, at this time, some of the American dustbowls were being formed by severe overgrazing and mismanagement.
5. In this light it is very instructive to follow the activities and findings of the Anglo-French Forestry Surveys in West Africa—see: Prothero, R. M.,

1962, "Some observations on desiccation in north-west Nigeria", *Erdkunde*, 16, p. 112-119.

6. Wilson, J. 1964, in Langdale-Brown I, et. al.: "The vegetation of Uganda", Government Printer, Entebbe, p. 89-92.
7. Johnson, D. L., 1969: "The nature of nomadism", Dept. of Geography Research Paper No. 118, University of Chicago.
8. Baker, P. R. 1968: "Problems of the cattle trade in Karamoja", in Berger H. (ed): *Ostafrikanische Studien*, Nuremberg, p. 211-226.
9. Such reports have to be treated very cautiously, see *The Guardian* 20.9.1973.
10. Ibid.
11. Swift, J., *The Times* 4.9.1973.
12. International Labour Organisation, 1968 "Technical meeting on the problems of nomadism in the Sahelian region of Africa" Ref. RTNS/R.1.
13. Swift, J., *The Times* 4.9.1973.

New from Penguins

HUMAN SPACE

A series for integrated geographical and social studies in the middle school and lower secondary school.

Three books which take as their starting point the geographer's view of the world and bring basic concepts of modern geography to life, but which also go beyond this to consider the social, moral and political issues which the geographer's view entails.

Lively visual appeal – books which convey their subject matter not only in words but in photographs, maps, newspaper cuttings, cartoons, poems, paintings and songs.

WHERE YOU'RE AT Brian Goodey

All about the labels, barriers and boundaries, both physical and psychological, with which we identify and define the space around us. 60p

UTOPIA Colin Ward

Describes many 'ideal places', both past and present, both in fantasy and reality, and examines different patterns of living. 60p

SURVIVAL David R. Wright

About the relationship between people and their environment, both physical and social, in the struggle to survive. 70p

Inspection copies will be sent on request.

To: Dept Ec/HS Schools Unit
Penguin Books Ltd
Harmondsworth
Middlesex UB7 0DA

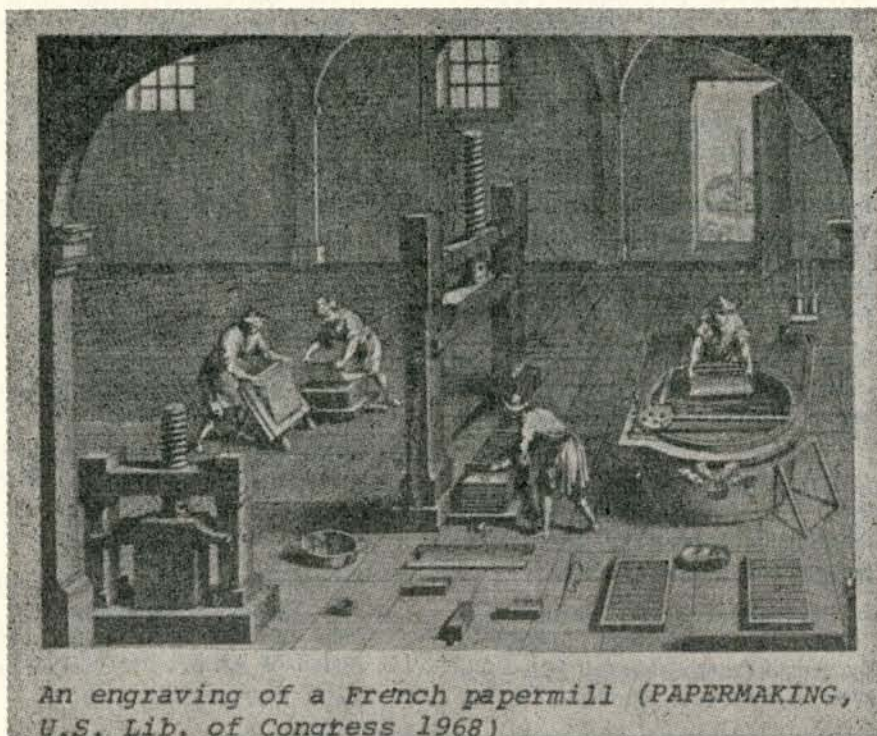
Please send me further details on Human Space.

Name

Teaching position

Address





An engraving of a French papermill (PAPERMAKING, U.S. Lib. of Congress 1968)

CANNABIS: a solution to the paper shortage

The paper shortage in Britain and throughout the west has become critical. Not only is newsprint in short supply but even lavatory paper, and we have now reached the point when the forests which supply us with wood for paper making are diminishing at an increasingly rapid rate. There are a number of solutions. An obvious but as yet impractical one would be to check the present flood of mass literature including newsprint. Another solution would be to do away with the manufacture of paper as we now know it and turn again to the use of hemp. Here at least we have a natural substance which grows rapidly, produces a sturdy paper with long-lasting qualities and whose use does not whittle down the few remaining forests of the world.

Hemp (*cannabis sativa*), was one of the first crops to be planted by the early American colonists. Their knowledge and use of the plant, however, started much earlier. The ships on which they sailed from Europe were rigged with hemp rope and hemp or flax sailcloth. Many wore hempen breeches and other coarse clothing from hemp fabric. And in all probability their land grants, sailing orders, and maps were inscribed on hemp/flax paper made from discarded cordage and rags.

The word paper comes from the latin papyrus, but modern paper as our

ancestors knew it was a substance totally different from either papyrus or woodpulp. It was a "mixture of flax and hemp, or a composition made from one of these two substances..."¹ This was true for the first 1,750 years of papermaking. A little over 160 years ago a new synthetic paper was developed from chemically treated woodpulp.

According to a generally accepted tradition the first paper was made by the Chinese in the 1st century AD. The inventor was Ts'ai Lun, from the province of Hunan, north of Canton. The oldest documents written on paper

and found by archeologists are in the British Museum. They are Buddhist texts from the 2nd and 3rd centuries AD. These and other manuscript rolls, some with Sanskrit characters, have been analysed by Dr. Wiener of Vienna. "His study showed that they were a mixture of bark, and old rags, principally hemp".²

As would be expected, the Chinese produced the first book. It was called the Dharani, or book of prayers, printed in AD 770 from copper plates. Thousands of these books were printed and several of them are on exhibit at the paper museum. Dard Hunter, who has researched and written about paper most of his life, examined this book to determine the kind of material used. Hunter: "The paper that I examined is composed one-hundred per cent of hemp (*cannabis sativa*), and is of the 'laid' type". He found the paper "of a light tan colour, as would naturally be the case with unbleached hemp as the material".³

After keeping the art to themselves for 500 years, Chinese papermaking spread to Japan and Korea in the east, and to Persia and Arabia in the west. It reached Korea in AD 600 and Baghdad in AD 793. Four-hundred years went by before Europeans picked up papermaking from the Arabs. The first Western papermill was built in Spain in AD 1150, by the Moors, the second was built in Italy in 1276. The art of papermaking finally reached England in 1494.⁴

Some scholars attributed the illiteracy and "flat world science" of Western Europe to the late development of papermaking and book printing. No doubt this is true. During the Dark and Middle Ages, when Europeans were still trying to decipher unreadable parchment, the Arabs were translating the works of Euclid, Ptolemy, Aristotle, Plato, and Hippocrates. The Greek classics did not find their way into Europe until the fall of Constantinople in 1453.

Europe, in those days, was suffering under the twin burden of racial bigotry and Christian paranoia. "The fanaticism that drove the Christian world to destroy everything that smacked of the Moslem civilisation" caused them to reject Arabic paper as well.⁵

By the 16th century hemp had become an integral part of European culture. François Rabelais (1490-1553) devoted eight pages to the

mighty hemp plant in his classic *The Histories of Gargantua and Pantagruel*: "Without it, how could water be drawn from the well? What would scribes, copyists, secretaries, and writers do without it? Would not official documents and rent-rolls disappear? Would not the noble art of printing perish?"⁶

Paper and the hemp and flax industries played as crucial a role in the rise of the Industrial Revolution of the American colonies as did coal, steel and wool. William Thompson, in his provocative book, *At the Edge of History* points out that "industry runs on paper as much as on coal, and if English mercantile society had no means of producing and controlling the vast amounts of information commerce generates, the Industrial Revolution would never have happened".⁷

Hemp, flax and papermaking in New England

Hemp and flax had to compete with tobacco from the very first days of colonial agriculture. The tobacco smoking craze was sweeping Europe at the same time the early colonists were trying to establish an economic base. Tobacco, because it was less bulky in proportion to its value, proved to be the most remunerative crop the colonists could grow. Some of the colonial families actually came close to starvation due to their dependence on tobacco and their failure to grow grain, vegetable and fibre crops. Tobacco being inedible, unwearable, unrecyclable, and soil-depleting was little more than a curse.

To counteract the tendency of the colonists to be one crop oriented, the Parliament of England and the colonial governments placed bounties on hemp and flax to encourage their production. The bounties were paid all during the 1600s and even during the pre-revolutionary period, primarily as a means to encourage fibre production for British shipping. In 1762 Virginia not only rewarded those who grew hemp, but also "imposed penalties upon those who did not produce it."⁸

Another means of stimulating fibre crops was the distribution of planting manuals to farmers. These manuals, or "treatises" as they were called, gave detailed instructions on all aspects of cultivation and preparation of flax and hemp.

The colonists were never able to

grow enough flax and hemp for British Shipping needs, but by 1690 a sufficient supply was produced to take care of the home market. Once this surplus had been created, one of the first manufacturing industries to be established were papermills. The first one built in Pennsylvania in 1690. By the early 1700s both the flax and hemp industries were thriving and several more paper-mills were built. One of the people instrumental in getting these mills in operation was Benjamin Franklin. "Owner of a flourishing business in pre-revolutionary Philadelphia, Franklin was also the most active paper merchant in the colonies".⁹

A N

E S S A Y

Towards the Improving of the

Hemp and Flax

MANUFACTURES

IN THE

Kingdom of IRELAND.

By *Louis Crommelin*, Overseer of the Royal
Linnen-Manufacture of that Kingdom.

D U B L I N :

Printed in the Year, 1705.

And Re-Printed for R. OWEN, Bookseller in Skinner-
Row, M,DCC,XXXIV.

The first recycled paper

In a very real sense paper-making in New England was made possible by the availability of discarded underwear, dresses, breeches, shirts, rope and sailcloth. This in turn brought down the price of the material used in the preparation of the pulp for paper-making. It was common in those days for mill owners to run ads such as the following: "The printer hereof; having a PAPER-MILL, now at work near this city, desires all persons to save their old Linen Rags, for making Paper. All sorts are useful, from the coarsest Crocus or Sailcloth (usually hemp), to the finest Holland or Cambrick (usually flax); and he will give a Price in Proportion to the Fineness, from a Half-penny to Three half-pence, per pound". (Virginia Almanak, 1749).

Paper in those days was made from 100 per cent recycled material. First the flax, hemp, and later cotton was turned into canvas, rope, sacking, cloth, and thread; then, after it was thread-bare and no longer serviceable, it was recycled into paper. This was our only source of paper for the first two hundred years of American history. It was not until papermakers began to use wood-pulp that plants (trees) were killed and used for paper, then thrown away.

George Washington, the first president of the USA, was both a hemp farmer and a patron of the early paper industry. Dard Hunter tells about Washington's visit to the Onderdonk paper-mill at Hempstead, Long Island in 1790. "On the morning of April 24 the word came suddenly... that the President of the United States was on his way through the island, and that he would stop with the paper-mill owner for breakfast. The Onderdonk family was around the table eating roasted clams when the message was received... Washington seemed much interested in the process of forming sheets of paper and asked many questions in regard to the methods employed..." George wanted to try his hand at papermaking and supposedly made a sheet which was a cherished possession at Hempstead for many years. When he returned home, Washington recorded the visit in his diary: "Breakfasted at a Mr Onderdonk's at the head of a little bay... This gentleman works a grist and two paper-mills, the last of which he seems to carry on with spirit and profit".¹⁰

Washington also recorded his hemp farming exploits in that famous diary. His entries in the spring and summer of 1765 should be of interest to the hemp farmers of today:

May 12-13, 1765: "Sowed Hemp at Muddy hole by swamp".

August 7, 1765: "...began to separate (sic) the male from the female Hemp at Do—rather too late".¹¹

Most hemp historians have assumed that Washington was trying to raise a superior marijuana crop by separating the male and female before pollination had taken place. This may be true. Another possibility, is that he was trying to harvest the male plants while they were still tender and would make good linen, since both hemp and flax can be used for linen manufacture if

they are harvested at the right time and prepared properly. Herodotus records the Thracians were making hempen linen indistinguishable from flaxen linen in 400 BC. In 13th-century Europe it was common to mix the two fibres in the same material.

Thomas Jefferson too, was an early desciple of hemp culture. A 1811 entry in *Jefferson's Garden Book* reveals the special attention hemp received: "An acre of the best ground for hemp, is to be selected, and sown in hemp and to be kept for a permanent hemp patch." There's probably a shopping centre or gas station sprouting from Jefferson's "permanent hemp patch" today.¹²

Woodpulp paper and waste

The first patent for the chemical wood-pulping process was granted in 1854. Woodpulp for paper began to be used to a limited extent shortly thereafter. It did not gain wide-spread acceptance until after the Civil War when sulphite pulp was introduced. This process made woodpulp useable for many grades of paper. By 1900, all newspapers and most books and magazines were printed on woodpulp paper.

The new, cheap, throw-away paper fits in perfectly with a growing, dynamic, disposable economy. The era of the "wastemakers" had arrived.

While cheap woodpulp was a blessing to newspapers, it was a curse to book publishers and libraries. Books began to deteriorate at an alarming rate after the introduction of woodpulp paper. The Library of Congress found that "while the paper in volumes three or four hundred years old is still strong... ninety-seven per cent of the books of nonfiction printed between 1900 and 1939 will be useable for less than fifty years".¹³ We have now reached the point where 80 per cent of our garbage is paper, but only 20 per cent of it is recycled.

Hugh Williamson, writing in *Methods of Book Design*, tells us why woodpulp is such an inferior paper. "There are three main sources of cellulose fibre; the first includes cotton, linen, and hemp. The fibres in these materials are known as normal or simple cellulose, and they are weakened less than any other kind of cellulose by the drastic process of purification which leads to papermaking." The second source of fibres, esparto, straw, and other grasses are called compound cellulose, "which tend to be

UNITED STATES DEPARTMENT OF AGRICULTURE
BULLETIN No. 404

Contribution from the Bureau of Plant Industry
WM. A. TAYLOR, Chief

Washington, D. C.

PROFESSIONAL PAPER

October 14, 1916

HEMP HURDS AS PAPER-MAKING MATERIAL

By

LYSTER H. DEWEY, Botanist in Charge of Fiber-Plant Investigations, and JASON L. MERRILL, Paper-Plant Chemist
Paper-Plant Investigations

This bulletin is printed on paper manufactured from hemp hurds, run No. 143, which is recorded on page 20

CONTENTS

	Page		Page
The Production and Handling of Hemp Hurds, by Lyster H. Dewey:		The Manufacture of Paper from Hemp Hurds, by Jason L. Merrill:	
What Hemp Hurds are	1	Introduction	7
Flk., Wood, and Fiber	2	Factors Justifying an Investigation of Hemp Hurds	8
Character of Hurds Affected by Retting	2	Character of the Material	11
Proportion of Hurds to Fiber and Yield per Acre	3	Character of the Tests	12
Hurds Available from Machine-Broken Hemp	3	Operations Involved in a Test	13
Present Uses of Hemp Hurds	4	Description of Tests	16
Present Supplies of Hurds Available	5	Comparison of the Tests and Commercial Practice	21
Baling for Shipment	5	Physical Tests of the Papers Produced	24
Cost of Baling	5	Conclusions	25
Summary	6		

TABLE II.—Comparison between wood and hemp hurds.

Material.	Pulp yield.	Raw material required per year.	Annual growth per acre.	Acres required for sustained supply.	
				For 25-ton mill.	For 1 ton of fiber per year.
Wood.....	Two cords yield 1 ton of fiber.	15,000 cords....	0.37 cord (about 0.55 ton).	40,500	5.4
Hemp hurds.....	One ton yields 600 pounds of fiber	25,000 tons....	2.5 tons...	10,000	1.33

TABLE II.—Comparison between wood and hemp hurds.

Material.	Pulp yield.	Raw material required per year.	Annual growth per acre.	Acres required for sustained supply.	
				For 25-ton mill.	For 1 ton of fiber per year.
Wood.....	Two cords yield 1 ton of fiber.	15,000 cords....	0.37 cord (about 0.55 ton).	40,500	5.4
Hemp hurds.....	One ton yields 600 pounds of fiber	25,000 tons....	2.5 tons...	10,000	1.33

weakened to some extent in the course of their reduction to pulp, and which therefore form a rather less durable paper than the first group. The third source of fibres is wood", also a compound cellulose. Wood forms a "paper which is less durable than any composed of compound grass or simple fibres. Cotton, linen, and hemp are by far the strongest and most costly, fibres for papermaking."¹⁴

Williamson says, "hemp is scarce and costly, and is rarely used alone; the highest qualities of India paper, however consist mainly of hemp. The resistance to tearing and folding of

papers made from simple cellulose is due in part to the length of the fibres, and of all the fibres mentioned hemp is the longest." And therefore the strongest. Bible makers and printers of paper money have always known this, so they use hemp whenever possible.¹⁵

1916—hemp reconsidered

After cotton replaced flax and hemp as the major fibre crop, and woodpulp replaced rag paper, both of these once essential crops began to decline. This was speeded up by the invention of the cotton gin, expanded trade in countries with cheap labour, and the Civil War,

which forced the abolition of slave labour in the hemp fields. At that time hemp was still processed by hand—the hemp decorticator had not yet been invented. Some rag paper continued to be made for “important” uses such as paper money, Bibles, and cigarette papers, but for books and newspapers it had become too expensive.

It was the early 1900s, during World War I, when the federal government first became concerned about the rapidly dwindling timber supply, and started shopping around for alternate sources of paper. The Department of Agriculture was asked to solve the problem. In 1916, Lyster Dewey, botanist in charge of Fibre-Plant Investigations, and Jason Merrill, paper-plant chemist published *Department of Agriculture Bulletin No. 404*.¹⁶ It was a research project to determine the feasibility of using *Hemp Hurds as Paper-making Material**.

Dewey and Merrill came to some startling conclusions, about both hemp and our timber supply. They deserve quoting: “Since hemp hurds are to be treated in this report as a raw material for the manufacture of book and printing papers, the qualities, supply, probable future, and cost of the material will be considered in comparison with wood, with which it must compete. There seems to be little doubt that the present wood supply can not withstand indefinitely the demands placed upon it, and with increasing scarcity economy in the use of wood will become imperative. This effect is already apparent in many wood-using industries... Our forests are being cut three times as fast as they grow... In view of these conditions it is advisable to investigate the paper-making value of the more promising plant materials before a critical situation arises.”

Dewey and Merrill found that to grow hemp and fibre and paper made far more economic and ecological sense than using the same land for woodpulp production. “Every tract of 10,000 acres which is devoted to hemp raising year by year is equivalent to a sustained pulp-producing capacity of 40,500 acres of average pulp-wood lands.”

At the same time this study was done, the authors were confident hemp would continue to be grown in the United States. They concluded that “without doubt, hemp will continue to be one of the staple agriculture crops of the United States. The wholesale destruction of the supply by fire, as frequently happens in the case of wood, is precluded by the very nature of the hemp-raising industry. Since only one year’s growth can be harvested annually the supply is not endangered by the pernicious practice of overcropping, which has contributed so much to the present high and increasing cost of pulp wood. The permanency of the supply of hemp hurds thus seems assured.” (Dewey and Merrill).

The Consumers Union has recommended the legalisation of marijuana, and various state legislatures have legalisation bills under consideration.

Dewey and Merrill were not alone in that belief. As late as 1938 there were people still working to revive the sagging hemp industry. The February 1938 issue of *Popular Mechanics* featured an article on hemp with this heading: “*New Billion Dollar Crop*”. The reason for excitement was the invention of a new machine. The article began: “American farmers are promised a new cash crop with an annual value of several hundred million dollars, all because a machine has been invented which solves a problem more than 6,000 years old... The machine which makes this possible is designed for removing the fibre-bearing cortex from the rest of the stalk, making hemp fibre available for use without a prohibitive amount of human labour...”¹⁷

At last, a solution to the labour problem, but one year too late. The Marijuana Tax Act had gone into effect on October 1st, 1937, four months before the *Popular Mechanics* article appeared. The editors did not think the new Act would be a serious obstacle to the “legitimate culture of hemp”, and concluded their article with this statement: “If federal regulations can be drawn to protect the public without preventing the legitimate culture of hemp, this new crop can add immeasurably to American

agriculture and industry.”

In the early forties, fate intervened on the side of hemp for a brief period. The Japanese bombed Pearl Harbour and invaded the Philippines, cutting off the supply of manila rope and twine, on which our government was depending as a hemp substitute to protect the youth of the country from the dread “marijuana menace”. The health of the young had to be forgotten temporarily, while the farmers of Iowa, Nebraska, Minnesota and other mid-western states rushed into the fields with their tractors to plant hemp.

They were aided in their law-breaking by the federal government. The Department of Agriculture provided seeds, fertiliser, machines, and planting instructions for those who had forgotten how to farm the weed. In 1943 American farmers produced 67,000 tons.

The planting manual, known as *Farmer's Bulletin No. 1935*, is both a historical curiosity and a valuable source of useful information. It was reprinted in 1952, when someone in Washington became worried that the Chinese might invade the Philippines, and cut off our manila rope supply as the Japanese had done in 1941. Now that the paper shortage has hit and another crisis is at hand, a third printing of *Farmer's Bulletin No. 1935* would seem to be in order.

At first glance, the possibility of hemp paper making a comeback may seem pretty remote. However, when we consider the alternatives: a rapidly diminishing timber supply, clearcutting in our national forests, ecological disasters from lost watersheds, deteriorating books in libraries, and escalating wood-pulp paper prices; the repeal of anti-hemp legislation and a crash programme to raise hemp and flax may be our best, if not only, way out. Another possibility would be to sit glued to TV and stop writing, publishing, and reading altogether.

Actually, the repeal of the senseless anti-hemp laws and the restoration of the hemp industry may not be far off. The *Consumers Union* has recommended the legalisation of marijuana, and various state legislatures have legalisation bills under consideration. According to a recent story in *Harper's Magazine*, Iowa is moving rapidly in that direction, and the next marijuana initiative in California is almost sure to succeed.¹⁸

* Note: Hemp hurds are the inner stalk of the hemp plant, the by-product of fibre production.

While reading the comments of book publishers, binders, and printers, one gets the impression they would like nothing better than to see the return of paper made from hemp, flax, and cotton. Librarians, who must watch their cheap wood-pulp books deteriorate and fall apart, would undoubtedly welcome the return of durable hemp/flax paper. Library custodians hold conferences, and launch research projects periodically to combat the problem, but so far without much success.

The *Library of Congress*, in a report on paper-making says: "To preserve man's recorded ideas for future generations, paper manufacturers, book publishers, librarians, and archivists must not only understand the magnitude of the problem but also its urgency and must join forces to solve it."¹⁹

I would like to add one name to the Library of Congress' list of people who need to "join forces" to solve the paper problem—the hemp farmers.

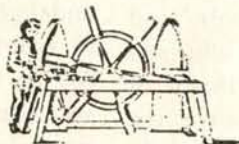
Extract from: *The marijuana farmers*
by Jack Frazier

References

1. On the Origin of Paper, Andre Blum, R. R. Bowker, 1934, p. 16.
2. *Ibid*, p. 17.
3. Papermaking, The History and Techniques of an Ancient Craft, Dard Hunter, Knopf, 1947, p. 70.
4. *Ibid*, map.
5. On the Origin... p. 34.
6. The Book of Grass, George Andrews and Simon Vinkenoog, Grove Press, 1967, p. 32.
7. At the Edge of History, William Thompson, Harper & Row, 1971, p. 124.
8. Licit and Illicit Drugs, Edward Brecher, Little & Brown, 1972, p. 403.
9. Papermaking, Art & Craft, Library of Congress, 1968, p. 34.
10. Papermaking... Hunter, p. 253-254.
11. The Book of Grass, p. 34.
12. Thomas Jefferson's Garden Book, Thomas Jefferson, American Philosophical Society, 1944, p. 466.
13. Papermaking, Lib. of Congress, p. 90.
14. Methods of Book Design, Hugh Williams, Oxford University Press, 1956, p. 284.
15. *Ibid*.
16. Bulletin No. 404, USDA, Lyster Dewey & Jason Merrill, 1916, 25 pages.
17. New Billion Dollar Crop, Popular Mechanics, February, 1938, p. 238.
18. Marijuana Politics Iowa 1973, Vanse Bourjaily, Harper's Magazine, August, 1973, p. 12.
19. Papermaking... Lib. of Congress, p. 90.

THE MARIJUANA FARMERS

HEMP CULTS AND CULTURES

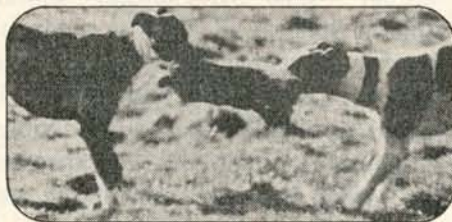


JACK FRAZIER

2.75

SOLAR AGE PRESS

Obtainable from the Ecologist at
£1.50p each to include post and packing



**Join the League
Against Cruel
Sports and
help fight
otter, stag,
fox hunting
and hare
coursing**

The League Against Cruel Sports is the only organisation that specifically buys land to provide refuge for the hunted animal and owns nature reserves where all wild life is protected. Join us. Full details from:-
The Secretary,

League against cruel sports
LIMITED

1 REFORM ROW, LONDON N17 9TW

TELEPHONE 01-801 2177/8

THE ORGANISATION THAT **REALLY** FIGHTS BLOODSPORTS



Barter among Australian aborigines

The Original Affluent Society

by Marshall Sahlins

Hunter-gatherers consume less energy per capita per year than any other group of human beings. Yet when you come to examine it the original affluent society was none other than the hunter's — in which all the people's material wants were easily satisfied. To accept that hunters are affluent is therefore to recognise that the present human condition of man slaving to bridge the gap between his unlimited wants and his insufficient means is a tragedy of modern times.

There are two possible courses to affluence. Wants may be "easily satisfied" either by producing much or desiring little. The familiar conception, the Galbraithian way—based on the concept of market economies—states that man's wants are great, not to say infinite, whereas his means are limited, although they can be improved. Thus, the gap between means and ends can be narrowed by industrial productivity, at least to the point that "urgent goods" become plentiful. But there is also a Zen road to affluence, which states that human material wants are finite and few, and technical means unchanging but on the whole adequate.

Adopting the Zen strategy, a people can enjoy an unparalleled material plenty—with a low standard of living.

That, I think, describes the hunters. And it helps explain some of their more curious economic behaviour: their "prodigality" for example—the inclination to consume at once all stocks on hand, as if they had it made. Free from market obsessions of scarcity, hunters' economic propensities may be more consistently predicated on abundance than our own.

Destutt de Tracy, "fish-blooded bourgeois doctrinaire" though he might have been, at least forced Marx to agree that "in poor nations the

people are comfortable", whereas in rich nations, "they are generally poor".

Sources of the Misconception

"Mere subsistence economy", "limited leisure save in exceptional circumstances", "incessant quest for food", "meagre and relatively unreliable" natural resources, "absence of an economic surplus", "maximum energy from a maximum number of people"—so runs the fair average anthropological opinion of hunting and gathering.

The traditional dismal view of the hunters' fix goes back to the time Adam Smith was writing, and prob-

ably to a time before anyone was writing. Probably it was one of the first distinctly neolithic prejudices, an ideological appreciation of the hunter's capacity to exploit the earth's resources most congenial to the historic task of depriving him of the same. We must have inherited it with the seed of Jacob, which "spread abroad to the west, and to the east, and to the north", to the disadvantage of Esau who was the elder son and cunning hunter, but in a famous scene deprived of his birthright.

Current low opinions of the hunting-gathering economy need not be laid to neolithic ethnocentrism. Bourgeois ethnocentrism will do as well. The existing business economy will promote the same dim conclusions about the hunting life.

Is it so paradoxical to contend that hunters have affluent economies, their absolute poverty notwithstanding? Modern capitalist societies, however richly endowed, dedicate themselves to the proposition of scarcity. Inadequacy of economic means is the first principle of the world's wealthiest peoples.

The market-industrial system institutes scarcity, in a manner completely without parallel. Where production and distribution are arranged through the behaviour of prices, and all livelihoods depend on getting and spending, insufficiency of material means becomes the explicit, calculable starting point of all economic activity.

The entrepreneur is confronted with alternative investments of a finite capital, the worker (hopefully) with alternative choices of remunerative employ, and the consumer... Consumption is a double tragedy: what begins in inadequacy will end in deprivation. Bringing together an international division of labour, the market makes available a dazzling array of products: all these Good Things within a man's reach—but never all within his grasp. Worse, in this game of consumer free choice, every acquisition is simultaneously a deprivation, for every purchase of something is a foregoing of something else, in general only marginally less desirable, and in some particulars more desirable, that could have been had instead.

That sentence of "life at hard labour" was passed uniquely upon us. Scarcity is the judgment decreed by our economy. And it is precisely from this anxious vantage that we look back

upon hunters. But if modern man, with all his technological advantages, still lacks the wherewithal, what chance has the naked savage with his puny bow and arrow? *Having equipped the hunter with bourgeois impulses and paleolithic tools, we judge his situation hopeless in advance.*

Yet scarcity is not an intrinsic property of technical means. It is a relation between means and ends. We should entertain the empirical possibility that hunters are in business for their health, a finite objective, and that bow and arrow are adequate to that end.

The market-industrial system institutes scarcity, in a manner completely without parallel.

The anthropological disposition to exaggerate the economic inefficiency of hunters appears notably by way of invidious comparison with neolithic economies. Hunters, as Lowie¹ put it blankly, "must work much harder in order to live than tillers and breeders" (p. 13). On this point evolutionary anthropology in particular found it congenial, even necessary theoretically, to adopt the usual tone of reproach. Ethnologists and archaeologists had become neolithic revolutionaries, and in their enthusiasm for the Revolution spared nothing in denouncing the Old (Stone Age) Regime. It was not the first time philosophers would relegate the earliest stage of humanity rather to nature than to culture. ("A man who spends his whole life following animals just to kill them to eat, or moving from one berry patch to another, is really living just like an animal himself"² (p. 122). The hunters thus downgraded, anthropology was free to extol the Neolithic Great Leap Forward: a main technological advance that brought about a "general availability of leisure through release from purely food-getting pursuits".³

In an influential essay on "Energy and the Evolution of Culture", Leslie White^{5, 6} explained that the neolithic generated a "great advance in cultural development... as a consequence of the great increase in the amount of energy harnessed and controlled *per capita* per year by means of the agricultural and pastoral arts". White further heightened the evolutionary contrast by specifying *human effort*

as the principal energy source of paleolithic culture, as opposed to the *domesticated plant and animal resources of neolithic culture*. This determination of the energy sources at once permitted a precise low estimate of hunters' thermodynamic potential—that developed by the human body: "average power resources" of one-twentieth horse-power *per capita*—even as, by eliminating human effort from the cultural enterprise of the neolithic, it appeared that people had been liberated by some labour-saving device (domesticated plants and animals). But White's problematic is obviously misconceived. The principal mechanical energy available to both paleolithic and neolithic culture is that supplied by human beings, as transformed in both cases from plant and animal source, so that, with negligible exceptions (the occasional direct use of non-human power), the amount of energy harnessed *per capita* per year is the same in paleolithic and neolithic economies—and fairly constant in human history until the advent of the industrial revolution.⁵

Marvellously varied diet

Marginal as the Australian or Kalahari desert is to agriculture, or to everyday European experience, it is a source of wonder to the untutored observer "how anybody could live in a place like this". The inference that the natives manage only to eke out a bare existence is apt to be reinforced by their marvellously varied diets. Ordinarily including objects deemed repulsive and inedible by Europeans, the local cuisine lends itself to the supposition that the people are starving to death.

It is a mistake Sir George Grey⁷ wrote, to suppose that the native Australians "have small means of subsistence, or are at times greatly pressed for want of food". Many and "almost ludicrous" are the errors travellers have fallen into in this regard: "They lament in their journals that the unfortunate Aborigines should be reduced by famine to the miserable necessity of subsisting on certain sorts of food, which they have found near their huts; whereas, in many instances, the articles thus quoted by them are those which the natives most prize, and are really neither deficient in flavour nor nutritious qualities". To render palpable "the ignorance that has prevailed with

regard to the habits and customs of this people when in their wild state", Grey provides one remarkable example, a citation from his fellow explorer, Captain Sturt, who, upon encountering a group of Aborigines engaged in gathering large quantities of mimosa gum, deduced that the "unfortunate creatures were reduced to the last extremity, and, being unable to procure any other nourishment, had been obliged to collect this mucilaginous". But, Sir George observes, the gum in question is a favourite article of food in the area, and when in season it affords the opportunity for large numbers of people to assemble and camp together, which otherwise they are unable to do. He concludes:

"Generally speaking, the natives live well; in some districts there may be at particular seasons of the year a deficiency of food, but if such is the case, these tracts are, at those times, deserted.

It is, however, utterly impossible for a traveller or even for a strange native to judge whether a district affords an abundance of food, or the contrary... But in his own district a native is very differently situated; he knows exactly what it produces, the proper time at which the several articles are in season, and the readiest means of procuring them. According to these circumstances he regulates his visits to different portions of his hunting ground; *and I can only say that I have always found the greatest abundance in their huts.*"⁸

In making this happy assessment, Sir George took special care to exclude the *lumpen-proletariat* aborigines living in and about European towns. The exception is instructive. It evokes a second source of ethnographic misconceptions: the anthropology of hunters is largely an anachronistic study of ex-savages—an inquest into the corpse of one society, Grey once said, presided over by members of another.

"A Kind of Material Plenty"

Considering the poverty in which hunters and gatherers live in theory, it comes as a surprise that Bushmen who live in the Kalahari enjoy "a kind of material plenty", at least in the realm of everyday useful things, apart from food and water:

"As the !Kung come into more contact with Europeans—and this is already happening—they will feel sharply the lack of our things and will need and want more. It makes them feel inferior to be without clothes when they stand among strangers who are clothed. But in their own life and with their own artifacts *they were comparatively free from material pressures*. Except for food and water (important exceptions!) of which the Nyae Nyae !Kung have a sufficiency—but barely so, judging from the fact that all are thin though not emaciated—they all had what they needed or could make what they needed, for every man can and does make the things that men make and every woman the things that women make... *They lived in a kind of material plenty* because they adapted the tools of their living to materials which lay in abundance around them and which were free for anyone to take (wood, reeds, bone for weapons and implements, fibres for cordage, grass for shelters), or to materials which were at least sufficient for the needs of the population... The !Kung could always use more ostrich egg shells for beads to wear or trade with, but, as it is, enough are found for every woman to have a dozen or more shells for water containers—all she can carry—and a goodly number of bead ornaments. In their nomadic hunting-gathering life, travelling from one source of food to another through the seasons, always going back and forth between food and water, they carry their young children and their belongings. With plenty of most materials at hand to replace artifacts as required, the !Kung have not developed means of permanent storage and have not needed or wanted to encumber themselves with surpluses or duplicates. They do not even want to carry one of everything. They borrow what they do not own. With this ease, they have not hoarded, and the accumulation of objects has not become associated with status."⁹

In the nonsubsistence sphere, the people's wants are generally easily satisfied. Such "material plenty" depends partly upon the simplicity of technology and democracy of property. Products are homespun: of stone, bone, wood, skin—materials such as "lay in abundance around them". As a rule, neither extraction of the raw material nor its working up take

strenuous effort. Access to natural resources is typically direct—"free for anyone to take"—even as possession of the necessary tools is general and knowledge of the required skills common. The division of labour is likewise simple, predominantly a division of labour by sex. Add in the liberal customs of sharing, for which hunters are properly famous, and all the people can usually participate in the going prosperity, such as it is.

For most hunters, such affluence without abundance in the nonsubsistence sphere need not be long debated. A more interesting question is why they are content with so few possessions—for it is with them a policy, a "matter of principle" as Gusinde¹⁰ says, and not a misfortune.

Access to natural resources is typically direct—"free for anyone to take"—even as possession of the necessary tools is general and knowledge of the required skills common.

But are hunters so undemanding of material goods because they are themselves enslaved by a food quest "demanding maximum energy from a maximum number of people", so that no time or effort remains for the provision of other comforts? Some ethnographers testify to the contrary that the food quest is so successful that half the time the people seem not to know what to do with themselves. On the other hand, *movement* is a condition of this success, more movement in some cases than others, but always enough to rapidly depreciate the satisfactions of property. Of the hunter it is truly said that his wealth is a burden. In his condition of life, goods can become "grievously oppressive", as Gusinde observes, and the more so the longer they are carried around. Certain food collectors do have canoes and a few have dog sleds, but most must carry themselves all the comforts they possess, and so only possess what they can comfortably carry themselves. Or perhaps only what the women can carry: the men are often left free to reach to the sudden opportunity of the chase or the sudden necessity of defence. As Owen Lattimore wrote in a not too different context, "the pure

nomad is the poor nomad". Mobility and property are in contradiction.

That wealth quickly becomes more of an encumbrance than a good thing is apparent even to the outsider. Laurens van der Post¹¹ was caught in the contradiction as he prepared to make farewells to his wild Bushmen friends:

"This matter of presents gave us many an anxious moment. We were humiliated by the realisation of how little there was we could give to the Bushmen. Almost everything seemed likely to make life more difficult for them by adding to the litter and weight of their daily round. They themselves had practically no possessions: a loin strap, a skin blanket and a leather satchel. There was nothing that they could not assemble in one minute, wrap up in their blankets and carry on their shoulders for a journey of a thousand miles. They had no sense of possession."

Here then is another economic "peculiarity"—some hunters at least, display a notable tendency to be sloppy about their possessions. They have the kind of nonchalance that would be appropriate to a people who have mastered the problems of production.

"They do not know how to take care of their belongings. No one dreams of putting them in order, folding them, drying or cleaning them, hanging them up, or putting them in a neat pile. If they are looking for some particular thing, they rummage carelessly through the hodgepodge of trifles in the little baskets. Larger objects that are piled up in a heap in the hut are dragged hither and yon with no regard for the damage that might be done them. The European observer has the impression that these (Yahgan) Indians place no value whatever on their utensils and that they have completely forgotten the effort it took to make them. Actually, no one clings to his few goods and chattels which, as it is, are often and easily lost, but just as easily replaced... The Indian does not even exercise care when he could conveniently do so. A European is likely to shake his head at the boundless indifference of these people who drag brand-new objects, precious clothing, fresh provisions, and valuable items through thick mud, or abandon them to their swift destruction by children and dogs... Expensive things that are given them are treas-



Latuko craftsmen—Ilyeu South Sudan

Radio Times Hulton Picture Library

ured for a few hours, out of curiosity; after that they thoughtlessly let everything deteriorate in the mud and wet. The less they own, the more comfortable they can travel, and what is ruined they occasionally replace. Hence, they are completely indifferent to any material possessions."¹⁰

The hunter, one is tempted to say, is "uneconomic man". At least as concerns nonsubsistence goods, he is the reverse of that standard caricature immortalised in any *General Principles of Economics*, page one. His wants are scarce and his means (in relation) plentiful. Consequently he is "comparatively free of material pressures", has "no sense of possession", shows "an undeveloped sense of property", is "completely indifferent to any material pressures", manifests a "lack of interest" in developing his technological equipment.

In this relation of hunters to worldly goods there is a neat and important point. From the internal perspective of the economy, it seems wrong to say that wants are "restricted", desires "restrained", or even that the notion of wealth is "limited". Such phrasings imply in advance an Economic Man and a struggle of the hunter against his own worse nature, which is finally then subdued by a cultural vow of

poverty. The words imply the renunciation of an acquisitiveness that in reality was never developed, a suppression of desires that were never broached. Economic Man is a bourgeois construction—as Marcel Mauss said, "not behind us, but before, like the moral man". It is not that hunters and gatherers have curbed their materialistic "impulses"; they simply never made an institution of them. "Moreover, if it is a great blessing to be free from a great evil, our (Montagnais) Savages are happy; for the two tyrants who provide hell and torture for many of our Europeans, do not reign in their great forests,—I mean ambition and avarice... as they are contented with a mere living, not one of them gives himself to the Devil to acquire wealth."¹²

Subsistence

When Herskovits¹³ was writing his *Economic Anthropology* (1958), it was common anthropological practice to take the Bushmen or the native Australians as "a classic illustration of a people whose economic resources are of the scantiest", so precariously situated that "only the most intense application makes survival possible". Today the "classic" understanding can be fairly reversed—on evidence largely

from these two groups. A good case can be made that hunters and gatherers work less than we do; and, rather than a continuous travail, the food quest is intermittent, leisure abundant, and there is a greater amount of sleep in the daytime *per capita* per year than in any other condition of society.

The most obvious, immediate conclusion is that the people do not work hard. The average length of time per person per day put into the appropriation and preparation of food was four or five hours. Moreover, they do not work continuously. The subsistence quest was highly intermittent. It would stop for the time being when the people had procured enough for the time being, which left them plenty of time to spare. Clearly in subsistence as in other sectors of production, we have to do with an economy of specific, limited objectives. By hunting and gathering these objectives are apt to be irregularly accomplished, so the work pattern becomes correspondingly erratic.

As for the Bushmen, economically likened to Australian hunters by Herskovits, two excellent recent reports by Richard Lee show their condition to be indeed the same^{14, 16} Lee's research merits a special hearing not only because it concerns Bushmen, but specifically the Dobe section of Kung Bushmen, adjacent to the Nyae about whose subsistence—in a context otherwise of "material plenty"—Mrs Marshall expressed important reservations. The Dobe occupy an area of Botswana where !Kung Bushmen have been living for at least a hundred years, but have only just begun to suffer dislocation pressures.

Abundance

Despite a low annual rainfall (6 to 10 inches), Lee found in the Dobe area a "surprising abundance of vegetation". Food resources were "both varied and abundant", particularly the energy-rich mangetti nut—"so abundant that millions of the nuts rotted on the ground each year for want of picking".¹⁵

The Bushman figures imply that one man's labour in hunting and gathering will support four or five people. Taken at face value, Bushman food collecting is more efficient than French farming in the period up to World War II, when more than 20 per cent of the

population were engaged in feeding the rest. Confessedly, the comparison is misleading, but not as misleading as it is astonishing. In the total population of free-ranging Bushmen contacted by Lee, 61.3 per cent (152 of 248) were effective food producers; the remainder were too young or too old to contribute importantly. In the particular camp under scrutiny, 65 per cent were "effectives". Thus the ratio of food producers to the general population is actually 3:5 or 2:3. *But*, these 65 per cent of the people "worked 36 per cent of the time, and 35 per cent of the people did not work at all!"¹⁵

We are inclined to think of hunters and gatherers as *poor* because they don't have anything; perhaps better to think of them for that reason as *free*. "Their extremely limited material possessions relieve them of all cares with regard to daily necessities and permit them to enjoy life".

For each adult worker, this comes to about two and one-half days labour per week. ("In other words, each productive individual supported herself or himself and dependants and still had 3½ to 5½ days available for other activities.") A "day's work" was about six hours; hence the Dobe work week is approximately 15 hours, or an average of 2 hours 9 minutes per day. All things considered, Bushmen subsistence labours are probably very close to those of native Australians.

Also like the Australians, the time Bushmen do not work in subsistence they pass in leisure or leisurely activity. One detects again that characteristic paleolithic rhythm of a day or two on, a day or two off—the latter passed desultorily in camp. Although food collecting is the primary productive activity, Lee writes, "the majority of the people's time (four to five days per week) is spent in other pursuits, such as resting in camp or visiting other camps"¹⁵:

"A woman gathers on one day enough food to feed her family for three days, and spends the rest of her time resting in camp, doing embroidery, visiting other camps, or entertaining visitors from other camps. For each day at home, kitchen routines, such as cooking, nut cracking, collecting firewood,

and fetching water, occupy one to three hours of her time. This rhythm of steady work and steady leisure is maintained throughout the year. The hunters tend to work more frequently than the women, but their schedule is uneven. It is not unusual for a man to hunt avidly for a week and then do no hunting at all for two or three weeks. Since hunting is an unpredictable business and subject to magical control, hunters sometimes experience a run of bad luck and stop hunting for a month or longer. During these periods, visiting, entertaining, and especially dancing are the primary activities of men."¹⁶

The daily per-capita subsistence yield for the Dobe Bushmen was 2,140 calories. However, taking into account body weight, normal activities, and the age-sex composition of the Dobe population, Lee estimates the people require only 1,975 calories per capita. Some of the surplus food probably went to the dogs, who ate what the people left over. "The conclusion can be drawn that the Bushmen do not lead a sub-standard existence on the edge of starvation as has been commonly supposed."¹⁵

Meanwhile, back in Africa the Hadza have been long enjoying a comparable ease, with a burden of subsistence occupations no more strenuous in hours per day than the Bushmen or the Australian Aborigines.¹⁶ Living in an area of "exceptional abundance" of animals and regular supplies of vegetables (the vicinity of Lake Eyasi), Hadza men seem much more concerned with games of chance than with chances of game. During the long dry season especially, they pass the greater part of days on end in gambling, perhaps only to lose the metal-tipped arrows they need for big game hunting at other times. In any case, many men are "quite unprepared or unable to hunt big game even when they possess the necessary arrows". Only a small minority, Woodburn writes, are active hunters of large animals, and if women are generally more assiduous at their vegetable collecting, still it is at a leisurely pace and without prolonged labour.¹⁷ Despite this nonchalance, and an only limited economic cooperation, Hadza "nonetheless obtain sufficient food without undue effort". Woodburn offers this "very rough approximation" of subsistence-labour requirements: "Over the year as a whole probably

an average of less than two hours a day is spent obtaining food" (Woodburn.¹⁶

Interesting that the Hadza, tutored by life and not by anthropology, reject the neolithic revolution in order to keep their leisure. Although surrounded by cultivators, they have until recently refused to take up agriculture themselves, "mainly on the grounds that this would involve too much hard work". In this they are like the Bushmen, who respond to the neolithic question with another: "Why should we plant, when there are so many mongomongo nuts in the world?"¹⁴ Woodburn moreover did form the impression, although as yet unsubstantiated, that Hadza actually expend less energy, and probably less time, in obtaining subsistence than do neighbouring cultivators of East Africa.¹⁶ To change continents but not contents, the fitful economic commitment of the South American hunter, too, could seem to the European outsider an incurable "natural disposition":

"... the Yamana are not capable of continuous, daily hard labour, much to the chagrin of European farmers and employers for whom they often work. Their work is more a matter of fits and starts, and in these occasional efforts they can develop considerable energy for a certain time. After that, however, they show a desire for an incalculably long rest period during which they lie about doing nothing, without showing great fatigue. ... It is obvious that repeated irregularities of this kind make the European employer despair, but the Indian cannot help it. It is his natural disposition."¹⁰

The hunter's attitude towards farming introduces us, lastly, to a few particulars of the way they relate to the food quest. Once again we venture here into the internal realm of the economy, a realm sometimes subjective and always difficult to understand; where, moreover, hunters seem deliberately inclined to overtax our comprehension by customs so odd as to invite the extreme interpretation that either these people are fools or they really have nothing to worry about. The former would be a true logical deduction from the hunter's nonchalance, on the premise that his economic condition is truly exigent. On the other hand, if a livelihood is usually easily procured, if one can usually expect to

succeed, then the people's seeming imprudence can no longer appear as such. Speaking to unique developments of the market economy, to its institutionalisation of scarcity, Karl Polanyi¹⁸ said that our "animal dependence upon food has been bared and the naked fear of starvation permitted to run loose. Our humiliating enslavement to the material, which all human culture is designed to mitigate, was deliberately made more rigorous" But our problems are not theirs.

Orientated forever in the present, without "the slightest thought of, or care for, what the morrow may bring",²³ the hunter seems unwilling to husband supplies.

Rather, a pristine affluence colours their economic arrangements, a trust in the abundance of nature's resources rather than despair at the inadequacy of human means. My point is that otherwise curious heathen devices become understandable by the people's confidence, a confidence which is the reasonable human attribute of a generally successful economy.

A more serious issue is presented by the frequent and exasperated observation of a certain "lack of foresight" among hunters and gatherers. Orientated forever in the present, without "the slightest thought of, or care for, what the morrow may bring",¹⁹ the hunter seems unwilling to husband supplies, incapable of a planned response to the doom surely awaiting him. He adopts instead a studied unconcern, which expresses itself in two complementary economic inclinations.

The first, prodigality: the propensity to eat right through all the food in the camp, even during objectively difficult times, "as if", LeJeune said of the Montagnais, "the game they were to hunt was shut up in a stable". Basedow²⁰ wrote of native Australians, their motto "might be interpreted in words to the effect that while there is plenty for today never care about tomorrow. On this account an Aboriginal is inclined to make one feast of his supplies, in preference to a modest meal now and another by and by." LeJeune even saw his Montagnais

carry such extravagance to the edge of disaster.

"In the famine through which we passed, if my host took two, three, or four Beavers, immediately, whether it was day or night, they had a feast for all neighbouring Savages. And if those people had captured something, they had one also at the same time; so that, on emerging from one feast, you went to another, and sometimes even to a third and a fourth. I told them that they did not manage well, and that it would be better to reserve these feasts for future days, and in doing this they would not be so pressed with hunger.

They laughed at me. 'Tomorrow' (they said) 'we shall make another feast with what we shall capture.' Yes, but more often they capture only cold and wind."¹²

A second and complementary inclination is merely prodigality's negative side: the failure to put by food surpluses, to develop food storage. For many hunters and gatherers, it appears, food storage cannot be proved technically impossible, nor is it certain that the people are unaware of the possibility.¹⁸ One must investigate instead what in the situation precludes the attempt. Gusinde asked this question, and for the Yahgan found the answer in the selfsame justifiable optimism. Storage would be "superfluous", "because through the entire year and with almost limitless generosity the sea puts all kinds of animals at the disposal of the man who hunts and the woman who gathers. Storm or accident will deprive a family of these things for no more than a few days. Generally no one need reckon with the danger of hunger, and everyone almost anywhere finds an abundance of what he needs. Why then should anyone worry about food for the future! ... Basically our Fuegians know that they need not fear for the future, hence they do not pile up supplies. Year in and year out they can look forward to the next day, free of care. ..."¹²

Gusinde's explanation is probably good as far as it goes, but probably incomplete. A more complex and subtle economic calculus seems in play. In fact one must consider the advantages of food storage against the diminishing returns to collection within a confined locale. An uncontrollable tendency to lower the local carrying capacity is for hunters *au fond des choses*: a basic condition of their pro-



Latuko tribesmen tilling their millet fields

Radio Times Hulton Picture Library.

duction and main cause of their movement. The potential drawback of storage is exactly that it engages the contradiction between wealth and mobility. It would anchor the camp to an area soon depleted of natural food supplies. Thus immobilised by their accumulated stocks, the people may suffer by comparison with a little hunting and gathering elsewhere, where nature has, so to speak, done considerable storage of her own—of foods possibly more desirable in diversity as well as amount than men can put by. As it works out, an attempt to stock up food may only reduce the overall output of a hunting band, for the have-nots will content themselves with staying in camp and living off the wherewithal amassed by the more prudent. Food storage, then, may be technically feasible, yet economically undesirable, and socially unachievable.

What are the real handicaps of the hunting-gathering *praxis*? Not “low productivity of labour”, if existing examples mean anything. But the economy is seriously afflicted by the *imminence of diminishing returns*. Beginning in subsistence and spreading from there to every sector, an initial success seems only to develop the probability that further efforts will yield smaller benefits. This describes the typical curve of food-getting within a particular locale. A modest number of people usually sooner than later reduce the food resources within convenient range of camp. Thereafter, they may stay on only by absorbing an increase in real costs or a decline in real returns: rise in costs if the people choose to search farther and farther afield, decline in returns if they are satisfied to live on the shorter supplies or inferior foods in easier reach. The

solution, of course, is to go somewhere else. Thus the first and decisive contingency of hunting-gathering: it requires movement to maintain production on advantageous terms.

But this movement, more or less frequent in different circumstances, more or less distant, merely transposes to other spheres of production the same diminishing returns of which it is born. *The manufacture of tools, clothing, utensils, or ornaments, however easily done, becomes senseless when these begin to be more of a burden than a comfort.* Utility falls quickly at the margin of portability. The construction of substantial houses likewise becomes absurd if they must soon be abandoned. Hence the hunter's very ascetic conceptions of material welfare: an interest only in minimal equipment, if that; a valuation of smaller things over bigger; a disinterest in acquiring two or more of most goods; and the like. Ecological pressure assumes a rare form of concreteness when it has to be shouldered. If the gross product is trimmed down in comparison with other economies, it is not the hunter's productivity that is at fault, but his mobility.

Demographic constraints

Almost the same thing can be said of the demographic constraints of hunting-gathering. The same policy of *debarassment* is in play on the level of people, describable in similar terms and ascribable to similar causes. The terms are, cold-bloodedly: diminishing returns at the margin of portability, minimum necessary equipment, elimination of duplicates, and so forth—that is to say, infanticide, senilicide, sexual continence for the duration of the nursing period, etc., practices for which many food-collecting peoples are well known. The presumption that such devices are due to an inability to support more people is probably true—if “support” is understood in the sense of carrying them rather than feeding them. The people eliminated, as hunters sometimes sadly tell, are precisely those who cannot effectively transport themselves, who would hinder the movement of family and camp. Hunters may be obliged to handle people and goods in parallel ways, the draconic population policy an expression of the same ecology as the ascetic economy.

Hunting and gathering has all the strengths of its weaknesses. Periodic movement and restraint in wealth and adaptations, the kinds of necessities of the economic practice and creative adaptations the kinds of necessities of which virtues are made. Precisely in such a framework, affluence becomes possible. Mobility and moderation put hunters' ends within range of their technical means. An undeveloped mode of production is thus rendered highly effective. The hunter's life is not as difficult as it looks from the outside. In some ways the economy reflects dire ecology, but it is also a complete inversion.

Three to five hour working day

Reports on hunters and gatherers of the ethnological present—specifically on those in marginal environments—suggest a mean of three to five hours per adult worker per day in food production. Hunters keep banker's hours, notably less than modern industrial workers (unionised), who would surely settle for a 21-35 hour week. An interesting comparison is also posed by recent studies of labour costs among agriculturalists of neolithic type. For example, the average adult Hanunoo, man or woman, spends 1,200 hours per year in swidden cultivation;²¹ which is to say, a mean of three hours twenty minutes per day. Yet this figure does not include food gathering, animal raising, cooking and other direct subsistence efforts of these Philippine tribesmen. Comparable data are beginning to appear in reports on other primitive agriculturalists from many parts of the world.

There is nothing either to the convention that hunters and gatherers can enjoy little leisure from tasks of sheer survival. By this, the evolutionary inadequacies of the paleolithic are customarily explained, while for the provision of leisure the neolithic is roundly congratulated. *But the traditional formulas might be truer if reversed: the amount of work (per capita) increases with the evolution of culture, and the amount of leisure decreases.* Hunter's subsistence labours are characteristically intermittent, a day on and a day off, and modern hunters at least tend to employ their time off in such activities as daytime sleep. In the tropical habitats occupied

by many of these existing hunters, plant collecting is more reliable than hunting itself. Therefore, the women, who do the collecting, work rather more regularly than the men, and provide the greater part of the food supply.

In alleging this is an affluent economy, therefore, I do not deny that certain hunters have moments of difficulty. Some do find it "almost inconceivable" for a man to die of hunger, or even to fail to satisfy his hunger for more than a day or two.¹⁶ But others, especially certain very peripheral hunters spread out in small groups across an environment of extremes, are exposed periodically to the kind of inclemency that interdicts travel or access to game. They suffer—although perhaps only fractionally, the shortage affecting particular immobilised families rather than the society as a whole.¹⁰

Still, granting this vulnerability, and allowing the most poorly situated modern hunters into comparison, it would be difficult to prove that privation is distinctly characteristic of the hunter-gatherers. Food shortage is not the indicative property of this mode of production as opposed to others; it does not mark off hunters and gatherers as a class or a general evolutionary stage. Lowie²² asks:

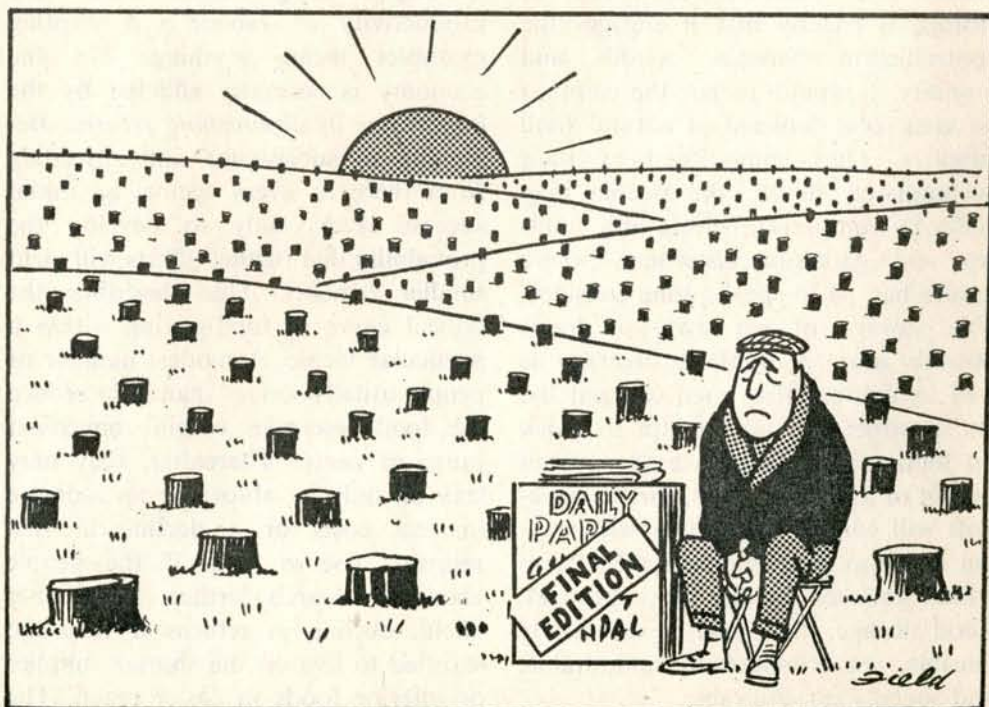
"But what of the herders on a simple plane whose maintenance is periodically jeopardised by plagues—who, like some Lapp bands of the nineteenth

century were obliged to fall back on fishing? What of the primitive peasants who clear and till without compensation of the soil, exhaust one plot and pass on to the next, and are threatened with famine at every drought? Are they any more in control of misfortune caused by natural conditions than the hunter-gatherer?"

Above all, what about the world today? One-third to one-half of humanity are said to go to bed hungry every night. In the Old Stone Age the fraction must have been much smaller. *This is the era of hunger unprecedented. Now, in the time of the greatest technical power, is starvation an insituation. Reverse another venerable formula: the amount of hunger increases relatively and absolutely with the evolution of culture.*

The world's most primitive people have few possessions, but they are not poor. Poverty is not a certain small amount of goods, nor is it just a relation between means and ends; above all it is a relation between people.

This paradox is my whole point. Hunters and gatherers have by force of circumstances an objectively low standard of living. But taken as their *objective*, and given their adequate means of production, all the people's material wants usually can be easily satisfied.



The world's most primitive people have few possessions, *but they are not poor*. Poverty is not a certain small amount of goods, nor is it just a relation between means and ends; above all it is a relation between people. Poverty is a social status. As such it is the invention of civilisation. It has grown with civilisation, at once as an invidious distinction between classes and more importantly as a tributary relation—that can render agrarian peasants more susceptible to natural catastrophes than any winter camp of Alaskan Eskimo.

References

- Lowie, Robert H. 1946. *An Introduction to Cultural Anthropology*. (2nd ed.) New York: Rinehart.
- Braidwood, Robert J. 1957. *Prehistoric Men*. 3rd ed. Chicago Natural History Museum Popular Series, Anthropology, Number 37.
- Braidwood, Robert J. 1952. *The Near East and the Foundations for Civilisation*. Eugene: Oregon State System of Higher Education.
- Boas, Franz. 1884-85. "The Central Eskimo", Smithsonian Institution, Bureau of American Ethnology, Anthropological Reports 6:399-699.
- White, Leslie A. 1949. *The Science of Culture*. New York: Farrar, Strauss.
- White, Leslie A. 1959. *The Evolution of Culture*. New York: McGraw-Hill.
- Grey, Sir George. 1841. *Journals of Two Expeditions of Discovery in North-West and Western Australia, During the Years 1837, 38, and 39...* 2 vols. London: Boone.
- Eyre, Edward John. 1845. *Journals of Expeditions of Discovery into Central Australia, and Overland from Adelaide to King George's Sound, in the Years 1840-41*. 2 vols. London: Boone.
- Marshall, Lorna. 1961. "Sharing, Talking, and Giving: Relief of Social Tensions Among 'Kung Bushmen'", *Africa* 31:231-49.
- Gusinde, Martin. 1961. *The Yamana*. 5 vols. New Haven, Conn.: Human Relations Area Files. (German edition 1931).
- Laurens van der Post: *The Heart of the Hunter*.
- LeJeune, le Père Paul. 1897. "Relation of What Occured in New France in the Year 1634", in R. G. Thwaites (ed.), *The Jesuit Relations and Allied Documents*. Vol. 6. Cleveland: Burrows. (First French edition, 1635).
- Herskovits, Melville J. 1952. *Economic Anthropology*. New York: Knopf.
- Lee, Richard. 1968. "What Hunters Do for a Living, or, How to Make Out on Scarce Resources", in R. Lee and I. DeVore (eds.), *Man the Hunter*. Chicago: Aldine.
- Lee, Richard. 1969. "Kung Bushmen Subsistence: An Input-Output Analysis", in A. Vayda (ed.), *Environment and Cultural Behaviour*. Garden City, N.Y.: Natural History Press.
- Woodburn, James. 1968. "An introduction to Hadza Ecology", in R. Lee and I. DeVore (eds.), *Man the Hunter*. Chicago: Aldine.
- Woodburn, James (director). 1966. "The Hadza" (film available from the anthropological director, department of Anthropology, London School of Economics).
- Polanyi, Karl. 1974. "Our Obsolete Market Mentality", *Commentary* 3:109-17.
- Spencer, Baldwin, and F. J. Gillen, 1899. *The Native Tribes of Central Australia*. London: Macmillan.
- Basedow, Herbert. 1925. *The Australian Aboriginal*. Adelaide, Australia: Preece.
- Conklin, Harold C. 1957. *Hanunoo Agriculture*. Rome: Food and Agricultural Organisation of the United Nations.
- Lowie, Robert H. 1938. "Subsistence", in F. Boas (ed.), *General Anthropology*. (2nd ed.) New York: Rinehart.

Extract from Stone-age Economics. By Marshall Sahlins

REMEMBER TO SUBSCRIBE

Make sure of your copy of THE ECOLOGIST by taking out an annual subscription. ORDINARY rate £4.75. (U.S.A. \$12.00). Members of the Conservation Society, Friends of the Earth, The Soil Association, Henry Doubleday Research Association £4.25. Students attending a full time course £3.75.

Name

Address

.....

Month of first issue required

Cheques, money orders, postal orders should be crossed and made payable to the Ecologist, and sent to **Subscription Dept., Ecologist, 73 Molesworth Street, Wadebridge, Cornwall.**

Information for Survival

Seas and Oceans

The Baltic

The Baltic sea is comprised of a layer of brackish water over a deeper layer of salt water. The entrance is protected by shallow sills. The two layers are divided at a depth of about 60 metres.

Organic detritus occurs, both because of the timber industry and of sewage. It sinks into the deeper layer where it tends to deplete oxygen and so to destroy life by eutrophication. When new salt water passes the sill, it flushes out the nutrients in the deep water which have become unusable because of lack of oxygen. These rise into the brackish water and increase the plant life there. The decay of this increasing biomass—along with further inputs from timber and sewage again depletes the lower layer. When this is again flushed out by oxygenated ocean water there is again increase in the plant life in the brackish water. The decay of this again increases deoxygenation of the deeper waters. The bottom turns black and dead.

The ecosystem is unstable. The Baltic has no tides. The low temperature slows chemical reactions. The turnover rate of the water is slow by reason of the sills. It is possible that the sea bed will be permanently covered with hydrogen sulphide as in the Black sea. This will affect fisheries enormously.

Dr Bengt Lundholm. *Nature In Focus* 1973
Ref: 000,619

The Mediterranean

Whereas outside-ocean water entering the Baltic flows into the bottom layer, in the Mediterranean it flows into the top layer—this ocean water being lighter than the general volume of Mediterranean water. A "reverse fountain" results and renews the oxygen diminished by the respiration of animals in the upper layer. Pollutants which can mix and dissolve in the water can eventually find their way out to the Atlantic or are precipitated in the deep bottom sediments. On the other hand, spilt oil stays at the surface and therefore tends to accumulate. Floating waste, such as plastics, in the Atlantic can, of course, also be carried in by the surface current. In most places, beach pollution by oil and by petrochemical residues gets worse each year. The vastly augmented sewage still mostly goes into the sea untreated—now spiced with modern additions such as synthetic detergents, with locally most unpleasant results.

Dr S. J. Holt. *Nature in Focus* No. 17.
Ref: 000,620

North East Atlantic

The accumulation in fish and shellfish of certain persistent substances, such as metals and very slowly degradable organic sub-

stances, may reach levels which are objectionable on public health grounds. Locally, in estuaries and bays where industrial effluents are present, levels in fish which which spend much of their life close in-shore, or in static shellfish, may be such that very high rates of consumption are undesirable. In Sweden this has led to the banning of the sale of certain fish, particularly salmonids, from some estuaries. In the Baltic the use of cod liver oil for human consumption has been stopped because of high organo-chlorine content.

H. A. Cole. Fisheries Laboratory, Lowestoft.
Nature in Focus 1973 No. 17.

Ref: 000,621

Land Surface

Pollution

Seventy per cent of all of Scotland's liquid chemical waste is being tipped at Eastfield Quarry, midway between Glasgow and Edinburgh. The dumping of toxic materials at this site is still perfectly legal in spite of the Deposit of Poisonous Wastes Act 1972. *The Guardian* 25.10.73, p. 6.

Ref: 000,597

Resources

Oil

More than 4 million gallons of used motor oil are dumped in gardens or down drains each year by Britain's do-it-yourself motorists says an AA report in the magazine *DRIVE*. The oil, rich in lead from petrol, cadmium from bearing metal, and probably copper and other toxic metals, severely inhibits bacterial activity in soil, takes many years to degrade, and leaves potentially harmful residues much longer.

The Guardian 18.1.74, p. 5.

Ref: 000,589.

Other Juggernauts

Juggernaut felling-machinery can now clear mature forest at the rate of, say, 5,000 to 6,000 trees a day, with a typical working group of 50 to 60 men.

Harford Thomas *The Guardian* 30.10.73.

Ref: 000,592.

Comment: In the meantime we are running out of trees—just as we are running out of fish.

Paper

Britain alone throws away more than six million tons of paper every year and one ton of waste paper is equivalent to the pulp from 17 trees. Paper equal to a very large forest of more than 100 million trees is simply being thrown away.

Clive Woodcock *The Guardian* 21.11.73.

Ref: 000,593.

New OPECs?

The organisation of Petroleum Exporting Countries has taken a scarcity price for oil. The Americans are now concerned that producers of bauxite, copper, tin and coffee could organise, to secure scarcity prices in these markets.

Adrian Dicks *Financial Times* 14.3.74.

Ref: 000,623.

Comment: Free market forces become inexplicably mixed with "unreasonable restraints".

Social Organisation

The Bonanza

Abu Dhabi lies on the Persian Gulf opposite Iran. In September 1973 it was producing 1.4 million barrels of oil per day. In October this oil sold at \$6 per barrel and the price has since gone up. The October income gives a yearly revenue of 3½ billion dollars.

Abu Dhabi has a population of about 100,000 of whom no more than 25,000 are nationals. The first generation of school children are beginning to complete their secondary education and it will be some time before they graduate from Universities. Not more than a handful of Abu Dhabi nationals hold major posts in the government.

David Housego. *Financial Times* 3.1.74.

Ref: 000,587

Comment: Parallel bonanzas from the price of oil are occurring in Venezuela and Indonesia. Nigeria notices.

The British Law

Local Authorities already have limited powers for requiring factories to control their discharge, but the penalties available have been hopelessly inadequate, and long-standing offenders have been largely free to go on in the old way. Councils were in any case inhibited from pressing too hard, because the factories would often be major sources of local employment and unwilling to undertake, perhaps expensive, alterations. Under the new system, river pollution will be the affair of the regional water authorities, which are much larger and it will be possible to lay down standards by regulation. In a field much bedevilled by secrecy—on the pretext that the published analysis of effluent might enable a firm's competitors to spy on its methods, registers will be set up listing discharges for which consent has been given, with analyses of samples.

The Times 6.11.73.

Ref: 000,584.

Comment: The law is effective but only when used.

Energy

Tidal Power

The Department of Civil Engineering in the University of Bristol is considering a Severn barrage to harness power.

They propose linking tidal output with pumped-storage facilities within the already flooded estuary on a low-head basis. Their plans would make extra transmission lines unnecessary and would remove pressure from special inland reservoirs. They state that their scheme could produce constant power over the same 12-hour, high-load period every day at a rate equivalent to one-eighth of our maximum national requirements.

R. T. Severn and T. L. Shaw.

Letter to *The Times*, 19.11.73.

Ref: 000,595.

Geothermal Power

There are perhaps 1,000 kilometre-size bodies of hot rock which lie anomalously near to the surface of the U.S. These are enough to satisfy the Western region's power needs for a very long time. The injection of water might both fracture the rock and jack up the strata so as to facilitate percolation. Steam would be withdrawn through separate exit holes. Since hot water dissolves many minerals it will be hard to keep cooler-piping free of mineral deposits. Moreover percolation channels tend to become enlarged where the flow is greatest—thus leading to large mass flow with poor heat transfer.

Prof. David J. Rose. *Scientific American* 230, January 1974, p. 23.

Ref: 000,611.

America's portion

The US has six per cent of the world's population, nine per cent of the world's oil reserves—and uses 49 per cent of the world's energy.

Robert Entwistle. *Sierra Club Bull.*

November, December 1973, Vol. 58, No. 10, p. 9.

Ref: 000,581.

Efficiency of Use

The use of energy in the US reaches the prodigious sum of 1.9×10^{14} B.t.u. per day or a 11 kilowatts continuously for every person. This goes somewhere and its rational use is only now receiving appreciable attention. The efficiency with which energy is consumed ranges from less than 5 per cent for the ordinary incandescent lamp to perhaps 75 per cent for a well maintained home furnace. The automobile engine has an efficiency of less than 20 per cent. Modern fossil-fuel plants are more than twice as efficient. On the average probably less than 35 per cent of all the B.t.u.'s consumed end up as comfort heat, useful work or visible light. Low as the figure is, it has probably quadrupled since 1900. Up to the present time the allotment of funds for developing efficient energy converters has been paltry.

Prof. David J. Rose. *Scientific American*, Vol. 230, 1 January 1974, p. 27.

Ref: 000,612.

The Athabasca Oil Sands

Geological maps show that the main deposits are widely scattered over 12,000 square miles, highly fractured in area and in depth, lying at all angles—near the surface or as deep as 2,000 feet.

The Alberta Conservation Board divides the reserves according to level—that is zero to 100 feet where 38,000 million barrels might be recovered by known means of extraction yielding $26\frac{1}{2}$ million barrels of synthetic oil; between 100 and 150 feet there are large reserves but there is no proved way of extracting the bitumen sands below the 100 foot level. The only practical reserve level is the first line with recoverable oil of 38,000 million barrels. This compares with an annual oil usage in the US of, say, 5,000 million barrels.

Robert Gibbens. *The Financial Times*, 10.1.74, p. 5.

Ref: 000,586.

NEW PENGUINS ON THE ENVIRONMENT



MENTAL MAPS

Peter Gould and Rodney White

This book opens up a new field of study which will be of vital importance for future planning and for widening our perception of the environment. It concerns the 'geography of perception': the mental images we form of places which are inevitably shaped by a selective channelling of information. The authors examine how these mental images affect our lives, and show mental maps at work in America, Sweden, South East Asia, parts of Africa and Britain. 75p

Other Penguins on the Environment

A BLUEPRINT FOR SURVIVAL

The Ecologist 30p

THE ENVIRONMENTAL REVOLUTION:

A Guide for the New Masters of the World

Max Nicholson 60p

MAN AND ENVIRONMENT

Robert Arvill (Third edition) 60p

ONLY ONE EARTH:

The Care and Maintenance of a Small Planet

Barbara Ward and René Dubos 45p



Forthcoming (June 1974)

CONFLICT IN MAN-MADE ENVIRONMENT

Anatol Rapoport

Considers how human conflict intimately affects the 'symbolic' environment (that is the non-material body of knowledge) which may be a more powerful determinant of man's condition than pollution, war or urbanization. This book is one of the finest in a new series of books broadly categorized under the title of 'Concepts in Man-Made Environment'. Further titles are in active preparation. 60p



Boycott the Bullfight

Bulls are sent into the ring in such a condition that a lady could dispatch them with ease. So, unless you enjoy the wanton letting of blood, or seeing such sadistic cruelty, join us, an entirely voluntary organisation. Membership £1 (min) or send donation to:

The International Council Against Bullfighting
(Dept EC), 10, Queensborough Terrace, London W.2.

BOYCOTT THE BULLFIGHT

Last season, 6,600 bulls were needlessly tortured to death for fun, over 200 horses were crushed, maimed or died with serious internal injuries. There is so much more to Spain than these barbaric shows—the locals prefer football! Yet it is only the tourist ticket money that maintains these unequal contests.

For the **LARGEST** range of

★ **slides**

★ **filmstrips**

★ **filmstrips with sound**

Architecture • Art • Astronomy • Biology • Careers
Creative Arts • Commerce • Design • Economics
Ecology • Electronics • Environmental Studies
Geography • History • Meteorology
Moral Education • Physics • Transport • etc

You must see the 1974 SLIDE CENTRE catalogue
40 colourful pages with over 1000 titles

for your FREE copy write to—

THE SLIDE CENTRE (Dept EC4)

Portman House 17 Brodrick Road London SW17 7DZ

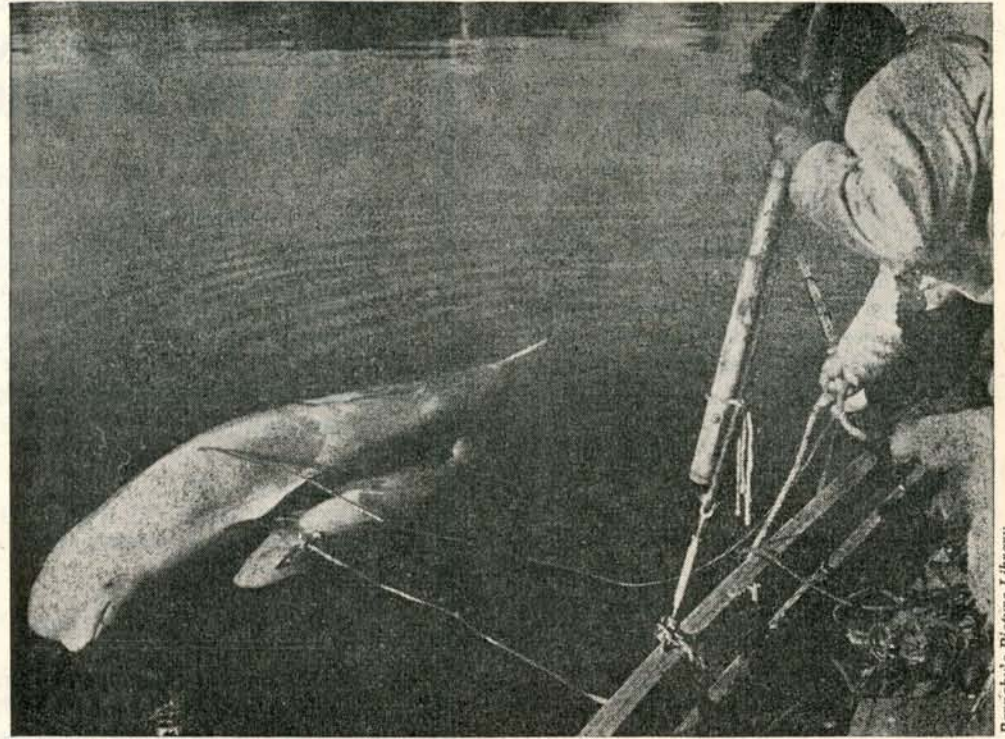


Reports

WHALING The slaughter continues

Whaling—The bloodshed continues in spite of growing world opinion in favour of a ten year moratorium on commercial whaling; in spite of an urgently worded United Nations' recommendation to stop whaling; in spite of the fact that eight out of fourteen members of the International Whaling Commission voted in favour of a whaling ban; enormous factory ships flying Japanese and Russian flags will again scour the seas for the last great whales. This season 37,500 whales have been earmarked for slaughter, as well as countless smaller whales and dolphins. And for what?

Russia and Japan are not the only whaling nations, though they account for 84 per cent of the recorded whale catches. Peruvian fleets, owned in part by Japanese interests, are killing protected humpback whales in unreported numbers and turning them into "fish sausage". Chile, Brazil and Spain are among countries that whale and do not fully report their catches. Last year only the USSR reported taking members of protected endangered species (seven blue whales and five humpbacks). But there is good reason to assume that these reported kills are only a small part of the story. International patrolling is non-existent. Whalers know that it is not good policy



Barnaby's Picture Library

to get caught killing endangered species; gunners and crew will be fined, and it will look bad in the reports. But most whales are processed on the open sea, and after the 30 minutes to an hour it takes to reduce the awesome bulk of a great whale into bone, oil and meat, no one could ever know what species the creature had been.

Last year the International Whaling Commission set a total world quota of 37,500 animals. At its June 1973 meeting in London the Commission set quotas for the Antarctic and North Pacific; for fin whales sei and brydes whales, minkes and sperm whales. These quotas were set despite the desire of Argentina, Australia, Canada, France, Mexico, Panama, the US and the UK that there be a total moratorium on the taking of all species, and despite the fact that with the exception of the minke whale quota, none of last year's quotas were filled.

The other commercial species were apparently too scarce to find and slaughter. The Whaling Commission, even though it assures us that it is finally regulating whaling and protecting the stocks, is still being browbeaten into accepting quotas more on the basis of political necessity—that is, not incurring the wrath of Japan and Russia—than on scientific evidence.

Japan and Russia threaten continuously to disregard international sanctions entirely if the quotas are not set high enough to please them, and Japan has already lodged objections on

three critical decisions made at the last meeting: (1) the phase-out of fin whaling in the Antarctic in three years, (2) the minke whale quota, and (3) catch regulations of sperm whaling by region.

To understand how this works consider the bizarre goings-on surrounding the setting of the minke whale quota for the coming season. At the June meeting Japanese scientists attempted to create by scientific fiat some 150,000 previously unknown minke whales to justify higher quotas. The year before the minke whale population had been estimated at 150,000 animals and a total worldwide quota of 5,000 was agreed on by the member nations of the I.W.C. At the last meeting the Japanese scientists re-estimated the minke whale population, not on the basis of seeing more whales, but on the basis of a new mathematical model, and came up with a figure of 300,000 rather than 150,000 minkes and asked for a worldwide quota of 12,000. Neither the Scientific Committee of the Commission nor the Commission itself accepted the Japanese reasoning, and set the minke quota at 5,000. Now Japan has lodged an official protest of the minke quota and has declared that it will take 4,000 minkes itself whether or not anyone else agrees.

A further example is the controversy surrounding the continued killing of fin whales in the Antarctic. These magnificent creatures, second in size only to the great blue whales, are quickly nearing the point of commercial—if not biological—extinction.

In 1953-54, whalers took 27,659 fin whales out of the Antarctic; and now only 20 years later it is unlikely that the quota of 1,450 fin whales set for the Antarctic can be reached.

The fin whale has been slaughtered to one fifth of its original number and is on the US government's Endangered Species List. At the last meeting of the I.W.C. the US urged a total ban on the taking of fins in the Antarctic. In response to threats by the USSR and Japan that if a fin quota were not set that met the needs of the whaling industry they would abandon the International Observer Scheme and set their own fin whale quota, the rest of the nations went along and agreed to the quota of 1,450 fin whales in the Antarctic with a rider that there be a phase-out to no hunting within the next three years. Now Japan has filed a formal protest, indicating that she will not be bound by the phase-out rider, thus undoing at a stroke the pitifully minimal conservation achieved at the last meeting. The spectacle of two powerful and affluent nations squabbling over the pitiful remains of once great herds of fin whales is obscene and absurd.

The final issue is perhaps the one which most clearly indicates the Alice in Wonderland science of the International Whaling Commission and of the whaling nations. The Japanese and Russians based their rejection of the proposed moratorium on a statement from the Scientific Committee that "a blanket moratorium cannot be justified scientifically... prudent management requires regulation of the stocks individually". Claiming that a moratorium represented blanket management and claiming that it was not scientifically justified, Japan and Russia argued vehemently against the moratorium. However, when the same scientific committee recommended very strongly that the catch of sperm whales in the South Pacific be regulated by region to protect regional animals and insure some minimal conservation in the face of a massive onslaught against sperms, the USSR objected. Now the Japanese government has filed a similar protest claiming that catch regulation of southern stocks of sperm whales by sea area is not based on adequate scientific findings.

And so the gun sight narrows and comes to rest on the smaller whales as the great whales disappear. Since the

advent of modern whaling, two million whales have died. More whales were slaughtered in the 1960s—half a million died—than at any other time in whaling history. Modern whaling techniques are like modern warfare—inhuman, efficient, and deadly.

But in spite of this past history, the whales will be saved. In the three years since the idea of a whaling moratorium was first presented to the International Whaling Commission, there have been enormous changes in public understanding and attitude regarding the conservation of whales. Almost every international conservation and wildlife organisation now supports the moratorium, including the prestigious World Wildlife Fund and the International Union for the Conservation of Nature (IUCN). The United Nations' Conference on the Human Environment meeting in Stockholm recommended the moratorium, and the UN has given its approval to this recommendation. In 1972, while only four nations in the I.W.C. supported the ban (they were Argentina, Mexico, the US and the UK), the 1973 meeting saw Australia, France, Panama, and Canada join the pro-moratorium forces. In Japan, public interest in whales and the issue of whaling is rising, and many voices are raised questioning whether the Japanese want themselves to be represented in the eyes of the world by one greedy industry. The Russians continue to say privately that they will be out of whal-

ing within the next few years. While publicly continuing to pursue the same ruthless policies in the oceans.

In spite of fears of some that the USSR and Japan might bolt the I.W.C. and continue whaling as unregulated pirates, it seems clear that neither nation would risk world opprobrium for such marginal profits and short-range economics as those of the dying whaling industry.

The appeal must now be directly to the leaders of the USSR and Japan. The issue of the whales seems the clearest symbol of our planetary problems and whether or not we can deal with them effectively. We are at a great turning point in human history. We must find the global connections and relationships necessary to solve problems that far transcend national boundaries; problems created largely by the human tendency to treat the earth and its creatures as if we were the only generation to have to live on it. We need to learn something about time and our place in it. Killing off the world's great whales, who have taken 65 million years to evolve, for 10,000 seasonal jobs for a few years is the economics of insanity. The spirit and the letter of the Stockholm Conference on the Human Environment find their first test in the question of whether we can save the whales. Perhaps we can stop in time, and demonstrate that the human being is an intelligence on this planet.

Joan McIntyre

Bread

don't eat it until you've read it

Why is the British loaf not allowed into any other Common Market country? Your daily bread is the most chemically treated in Western Europe: is it really good enough to eat?

A brilliant new research team, TACC, spent two years examining the British bread industry, and felt it must publish its findings.

Get your copy of *Bread: an assessment of the British bread industry*, and discover what lies beneath that stiff upper crust. Written by academics for the intelligent general reader. Carefully annotated, with extensive index. Available in elegant standard edition, only direct from the publisher.

Send to:

Intermediate Publishing Limited
P.O. Box 6 Kettering Northants

Please send me copy/copies of your new book, *Bread*, at £1.25 a copy (including p & p within the UK).

I enclose total amount £

(Please make cheque/postal order payable to: Intermediate Publishing Limited).

NAME _____ (Block letters please)

ADDRESS _____

Orders fulfilled within 21 days.

EC

Intermediate Publishing



Books

The environment is still with us

ASPECTS OF ENVIRONMENTAL PROTECTION.

Edited by S. H. Jenkins (I.P. Environmental Ltd., London)

ENVIRONMENTAL POLICY: CONCEPTS AND INTERNATIONAL IMPLICATIONS.

Edited by Albert Utton and Daniel H. Henning. (Praeger Publishers, New York) 1973.

ENVIRONMENTAL PROTECTION AGENCY: A PROGRESS REPORT

(Administrator: William D. Ruckelshaus) (U.S. Govt. Printing Office) 1972.

UNDER SIEGE: MAN, MEN AND EARTH.

Kenneth A. Wagner, Paul C. Bailey, and Glenn H. Campbell (Intertext Publishing Ltd, New York) 1973 £5.

Recent anxieties about expensive energy and the adverse balance of payments have eclipsed public concern about the environment. Let us hope it is no more than an eclipse; for after we have become reconciled to costly oil and coal, intensified commercial competition from abroad, and (probably) no short-term improvement in the material standard of living, we shall find that environmental problems are still with us. Unless public concern in the environment is rekindled, much of the good work began in the early 1970s may lose its impetus.

So it is in the public interest that new books on the environment should continue to appear and that attention should be drawn to them. One may well ask what still needs to be written. The public have been showered with cool government reports, hysterical

predictions about impending doom, computerised speculations, and a whole library on environmental technology; the lot. However, there is still more to be said, and each of these four books has something new to say.

Aspects of Environmental Protection deals with the nuts-and-bolts of pollution technology. It is the report of a conference, with contributions from 25 speakers, on the control of air and water pollution, noise and vibration, and the disposal of solid wastes. One good feature of the book is the large number of graphs, tables and illustrations. It is very useful to have, from experts, brief and documented summaries on such topics as new techniques of sewage treatment, automatic monitoring of water quality, controversial issues about control of emission from motor vehicles, the techniques for noise abatement on streets, and the incineration of solid wastes. The contributions are, as one would expect, uneven; those on technology are the more interesting, and those on economics are the weaker. But the general impression created by the book—and I believe it is correct—is that the technology for environmental control is, by and large, already available; most of the difficulties to be overcome are economic or legislative. It costs money to protect the environment, and it requires legislation. The costs fall on the public and legislation requires the consensus of the public. So environmental protection becomes a matter of public conscience.

A handbook about environmental technology contains many useful facts which readers of the book may want to quote. So it has to be added that *Aspects of Environmental Protection* is a carelessly edited book. Indeed, it does not seem to have been edited at all. On page 100 there is a paragraph of discussion on Mr Stedman's paper. On page 101 the discussion (now on Dwight O. Stedman's paper) is repeated verbatim. Well, not quite verbatim; for the formula for phenol in the repeated version contains no carbon! On page 209 the oxides of nitrogen are described as NOX, and six lines further down (this time correctly) as NO_x. D. S. Sharp's contribution (page 163) is followed by a discussion, to which the author D. H. Sharpe (sic) replied. Some of the diagrams have no adequate legends or labels (e.g. there is no label to the

ordinate in figure I). It is a great pity that a book with so many useful ideas cannot be read without apprehension lest the data should be incorrect.

Aspects of Environmental Protection is about the tools for the job. *Environmental Policy: concepts and international implications* is about the politics of the job. It, too, is a collection of essays, 25 of them, from two issues of *Natural Resources Journal*, published by the Law School of the University of New Mexico. The essays tackle the basic problem of environmental protection, namely, the value systems of society in regard to the environment. Social values (as Geoffrey Vickers has written) define norms; norms determine policies; policies are carried out through economic devices (tariffs, subsidies, taxes) or through legislation. So to examine the prospect for environmental protection, one has to go back along the chain of causation, through norms to values.

This is what this book tries to do, with considerable success. All a reviewer can do is to sample the essays, and to urge anyone seriously interested in the environment to read the book. Lynton Caldwell's essay is a good place to start. American society, he writes, is suffering from "hypertrophic affluence". The hypertrophic society embarks upon an ever accelerating cycle of self stimulation; development feeds development... and this produces interdependent vulnerable, unstable, social systems. Caldwell faces squarely three prospects for such a society, all unpalatable. One prospect is that the public simply will not accept present constraints and self-denials as an insurance for future generations; somehow technology will solve future problems as it has solved problems in the past. Let our grandchildren take care of themselves. A second prospect is that social values will change, the public conscience will respond, when the environmental crisis is understood; but Caldwell holds out little hope for this. Societies, like organisms, may adapt in response to crises; they do not adapt in anticipation of crises. So the public is likely to put off change until it is too late to change. The third prospect is that the headlong rush to disaster may be averted by the emergence of a new (and presumably dictatorial) leadership. Abdication from democracy may be the price of survival. "Duress," he writes, "has been

the most reliable mover of men."

Caldwell's perceptive essay sets the scene for a number of admirable contributions on environmental policy and politics, the role of litigation, public participation and "open" information, international policy, and (a characteristically thoughtful essay by Abel Wolman) global pollution and human rights. Wolman introduces a case history, which is a reliable indication of the level of the public conscience in global problems: what (he asks) is society's obligation to the arctic environment? Since he wrote his essay the Middle East crisis has occurred, and we have had a measure of the level of public conscience: a pretty low level. Keeping American automobiles on the road—is, in social values—far more important than protecting the arctic.

This important, and, so far, unique book at last puts environmental policy in its right perspective. Technological problems of control are secondary; the primary problem is to lift the level of social values, to sharpen the public conscience. As one contributor puts it: what is required is a "theory of environmental administration".

The third book in this package contains if not a theory, at any rate a hypothesis of environmental administration. *Environmental Protection Agency: a progress report*, records the activities of the EPA in America, from 1970-72, under the vigorous leadership of William D. Ruckelshaus. The EPA was set up in December 1970, with sweeping powers to act on behalf of the environment as zealously as trade unions act on behalf of the employees. In its first year of operation the EPA plunged into such controversial issues as the cross-Florida canal, supersonic transport, the Alaska pipeline, mercury in water, asbestos in air, DDT, and the necessity for environmental impact statements before any enterprise which will affect the environment is permitted.

The achievements, summarised with a wealth of statistics in this book, have received plenty of publicity already. For the British reader the most interesting feature is the emergence of a "philosophy" for environmental control, very different from that adopted in Britain. The British "philosophy" is severely pragmatic. For air the Department of the Environment (through the alkali inspectors), and for water the Regional Water Authorities (formerly the River Authorities) give

what are virtually consents-to-pollute. The consents are determined by the location (it is assumed that the Trent will be dirtier than the Dee and the air over Tees-side dirtier than the air over Plymouth), and by the polluter's ability to abate his pollution by "the best practicable means". There are, of course, reserve powers of prohibition, but the system works—and works tolerably well—by rule-of-thumb *ad hoc* decisions.

By contrast, the American policy is to have air-and-water quality criteria and to set air and water quality standards (e.g. that the concentration of sulphur dioxide over a 24-hour period must not exceed 0.14 parts per million, *anywhere*). Based on these standards there is drawn up a set of emission standards, and these are enforced by legislation. The American system looks neater; but in fact it is an uneconomic way to use the environment and it demands a complex and expensive monitoring service.

It is instructive to put this EPA report beside the annual reports of the alkali inspectors or the recent air and water pollution surveys of Britain. My own view (subjective and certainly open to challenge) is that the British "philosophy", given our smaller size and our sophisticated civil service and local government, is better for our environment than the more doctrinaire American "philosophy" would be.

The last book in this package is very different from the others. *Under Siege* is a text book of environmental biology. It is, as its title suggests, frankly tendentious. It is elegantly illustrated, and it covers a very wide field. The book opens with discussions of air, water and soil in relation to man. Then come chapters on stresses, both ecological and personal, a discussion of disease (including a clinical account of venereal disease); a chapter on drugs, with lurid accounts of the effects of heroin and LSD, and even a photograph of a girl injecting herself; then some ecological stresses, with a discussion of pesticides and the danger of extinction of gazelles, ostriches and koala bears. The next set of chapters returns to personal stresses arising from population. Human reproduction is well described (with numerous anatomical photographs) and there follows a sort of child's guide to contraception. The book ends with an inconclusive and woolly chapter on the

quest for an environmental ethic.

It is difficult to decide what sort of readership the authors have in mind. Some of the biology is of primary school level. The chapters on drugs and contraception are frank accounts suitable for upper teenagers. A great deal of solid information is packed into the book; and while many of the illustrations (e.g. a photograph of boxes of oral contraceptives) seem superfluous, there are others (e.g. the photographs of insects) which are very good. The scope of the book is so wide that the treatment is inevitably superficial; but as a satellite-survey (so to speak) of biology in relation to man and the environment, it is fresh and outspoken and (on the whole) reliable.

Eric Ashby

Architecture—how to change it

TOWARDS A HUMANE ARCHITECTURE by Bruce Allsopp. Frederick Muller Limited, £2.50.

In this very short book Bruce Allsopp tries, with considerable success, to analyse the maladies of contemporary architecture and outlines a possible cure. If accepted wholeheartedly his remedies must surely cause an upheaval in the conventions of the architectural profession, and a long needed revolution in its educational and academic outlook. Scepticism, disillusionment and even disgust with the physical environment produced by the modern movement is widespread. Furthermore the most brilliant futuristic architects appear to have chosen ways which lead to dead ends. So what has gone wrong?

By delving down into the roots of the architectural movement the author emphasises that modern architecture has patently failed to provide a sound environment for human activity because of its excessive zeal for materialistic functionalism. Consequently, architects have produced austere machines for living stacked into volumes where sculptural or ornamental aesthetics are hardly meaningful to their users and inhabitants. Their needs instead are an environment which satisfies them on the physical, emotional, intellectual, and social levels.

Architects are a reflection of the society in which they live and an impersonal, monotonous environment can be seen as the natural product of a bureaucratic society, whose real values are distorted through its economic system. Like many contemporary planners and politicians, Mr. Allsopp is strongly critical of the way that land can be bought and sold by the speculators, then to suffer the fate of unimaginative, shoddy, even puerile planning. Even then, the panacea is not simply "socialism". Indeed in socialist countries where land is publicly owned the poor standard of environmental design is all too apparent.

What then is the role of the architect in creating a humane environment? Here Bruce Allsopp suggests two levels at which architects must first understand the problems facing them. Through a convincing historical analysis, he classifies architectural ideas into two major categories: the "Aedicule", which is mainly the home or space enclosure of man and his activities, and the "Trilithone", which is the non-enclosing symbolic monument of man to himself or his ideas. By consistently and wrongly applying concepts and symbols of the latter to the design of domestic architecture—mainly since the modern technological period—architects have frustrated man's deep needs to have his personal, individual home. This is strongly linked with the architect's traditional main occupation with designs of the monumental type, while most domestic architecture was dominated by craftsmen and users, and thus had an immediacy and a humane character. The psychology, philosophy and methodology which may be applicable to public monumental objects seem to fail when confronted with the problems of domestic architecture.

The other level, at which Allsopp sees the architect's responsibility, is that through their attachment to the wider modern movement in art, the ideals of personal self expression have been applied to a type of social creation, in which this approach is completely irrelevant and not legitimate. By maintaining this attitude, architects have become even more detached from reality. In view of all these difficulties, which are only too true, it is hard to visualise how the author expects architects to change

from this "transition" period to a humane architecture, which will reconcile man to his society and its natural and man-made environment. The designer is not within his rights as social reformer, similarly he lacks the capacity and power. The author's stating all this "loudly and clearly", as recommended, does not seem to be an effective strategy. He also recommends a complete change in architectural research and in the way that design problems are tackled. This is most commendable, but has flaws: focusing architecture on research takes a very long time and it needs a very deep-going transformation of architectural education. This must be a formidable process, as the replacement of the traditional art orientated values of the

studio situation by new man-orientated ones can only be done by staff whose appointment must be aimed at this new concept of architecture. The present design-orientated criteria of academic life are not adequate for this situation, neither are many suitable candidates available yet.

In spite of all these remarks, this is a most sensible way for the architectural profession to take, if it wishes to be meaningful to the development of a humane environment. A first step on this track would be to recommend this book to teachers and students of architecture, as well as to other people, who feel discontent with the present patterns of our environmental relationships.

Michael Meyer-Brodnitz

ITS A GAS NEW PRODUCTS 20p A2 POSTER

From the immortal pens of **LIT** comes this A2 size informative poster showing exactly how to run a car on gas, converting it with the minimum cost. The reverse shows several new products and services available from **LIT**.

ORDER NOW. 20p including p. & p.

The Environment

John D. Baines
Past-into-Present Series
65 b/w photographs
£1.50

Man's activities modify the environment. John Baines shows how to discover from the landscape the evidence of past changes and illustrates the effects of our modern way of life on our surroundings.

Disease and World Health

Nance Lui Fyson
World Wide Series
64 b/w photographs
£1.50

Here Nance Fyson shows that the pattern of disease varies between rich and poor societies. She describes their attempts to provide health care and some of the social problems which arise.

World Population

M. D. Palmer
World Wide Series
64 b/w photographs
£1.50

It is vital to check the growth of the world's population. Michael Palmer tells us what failure could mean, and explains how birth and death rates can be measured and controlled.

 **BATSFORD**

4 Fitzhardinge Street, London W1H 0AH



Friends of the Earth

1974 has been designated World Population Year by the United Nations. One of the objectives of the year is "to sharpen awareness and heighten appreciation of population problems". The situation can be described as follows: at the beginning of 1974, the estimated number of people in the world was 3,898 million, and that figure is expected to double in about 30-35 years. The age structure of the population almost guarantees this doubling, as 37 per cent of the world's people are now under the age of 15. There are so many young couples that to bring population growth to an immediate halt the birth rate would have to drop by almost 50 per cent, and today's young generation of parents would have to limit themselves to an average of about one child. That, of course, is just not going to happen.

The distribution of the world's population—like its natural resources and its wealth—is uneven. The industrialised world occupies some 20 per cent of the planet's land area, yet consumes over 80 per cent of its natural resources and controls 70 per cent of the world GNP. Rates of population growth worldwide also vary—about 1 per cent per annum in the industrialised regions, but about 2.5 per cent in the Third World. These high rates of growth in the developing countries are seen by many as a deterrent to development there. But it must also be remembered that there is a 2-way relationship between demographic variables and socio-economic development. Levels of education and housing tend to have a significant effect on population growth. With this in mind, an advisory committee to the UN Population Commission pointed out that "A population policy must form an integral part of overall development policy and be explicitly related to such goals as better education, full employment and the

nationalisation of reproductive behaviour".

The debate between the population and development lobbies is one which is taking on increasing importance during World Population Year. The interaction of the two approaches (and the way to see them in relation to each other) is best summed up in the UN document, "World Population: The Task Ahead". "Family planning programmes have not yet been proved to be instrumental in *initiating* a long-term decline in fertility anywhere in the world... The failure of many family planning programmes to achieve a large demographic impact is probably largely a result of the gap between awareness and behaviour, a gap that can probably only be bridged by changing the socio-economic milieu in which reproduction takes place... When the proper socio-economic circumstances for a decline in fertility are achieved, however, a family planning programme is likely to contribute to a significant more rapid decline in fertility than would otherwise prevail."

All these issues will be endlessly discussed at the World Population Conference in Bucharest which is the focus of WPY (see insert for description of this and related events). This will be the first official international conference with government delegations, and it is unfortunately questionable what concrete decisions will result from it. Discussions will inevitably split along the lines of developed versus developing nations, with the latter delegations suspicious of population control programmes urged by the Western world without a simultaneous commitment to greatly increase other aid programmes and change discriminatory trade patterns. Hopefully some of these issues will be aired before Bucharest during the Special Session of the UN called by Algeria to discuss the trade situation and world-wide distribution of natural resources.

Concern about continued population growth in Britain culminated in 1973 on 12 May, Population Day. A Call for Action was delivered to the Prime Minister and to 100 local authorities urging that population be recognised as a rightful concern of government, and that a stable population be achieved in Britain as soon as possible. Following the success of Population Day, representatives of the national organisations involved joined the Population Work-

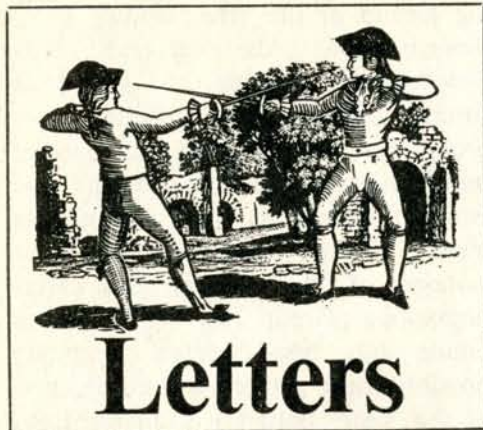
ing Group of the UK Standing Conference on the Second UN Development Decade to see what further action was possible. This group has now produced a booklet on "Population and Development: The Role of Britain in World Population Year", written mainly by Dr John Loraine of the Doctors and Overpopulation Group. A WPY Action Guide was also written, outlining possible local activities in recognition of the Year. Both are available from the secretariat of the Standing Conference: VCOAD, Parnell House, 25 Wilton Rd, London SW1V 1LW (booklet—10p; Action Guide—2p). It is hoped that supplements to the action section will soon be available, reflecting recent changes in the British situation and new resource material.

In February of this year, yet another organisation was formed—this one is a coalition of organisations concerned about UPY, under the title of Population Action Group. One full-time coordinator, Linda Starke, will keep track of local activities about World Population Year and press for further media coverage of Bucharest and local events. Members of the coalition are the British Control Campaign, Brook Advisory Centres, Conservation Society, Doctors and Overpopulation Group, Family Planning Association, Population Count Down, Population Stabilisation, and the World Development Movement.

A meeting is planned for late July of all interested people who will be going to the Population Tribune in Bucharest, and Linda would like to hear from any readers who are interested. Activities in the Autumn will centre around UN Day on 24 October, as the theme this year is Population. It is hoped that local meetings and demonstrations will draw attention to the results (or lack of them) of the World Population Conference and to the inter-relatedness of family planning and development programmes in most of the world.

The Government has not yet announced who will be in the official delegation to the World Population Conference, nor what policies will be pursued there. Pressure from concerned individuals can encourage Lord Shepherd (Lord Privy Seal and Leader of the House of Lords) who is responsible for population, to reach these decisions quickly and to make them public.

Colin Hines



Atomic energy

Sir,

After reading Peter Bunyard's column (December Comment), I am beginning to believe that there is a "conspiracy of silence" against the Canadian nuclear power system.

Nuclear power does not depend on enriched uranium. The largest nuclear power station in the world is operated with natural uranium. It is the Pickering Generating Station in Ontario, a 2,000,000 kilowatt station owned by Ontario Hydro, which uses CANDU reactors designed by Atomic Energy of Canada Limited.

AECL is designing over 10,000 megawatts more of this type of natural uranium reactor for Ontario alone, as well as several thousands of megawatts for other customers both in Canada and in other countries.

Perhaps Mr. Bunyard meant to say that nuclear power depends on isotope separation, but the investment required for separating hydrogen isotopes (to produce the heavy water we use) is very much less than that needed for a uranium diffusion plant.

Dr. W. B. Lewis, who recently retired from AECL, has estimated that CANDU reactors using advanced fuel cycles could satisfy energy demands for thousands of years. Even in this long term view of uranium use, enrichment processes are not necessary for maximum extraction of energy.

Yours truly,

A. R. Burge,

Public Relations Officer,
Atomic Energy of Canada Limited,
Power Projects, Sheridan Park,
Ontario, Canada.

Correction

In the letter *Sulphur Emissions* in the May issue of the *Ecologist* the 24 hour observation of sulphur-dioxide concentration in the east winds was misprinted. This should have read 121 $\mu\text{g}/\text{m}^3$.

A New Party?

Sir,

In your February leader you make the case that hypertechnological "answers" to our problems simply make them worse. This can be disputed only by people with a vested interest in technology for its own sake or by people who have been kept ignorant of the facts. The rest of us—perhaps 0.2 per cent of the population—agree with every word you say.

It is when you propose the remedy of a new political party that doubts begin. After the election I spoke to several avid followers of politics and asked them if they had noticed a new minority party in the arena; none of them had. I think they were typical; the Press were not over-exerting themselves to give publicity.

This, surely, arises from the lack of infrastructure. When the Labour Party's predecessors first put up candidates at the turn of the century, there was a colossal infrastructure: generations of trade unionists, pamphlets for the newly literate workers and roots going back at least to Robert Owen (born 1771). Yet that party reached maturity only in 1945. The Conservative party has roots in seventeenth century dynastic struggles. An ecologist must feel that in this the truth that a hardwood tree needs long, slow growth; not like your Forestry Commission conifer that wrecks the soil for an economic return in a quarter of a lifetime.

In terms of people, I know there is a potential infrastructure for a powerful movement; an infinitesimal fraction of that potential meets in my sitting room to discuss problems of environment, energy etc. But that fraction doesn't read the *Ecologist*. It looks at the way the productive nature of the countryside is being wrecked, or it worries about artificial food, and is frightened for its children. This is part of the grass-roots support on which the future depends. It is, however, totally committed to one of the existing large political parties; no new party could win its allegiance under present circumstances. Groups like this, however, are working like leaven in the lump of the existing political mass. But there is a serious lack of pamphlets, news-sheets etc. to nourish and inform such grass-roots support.

If there is any money available to fight an election, would it not be better

spent on popular information of this sort, at least in the first instance? Electioneering is expensive; a proper campaign costs around £1,000 per constituency and 600 candidates means £90,000 in deposits at risk before a single manifesto is printed. Another form of campaign that has been highly successful in the past provides an alternative approach. This is the mass-movement concentrating on very few issues—for example—CND and the Vietnam protesters. I should doubt that there were more than 100,000 active people in these movements, yet CND captured the soul of the Labour Party for a time. In an election, 100,000 people would have to be concentrated in four constituencies to elect four MPs and, if they were spread over more than 20 constituencies, they would be unlikely even to save deposits. Consider the effect, however, of mass demonstrations by such numbers, supported by a good Press campaign.

At present, therefore, the best political action would seem to be a mass information campaign, supported by rallies, and concentrating on a few issues (e.g. danger from radiation and toxic metals, urban disintegration, resource-waste on prestige projects). While the majority is unaware that we have a problem, to support a separate political party is like financing Concorde. There are, after all, buses to Westminster; for example members of the Labour Party have formed the Socialist Environmental and Resources Association, which already has the names of MPs and candidates on its masthead. If this can get into top gear, the results could be surprising. In the meantime, what about a weekly news sheet relating the *world problematique* to the day-by-day problematiques of the man in the street?

Yours faithfully,

R. D. Oakley-Hill,

Tidy's Cottage,
School Lane,
West Kingsdown,
Sevenoaks, Kent.

The Economics of Wilderness

Sir,

Last Sunday, in the series "The World About Us", the BBC broadcast a programme about the Bushmen of the Kalahari Desert. The film showed how an anthropologist, Dr Heinz, was "protecting these bushmen from extinction" by teaching them to read and

write (and thus by easy stages to industrialisation and sociological genocide). Today I saw the illustration for your article "The Economics of Wilderness" and could not help but notice the hideous similarity between your cartoon and the real-life photograph the BBC used to advertise the Bushmen programme. This depressing similarity vividly highlights the Western World's present attitude to the "under-developed" countries.

In the early part of this century Africa was swamped with eager missionaries, armed with Bibles and brassieres, who went about that unspoilt land to bring light and civilisation to those quaint little black savages. In those unenlightened days the civilising process was unquestioned as being for the native's own good and the developed world sat back and basked in the reflected Christian charity.

Today, it is becoming increasingly obvious that our own economic and social life-styles are far worse than those of the societies we are trying to "protect". Why then do we still benignly sit back and permit these modern-day Missionaries (now called anthropologists) to spread their evil gospel of literacy and industrialisation to these last islands of ecological perfection? If we do not curb this misguided zeal our own concrete and plastic jungle will extend even into the Kalahari Desert.

Yours faithfully,
P. J. S. Brooks,
Cottage-by-the-Ford,
Mill Lane,
Middle Barton,
Oxon.

Ivan Illich

Sir,

Brian Johnson, in reviewing the writings of Ivan Illich (February 1974), concludes that Illich's value system "remains clouded by unstated assumptions of catholicism". Maybe the assumptions should be stated but to take for granted that they have a "clouding" effect is surely to fall into the very trap which Illich continually pleads avoidance of—the belief that value systems can only be based on rational, scientific phenomena. This is the ultimate arrogance of human nature which has resulted in accelerating ecological disruption—that there is

nothing which the mind of man cannot fully comprehend and master.

But perhaps I am too concerned with whether Illich has "intellectual stature"—what may ultimately eliminate Marx from the long line of true prophets is that he had only intellectual, not mystical stature.

Yours sincerely,
Roger Kelly,
16 Paul Street,
Frome,
Somerset.



They didn't tell us
what it would be like
without trees.

Nobody imagined
that the whispering of leaves
would grow silent
or the vibrant jade of spring
pale to grey death.

And now we pile
rubbish on rubbish
in this dusty landscape
—struggling to create
a tree

but though the shape is right
and the nailed branches
lean upon the wind
and plastic leaves
lend colour to the twigs

we wait in vain
for the slow unfurling of buds
and no amount of loving
can stir our weary tree
to singing

TINA MORRIS

THIS MONTH'S AUTHORS

- | | |
|-------------------------|---|
| Ian Campbell | Professor of Geography at The University of Alberta |
| Randall Baker | Lecturer in Geography at the School of Development Studies University of East Anglia |
| Jack Frazier | Author of <i>The Marijuana Farmers Hemp Cults and Cultures</i> . Solar Press. New Orleans. |
| Marshall Sahlins | Professor of Anthropology at University of Chicago and author of <i>Stone Age Economics</i> . |

Classified advertisements

APPOINTMENTS

ROYAL COUNTY OF BERKSHIRE

PLANNING DEPARTMENT

Due to reorganisation of the Department, applications are invited for the following posts:

LANDSCAPE GROUP

TWO CAREER GRADE POSTS

£1,644 - £3,165 per annum according to qualifications and experience

The persons appointed will work in the multi-professional landscape group headed by David Randall, ARIBA, FILA: the Principal Landscape Architect.

Applicants should be either recently qualified landscape architects or qualified in one of the following disciplines: horticulture, botany, planning, forestry, geography or estate management and be well advanced in the examinations of the Institute of Landscape Architects.

Applications for these posts are not restricted but, all things being equal, preference will be given to local government staff affected by reorganisation. The Staff Commission has been consulted.

The Group aim to provide a landscape design service both within the County Council and to the District Councils and are concerned with a variety of subjects. The Group is directly responsible to the County Planning Officer.

Casual user car allowance; flextime working; temporary lodging allowance; 75% removal expenses; up to £100 towards legal and agents fees for house sale and purchase; up to £50 for incidental house moving expenses; rented housing may be available.

**Application forms from the COUNTY PLANNING OFFICER,
ALPHA HOUSE, 120 KING'S ROAD, READING RG1 3DN.**

To be returned not later than 14 days from the appearance of this advertisement.

THE SUE RYDER FOUNDATION

Experienced Site Supervisors and Skilled Tradesmen (bricklayers, carpenters, plumbers, electricians, decorators, floor layers/screeders) required for work in U.K. and Europe, erecting homes and hospitals for sick and disabled, and renovating older buildings. Serious, preferably single, applicants. Insurance and maintenance provided. Remuneration by arrangement. Please apply to Appointments Secretary, Sue Ryder Foundation, Cavendish, Suffolk.

THE READER RESPONSE to classified advertisements in *Ecologist* shows the classified page to be a highly effective advertisement medium.

A WELL ESTABLISHED environmental organisation has a vacancy for a Secretary (graduate or similar standard preferred). Interesting work. Pleasant flat with good-sized garden is offered on a service tenancy, situated about 250 feet above sea level in Worcester. The flat is suitable for one or two persons, the second person to follow own employment. A good salary is offered for the right applicant. Full particulars, Box No. PD38.

WHY NOT PRACTICE running a small-holding this summer? We need a couple to care for our goats, hens, ducks, ponies, vegetables and fruit trees for one or two months during the summer. Anyone interested write to Box No. PD37.

SITUATIONS WANTED

A WORTHWHILE JOB wanted connected with Natural History/Ecology/Conservation, by young man, 29, single, General Degree in Botany/Agricultural Botany, who, after several years as professional musician would like to follow up sincere interests in above subjects. P. Darby, 152, Glyn Road, London E5 0JE.

ENTHUSIASTIC SCIENCE STUDENT would like Environmentally inclined employment for up to ten weeks during July—mid-October. Box No. PD40.

COURSES

ENVIRONMENTAL RESEARCH BY REMOTE SENSING UNIVERSITY OF ASTON IN BIRMINGHAM

Remote Sensing involves the acquisition and analysis of information collected by airborne sensors in aircraft and satellite surveys of the earth.

If you hold or expect to obtain a good Honours Degree and are interested in carrying out Remote Sensing research into Environmental problems, Ecological/Economic/Engineering/Data Handling/Planning/Pollution etc. then come and join our multidisciplinary research team and work for a higher degree in this field.

All our research projects are 'problem oriented' and are designed to make a useful contribution to the utilisation and management of the earth's resources.

Research Studentships are available. Enquiries from all disciplines are welcome. Training in remote sensing systems will be provided. Send personal details of qualifications and interests to:-

Dr. W. G. Collins
Remote Sensing Unit
Civil Engineering Department
University of Aston
Gosta Green
Birmingham B4 7ET

SOCIETIES

A FOOT IN BOTH CAMPS. Housing Society (not self-build) setting up to provide new low-energy homes with family privacy plus communal sharing, for ecological living with organic gardening, etc. In Herts within commuting distance of the treadmill. Box No. PD 35.

DOES YOUR PROJECT NEED MONEY? If it's unusual, imaginative, alternative or revolutionary apply to "CLAP", Community Levy for Alternative Projects, c/o BIT, 146 Great Western Road, London W11. (Telephone 01-229 8219).

ALTERNATIVE SOCIETY

provides a communication centre for all those who in many different fields are working to create the cells of a new society.

There are at every level of society individuals and groups experimenting, reaching out towards new forms of social organisation, new forms of education, new forms of political structure and new kinds of community. Alternative Society organises weekend meetings, Summer Schools and Summer Camps.

For further details contact Stan Windass, 9 Morton Ave., Kidlington, Oxford. Tel: Kidlington (08675) 3413.

Classified advertisements

HOLIDAYS

EXMOOR NATIONAL PARK

Unique holiday in 77 acre woodland nature reserve containing red deer. Nature trails, hides, wildlife garden, organic produce. Only 6 camouflaged caravans, modern toilet facilities. SAE Brochure. Cowley Wood Conservation Centre, Parracombe, North Devon, Parracombe 200. 10% discount F.O.E.

THE LIHOU YOUTH FELLOWSHIP is an International and Interdenominational fraternity to encourage a CONSTRUCTIVE pattern for living in this difficult age. Members can take part in interesting wild life and ecological studies whilst on the island, besides enjoying a holiday with swimming, boating etc. Spiritual and sociological problems of today are discussed during informal gatherings and opportunities for developing these ideals and principles are both encouraged and effected. Accommodation is under canvas; washing and other facilities in buildings. Young men and women between 17-20 years can take part and there are a few vacancies for the three consecutive camps from July 25th-Sept. 5th. £25 incl. return travel from London. The Lihou Youth Fellowship, Les Rouvets Farm, St. Saviours's, Guernsey.

PUBLICATIONS

Blueprint for Survival

Now available!

Demand for this famous issue of the Ecologist has been so great that we have had to reprint. Please order now—30p, to make sure of your copy.

INTERESTED IN ANARCHISM? (see *The Ecologist* March/April 1974.) Read *Freedom*, the Anarchist weekly. Trial three-month subscription costs 90p., to: Freedom Press, 84b Whitechapel High Street, London E.1. Books by Godwin, Bakunin, Kropotkin and many others also available. Ask for list.

ENERGY: A TIME TO CHOOSE... One of the most comprehensive publications available on energy resources for the future. \$1 (plus 50c postage) to: Community Environmental Council, 15 W. Anapamu, Santa Barbara, California 93101.

AUDIO-VISUAL AIDS IN ENVIRONMENTAL EDUCATION

The September issue of *The Ecologist* will have a special feature on the availability of audio-visual material in environmental education at the primary, secondary and tertiary levels of education.

This will list films, film strips, slides, tapes, cassettes, records, charts, study prints, learning systems etc.

To help us in the compiling of this list we welcome your co-operation. If you produce or distribute audio-visual material in this specialized field, and have not already been contacted, please send us details as soon as possible. In order to ensure that the information provided in the feature is absolutely correct and up-to-date we will not print anything that has not been personally sent to us.

Send to: **Audio-Visual Aids in Environmental Education, The Ecologist, 19 Anne Boleyn's Walk, Cheam, Surrey SM3 8DE.**

ORGANIC SYNTHETIC ROUTES WALLCHART

plus FREE 275 PAGE BOOK for only 60p. Compiled by Dr. R. C. Denney of the Thames Polytechnic School of Chemistry the wallchart is printed in four colours and measures 28 x 21 inches. The book, "Organic Reagents for Metals and for Certain Radicals", usually costs £2.50. Yours free with the wallchart for only 60p from

HOPKIN & WILLIAMS
Publicity Department
P.O. Box 1, Romford, RM1 1HA

PERSONAL

GIRL—18-25, intelligent, imaginative, rational, social conscience, physically fit, sought by young man of similar attributes who fears inevitable eco-catastrophe and desires companionship of attractive like-minded partner with whom to share happily the remaining years of industrial civilisation. No children desired of course. Perfectly serious. All letters answered. Box No. PD.27.

FURNISHED COTTAGE AND SMALL WORKSHOP in Wales available to rent for one year to responsible couple who wish to test out a desire to live and work in a rural situation. Transport essential. Write fully please to Box PD41.

PROPERTY FOR SALE

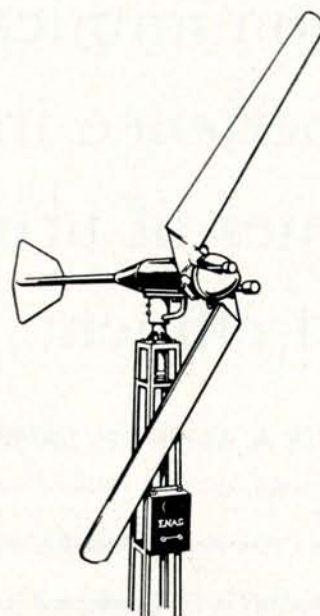
FOR SALE. Exmoor fringe, Dulverton 2½ miles large 16th C. farmhouse. 5 bedrooms, 2 bathrooms, 2 living rooms, 2 kitchens etc. 10 good acres, plus gardens, wilderness, pond, stream, orchards. 5 large outbuildings. £35,000. Box No. PD39.

LIVESTOCK FOR SALE

STOCK COCKERELS. R.I.R. L.S. Dorsets. Shipton Poultry Farm, Bridport, Dorset. Tel. Burton Bradstock 327.

FOR SALE: Team of working bullocks, working horses, harness, farm implements, complete village forge and many other animals and implements. Send for full list to Tibetan Farm School, Brynnyre Talybont-on-Usk, Breconshire.

SERVICES



Colour poster/catalogue (A2 size) now available showing our range of products and services. Order now at:

15p inc. postage (single copies)

10p per copy inc. postage (10 or more)

**SOLAR, WATER AND WIND
POWER · ORGANIC RECYCLING
LOW COST TECHNOLOGIES**

Write to us for advice and information

LOW IMPACT TECHNOLOGY LTD.

LIT, 73 MOLESWORTH STREET,
WADEBRIDGE, CORNWALL

Tel: Wadebridge (020 881) 2996

EYLES AND PARTNERS INTERNATIONAL, est. 1925. Verbatim conference reporters/interpreters. Copy editing. Professional tape transcribing, presentation electric duplicating, translating. Private coaching (shorthand to verbatim speeds). 3 Highgate High Street, N6 5JT, 01-348 4791 (24 hours).

BOOKS REVIEWED or advertised in *Ecologist*, and any other books on environmental and related subjects, can be supplied by **CONSERVATION BOOKS**—The Conservation Society Book Service. Efficient, reliable service—orders from stock sent by return of post. Please state title, author and publisher, and send full payment including 10% for P & P. For our latest classified stock list, please send an SAE to: Conservation Books (E), 28 Bearwood Road, Wokingham, Berks., RG11 4TD. Tel: 0734 780989.

Classified rates

Display: £4 per single column inch

Lineage: All classifications 8p per word—Minimum £3

Box numbers: 25p per insertion

Series discount: 6 insertions 5%; 12 insertions 10%

Classified advertisements must be prepaid (cheques made out to INTERPRESS) and sent to Katie Thear, *Ecologist* Advertisement Department, 19 Anne Boleyn's Walk, Cheam, Surrey. (Tel: 01-642 5826).

Bi-monthly authoritative facts and
comment from international contributors
—communicating special knowledge and
experience in utilising the commercial
values of urban and industrial waste
and effluent

HERE IS A RANDOM SAMPLE OF PAST CONTRIBUTIONS

The proceedings of the Third Annual Composting and Waste Recycling Conference (free with a subscription to COMPOST SCIENCE) include:

European Experiences in Applying Sludge to Farmland *Dr. Cord Tietjen, Forschungsanstalt für Landwirtschaft, D33 Braunschweig, Bundesallee 50, Germany*

Latest Methods in Composting and Recycling *Dr. Clarence Golueke, Sanitary Eng. Research Lab., University of California, 1301 S. 46th St., Richmond, California 94804*

Composting Sewage Sludge: Why? *John Walker, George B. Wilson, Biological Waste Management Lab. Agricultural Research Center, Beltsville, Md. 20705*

EPA Studies on Applying Sludge and Effluent to the Land *Dr. Curtis C. Harlin, Jr., National Water Quality Control Research Programme, EPA, Ada, Oklahoma 47820*

Marketing Sewage Sludge *H. Clay Kellogg, Jr., Kellogg Supply Inc., 23924 So. Figueroa St., Carson, California 90745*

Utilization of Municipal Leaves *John Van Vorst, Borough of Tenafly, 107 Grove St., Tenafly, NJ 07670*

Nitrogen Fertilization and Farming Methods—A perspective *Michael Sheldrick, Center for the Biology of Natural Systems, Washington University, St. Louis, Missouri 63130*

Health Problems *Dr. William Vaughan, Center for the Biology of Natural Systems, Washington University, St. Louis, Missouri 63130*

Operating a 400-Acre Livestock Farm *Michael Scully, Scully Estates, Buffalo, Illinois 62515*

fill in and post this subscription order

form for your regular copy of

**COMPOST
SCIENCE**

EMMAUS, PENNA. 18049, USA

TO 'COMPOST SCIENCE' • 73 MOLESWORTH STREET • WADEBRIDGE • CORNWALL PL27 7DS

please enter the following subscription to Compost Science published bi-monthly

☐ 2 years subscription: £5 ☐ 1 year's subscription: £2.70
(overseas: add 50p per annum)

NAME..... TITLE.....

COMPANY.....

ADDRESS.....

☐ Remittance enclosed for subscription as ticked above