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**DUTCH RESEARCH ON
ENVIRONMENT AND DEVELOPMENT
IN SUB-SAHARAN AFRICA**

Leo De Haan and Peter Ton

Werkgemeenschap Afrika
(Netherlands African Studies Association)

1994

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INTRODUCTION

This paper was written at the request of the Werkgemeenschap Afrika (Netherlands African Studies Association). Its main objective is to present a review of recent Dutch research on environmental issues in Sub-Saharan Africa.

In order to compile this review, an inventory of Dutch research on Environment and Development with respect to Sub-Saharan Africa was made in the summer of 1993. To gather sufficient information, we primarily used the snow-ball method to contact researchers and research institutes and asked them to provide annual reports, lists of publications, and key publications of the programmes and projects related to our topic of interest. Because several departments did not respond to our repeated requests or provided only very condensed information, some research will perhaps not have received the attention it deserves.

The information we used were the above-mentioned programmes, annual reports, publication lists and occasionally information from scientific publications. Our starting point was to review the results of the research actually carried out and therefore we preferred annual reports and key publications rather than general information provided in glossy brochures on research programmes.

Many colleagues offered valuable comments and criticisms on an earlier draft of this paper during a discussion session organized by the Werkgemeenschap Afrika. We are especially indebted to Freerk Wiersum for his detailed remarks and Nancy Bishop who improved our English text. However it goes without saying that any errors or weaknesses remain the responsibility of the authors.

Although the Werkgemeenschap Afrika is mainly an organization of social scientists, we did not limit our initial list to social studies. We adopt that broad approach in this paper also. We define "environment" as the natural resource base of a certain area. By focusing on "environment and development" this paper will primarily be concerned with the environmental aspects of the development process in Africa, i.e., the exploitation and management of the resource base (or natural resources such as land, water, air, vegetation and wildlife) within the context of development. This specific context of economic growth and poverty reduction, increased population growth, world market dependence, etcetera, distinguishes environmental problems in developing countries from those in the developed world (although they may be interconnected in many ways). In developed countries, the emphasis seems to be on pollution and related health problems. However in many developing countries and in Africa in particular emphasis is on the degradation of natural resources and dwindling productivity as a consequence. Some studies we will discuss concentrate on understanding environmental problems within the particular context of development. Other studies are more intervention-oriented and aim, one way or another, at improving the environmental situation.

The largest part of this paper is formed by chapter 2, which presents an inventory classified according to a number of thematic clusters that stood out after comparing some 80 research programmes and projects carried out in the Netherlands during the 1990s. In this chapter, a distinction is made between studies focusing on the exploitation of natural resources by production systems that concentrate on developing sustainable technologies (section 1), and research concerning livelihood strategies that attempts to explain the causes of the environmental problems in a wider context (section 2). Section 2 is divided into two subsections. The first concerns actor-oriented research dealing with household activities vis-à-vis the environment. The second subsection discusses village land management and deals with aspects at supra-household level. Chapter 2 is completed by short sections on the urban habitat (section 3), environmental policy (section 4),

environmental economics (section 5), and institution-building (section 6). In chapter 3, this inventory is discussed in terms of the contrasts between the various methods, interdisciplinary approach, as well as sub-themes and geographical areas covered. To provide a contextual framework for these two chapters, the historical development of environmental studies in the Netherlands is described in chapter 1.

Chapter 1

THE HISTORICAL CONTEXT OF ENVIRONMENTAL STUDIES IN THE NETHERLANDS

At first sight, environment seems to be a recent theme in Dutch development studies. Hinderink & Kleinpenning (1988) for example noted that as far as the geography of development was concerned, little attention had been paid until then to environmental problems. Nevertheless in geography as well as in anthropology and economics, the environment has always played an explanatory role, be it with ups and downs. As early as 1922, the geographer Van Vuuren (cited in Kleinpenning 1978, p.36) extensively depicted the narrow relationship between the physical environment and economic exploitation in the Dutch East-Indies.

Moreover, although many anthropologists oppose environmental explanations, in general they would not deny that the relationship between physical conditions and cultural patterns is of importance for understanding human society. Writing on the subject of cultural change, the anthropologist Van Baal (1969, p.31) describes the Kalahari desert as an unalterable fact that completely dominates the lives of the Bushmen.

Nevertheless, although the triangle of environment, economy and society was often emphasized, research on specific environmental problems was scarce in the past and was often limited to more agro-technical studies such as those on soil erosion and land degradation in the Dutch East-Indies during the 1930s (Van Schaik 1986, p.12).

As early as 1948, in The Netherlands, Egbert de Vries (an agricultural scientist, quoted in Cramer 1989, p.22), stressed that "the overexploitation of soils is the result of the unlimited striving for profit by individuals, groups or nations, ... This tide can only be turned by developing a new responsibility towards nature and our fellow-men and by striving for an alternative economic structure No country, no people and no government can or should deny this new responsibility: to show solidarity towards the management of the natural resources entrusted to them; to cooperate in conserving these natural resources ...; to adapt national and international economic life to the needs of a justified management of natural resources; and to search for a balance between the interests of our generation and those of generations yet to be born."

In spite of De Vries' prophetic words in 1948, it was not until the beginning of the 1970s that environmental studies emerged in the Netherlands, taking the connection between environment and economic growth as point of departure and indicating the risks of pollution and the exhaustion of natural resources.

Cramer (1989, pp.36-37) explains the emergence of environmental studies by enumerating a number of processes in Dutch society, such as the negative effects of increased economic growth in a small, densely populated country; the decompartmentalization of society and the related political instability; impending economic stagnation; and the first oil crisis. This culminated in an overwhelming susceptibility in The Netherlands to the message of Meadows' (1972) "Limits to Growth", better known as the "Report of the Club of Rome". Since then, the non-renewability of most resources has been given a prominent place on the Dutch agenda.

In that period, environmental studies concerning the Third World were primarily initiated by researchers "traditionally" engaged with the environment, such as in the sections of nature conservation and forestry at Wageningen Agricultural University (WAU). Following the 1971 U.N. Conference on the Human Environment, these researchers called attention to the need for proper manage-

ment of the ecological environment in developing countries next to the existing attention for the social environment characterized by poverty and social disruption (Wiersum 1972).

During the following decade, information about the destruction of the tropical rain forests, the greenhouse effect, the vanishing ozone layer and the pollution-related acidification process, made the international dimension of environmental problems increasingly apparent in The Netherlands.

The 1980s witnessed the establishing in The Netherlands of several centres for policy-oriented, environmental research funded by the Dutch government through research contracts. The research projects were rather technical and did not address environmental problems in Third World countries. However by the time the Brundtland report on environment and development (WCED 1987) was published, which focused on the concept of sustainability (as De Vries had done, defining it as "meeting the needs of the present generation without compromising the needs of future generations"), Dutch development studies also had become increasingly aware of the environment.

The beginning of the 1980s saw the publication of several studies at introductory level on the environmental problems of the Third World in general (Kleinpenning 1980; Mansvelt Beck 1981 — the former also paying attention to the Sahel).

However in the case of Sub-Saharan Africa attention had already been attracted towards environmental problems at an early stage due to the Great Sahel Drought of the 1970s and its aftermath. Desertification, deforestation, the wood fuel crisis, and in more general terms, the carrying capacity in marginal areas evidently became important themes of interest.

Van den Boorn & Van Dijk (1982) identified three different approaches to the environmental crisis in the Sahel, which may also be distinguished in Dutch development studies.

Firstly, there is the climatological-ecological interpretation represented by Welle (1976), that explains the drought in terms of

climatic change, pointing at increasing desertification and proposing reforestation.

The second approach is the agro-technical interpretation, suggesting that agricultural production techniques are no longer suitable for guaranteeing sustainable land use under the current population pressure. Interesting research in this field was carried out in Mali by the Centre for Agro-Biological Research (CABO) of Wageningen and financed by Dutch Development Cooperation. CABO concentrated on the productivity of pastures demonstrating that without expensive inputs the quantity of fodder in the Sahel only allows limited exploitation (Breman et al. 1979; Penning de Vries & Djiteye 1982). From a farming system point of view, the Royal Tropical Institute (KIT) in Amsterdam (Broekhuysen 1974) came to the same conclusion for the Mossi Plateau, demonstrating that environmental degradation was caused by farming techniques that could not maintain sustainable land use under population pressure in combination with commercialization.

The inquiries of Reij (1983; 1984; Reij et al. 1986) into soil and water conservation marked the start of increased attention for the dynamics of African farming systems and indigenous knowledge of the environment. Looking for the ideal mix of external stimuli, local knowledge and local initiative to counterbalance environmental degradation, Reij's work should not be confused with that of the Information Centre for Low External Input Agriculture (ILEIA) in Leusden, which is also concerned with indigenous knowledge systems.

Since 1982, ILEIA, financed by Dutch Development Cooperation, promotes the concept of Low External Input and Sustainable Agriculture (LEISA), aiming at increased (sustainable) agricultural production with a minimum use of external inputs. Because farmers cannot afford to buy these inputs or because the inputs are not adapted to local conditions, ILEIA proposes a wide range of simple, improved production techniques and locally produced inputs (Reijntjes et al. 1992). The concept has been vehemently criticized by representatives of the agro-technical view such as Breman (cf. Donkers 1993). We will return to this discussion in chapter 2.

The third approach is the political economy interpretation, which blames the integration of the Sahel in the capitalist world economy for the disrupted equilibrium between production systems and the environment. An interesting contribution to this discussion was made by the anthropologist Jorritsma (1979), with his study on the Tuareg in Central Niger, which for a long time was the only Dutch research study on nomadic peoples in West Africa.

Of course this distinction is, to a certain extent, artificial. For example from an agro-technical point of view, Kessler & Ohler (1983) made a concise but valuable contribution to the evaluation of development interventions, such as the intensification of agriculture, reforestation and boreholes, with respect to the environmental effects in the Sahel.

In studying man-environment relations in other parts of Sub-Saharan Africa, a number of geographers from the Faculty of Environmental Sciences of the University of Amsterdam (FES/UvA) tried to combine these different interpretations. Van Haastrecht & Schomaker (1985), Jungerius & Dietz (1988) and Moonen & Verolme (1991) explored the concept of carrying capacity in Kenya; De Haan & Coenen (1989) elaborated a rapid appraisal methodology on land evaluation and land use in northern Togo (cf. De Haan 1988). The agricultural sciences at WAU also paid attention to carrying capacity (Geerling & De Bie 1986; Kessler 1994). In Mali, Harts-Broekhuis & De Jong (1987) from Utrecht explored man-environment relations in the Inner Delta of the Niger.

Following the international perturbation concerning the exhaustion of energy sources, the wood fuel crisis in Africa was at the centre of attention for a short period of time. Also in The Netherlands this topic received attention, first of all from tropical foresters such as Wiersum (1988). Groen (1988) published on women and wood fuel. Geographers such as Meijs & Zijlstra (1988) made a contribution with their study of wood fuel production and trade in northern Togo.

During the mid 1980s the Centre for Environmental Research in Leyden, became the first environmental studies centre to extend its research to developing countries, for example Cameroon and the Philippines. During the same period at Wageningen Agricultural University, the technologically-oriented research in agronomy was criticized by dissident students and researchers (IK 1985). Although by that time an ecological tradition was already solidly established at WAU in the Nature Conservation and Forestry Departments (which because of their focus on village management of natural resources had developed an interest in political economy too), the opposition to the emphasis on technology contributed to the WAU's spectacular shift towards "sustainability". Currently, one of the programmes being carried out is an extensive interdisciplinary programme on the management of resources in the Sahel encompassing physical, technical and social aspects.

In summary, we may conclude that the 1980s witnessed the take-off of Dutch environmental studies on Sub-Saharan Africa. Although drought in the Sahel definitely contributed to that take-off, by the end of the 1990s attention was equally distributed over the whole of Sub-Saharan Africa. This we learn from an inventory of research groups and institutes doing environmental studies in developing countries (Cramer et al. 1993). Out of a total of 85 cases, Sub-Saharan Africa was mentioned 22 times as research area. Out of these 22 research projects, 9 were located in East Africa, 6 in Southern Africa and 7 in West Africa, including the Sahel. Note that the authors included all types of environmental studies in their survey; 37% in the field of science and technology and 40% in the field of social sciences.

Chapter 2

A THEMATIC OVERVIEW OF DUTCH RESEARCH ON ENVIRONMENT AND DEVELOPMENT IN SUB-SAHARAN AFRICA IN THE 1990s

We have identified approximately 80 Dutch research programmes and projects on environment and development concerned with Sub-Saharan Africa either entirely or in part. With a view to making a clear presentation we have sought a manageable classification of themes and approaches. Given the multidisciplinary nature of environmental issues, we rejected the option of a classification per academic discipline. Instead we have chosen a categorization per sub-theme or problem area.

Granted that every classification is to some extent artificial, especially in the case of interdisciplinary projects which tend to be broad, on the one hand a number of sub-themes emerged quite clearly from the inventory. These sub-themes are for the most part the subject of small or monodisciplinary research projects located somewhat remotely from mainstream research, which by the way does not mean that they are less interesting. We refer to themes such as urban habitat (section 3), environmental policy (section 3) environmental economics (section 5) and institution-building (section 6).

On the other hand, mainstream research was much more difficult to classify. It could be discussed under the general heading of "natural resources exploitation". Nevertheless, in our view it is possible to make a distinction between research directed towards production

systems and research analyzing livelihood strategies with respect to the environment.

The former concerns research projects that study environmental degradation as a result of the exploitation of natural resources by production systems. They are more technically oriented and often focus both on an analysis of the causes as well as on the development of more appropriate and sustainable technologies. These studies are reviewed in section 1 and are labelled "sustainable land use technologies".

The latter, livelihood strategies and environment, are discussed in section 2. This type of study attempts to understand the ways people make use of the local environment by analyzing their interaction with the environment as part of their livelihood strategy. Livelihood strategies refer to the way people make a living within a wider social, cultural, political and economic context.

1 Developing Sustainable Land Use Technologies

This cluster comprises research projects that study environmental degradation resulting from the exploitation of natural resources by production systems and the possibilities to restore the situation. Although a few projects appear to examine degradation processes as such, and should therefore, from our development perspective, preferably be labelled "supporting research projects", all claim to include the relationship with various forms of production and most of them aim at developing more sustainable technologies. As we will demonstrate, this type of research is concerned with exploitation of natural resources such as soil, vegetation and water for agriculture, (agro-)pastoralism and forestry.

Research with respect to agriculture is carried out by CABO in Mali, by the Sahel programme of WAU, and by KIT in Mali, Benin and Tanzania. With regard to the scale of their activities, these three institutions represent a strong contribution to Dutch environmental research. Most of their work concentrates on the restrictions

imposed by local environments or the possibilities these environments offer for agricultural production.

Van Der Pol (1992; Van der Pol et al., 1993) of KIT measured the "sustainability rate" of crop production in southern Mali and southern Benin, using nutrient balances to assess the economic value of loss of nutrients in the soil. Berckmoes et al. (1988) investigated the conditions for agricultural intensification in southern Mali. Van Duivenbooden (1992) of CABO adopted a similar approach with regard to agro-pastoralism in the Sahel. Zeppenfeldt & Vlaar (1990) of WAU surveyed the agricultural potential of river valleys ("bas-fonds") in the Sahel.

Finally, an interesting article was written by Kessler & Breman (1991) about the sense and non-sense of agro-forestry as a solution to soil degradation, showing that it is not a panacea.

With regard to **(agro-)pastoralism** the work of CABO in Mali is well-known, as explained earlier. Starting with a research programme on the productivity of pastures in Mali and the constraints this imposes on the development of (agro-)pastoralism and livestock production in the Sahel, the Centre has also entered related fields such as those mentioned above. Veeneklaas et al. (1991) made a balance of the competition for resources in Mali, as a final report on the Mopti-project. Breman (1990), as already explained in chapter 1, perseveres in his opinion that the possibilities of developing sustainable production systems in the Sahel without the use of external inputs are limited.

In addition De Boer & Kessler (1994) concentrated on sustainable land-use possibilities for cattle-breeding in southern Burkina Faso.

Also from the WAU Sahel programme, Kessler & Wiersum (1992) and Van Der Graaf (1992) reported on **silvo-pastoral** areas and the characteristics of the relationship between forestry and pastoralism. Van Der Hoek et al. (1993) explored the perspectives of agro-silvo-pastoral production in Burkina Faso.

The exploitation of **tropical forests** in the Ivory Coast, Gabon and Cameroon by (agro-)forestry, silvo-pastoralism and the collection of non-wood products, is studied by the Department of Forestry of WAU within the framework of TROPENBOS, the programme for the sustainable use and the conservation of tropical forests sponsored by the Dutch government. The Ivory Coast project concentrates on the conservation of a national park threatened by population pressure and agricultural commercialization (Oldeman 1992). The research in Gabon is concerned with the threat commercial exploitation poses to the quality of the forest. It examines species that could be produced on plantations in order to limit the pressure on natural forests. The Cameroon project tries to develop an efficient and sustainable timber harvesting system.

Finally, the utilization and management of **wildlife** resources is the focus of the Mali project of the Department of Nature Conservation of WAU (Geerling & Diokité 1988; De Bie 1991).

As already mentioned in chapter 1, discontent with the unsuitable adaptation of modern technology to local conditions in the Third World prompted ETC Foundation to develop LEISA. In all kinds of fields and in many African countries ETC tries, through a participatory technology development approach, to reduce the use of external inputs through the improvement of low-cost alternatives aimed at sustainable land use (Haverkort et al. 1991). Note that the Dutch Ministry for Development Cooperation gave LEISA a central position in its policy (DGIS 1992).

The debate between CABO and ETC on the perspectives of LEISA concentrate on the one hand on the risks LEISA runs of contributing in effect to an even greater exhaustion of natural resources (according to CABO, cf. Van Keulen & Breman 1990) and on the other hand on the negative effects of modern inputs (pollution, inputs poorly adapted to local conditions, expensive - according to ETC, cf. Reijntjes et al. 1992). Part of the controversy is caused by the insufficient quantitative proof provided by LEISA (Donkers 1993). It has become clear that a distinction should be made into an approach that aims at maintaining and buffering the existing pro-

duction level and an approach that aims at increasing it. However recently, ETC, CABO and the Staring Centre have launched a joint project aimed at integrating LEISA-techniques into models developed by CABO.

A specific and valuable contribution to understanding the motivation and perception of man in his exploitation of natural resources are studies concentrating on **indigenous knowledge** systems. These studies frequently stress the dynamics of local farming systems and their ability to cope with economic, demographic and environmental change. To a certain degree, these studies converge with LEISA-oriented studies, which try to develop sustainable land use from or on the basis of the existing situation. Indigenous knowledge studies constitute one of the promising bridges between this category of "Sustainable Land Use Technology Studies" and the category "Livelihood Strategies Studies". We will describe indigenous knowledge systems in further detail in section 2.

Supporting Projects

Various research projects focus on the analysis of degradation processes as such. CML investigates the physical processes underlying soil degradation such as depletion dynamics and nutrient and moisture cycles in Cameroon.

Technical research on soil and water conservation is being carried out by the Department of Irrigation and Soil and Water Conservation of WAU (Vlaar, 1992). The research concentrates on the links between soil and water conservation and agro-forestry in Kenya and Ethiopia, wind erosion and silvo-pastoralism in the Sahel, and the use of termites for soil regeneration in the Sahel.

In addition to themes such as forest management and community forestry, the Department of Forestry of WAU is engaged in more technical studies, for example studies on the

dynamics and productivity of forest-ecosystems (Vooren 1992; Rompaey 1992).

Research on integrated pest management, also concentrating on weeds, is carried out by the Crop Protection Centre of WAU, KIT and the Department of Biology of the University of Amsterdam. In general, the aim is to develop biological control and integrated pest management strategies, in order to reduce the natural barriers to enhanced agricultural production. In this connection, Kiss & Meerman (1991) of WAU studied integrated pest management for cotton in Togo and Zimbabwe, rice in Burkina Faso and coffee in Kenya.

The Staring Centre in Wageningen has directed its research towards rice-growing ecosystems in West Africa, in order to develop technologies for soil, water and crop management (Andriess & Fresco 1991). As already explained, together with ETC and CABO, the Staring Centre has started a study on the integration of several LEISA techniques into ecological and socio-economic models developed by CABO.

The International Institute for Aerospace Survey and Earth Sciences (ITC) in Enschede is the most important Dutch institute on remote sensing and the development of environmental profiles via GIS systems. In Zambia, ITC is carrying out a project aimed at planning and management of sustainable land use in semi-arid zones susceptible to desertification, drought and salinization. In Burkina Faso, research focuses on monitoring Sahelian agro-ecosystems, with emphasis on the temporal variability of plant production and the carrying capacity of rangelands (Groten, 1991).

Finally, FES/UvA has used both soil and vegetation surveys and GIS techniques to make an assessment of environmental degradation in a research project on ecology and land use by peasants and pastoralists in northern Benin (De Haan 1992a). The results of these degradation analyses were used as input for identifying the environmental effects of livelihood strategies.

2 Livelihood Strategies and Environment

In this cluster we have grouped research projects that concentrate on the study of livelihood strategies and their interaction with the environment.

Livelihood strategies relate to the way people find a place to live, acquire goods and services by production and social networks, and obtain an income in order to buy goods and services and to maintain social networks. The word "strategy" is used with some reluctance because it suggests a rational, long term planning which especially the African poor cannot sustain. Livelihood strategies do not exist in a vacuum, but interact with the wider (regional, national and international) context and with the local environment. We emphatically wish to avoid the impression here that livelihood strategies are always re-active or defensive. All too often the African rural poor, for example, are seen as victims of inescapable circumstances such as drought. In our view, there is in reality a continuous scale, ranging from defensive strategies on the one hand to offensive strategies on the other. On the extreme defensive end of the scale there are the pure survival strategies in periods of environmental disasters such as drought; then come the coping mechanisms that serve to deal with regular environmental problems such as seasonality. On the offensive end we find activities aimed at improvement, for example by means of investment (cf. Reitsma et al. 1992).

However, this continuous scale of livelihood strategies does not yet include a qualification for the degree of sustainability of the strategy. Investment in cotton production could further land degradation and surviving drought could mean having to down the last remaining trees in order to buy food. The relationship between ecology and livelihood security will therefore be one of the main themes of the Centre for Resource Studies for Human Development (CERES 1993), the recently founded research school that encompasses a great number of (social) development studies at Dutch universities.

Livelihood studies have very often chosen households as their unit of research, since households are considered important decision-making units for production and consumption. As a consequence, household livelihood strategies also take a prominent position in research that attempts to understand the links with the environment. However, households studies have also been criticized, for example by researchers concentrating on gender issues. In the past, household studies have tended to neglect intra-household differences or polarization between the genders and between older and younger household members.

Moreover, since many natural resources in Africa, though exploited by individual households, are not owned by these households, an important part of environmental management is expected to be performed at the community (lineage, clan, village) level. This results in another category of studies focusing on environmental management and usually concentrating on supra-household layers. As a consequence, in the following sub-sections we will make a distinction between actor-oriented studies, primarily comprising research that focuses on actors such as farmers, women and households, and management studies focusing in general on the village level.

Actor-oriented Research

Between 1986 and 1990, the Amsterdam Semi-Arid Lands Project (SALPA) of the Department of Human Geography (FES/UvA) focused on livelihood strategies in **dry-season environments** in, among others, Kenya and Togo (Reitsma et al. 1992). Mostly production and income strategies were analyzed on the full scale from defensive to offensive. In addition, Dietz (1990) highlighted mechanisms to cope with seasonality.

In SALPA's successor, Livelihood & Environment, the environment takes a more central position. Livelihood strategies, ranging from adapting to exploiting the environment and social and economic possibilities for sustainable land use are examined in West Africa and East Africa. A variety of themes is studied within the framework of an inter-university programme set up with the School for Environmental Studies of Moi University in Kenya. In northern

Benin, land degradation was viewed from the perspective of the survival and coping mechanisms of peasants and pastoralists (De Haan 1992a). In Zimbabwe a project is being carried out on the livelihood and coping strategies of women in a semi-arid region (Van Wiechen 1992).

In the SOREGIO programme of Utrecht University researchers from the Department of Geography concentrated on survival strategies and coping mechanisms during the great **drought** of the 1980s in Mali (Harts-Broekhuis & De Jong 1993). The second phase of this programme, including reference to Botswana and Zimbabwe, will concentrate on access to and use of resources and the consequences for environmental stability and livelihood security.

With regard to **pastoralists** the Institute of Social Studies (ISS) in The Hague has recently launched a programme on pastoralism, competition for resources and political conflict in East Africa. The programme consists of several projects. Some of these focus on environment such as the project on production strategies (Doornbos & Markakis 1993).

Wood fuel consumption by households is studied by the African Studies Centre in Leyden in Malawi and FES/UvA (IVAM) in Swaziland. The ETC Foundation in Leusden published on extension methods in rural wood fuel development (Huby, 1990) and on wood fuel and gender (Bradley 1993) in Kenya.

Women's use of wood fuel was also studied by Groen (1988) of Twente Technical University in Burkina Faso. The role of forests and **forestry** within the context of socio-economic and cultural change is a field of research designated by WAU's Department of Forestry. Sollart (1986) studied indigenous tree management and conservation methods in the Sahel, and Haberland (1993) the exploitation of village wood lots in Burkina Faso.

Social forestry, local participation and people's perception of forest exploitation are important angles in a research study that is part of the Leyden Ethnosystems And Development (LEAD) programme in Senegal and Cameroon carried out by the Department

of Cultural Anthropology (Van Den Breemer & Bergh 1992; Van Den Breemer et al. 1993a; Fisiy & Geschiere 1992) and the International Agricultural Centre in Wageningen (Laban 1988).

As stated in section 1, an important contribution to the understanding of the motivation and perception of man in his exploitation of natural resources is formed by **indigenous knowledge** studies. KIT (Koudokpon 1992) and the Research Programme on Knowledge Systems for Sustainable Agriculture of the Department of Communication and Innovation Studies of WAU (Brouwers 1993) are currently carrying out a promising project in southern Benin. The functioning of local adaption mechanisms to environmental degradation as a result of population pressure is being investigated. By means of a participatory technology development approach utilized by KIT, agronomic research tries to support indigenous knowledge.

Of long standing is the experience of the Centre for Development Cooperation Services (CDCS) of the Free University of Amsterdam in the field of indigenous knowledge, particularly concerning soil and water conservation techniques. Research is carried out in a number of Sahel countries and in Swaziland (Reij 1984; Reij et al., 1986). These studies converge interestingly with the theme "environmental management" discussed in the next section. Much attention is paid by CDCS to local participation in soil and water conservation projects and the links between local knowledge, motivation and perception.

In addition, Van Dijk & Ahmed (1993) of FES/UvA studied water harvesting techniques in Sudan. Indigenous knowledge of the environment and food production is the focus of the LEAD programme in Kenya (Leakey & Slikkerveer 1991).

Indigenous systems are also studied in the field of forestry (Sollart 1986; Wiersum 1993). Interaction between **ecology and culture** in Mali is the focus of the Department of Cultural Anthropology of Utrecht University (Van Beek & Banga 1992).

Village Environmental Management

Growing concern about land degradation and deforestation in Africa has caused an increased interest in land management. Rising attention for traditional land management systems, such as common property regimes, accompany this shift.

At the same time failing government development policies at the national level direct attention towards opportunities to stimulate local initiative and to build local capacity in the fields of income generation and the exploitation and management of local resources. Keeping in mind the failure of central government interventions, it is anticipated that land management at the local level will be more successful.

It is often claimed in this respect, that traditional resource management institutions can play an important role.

Recently a conference was organized in Leyden by NASA and CML (Van Den Breemer et al. 1993b) on **local land management** in Africa. CML researchers presented papers both at explanatory and at case study level, i.e., the organizational aspects of exploitation of fishery and agricultural resources in Cameroon. Anthropologists of LEAD and ASC presented their observations on the unsatisfactory participation of villagers in a reforestation programme (Van Den Breemer et al. 1993c). Many researchers pointed out the importance of traditional arrangements and environmental perception in this respect. In addition, Hesseling & Ba (1994) of ASC stressed the need for proper land tenure arrangements if local land management is to be successful.

Striking is the study of Olthof (1993) from ISS on the management of wild life in national parks by surrounding villagers. The same topic is studied by anthropologists of Nijmegen University (Heerkens 1993).

Also at ISS, Van De Laar (1990) conducted a study on the management of common property natural resources. Within the framework of TROPENBOS, WAU and CML study the local management of the exploitation of tropical forests in Cameroon (Foaham & Jonkers, 1992).

Since resource management with regard to forest areas in Africa is mostly a matter of common or public concern, foresters such as Van Haeringen & Wiersum (1988) drew attention to aspects of village resource management at an early stage. They are now followed by a large number of other WAU researchers from disciplines such as forestry, animal husbandry and landscape planning, collaborating in the WAU Sahel programme and participating in the primarily French language *gestion de terroir (villageois)* debate (Stroosnijder et al. 1990; Bognetteau-Verlinden et al. 1992; Van Den Briel et al. 1994). The latter reported on a reforestation project in Niger with reference to this village environmental management context.

Quite impressive and combining both research and implementation is KIT's land management and anti-erosion, casu quo soil improvement, project in southern Mali (Hijkoop et al., 1989; Van Campen 1991). On the basis of individual conservation methods and by using a participatory technology development approach, land management arrangements have successfully been put into practice on the village level. An annotated bibliography concerning environmental management in the tropics (KIT 1990) and a publication by Huijsman & Savenije (1991) about strengthening local environmental management are interesting contributions to this theme.

Resource management in **pastoral societies** is slightly underexposed in Dutch environmental studies. The possibilities of common resource management by peasants and pastoralists in northern Benin were studied by FES/UvA (De Haan et al. 1991; De Haan 1992a; 1992b) The project examined if and how, within a setting of increasing conflicts between both groups, village land management could be developed.

The same type of competition for resources is one of the themes in the ISS project in Ethiopia, Sudan and Kenya (Doornbos & Markakis 1993), which focus also on power relations and the role of the state.

Finally, De Bruijn & Van Dijk (1993), respectively from the Department of Cultural Anthropology of Utrecht University and the

Departments of Agrarian Law and Forestry of WAU, have made an interesting contribution to the study of resource management by pastoralists. They have shown that power relations in pastoralist communities, and consequently tenure or grazing resources, may change significantly due to development project interventions.

3 Urban Habitat

Dutch research on urban issues in Sub-Saharan Africa has always been outnumbered by rural studies, probably because rural problems were considered to be the most essential part of under-development. Environmental studies also suffer from this bias.

The International Institute for the Urban Environment (IUE) in Delft is oriented towards human settlements and sustainable development in the Third World. The institute has started a programme on "green cities" aiming to bring together experiences with the preservation, the (re)development and the use and management of open spaces in major metropolitan areas, among others in Nigeria, Zambia and South Africa (IUE 1993).

In addition, the Department of Landscape Planning of WAU has started a research programme on environment and development in three towns in Kenya (Duchhart 1989).

The International Water and Sanitation Centre (IRC) in The Hague is carrying out various research projects in Sub-Saharan Africa on urban water supply, school sanitation, gender and community-based water and sanitation management (Evans 1992a; 1992b).

4 Environmental Policy

Most of the research projects discussed above claim to be relevant to policy and most researchers are convinced of the practical relevance of their work. Often they aim at the formulation of policy goals and the design of environmental policy. However, few have analyzed environmental policies as such.

CDCS made a contribution to this field (Reij 1989), by studying trends in the drought and desertification strategies of major donor agencies in the Sahel. Moreover, Haagsma (1993) published on state intervention and local water management on the Cape Verde Islands.

In addition, ETC studies wood fuel development policies in the SADCC countries.

Recently the European Centre for Development Policy Management (ECDPM) in Maastricht started a programme on the management of sectoral linkages relating to policy on the environment in general, and wildlife in particular, in Kenya.

Finally, the ISS programme on pastoralism in East Africa discussed above, includes the effects of government policies on the exploitation of the environment by pastoralists (Doornbos & Markakis 1993).

An interesting phenomenon are the so-called **environmental profiles**, i.e. compilations of data resulting from both primary and secondary research aimed at diagnosing the state of the environment, the way it is being exploited and the background of this exploitation. Usually, it is the intention that this diagnosis is followed by interventions solving the bottlenecks encountered. In that respect the environmental profiles do not differ much from other studies trying to design interventions. It is rather because of the basic and introductory approach of most profiles, often designed to alert policy makers, that we are inclined to classify them in this category.

Physical and human geographers cooperating in SOREGIO produced "location development profiles" for various districts in Kenya (Hinderink & Riezebos 1989; Sterkenburg & Riezebos 1989) concentrating mainly on land suitability for land use planning. In Botswana their environmental profiles consist of various baseline surveys contributing to the presentation of Integrated Land Use Plans for Communal Development Areas (Mulder & Riezebos 1988; Sterkenburg 1990; Barnhoorn et al. 1993).

In addition, KIT has produced an environmental profile of southern Mali (Berthé et al. 1991).

5 Environmental Economics

Since a few years, environmental sustainability is one of the items, together with poverty alleviation and the autonomy of women, in project appraisals by the Dutch Ministry of Development Cooperation. Thus it becomes increasingly important to include environmental parameters in cost-benefit analysis (Van Pelt 1993). However with regard to Sub-Saharan Africa the list of economic research projects is quite short.

However, already in the 1980s economists (and anthropologists) of the Agricultural Risk and Food Supply (AGRISK) research group at Groningen University started to examine the impact of rainfall variability on food crop production in Burkina Faso (Schweigman et al. 1989). Nowadays the research group focuses, among others, on crop growth modelling to analyze the impact of various agricultural practices on cultivation conditions and the yield of cereals with a view to sustainable agriculture.

The Department of Irrigation and Soil and Water Conservation of WAU uses economic analyses of soil conservation and watershed development (De Graaf 1993). Finally, Huysman & Van Tilburg (1993) edited a number of conference papers on economics and sustainable agriculture in the Sahel.

6 Institution building

Almost all research projects and programmes discussed are in one way or another carried out in cooperation with universities, research and government institutions or individual researchers in the countries under examination. Thus institution building and reinforcing research capacity are at least minor objectives or side-effects in almost every activity. However some projects aim explicitly at institution building in environmental issues.

FES/UvA is involved in a ten-year programme to build up research capacity at the School for Environmental Studies of Moi University in Kenya. Kenyan Ph.D. students examine a variety of themes, ranging from environmental application of remote sensing to environmental awareness in the mass media.

The Ph.D. training formula is also practised by WAU, ISS and ITC, training numerous researchers on environmental issues.

Moreover, ITC has elaborated guidelines for education and training programmes on environmental information systems (Van Genderen 1992).

The Centre for International Cooperation and Appropriate Technology (CICAT) of the Technical University Delft develops research and training programmes on erosion control and soil conservation in Nigeria. IHE is involved in institution building in resources conservation in Malawi.

Finally, ETC maintains a network for diffusing experiences on LEISA techniques.

Chapter 3

CONCLUDING REMARKS

Dutch research on Sub-Saharan Africa has definitely undergone an environmental shift during the late 1980s. As is shown in chapter 1, this shift cannot be understood without a proper understanding of the development of environmental awareness in Dutch society itself.

Over 15 years ago, Van Dam (1978) observed that development strategies, and we think this also applies to development studies, are subject to the whims of fashion. He argues that in the course of time consecutive development strategies have followed each other up not due to the changing priorities of the developing countries themselves but because themes in global discussions are set by the developed countries and international agencies reflecting their own priorities rather than those of developing countries.

On the one hand, we could apply the same argument to the environmental shift in development research. Of course we do not contest the importance of the theme. Nevertheless, our point is that it was only when pollution, the greenhouse effect, etc., became important issues in the developed countries, that the deforestation of tropical forests, land degradation, etc., in developing countries received the attention they deserve.

On the other hand, the interesting point about Sub-Saharan Africa is that because of the Great Sahel Drought of the 1970s, African studies took up the environmental challenge quite early. Nevertheless, as can be learned from comparing chapter 1 and 2, it was

only towards the end of the 1980s that environmental issues became truly established.

A reason for this delay might be that during the 1980s Dutch universities had agreed with the Ministry of Education and Science on medium-term research programmes, which fixed a considerable part of research budgets and research time. Many important Ph.D. projects had already been started under these agreements. This inertia imposed by Dutch science policy, perhaps blocked to a certain extent the development of environmental research. This position seems to be confirmed by the fact that especially non-university institutes, such as CABO and KIT, whose research is to a large degree directly financed by the Ministry of Development Cooperation, took the lead in the environmental shift.

Looking at the research themes, we have shown in chapter 2 that most research in Sub-Saharan African is concentrated on the exploitation of natural resources, either analyzed from the angle of production systems (section 1) or examined within the wider and even more complex context of livelihood strategies (section 2). The first category focuses much more on the technical aspects than the second. This hardly comes as a surprise since most studies in this category originate from an agronomic or farming systems background. Sometimes the link with the socio-economic context is hardly elaborated. In very obvious cases, these projects have been classified as "supporting". However, usually in this category the socio-economic links receive explicit attention, although they may have a subordinate position in the project as whole. Nevertheless we think that in this way a certain level of interdisciplinarity, which is indispensable in environmental studies, is accomplished. However, the most important distinction between the two types of research projects is not the difference between "technical" and "socio-economic" (which is, moreover, only partially correct as has become clear) but the difference between "intervention" and "explanation". The former are often focused both on an analysis of the causes as well as on the development of more appropriate and sustainable technologies. That is why these studies are reviewed

in section 1 under the heading "developing sustainable land use technologies".

The latter, livelihood strategies and environment, are discussed in section 2. This type of study tries to explain why people make use of the local environment the way they do. This category is much more socio-economically oriented, because man-environment relations are studied within a wider context of livelihood strategies.

Contrary to what is frequently thought by researchers from the former cluster and even by some policy makers, these livelihood studies aim at exploring options for development interventions as well. Of course they do not concentrate on the design of a sustainable technology. They focus on the social, cultural, economic and political conditions under which implementation will be successful and truly sustainable. For that reason we found it useful to distinguish between intervention and non-intervention oriented research between these two clusters.

Livelihood studies can be divided into household, intra-household and supra-household studies. The first and the second category have been discussed under the heading "actor-oriented studies". With regard to the intra-household aspects we have noticed very few studies on women and environment. Although the gender aspects of environmental issues seem to be well recognized in general, this has not materialized in Dutch African studies.

The household level is abundantly represented as can be seen from section 2.a. Sometimes "household" is narrowed down to "farm" and as a matter of fact, this particular level of research unit has proved extremely useful in studying peasant communities. However, its limitations emerge for example when studying pastoral societies, or to be more specific, when studying the exploitation of natural resources such as water, grazing and wood lands, which are more or less managed communally or can be regarded as common property. This has resulted in studies focusing on the supra-household level, i.e. village environmental management discussed in section 2.b. It seems clear especially from

studies on wood fuel or forestry and nature conservation, concentrating on common properties such as forests, that the transition towards environmental management was made the earliest.

In due time environmental management has become a theme of increasing importance. This field of interest has been embarked upon both from the technology/production-systems-side as well as from the livelihood-side. Environmental management is pre-eminently a field of multidisciplinary research since it involves so many processes. However, as can be seen from section 2.a., multidisciplinary collaboration in this field is rather disappointing. It is only in the WAU Sahel programme on a large scale, and in the Benin study of FES/UvA on a smaller scale, that multidisciplinary collaboration has taken shape.

Because it is much easier to express the need for multidisciplinary collaboration than to put it into practice, we find it encouraging to ascertain that an increasing number of studies in this category has gone beyond a monodisciplinary approach. In interdisciplinary projects, it is essential to reach agreement on the problem statement and hypotheses and how to make them operational. In practice this means approval of and commitment to common research units and variables to be collected, that researchers from different disciplines should explain their questionnaires, fieldwork techniques, etc., to one another and, wherever possible, integrate them. Cross-disciplinary communication requires more guidance and leadership in the project in order to achieve clarity about concepts. It also requires a clear timetable, phasing and intermediate reporting in order to convey information from one researcher to another in good time. However, one has to bear in mind that especially in interdisciplinary research the interference-free harmonization of concepts is extremely difficult.

Disappointingly, but as explained in section 3 given the history of Dutch studies on Sub-Saharan African not surprisingly, the urban habitat has received little attention until now. Recently Dutch development cooperation has become much more open to urban issues, which means that in the near future we may also expect a

growth of urban habitat studies stimulated by "contract research". After all, already 30% of the population in Sub-Saharan Africa lives in cities and 70% of the GDP is earned in other sectors than agriculture. These figures may serve as an indication for the importance of urban issues in the region.

Many social scientists studying problems of development want to contribute to solving them, and those studying environmental problems are no exception to the rule. In general many social scientists are convinced of the practical potential of their discipline and quite a few research projects are requested by Ministries, etc., illustrating their policy-relevance. However, as we may learn from section 4 this policy orientation has not yet resulted in much attention for environmental policies as a theme for research.

Nevertheless, many African governments have drafted their (sometimes donor-driven) environmental action plans and some countries have even reached the implementation phase. Moreover, many African countries have organized their post-UNCED, Agenda 21 and Desertification Conference activities. Thus, there are enough possibilities to develop this research theme.

In addition we found very few examples of environmental studies by economists as explained in section 5. It seems that the economic appraisal of environmental problems is still in a modelling phase. We might therefore expect more involvement in case studies, also in Sub-Saharan Africa in the future.

We have not attempted to include in our inventory indicators such as budgets and man-hours in order to make an assessment of the importance of the (sub-)categories from a "money and time point of view". From the discussion in chapter 2 it has become quite clear which topics belong to main stream research in the Netherlands, those are "sustainable land use" and "livelihood strategies". We find it a bit tricky to draw conclusions about the geographical distribution of the research projects if budgets and man-hours are not known. Nevertheless we can present a list of those Sub-

Saharan countries not included in the research projects we have encountered. These countries are: Mauritania, Gambia, Guinea, Guinea-Bissau, Liberia, Sierra Leone, Ghana, Equatorial Guinea, Central African Republic, Gabon, Congo, Zaire, Uganda, Rwanda, Burundi, Angola, Mozambique, Namibia and Madagascar. Reviewing this list, we feel that there is a certain bias in favour of the French-speaking Sahel and English-speaking East Africa, to the detriment of countries in unstable or even violent political situations, although environmental problems, for example the masses of refugees, might well be tremendous there.

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