

2 INDIGENOUS FORESTRY: HOW TO TURN LOCALISED KNOWLEDGE INTO A RELEVANT FORESTRY SCIENCE

Genevieve Michon

FOREWORD

I have worked for the last 17 years on local knowledge related to forest use, management and domestication by farmers in Congo and Indonesia. I have learned a lot from these farmers and I have been struck by the sterile confrontation between them and professional foresters in the field of local forest management. I have tried my best to promote ideas for an alternative forestry based on the validation of local rights, practices and knowledge. I am therefore convinced that there is a profound need for renewal of the forestry approach and that this renewal should start from local bases and use local knowledge and practices as its foundation. However, the following contribution is written as a note of caution.

Recently, probably as a consequence of the worldwide promotion of ‘sustainability’ and ‘equitability’ in the development business, some changes have occurred in the attitude of foresters towards local knowledge: forest development now seems to attach great importance to ‘indigenous people’ and their ‘traditional knowledge’. These changes, which touch research as well as action forestry, have often been more superficial and fashionable than carefully thought-out. Many scientists from various disciplines, as well as many professional foresters, have been stimulated to learn more about local knowledge. However, these people often proceed without the relevant intellectual, methodological and theoretical background, and contribute to the reduction of local knowledge into a set of utilitarian practices. In development, this often translates into standardisation of ‘local knowledge’ where policy-makers and development agencies retain one or two simple local techniques of forest production and drop the whole socio-ecological context that sustains it. An illustration of this is seen in the proposed extension of local agroforestry practices from southern Sumatra to the whole province by the regional forestry services (Dinas, 1995; Michon *et al.*, 2000).

The main question that should lead our reflection in this volume is the following: are we looking for a catalogue of attractive knowledge and practices, or for a revolution of our own forestry science? My preference is clearly for the second, but if this is to be a viable and really successful enterprise we need to shape it into a solid science. In this respect, my contribution aims at pointing out the dangers, and proposing relevant alternatives, in this foundation of a new field in forestry.

2.1 INTRODUCTION

Forestry is a complex matter: it started from a collection of locally relevant practices on trees and forests and evolved into an institutional field of widely recognised management norms. It is a science – or a particular combination of fundamental sciences

applied to forests as a particular object – as well as a very important sector of economic activities.

The term paradigm can refer either to archetypes and models or to the generally accepted perspective of a discipline. Paradigm in forestry mainly refers to technical patterns or models of forest utilisation derived from examples considered as important, and much less to a theoretical framework allowing the formulation of new theories, laws, and generalisations upon which a new field of science can establish and develop.

Forestry as a formalised science developed in a socio-historical context of juridical separation and on-going economic dissociation between agriculture and forestry. In this context in Europe, from the middle of the last century until now, the dominant users of forest resources were the State and private managers of forest domains rather than local smallholder farmers (Devèze, 1965; Corvol, 1987). The purpose of professional and scientific forestry was more concerned with the production of timber and the protection or restoration of a forest resource ‘degraded’ by centuries of misuse by farmers, than with farmers’ practices related to the management of forests as a complement to agricultural activities and a support to the rural economy (Michon, 1999). The formalisation of forestry started from the rationalisation of existing forest management practices through scientific interpretations and experiments.

This forestry framework was transferred to the tropics through the colonial forest services and perpetuated into the forest administrations of the new post-colonial states (Bergeret, 1995). This history has resulted, after 20 to 50 years of public administration and professional forestry practice, in high rates of deforestation, without any noticeable success in reforestation. In response to this global failure, the need for a renewed forestry for the tropics is emerging in various circles. Central to this renewal is the idea that local users could be at least great inspirers, if not the legitimate managers of the improved use of local forests.

What I want to examine here is the consolidation of this trend into a science and the related impact upon (forest) development.

In the tropical context where a great majority of forest users and managers are still local people, and where a large part of forest lands are totally shaped by local knowledge and not by scientific forestry, local practices are dominant and therefore need to be taken into consideration in any attempt at development and also in applied research. However, in many development circles rehabilitation of local knowledge and advocacy for more local authority in forest management (which I fully support) is very much based on the assumption that local people know how to manage forests *sustainably*, but this assumption is still as much a matter of faith as of scientific or historical evidence. There is a tendency to forget that validation of indigenous knowledge *per se* has been built upon a rapid extrapolation of positive examples taken from particular economic, socio-political and historical contexts, not specifically from inside the forestry sector. The sudden rehabilitation of local users in forestry, a professional discipline that has consistently combated those users over recent centuries, must be carefully examined if it aims at being more than a short-lived trend. Scientists, in particular, have to understand how far these new interpretations, upon which research and policies are based and justified, coincide with facts.

As with any recent research trend, research on local knowledge in forestry can still be considered in a first phase of data accumulation. However, this trend is 20 years old now, or older if we take into account the pioneering works of anthropologists interested in the relation between nature and society in forest areas (Conklin, 1957; Haudricourt, 1962; Clarke, 1975; Ellen, 1978), who have produced detailed analyses of forest-related knowledge, although not always as the main focus of their work. Besides these anthropological works that contributed to the emergence of a new field of knowledge in *anthropology*, few attempts at scientific formalisation of research on forest-related knowledge have occurred. With some exceptions (e.g. Thorne *et al.*, 1999; Walker *et al.*, 1999; the People and Plants initiative of WWF/UNESCO, and some projects of the global TROPENBOS programme), the bulk of research carried out on forest-related knowledge and practices has not yet produced anything more than fascinating case studies.

In order to be considered a serious research discipline, this field needs to evolve stricter formalisation of its objectives, concepts, methodologies and even theories. What is at stake here is not only the construction of a new field of knowledge, but also the renewal or the definition of a new field of science. In the next section I propose steps to be taken to achieve that.

2.2 THE LOCAL SCIENCE AND SOCIAL LOGICS BEHIND FRAGMENTED KNOWLEDGE

The main difficulty in studying, understanding and using local knowledge in forestry starts with the precise delimitation of the research object.

Techniques of forest utilisation and management constitute a well-defined research object, but forest-related knowledge does not. We can go to the Amazon estuary and undertake research on ‘managed forests’ where stands of *Euterpe* palm are encouraged by *Caboclos* (riverine populations along the Amazon) through precise enrichment techniques, or to Sumatra to learn about complex agroforestry practices that have established incredibly biodiverse commercial forests of NTFPs. But what and how will we learn about underlying knowledge?

The obvious part of ‘local knowledge’ and that which is most easily appreciated by non local observers, is precisely that which directly materialises into observable activities - utilisation and management techniques. But technical knowledge is not all that we need to learn about local forest-related knowledge. The next step of integration consists of environmental knowledge relating to the ecological constraints and explanations that support observed techniques. Although not directly observable, this can be accessed through more or less direct questions, asking people what they ‘know’ as opposed to just observing what they ‘do’ (Martin, 1995; Sinclair and Walker, 1998; Walker and Sinclair, 1998). But there is another aspect of local knowledge, relating to the socio-political and religious dimensions of forest-related activities. This knowledge is usually expressed in social institutions and religious rituals, through myths and symbols and through codified relations between people. Specific methods for investigating the socio-political and religious dimensions of knowledge have been developed in various fields of anthropology, related to cultural anthropology and to the more recent school of

political ecology or ecological anthropology (see for example Steward, 1955; Vayda, 1969; Vayda, 1983; Descola, 1986; Escobar & Hvalkof, 1998). They can also be revealed to the scientific observer when obvious differences exist between practices (what people do) and technical or ecological knowledge (what people know).

By learning from local users, foresters hope to find immediately workable alternatives to conventional silviculture or to cosmetic social forestry programmes. The bases of research on local forestry usually concentrate on describing practices and explaining the technical or sometimes the economic rationale behind these reported practices. The danger in this very applied approach, is to focus on techniques and practices rather than on the global knowledge system that underlies them, or to their role and place in the society, and to describe these activities *per se*, from an utilitarian point of view (Friedberg, 1996), by asking only 'What benefit does it produce? How is it technically conceived?'.

This is not to say that the utilitarian approach is not useful as part of a global approach (see below) but rather that it is not sufficient. In particular, this approach does not pay enough attention to the meaning of these practices in the overall functioning of the concerned society. It avoids any reference to the social logics that frame these practices and ends in producing catalogues describing highly localised practices or very focused technical or ecological knowledge. These catalogues are very useful - but primarily in their particular context. Their simple extrapolation to other areas with a different social or historical background might prove hazardous. Examples of this can be found in the numerous lists of 'useful plants', or, more recently, of 'successful' agro-forestry practices produced by forest departments, NGOs or research organisations, which fail to pay attention to the underlying organisation of knowledge, to the perception of 'usefulness' in the studied local group compared with that of the observer, or the social or political factors influencing plant utilisation. Such catalogues tend to be used in highly simplified ways in development projects. An illustration can be found in the Integrated Conservation and Development project of Gunung Leuser National Park in Sumatra, where the project proposed generalising the cultivation of benzoin gardens in the buffer zone as an 'ecologically sound' agroforestry practice common in neighbouring areas, while ignoring the social and market problems presently linked to benzoin. The same happened with the recommendations for cultivation of cashew nut in Jambi, or with the generalisation of the cultivation of cinnamon in the buffer zones of national parks in highland areas of Sumatra and Kalimantan.

Research on local knowledge in forestry sometimes tries to elucidate the property regimes or social strategies associated with the collection and use of resources, but it barely addresses the social, political or religious logic that underlies local understanding and interpretation (or 'appropriation') of nature (Barrau, 1970; Godelier, 1984; Descola, 1986; Descola, 1994). This happens because our scientific approach to knowledge is by its nature and through our culture segregated into well defined, very autonomous and sometimes even unrelated fields. The prerequisite for adapting conventional scientific approaches to relevant research about local knowledge is what anthropologists can teach us, to be aware of the fact that in so-called 'non-modern' societies, local science is *not* fragmented in the same way as it is in the occidental scientific culture. Knowledge and know-how underlying practices on nature do not follow what scientists often perceive as a universal segregation into an utilitarian, or technical ('applied')

sector and a non-utilitarian, symbolic or political ('fundamental') domain. Rather, they operate in an intricate, holistic way, which precisely reflects a conception of the world where plants, animals and people are in a relation of complex interdependency (Descola, 1986; Friedberg, 1996; Gille-Escuret, 1998). This interdependency is expressed in utilisation as well as in religious or institutional aspects. By refusing to explore what we perceive as a non-utilitarian aspect of knowledge because this is 'not directly relevant to our applied objectives', we are in danger of missing the global meaning of a reported practice in the functioning of the society that produces it (as an illustration of how symbolic and religious perceptions of the world can be integrated in an applied research programme on plant-related knowledge, see Ghimire *et al.*, 1999). This often leads to important misinterpretations or misuse of this knowledge.

2.2.1 What does this imply for researchers interested in learning from forest users?

It is important that scientists dealing with local knowledge try to go beyond compiling summaries of knowledge to aim at reporting more globally on the local science that underlies management systems, including its very clear and sometimes major social, political and symbolic components. This does not mean that focused, utilitarian approaches are not useful but that they are not sufficient. For example, Sinclair and Walker (1998) argue for a series of partial approaches, each focused on a particular compartment of the global environmental knowledge, to fully understand local knowledge, somewhat similar to the 'deconstruction' process commonly used in anthropological research (see for example Godelier, 1984). Sinclair and his colleagues point to the dangers of conflation of different levels of explanation, leading to misinterpretation. Deconstruction into partial approaches necessarily has to be coupled with a process of scientific 'reconstruction' – or global interpretation – of the knowledge system. This last step is critical since it is where synthesis could be turned into conflation. Many researchers – foresters, agronomists, ecologists, geographers or economists – currently involved in this kind of research lack the appropriate intellectual tools to apprehend the full dimension of local knowledge. I do not suggest that all these scientists must turn to anthropology, but they must recognise that some aspects of local knowledge that they may not perceive as important, have to be integrated (even if not by themselves) into the analysis. If they want to perform in this new field or research, they must become acquainted with some of the relevant concepts and methodologies. They must learn new languages and approaches and find the most effective way of combining them with their own science. At the same time, anthropologists have to support these various non-specialists in the construction of the methodological, conceptual and theoretical framework that will help to build this new field of scientific knowledge, in allowing the applied aspects of knowledge to be related to the less tangible ones.

2.3 REFINING THE RESEARCH FIELD THROUGH CONCEPTS AND METHODOLOGIES

The easiest way to learn about local knowledge systems is that which anthropologists and agronomists have always used: start from observable practices. Practices are usually a very synthetic expression of the integration of technical, socio-political and religious spheres of the manipulation of nature.

But even if they are committed to exploring beyond visible, utilitarian knowledge and related forest utilisation practices, foresters entering this new field are confronted by three questions:

- how to relate utilitarian, social and ritual practices;
- how to analyse the relation between observable practices and knowledge; and
- how to apprehend the global logic of the society that lies behind these practices?

A first conceptual tool that could help synthesise the observed elements relates to the characterisation of forest management systems. These represent the highest directly observable level of integration of the various aspects of knowledge. It is easy to formalise a conceptual and methodological approach, equivalent to the ‘farming systems approach’ developed for agricultural research, focusing on forest-related aspects of production activities. This formalisation does not aim to provide a global theory of indigenous forest management but rather aims to offer a global framework for observation and analysis of simple technical, ecological and economic reasoning and objectives behind the arrangement of forest utilisation and management practices. This first level of observation relates mostly to utilitarian aspects of local knowledge. It provides valuable information about knowledge relating to environmental and technical constraints or opportunities, and about household objectives, but does not say much about non-utilitarian knowledge underlying relations between the members of the studied society and natural resources.

Information on practices and utilitarian knowledge relates to the technical appropriation of nature. The second set of tools that we must develop relates to the social and symbolic aspects of appropriation. This includes information about formal and non-formal rules, regulations and prescriptions of use and access to forest resources (social appropriation) and analyses of rituals, representations and perceptions of nature and resources (symbolic appropriation). Profound analysis of these aspects of nature appropriation sits in the field of cultural anthropology, but non-anthropologists can easily learn relevant concepts and methods to be able to ask relevant questions and then integrate this gathered information into their global analysis (Weber *et al.*, 1990)

A third sets of tools for research and analysis also relates to the social nature of knowledge. It addresses the relations between the studied society and the ‘external world’: the socio-political environment in which forest-related activities develop and evolve. Management of forests has always been dominated by political considerations, perhaps more than by technical or economic reasoning, and the political dimension of local knowledge is an important aspect that should not be neglected.

2.3.1 Towards a new integrated discipline?

Research into local forest-related knowledge and practices lies at the crossroads between several disciplinary approaches from ecology and botany, resource economy and agro-economy, and, of course, ethnosciences and anthropology. Foresters and agronomists have more recently started to include the study of such practices in their research agendas. Each of these disciplinary fields touches this research object through recurrent themes – biodiversity and conservation for ecologists, sustainable development for socio-economic sciences. These disciplinary approaches applied to indigenous knowledge and practices tend to relate more to vague or global concepts than to clearly defined

research objectives. They also lack clear interaction or coordination. In spite of real progress in interdisciplinary research processes, the global scientific picture is still made up of scattered, highly site-specific and thematically partial information. Most analyses are still compartmentalised in the disciplines that have generated the information, and each discipline concentrates first and above all on elements able to feed its own agenda.

The scientific challenge for research on indigenous knowledge in forestry – and more globally on natural resource management – is no longer the primitive accumulation of scientific data that is already well under way, nor is it the creation of a true collaboration between natural and social sciences that has already fully emerged with the development of ethnosciences and agroforestry. What is essential now is a global re-organisation and scrupulous formalisation of this scattered knowledge into a consistent field: only through a rigorous confrontation of the different types of information gathered through the different disciplines and over the different sites will we be able to contribute to the emergence of a real scientific field.

One reason for the global failure of conventional forestry in the tropics is the attempt to apply uniform methods to a highly diverse reality. I do not claim here that we have to look for universal alternatives to conventional forestry. Neither do I say that there can be one global interpretation of local forest-related knowledge or indigenous forest management. The diversity of situations reflects the complexity of the relation between forests and people, and this complexity should not be reduced to one or two universal archetypes. But if we want to understand and value this multi-dimensional diversity of the real world, precisely in order to avoid standardisation and reductionist views of local forestry systems, we need to be able to relate similar, as well as diverging cases, to each other through comparisons or contrasts. Our ultimate objective would be to catalyse the understanding of patterns, tendencies, consistencies and inconsistencies as well as critical factors, in the nature and changes of the relations between people and forests. This is precisely the definition of the shaping of a new field of knowledge.

An attempt at formalisation in the field of local knowledge related to resource management was initiated at ICRAF, through the Global Inventory of Agroforestry Systems (Nair, 1989). However, the instigators failed to develop any theoretical framework for the interpretation of indigenous agroforestry systems, their conclusion being that each example was so particular that each new case added more diversity than consistency to the global picture, rendering any global conceptualisation impossible. Sinclair (1999) has criticised Nair's (lack of) analysis as consisting merely of a collation of descriptive information by local technical people.

The construction of this field needs to be carried out through different intellectual instruments in reference to the disciplines that have generated them. The common criticism of the proposed approach to local knowledge is precisely its strength: it works on the boundaries of different disciplines, and constantly crosses them, allowing assumptions, methods, or theories to be broadened and new answers to be sought to old questions. A first important step in the formulation of our founding corpus of theories would be to sort out what can be relevant to our scientific objective among the various assumptions and theories elaborated in each of the above-mentioned fields, in relation to indigenous knowledge, forest/agriculture interaction and the relationship between

nature and society. Then, discussions and confrontation of reasoning among the various academic fields involved in this interdisciplinary research would be needed to boost the emergence of coherent rationales and the identification of relevant research questions for the future.

Beyond assumptions and theories, we also have to work on the thematic keys and methodological tools used to forge the approach to local knowledge, which are necessarily borrowed from these different disciplines. Three broad categories of themes and methods can be suggested at this stage.

The first would be a comparison of case studies, aimed at identifying similarities and contrasts, in order to define the significant or determining factors in these similarities/contrasts. Secondly, a systematic confrontation of contrasting factors is needed, in order to frame the understanding of relationships between local knowledge and related factors (for example: utilisation practices and biodiversity, or ecological constraints and regulation of access to resources). This approach could frame the comparison enterprise mentioned above.

These two complementary approaches will necessarily contribute to the precise definition of the terms of the most appropriate systems approach for our research object, just as this happened for the farming system approach and the related theory that constituted its fundamentals. But comparison is not the final objective of this global research process. A third category of compilation activities would aim at drawing tendencies and consistencies in the profusion of diverse examples.

2.4 CONCLUSION

What this book proposes is clearly a reconstruction if not a revolution, in the field of forest science and practice: learning to utilise local knowledge as the new foundation of local forest development and giving all types of forest knowledge a chance to build a better future for forests in the tropics. The reconstruction consists of the inclusion of new sets of knowledge and practices for further development of forest science. Such an inclusion has not really happened since the first formalisation, at the beginning of the 19th century, of professional and scientific forestry which was itself founded on empirical knowledge and practices of forest management, then further developed through experiments. The real revolution proposed here, would target the globality of farmers' forest-related knowledge and practices, not only those of the dominant class of forest managers (timber loggers and producers).

I have presented a personal vision of how such a revolution should proceed, through a progression from local to global levels. This renewal starts with the definition of the full dimension of 'local knowledge'. It then develops through the definition of a conceptual and methodological framework that will allow characterisation and analysis of single objects in their own complexity. The last level of integration consists of the shaping and the constant tuning of the theoretical body of the paradigm that will allow comprehension of the diversity of the relevant objects and will result in action. But we have to keep in mind that this progression needs constant re-adjustment based on continuous feedback between the global and local levels.

Local knowledge being the central focus of the scientific approach, we might assume that anthropology offers the best intellectual and conceptual framework to refine the analysis. However, our objective depends not only on the definition of a new rationale for the relationship between nature and society, but also on the reconstruction of forestry as a field of economic activity that might discourage anthropologists.

Forest sciences therefore appear to be the appropriate place for the development and implementation of this original field of knowledge, partly because they will be the prime benefactor of this new type of research, but mainly because of their multidisciplinary nature and their applied objective. Foresters might lack skills in anthropological analysis, but, if well trained in relevant concepts, theories and methodologies will have enough capacity in systematic analysis to perform well in this field. And if this might imply a painful conversion of the present generation of interested foresters, the next generation of students can easily overcome this problem if well trained in this new combination of disciplinary fields. For the consolidation of the success of this new trend in forest science, education of forest scientists is essential.

What is at stake here is the whole relationship between forest-related and agricultural practices in the tropical world. This proposed revolution in the forestry approach of its scientific background through the integration of a local knowledge perspective, could constitute a second chance for forestry to successfully address not only forest management problems, but also the interface between forest and agriculture because local forest users are mostly farmers, not isolated forest dwellers. A first window of opportunity opened 25 years ago with the creation of agroforestry as a new field of applied science, able to reconcile agriculture with trees, farming activities with forests and farmers with foresters. But agroforestry developed mainly as an agronomic approach to the management of trees as auxiliaries of agricultural crops in agricultural fields. It did not succeed in touching the global interaction between forests and agriculture, but created a third field in resource management sciences, somewhere distinctly between forest and agriculture but not joining these sectors. This global failure of agroforestry as an integrating science can be partly explained by the choice of its approach, which was dominantly experimental and did not succeed in integrating local knowledge and practice into its research field. Important changes have occurred in the second half of the nineties which give more hope for further development of agroforestry as a really integrative science (Leakey, 1996; Sinclair, 1999). If science based on local forest-related knowledge is to succeed in changing the face of forestry, and not to become a marginalised field in forestry, it should avoid concentration upon single discipline projects and take into account the whole reality of local forest management, from integrated practices of Jivaros Indians to the more destructive practices of swidden farmers in Vietnam.

REFERENCES

- Barrau, J. (1970). *L'Homme et son environnement végétal en région tropicale humide: L'exemple Malayo-Océanien*. (People and plant environment in tropical humid areas.) No. Fac. de Lettres/ Museum d'Histoire Naturelle, Paris.
- Bene, J. G., Beall, H. W., Cote, A. (1977) *Trees, food and people: Land management in the tropics*. IDRC, Ottawa.

- Bergeret, A. (1995). Les forestiers coloniaux: une doctrine et des politiques qui n'ont cessé de rejeter de souche. (Colonial foresters: doctrine and policies that constantly resprout.). In: Collective work 'Les sciences hors d'occident au XXème siècle'. ORSTOM Editions. Paris.
- Clarke, W. C. (1975). *The maintenance of agriculture and human habitats within the tropical forest ecosystem*. MAB Symposium on Ecological effects of increasing human activities on tropical and subtropical forest ecosystems, Port Moresby, UNESCO, Camberra.
- Conklin, H. C. (1957). *Hanunóo Agriculture*. FAO, Rome.
- Corvol, A. (1987). *L'Homme aux bois. Histoire des relations de l'homme et de la forêt XVIIe-XX siècles* (Man and woods. History of relations between people and forests XVII-XX centuries.). Fayard, Paris.
- Descola, P. (1994). *In the Society of Nature: A Native Ecology in Amazonia*. University of Cambridge Press, Cambridge. Translation of: Descola, P. (1986). *La Nature Domestique*. Plon, Paris.
- Descola, P. (1986). *La Nature Domestique* (In the Society of Nature). Plon, Paris.
- Devèze, M. (1965). *Histoire des forêts* (History of forests). PUF. Paris.
- Dinas, K. I. L. (1995). Damar gardens in Pesisir, development and transfer to other areas in Lampung (in Indonesian). In: *Collective work: Damar gardens as a model for community forestry*. Bandar Lampung, Sumatera, Indonesia.
- Ellen, R. F. (1978). *Nuaulu Settlement and Ecology*. Martinus Nijhoff, The Hague.
- Escobar, A. and Hvalkof, S. (1998). Nature, Political Ecology and Social Practice: Towards an Academic and Political Agenda. In: Goodman, A. and Leatherman, T. (eds.). *Building a New Biocultural Synthesis*. Ann Arbor: University of Michigan Press.
- Friedberg, C. (1996). Les droits de propriété intellectuelle: le point de vue de l'anthropologue. (Intellectual Property Rights: The point of view of an anthropologist.). *Nature, Sciences, Sociétés*. 7 (3) pp. 45-53.
- Ghimire, S.K., Parajuli, D.B., Gurung, T.N., Lama, Y.C.C. and Aumeeruddy, Y. (1999): *Conservation of Plant Resources, Community Development and Training in Applied Ethnobotany at Shey Phoksundo National Park*, Dolpa. Report to the EC.
- Gille-Escuret, G. (1998). *Les Sociétés et leurs Natures* (Societies and their Natures). Armand Colin, Paris.
- Godelier, M. (1984). *L'Idéal et le Matériel* (Ideal and Material.). Fayard, Paris.
- Haudricourt, A.G. (1962). Domestication des animaux, culture des plantes et traitement d'autrui (Animal husbandry, cultivation of plants and other treatments). *L'Homme* (People) II, pp 40-50.
- Leakey, R.R.B. (1996). Definition of agroforestry revisited. *Agroforestry Today* 8 (1), 5-7.
- Martin, G. (1995). *Ethnobotany: a methods manual*. Chapman and Hall, London.
- Michon, G. (1999). Cultiver la forêt: silva, ager, ou hortus? (Cultivating the forest: ager, hortus or silva). In: Pagezy H. (ed.). *L'Homme et la Forêt Tropicale*. SFEH, Marseille.
- Michon, G., de Foresta, H., Levang, P. and Kusworo (2000). The Damar Agroforests of Krui, Indonesia: Justice for Forest Farmers. In: Zerner, C. (ed.). *People, Plants and Justice. The Politics of Conservation*. Chapter 7, pp. 180-205. Cambridge University Press, New York.
- Nair, P. K. R. (ed.). (1989). *Agroforestry Systems in the Tropics*. Forestry Science, Kluwer Academic Publishers.
- Sinclair, F.L. (1999). A general classification of agroforestry practice. *Agroforestry Systems*. 46: 161-180.
- Sinclair, F.L. and Walker D.H. (1998). Qualitative knowledge about complex agroecosystems. Part 1: a natural language approach to representation. *Agricultural Systems* 56: 341-363.

- Sinclair, F.L. and Walker, D.H. (1999). A utilitarian approach to the incorporation of local knowledge in agroforestry research and extension. In: Buck, L.E., Lassoie, J.P. and Fernandes, E.C.M. (eds.). *Agroforestry in Sustainable Agricultural Systems*. pp. 245-275, Lewis Publishers, New York.
- Steward, J.(1955). *The Concept and Method of Cultural Ecology*. Urbana, University of Illinois Press.
- Thorne, P.J., Subba, D.B., Walker, D.H., Thapa, B., Wood, C.D. and Sinclair, F.L. (1999). The basis of indigenous knowledge of tree fodder quality and its implications for improving the use of tree fodder in developing countries. *Animal Feed Science and Technology* 81: 119 – 131.
- Vayda, A.P. (ed.) (1969). *Environment and Cultural Behavior: Ecological Studies in Cultural Anthropology*. Natural History Press, Garden City.
- Vayda, A.P. (1983). Progressive Contextualization: Methods for Research in Human Ecology. *Human Ecology* 11:265-281.
- Walker, D.H. and Sinclair, F.L. (1998). Qualitative knowledge about complex agroecosystems. Part 2: formal representation. *Agricultural Systems* 56: 365-386.
- Walker, D.H., Thorne, P.J., Sinclair, F.L., Thapa, B., Wood, C.D. and Subba, D.B. (1999). A systems approach to comparing indigenous and scientific knowledge: consistency and discriminatory power of indigenous and laboratory assessment of the nutritive value of tree fodder. *Agricultural Systems* 62: 87-103.
- Weber, J., Betsch, J. M., & Cury, P. (1990). A l'interface Hommes-Nature: les ressources renouvelables. (Between people and nature: natural renewable resources.). In: Piren, P. E. (ed.): *La recherche et l'environnement*. pp.14. Strasbourg: