Secondary sources on cultures and indigenous knowledge systems

12

L. Guarino
IPGRI, c/o International Laboratory for Research on Animal Diseases, PO Box 30709, Nairobi, Kenya.

Introduction

Data from scientific observations and experiments are used routinely by plant germplasm collectors to plan their work and document their collections. Measurements of environmental features of collecting sites taken in the field (e.g. soil pH, altitude) or estimated from their values at nearby sites (e.g. temperature, rainfall) help define the adaptation of the material collected and can thus guide multiplication, evaluation and use. Observations of plant characters made during characterization and evaluation trials will be of interest to breeders and other users and can also be helpful in directing future collecting by identifying areas of high diversity and pin-pointing where desired traits occur.

There is, however, another sort of data that can tell us about plants and the places where they are found: that derived from local or indigenous knowledge (IK). Farmers give names to the different landraces they cultivate and know their properties and requirements; nomadic pastoralists know where and when the plants grow which their livestock like to eat; tropical rain-forest dwellers know which nut can be eaten and which bark can be pounded to make a poison. Customs, cults, rites, taboos, legends, myths and folklore all speak of the relationship between people and plants, a relationship that is based on long-term, intimate experience and is often crucial to survival. The term 'traditional knowledge' is also sometimes used for this, but has been generally rejected as implying that the knowledge of local people is somehow static (G.D. Prain, pers. comm.). Richards (1985) states that local farming practice is 'not a matter of "traditions" refined by a long process of trial and error and handed down from generation to generation, but of active innovation and invention ... in the recent past'. In fact, both processes will be important.

No less than scientific data, the knowledge of plants, of animals (including pests) and of the environment that local men and women acquire, refine, maintain and exchange (usually orally, but also in writing and by observation) can help in making decisions about what and how to sample and about the use of germplasm. The two domains, the scientific and the indigenous, are complementary. Most importantly, in contrast to reductionist scientific knowledge, IK is interdisciplinary, holistic and diachronic, an approach that farming systems research and related techniques seek to emulate. It is, however, important to recognize that IK has limitations. They include its uneven (and often limited) distribution within communities, the fact that its transfer by oral means is error-prone, and its occasional fragility in the face of disturbance (IDS Workshop, 1989). This means that specialized methodologies are needed for its study and use. The documentation of indigenous botanical knowledge – the study of indigenous peoples and their relationship with, and use of, plants – is ethnobotany, a branch of ethnography (Plotkin, 1989; Given and Harris, 1992). Martin (1994) is a general guide to ethnobotanical fieldwork. Chapter 18 presents a methodology for documenting IK specifically of plant genetic resources. Chapter 19 discusses in more detail the specific topics on which information derived from both scientific observation and indigenous knowledge is needed in documenting a germplasm collection. This chapter discusses the role of IK in plant germplasm collecting and describes the various secondary sources of ethnographic data, in particular ethnobotanical data.

The importance of IK – of, that is, the knowledge of farmer, homemaker, herder, traditional healer – in the conservation of biodiversity has not perhaps been fully recognized in the past. However, this is changing, in particular as a result of the relatively recent involvement of social scientists in so-called formal sector plant genetic resources work and of the efforts of non-governmental organizations (NGOs) in the informal sector (e.g. the various papers in Cooper *et al.*, 1992). Indeed, Article 8 of the *Convention on Biological Diversity* now enjoins each Contracting Party to

> Subject to its national legislation, take action to respect, preserve and maintain knowledge, innovations, and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilisation of such knowledge, innovations and practices.

The role of women in this context is particularly emphasized in the preamble of the *Convention*. In Africa, for example, women make up perhaps 70% of the agricultural labour force and 80% of food producers, they undertake 60–90% of the marketing and they do all the processing of basic foodstuffs (Anon., 1993). They are thus the main custodians of

crop-related knowledge, though there is often a discrepancy between female workloads and experience on the one side and their social status (and power) on the other. Even where women's direct production tasks are more limited, they will probably be responsible for pre-sowing, processing, storage or cooking activities, and thus hold key information on germplasm performance and quality. Further, their general lack of decision-making power on land use means women often cultivate the main field crops at marginal sites, and thus have specialist knowledge of landrace performance with respect to problem soils or environments. In addition, women's trading networks and kin relationships are often the main channels for acquisition and exchange of germplasm (Jiggins, 1990).

Of course, communities have always changed, and continue to do so. For example, worldwide over 30% of rural households are now headed by women owing to male out-migration, and in some areas the proportion can be as high as 70%. The accompanying shifts in tasks and responsibilities and in labour inputs is bringing about far-reaching changes in management practices and in selection criteria (Jiggins, 1986). IK is thus not static: like the germplasm itself, it evolves. Unfortunately, however, it is also sometimes as threatened with erosion and extinction as the germplasm. In many areas it is fading even faster, as the cultural assimilation of rural populations outstrips even deforestation. D.A. Posey (quoted by Khalil *et al.*, 1992) has estimated that one Amerind group has vanished every year in one way or another since the beginning of the century: with each has gone 'an accumulated wealth of millennia of human experience and adaptation'. IK disappears when native people are stripped of their land or when war dislocates societies, but also when young people in contact with the outside world start to embrace the view that traditional ways are illegitimate and irrelevant.

Preserving and documenting the dwindling resource represented by IK are not an optional adjunct to the conservation of germplasm, but an integral and necessary part of the process. This is perhaps most obvious in the case of crops. A landrace may be defined as a set of populations (or clones) of a crop species developed and maintained by farmers and recognized by them as all belonging to the same entity. Landraces have also been called 'primitive varieties' or 'traditional varieties', but terms such as 'farmer's varieties' and 'folkseeds' are perhaps more appropriate than either (Mooney, 1992; but see Cromwell (1990) for a different use of the term 'farmer's variety'). Landraces are defined and delimited by what farmers and other everyday users know about them just as much as modern varieties, the products of scientific plant breeding, are defined by their pedigree and performance in trials. As Berg *et al.* (1991) point out, 'behind any named folk variety there is knowledge'. Collecting landraces (but also medicinal plants, forages and other species used by local communities) while ignoring the dimension of local knowledge cannot but be wasteful at best, hopelessly flawed at worst.

IK recorded on collecting forms can affect the later use of conserved germplasm no less than the results of formal evaluation and screening trials. But it is not just that breeding and introduction programmes will have had part of their work already done for them if conserved germplasm is accompanied by IK. The very aims and procedures of such programmes should be informed, even dictated, by what farmers and other local users of germplasm require and need, and collecting is an excellent opportunity to document such information. Farmers have been fulfilling their own requirements and needs for centuries. As Vellvé (1992) puts it: 'farmers have been breeders ever since agriculture began, ... breeders have been scientists only for the past two hundred years or so'. The scientific community needs to learn how farmers have been working, if their weaknesses are to be overcome and their strengths built on. At a time of shortages of staff and resources, the formal sector cannot afford to ignore the accumulated experience of local people, and in particular local women, in solving their own conservation and development problems.

IK is thus increasingly being recognized as crucial in agricultural research, extension and development in general (e.g. Brokensha *et al.*, 1980; McCorkle, 1989; Warren *et al.*, 1990, 1994; Warren, 1991). Some examples from the Consultative Group on International Agricultural Research (CGIAR) may be instructive. The Centro Internacional de Agricultura Tropical (CIAT) and Centro Internacional de la Papa (CIP) have been leaders in on-farm experimentation, the Internatioal Rice Research Institute (IRRI) rice breeders have used farmers' evaluations of germplasm to guide their work and International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and International Institute of Tropical Agriculture (IITA) have shown that understanding indigenous soil classification and management systems can assist farming systems research (Warren, 1993). On the role of women in particular, CIAT has pioneered the involvement of women bean farmers in the breeding process, IRRI has expanded understanding of postharvest rice characterization through the Women in Asian Rice Farming Systems Network and ICRISAT has demonstrated the value of collaborative work between entomologists and poor women sorghum growers in breeding for insect resistance.

Relevance of IK in germplasm collecting

Everyday users of germplasm have information that can play an important, and sometimes a decisive, role in several aspects of the collecting process and beyond. In particular, they have knowledge of:

- the vernacular names of landraces, wild plants and their pests;
- the local criteria for distinguishing among them, and their relationship to each other in any folk taxonomy;

- their appearance, properties, environmental preferences and uses;
- the places and habitats where they may be found, and the rules of access to them;
- the agricultural and management practices with which they are associated;
- the origin (history) of planting material, including any selection practices that may have been applied;
- the character of any changes in farming practice, land management and natural habitats.

The specific tasks in which such information will be important to the collector are listed in Box 12.1, and are discussed in more detail below.

Box 12.1
Uses of IK in germplasm collecting

- Locating target areas and material.
- Deciding what to collect, and how.
- Documenting the collection.
- Assessing the 'completeness' of collections.
- Understanding the origin and distribution of diversity, and the rules of access to it.
- Assessing the extent and threat of genetic erosion.

Locating and accessing target areas and material

Knowing the name in the local vernacular of a wild species, crop or landrace of interest can significantly facilitate the process of finding it, especially if it is rare. For example, it was possible to find the tree *Punica protopunica* at a number of 'new' sites on the island of Socotra (Republic of Yemen) through the help of local people because the correct local name was known. Finding another species, *Dirachma socotrana*, proved more difficult due to a confusion over its Socotri name (Ba'azara *et al.*, 1991). Not all wild species have distinct vernacular names, however, especially if they have no particular local uses and/or are inconspicuous. In contrast, it is unusual for this to be the case with landraces, though problems may occur with synonymy or when the same name (e.g. a 'category name' referring to the circumstances of acquisition) is used to refer to more than one morphological entity (Richards, 1991). In ethnically or linguistically diverse areas the names and uses of wild plants and landraces may change drastically within short distances.

Local people have knowledge not only of the distribution of particular wild plants, but also of the existence and location of 'sanctuaries' of high diversity (G.D. Prain, pers. comm.). Indeed, as A. Gupta (quoted by Khalil *et al.*, 1992) points out, these are often actively protected by communities, who may regard niches of plant and animal abundance as

sacred groves, the residences of ancestral spirits or deities. They may also fulfil a more practical function, serving as fall-backs, reserves to meet contingencies and for lean seasons and bad years (Chambers, 1990). Use of these areas, as of communal grazing areas and the like, may be under strict control, and collectors will need to be aware of this, so that permission for access can be asked of the appropriate community authorities.

Chambers (1990) makes the point that much subsistence agriculture works by creating or altering 'distinct, small-scale environments which differ from their surroundings, presenting sharp gradients or contrasts in physical conditions internally and/or externally'. Examples are silt-trap fields, pockets of fertile soil (e.g. termitaria), flood recession zones, patches of high groundwater, etc. Such specialized, in many cases marginal, environments are generally missed by conventional soil surveys and land systems studies because of their small size and dispersion. They are also often neglected by agricultural professionals, who tend to be male, have shorter time horizons than farmers and concentrate on staple and cash crops. These environments are often tended by women, may take years to develop, often feature 'unimportant' crops and do not fit in easily with conventional station-based research. Finding them requires collectors to go out of their way to talk to local people.

Locating target material requires not only being in the right place, but also being there at the right time. Local knowledge is often the best guide not only to where a particular wild species, crop, landrace or area of high diversity may be found, but also to the optimal timing of collecting. Farmers will know where harvesting is late in their area and which landraces mature early, for example, and pastoralists where the grass is in seed.

Deciding what to collect, and how

Farmers will be able to help the collector avoid modern cultivars, recently introduced exotic material and duplicates. When material with particular characteristics that are not easily observable in the field is being sought, indigenous knowledge (even just the vernacular name of a plant or landrace) can provide crucial clues. The classic case of this is medicinal plants, where ethnobotany has proved a valuable short cut to the identification of those plants that are likely to be of interest to medicine (Schultes, 1986; Waterman, 1989). Forages provide another example. The decision to collect a particular little-known species as a potential forage will usually be determined by its appearance (e.g. habit, leafiness), actual field observations of grazing and/or its taxonomic proximity to better-known species. Local knowledge of its acceptance by livestock can be much more precise than any of these, for example as regards differences in acceptability to different kinds of livestock and at different stages of growth. Thus, among Fulbe pastoralists in semiarid West Africa, the names of grasses will change with their quality as feed as they mature after rain, the quality of pasture being linked mainly to

the taste of the milk produced by the herd feeding on it (Bonfiglioli, 1992). Barrau (1989) discusses how ethnobotany can aid the search for new food and industrial crops.

The strategy and tactics used in collecting will also be informed by IK. Farmers will be able to define the extent of local market areas and seed exchange networks, which could form the basis of a stratification for sampling. The participation of farmers will be crucial when collecting from mixed fields. For example, the collector will need to know if the individual phenotypic entities in a heterogeneous field have been maintained separately and only mixed at sowing, before a decision can be made about how to collect. This issue is explored further in Chapter 18.

Documenting the collection

IK can help collectors decide if a particular crop field or wild population should be collected and, if so, how. It should, however, also form an important part of the documentation of any germplasm samples that are collected. Documenting IK on the properties and adaptations of germplasm – the kind of cultural practices and management that a landrace is subjected to, its requirements and susceptibilities, why it is favoured or disliked and how its products are processed, how a certain wild plant is used, etc. – can be seen as part of the characterization and evaluation process. Indeed, it is that process carried out from the everyday user's point of view. Local people's knowledge of landraces develops over generations of first-hand observation of crucial features of their appearance and performance in a variety of environments, through good years and bad years, 'observation which has to be keenly executed since farmers' lives literally depend on it' (V.D. Nazarea-Sandoval, pers. comm.).

There are numerous cases of the names of landraces reflecting not just appearance but properties such as days to heading and cooking quality (Boster, 1985; Hamon and Hamon, 1991; Richards, 1991). Sorghum landraces identified by Ethiopian farmers as of superior food quality (being referred to by such names as 'milk in my mouth' and 'squirts out honey', for example) were found by breeders to contain high levels of lysine and protein (Brhane and Yilma, 1979). The indigenous vegetable *Gynandropsis gynandra* is taken by pregnant women in western Kenya because it is said to relieve dizziness and generally make them stronger. Chemical analysis has revealed particularly high levels of iron (dizziness is a common symptom of iron deficiency syndrome in pregnant women), calcium and vitamin C (Opole, 1991). There is also evidence that farmers are aware of differences among landraces in their resistance to pests; they certainly have considerable knowledge of the biology of pests, and of pest control methods (Altieri, 1993).

Such knowledge about species and landraces is often systematized in folk classifications (e.g. Conklin, 1972; Brown, 1985; Brush, 1986; Berlin, 1992). These can be remarkably congruent with the results of scientific approaches, at both the interspecific (Alcorn, 1984) and the

intraspecific (Asfaw, 1990; Quiros *et al.*, 1990) levels. They can also provide new and useful insights. Folk taxonomies are not, however, invariable. Ellen (1982) points out that they are 'extremely flexible, vary considerably within a culture, contain different and contradictory organizational structures and appear generally pretty messy'. Though, as he goes on to say, 'this is not to suggest that they are somehow without structure', it does mean that a certain amount of methodological sophistication is necessary in studying them.

In addition to the properties of crop germplasm, its history also needs to be documented. Is the origin of the material to be traced back to just a few seeds from a single mother plant? Was the seed lot from which the material is descended only recently introduced to the collecting area from a place that is very different agroecologically? Is the sample taken from seeds already selected for planting? An understanding of the workings of local seed production and exchange systems will help to characterize the origin, genetic base and degree of adaptation of germplasm (Cromwell, 1990). The local names of crops and landraces can sometimes be used to deduce origin. For example, Esquivel and Hammer (1988) used linguistic as well as historical evidence to trace the geographical source of crops grown in Cuba today.

There is IK of the environment as much as of plants and pests. Niamir (1990) gives examples of descriptive IK of climate, soils, geomorphology (including groundwater) and vegetation types from Africa. Folk taxonomies and descriptions of land types, farming systems, soils and vegetation can all help in characterizing the collecting site, complementing scientific descriptions by highlighting those features of the environment most relevant to everyday users of the land (Johnson, 1974; Rhoades, 1990; Tabor *et al.*, 1990; Nazarea-Sandoval, 1991). For example, Tabor and Hutchinson (1994) note that the three riparian landscapes recognized in the valley of the Senegal River by local farmers are mapped as essentially identical in conventional soil surveys but differ in how often, for how long and at what time of year they are flooded and are therefore managed and used quite differently.

Assessing the completeness of collecting

Local men and women will know which crops, and which varieties of each crop, are grown in their village or district or are being sold in the local markets. People will also know which trees in their area are good firewood sources, which produce palatable fodder, which are suitable for building, and so on. Bearing in mind the problems of synonymy and category names, a checklist can be compiled based on such information which can act as a guide to collecting in a given area. In his work in Peru, for example, Berlin (1985) asked his local collaborators 'to produce comprehensive written inventories of all recognized, named plant taxa in the local flora and then to monitor carefully that list as collections were made'. Hammer (1991) discusses the use of annotated botanical checklists, incorporating local names, in crop germplasm collecting.

Understanding the origin and distribution of diversity, and the rules of access to it

The preamble to the action plan proposed by the International Society of Ethnobiology at its first congress in 1988 states that 'there is an inextricable link between cultural and biological diversity'. Understanding the diversity within a crop in an area (which is crucial in developing a sampling strategy) means understanding the people who grow it just as much as understanding the climate and soils of the region and the distribution of wild relatives and pests. This is because the pattern of diversity in crops is the result of an interaction between the genetic make-up of the plants and not just environmental (e.g. climate, soil) and biotic (e.g. relatives, pests) but also human factors.

Landraces are at least partly shaped by what may be referred to as the informal plant breeding and seed production and supply systems. There are often well-defined patterns of germplasm exchange within and between communities, sometimes stretching over large areas, based on kin groups and the extended family. Farmers also obtain landraces from local markets and during occasional journeys outside their home areas. Evidence that farmer selection is widespread in the tropics is given by Clawson (1985) and Brush (1986). Xolocotzi (1987) points out that differences between Cuban and Mexican maize are due to the fact that it is prepared and eaten in different ways in the two countries, which has led to selection for different properties. The work of Boster (1984, 1985) shows that among the Aguaruna of the Peruvian Amazon diversity in cassava is sought for its own sake. He recognizes selection for mere perceptual distinctiveness as well as for locally valued characters (not necessarily conventional 'agronomic' characters) such as taste and cooking quality. Such idiosyncratically selective maintenance, in conjunction with farmer-to-farmer exchange, occasional introduction and random loss, has meant that there is 'a core of common widely shared and widely known [cassava] cultivars and a much larger number of rarer cultivars known only by small numbers of women' (Boster, 1984). This is a common situation. Even knowledge of the fact that multiplication of open-pollinated varieties requires reproductive isolation is documented from traditional farming systems (Berg *et al.*, 1991). All this can only really be investigated by observing local people and asking them questions.

In wild species also, human action is often responsible for the maintenance of diversity within particular ecosystems through such management practices as grazing, burning and cutting in particular ways or at particular times. Examples range from Aboriginal Australians burning the bush to sheep grazing on the English Downs. Individual species are often protected against overexploitation by traditional systems of ownership or rights of use over the land or the plants themselves, often underpinned by a concept of the spiritual value of the land. The collector must be aware of these rules and conform to them. Osemeobo (1992) points out that plants of economic or of social and medicinal value such

as *Garcinia cola* and *Piper quineense* are protected in Nigeria under communal land tenure systems. Barrow (1992) discusses tree rights among the Turkana, and how they have worked to preserve a crucial resource in the semiarid regions of Kenya. An early European visitor to Australia, Sir George Gray, noted in 1841 that 'the natives have ... a law that no plant bearing seeds is to be dug up after it has flowered' (quoted by Harlan, 1989). Niamir (1990) reviews the range and plant tenure, management, monitoring and improvement practices of African pastoralists.

Assessing the reasons for and extent and danger of genetic erosion

To what extent farmers adopt modern varieties to replace their multiplicity of local landraces ultimately depends on the extent to which the varieties offered by scientific plant breeding and the formal seed industry better satisfy their household livelihood strategy. This in turn will be shaped not just by what is usually, and rather narrowly, defined as 'culture' (belief, art, moral law, custom, religion, etc.), but also by such socioeconomic factors as access to land, labour and capital, government macroeconomic initiatives and the influence of extension workers and other 'modernizers'.

For millions of resource-poor farmers in marginal areas, it is still local cultivars that serve them best, though there may be considerable turnover of landraces within a community as novel types arise by hybridization and volunteer seeding or are introduced and are then either maintained or eventually rejected. This preference for landraces (as for one landrace over another) may be difficult to account for in conventional on-station agronomic evaluation trials (e.g. Carney, 1980; Jackson *et al.*, 1980). In the Wadi Hadramaut region of southern Yemen, for example, farmers are resisting the introduction of higher-yielding, modern varieties of wheat partly because of the greater tolerance of the local landraces to increasingly saline irrigation water, but also because these are taller and much of the value of the crop in the area lies in the straw, which is essential in making mud bricks (pers. obs.). Jackson *et al.* (1980) also discuss the different reasons, human and natural, why apparently 'inferior' potato genotypes survive in Andean fields. Brush (1993) describes three cases of continued maintenance of landraces by farmers who have also adopted modern varieties, and discusses the factors which promote this (Chapter 4).

The socioeconomic and cultural context is no less important a factor in understanding genetic erosion in some wild species. It is common for Turkana women in northern Kenya to say that 'eusugu' (*Zanthoxylum chalybeum*), an alternative to tea leaves, 'is moving further and further up the hills' (Anon., 1992). Tyler *et al.* (1992) describe how changes in the management of old permanent pastures in the UK, some in use since medieval times, are threatening diversity.

It is often the abandonment of traditional management practices and tenure systems, sometimes as a result of misguided development

efforts, that is threatening range vegetation in many arid and semiarid areas of the world (Gilles, 1988). Documenting how indigenous management of individual species and of vegetation as a whole operates, as discussed in the previous section, will help in predicting what will happen if it should stop. Conant (1989), for example, describes how the movement of several hundred pastoralist Pokot families from the Masol Plains of Kenya resulted in massive changes in the vegetation, as revealed by Landsat data. The Sahel Oral History Project of SOS Sahel has used hundreds of interviews with elderly people to document how development has affected land use practice, land tenure and farming and pastoral systems in the region (Cross and Barker, 1991). Though satellite imagery and written historical sources can make a contribution, such oral testimony is often the only source of information on change – whether in the vegetation of an area, in the extent of cultivation of a crop or landrace, in the cultural practices being used or in the range or abundance of a wild species.

Secondary sources of information on human cultures

Clearly, if previous attempts have been made to document how a community uses wild plants or grows crops, the germplasm collector will need to become familiar with them. This will be as critical as consulting and collating Floras, taxonomic monographs, soil maps, climatic data and the results of agricultural and socioeconomic surveys, and not just to the plant genetic resources worker planning to collect in a foreign country. As McArthur Crissman (1989) points out in the case of Kenya, for example, 'ethnic affiliation is correlated with choice of crops and even occupations'. There is considerable ethnic, cultural and linguistic diversity within countries, and national plant genetic resources programmes need to be aware of it and its link to the diversity not just of crops, but of wild species too.

It is not just strictly ethnobotanical information that will be relevant to the germplasm collector, however. Indigenous ecological knowledge will be important, for example folk soil taxonomies. More general ethnographic information will also be pertinent. Knowing the local system of measuring area, distance, weight and time will be essential in making sense of discussions with local people, as will knowing about the system of land tenure, when market days fall and who the decision-makers are in the community. Secondary sources on these subjects may well be very numerous, generating a considerable amount of complex and contradictory textual information, which will need somehow to be abstracted and organized. A record will need to be kept of conflicting statements, of information that is probably imprecise or no longer valid and of any gaps in the documentation.

One useful approach to the ordering of such data is to develop 'profile memos', bringing together and summarizing information (with

references to sources, including the date of the observations) on particular individual topics of interest to the collector. Thus, for example, for each area or ethnic (or language) group to be visited during the collecting there would be memos on:

- the phonetic system commonly used to render local words into the collector's language, and the local script, if any;
- the local systems for the measurement of time, distance, area, weight and volume;
- different crops and wild species, and the relationships among them in any folk taxonomy;
- any folk nomenclatures and taxonomies of land types, soils, vegetation, etc.;
- different farming systems and agricultural and pastoral practices;
- significant places and geographical features in the target area;
- important people, social groupings and indigenous institutions;
- relevant laws, customs, taboos and restrictions, in particular as regards tenure of, and access to, land and natural resources;
- significant occasions (e.g. holidays and festivities, market days, village temple days, etc.);
- how gender, age, class, ethnicity and other socioeconomic and cultural factors affect access to and control of resources, including plant genetic resources.

The information in some of these memos could then be worked up into annotated glossaries of local terms, suitable for taking into the field. (Clearly, published dictionaries, if available, can also be extremely useful in the field.) In the case of the terms for soils, vegetation types, farming systems, etc., these could also be incorporated into the collecting forms, suitably defined (Chapter 19). A special case of such glossaries would be the annotated checklists of wild species, crops and landraces already mentioned, against which the material collected can be ticked off and which can be updated during the course of the collecting (Hammer, 1991). Some of the information, in coded form, will also find its way into the databases constructed as part of ecogeographic surveys (Chapter 14).

Literature

Where can the prospective collector obtain this kind of information? The main source will be the literature – historical and current, formal and grey. Travellers, explorers, conquerors and colonists have often written about the plants that are grown or gathered by the peoples among whom they have found themselves. They include ibn Battuta writing of his African and Asian travels, Marco Polo and his *Il Milione*, the story of his travels to China, composed in a Genoese prison, and the Franciscan friar Bernardino de Sahagon recording the customs of the Aztecs in the *Historia General de las Cosas de la Nueva España*. Arrogance, bias, ethnocentricity and insensitivity are all too obvious in the lesser

exponents of this tradition, which, however, finds specialized, professional expression in modern scientific anthropology and ethnography. The work on the Nupe of west-central Nigeria described by Blench (1989) is a good example of how the diverse (in accuracy and attitude as much as style) writings of explorers, traders, colonial administrators and missionaries, as well as ethnologists, linguists, anthropologists and historians, in this case spanning almost two centuries, can be used to build up a picture of changes in crop repertoire and farming systems in an area.

At the other extreme from the anthropological and ethnographic literature, both amateur and professional, limited information on the vernacular names and uses of wild plants can occasionally be gleaned from purely taxonomic works such as Floras and botanical checklists, especially local ones. Floras are of course usually compiled in herbaria, and specimen labels (as well as the notebooks of botanical collectors) can therefore be another useful source of ethnobotanical information. Examples of the kind of ethnobotanical information available on herbarium labels may be found in Altschul (1968, 1970, 1973) and in such unpublished sources as the East African Herbarium Card Catalogue on Plant Uses (cited by Peters *et al.*, 1992). This herbarium also has a card catalogue of local names; both are being upgraded to computer databases. In agriculture, Richards (1985) quotes examples of colonial departments of agriculture in West Africa recording different aspects of local practice, including the vernacular names of species and landraces. Often, this was a preliminary to trying to replace them (usually with disastrous results), but such was by no means always the case. The sophistication, adaptability and appropriateness of local farming practices were occasionally recognized even in the colonial context, not usually otherwise particularly conducive to the development of such views. Official agricultural censuses, specialized surveys, the reports of extension workers and other grey literature can still occasionally provide information on local practices, making the archives of municipal libraries (Marchenay, 1987), district departments of agriculture and local extension offices potentially important sources.

Crop germplasm collectors have gathered ethnobotanical data in the field no less than botanists collecting for herbaria, but until relatively recently this has unfortunately often been similarly haphazard and unsystematic. As a result, collecting mission reports and the notebooks of germplasm collectors are often better sources of ethnobotanical insights than the admittedly more easily accessible passport data associated with collections (the equivalent of herbarium labels).

Inevitably, ethnographic sources suffer on occasion from a lack of botanical and agricultural expertise in their recording of IK relating to wild plants and crops. The usefulness of botanical, agricultural and genetic resources works in this context is often similarly limited by a lack of ethnographic or linguistic expertise. Travel and other amateur literature often suffers from a lack of both. Care should therefore be

exercised in interpreting ethnobotanical data in non-specialist sources. Bisset (1990) gives examples of problems that have arisen in using the ethnographic literature as a source of information on medicinal and toxic plants. Data in older sources may no longer be valid. A local plant name or use quoted in a travel book, or even a Flora, and remarks such as 'said to be liked by camels' and 'used as a diuretic' on a herbarium label, are to be treated with due caution. In many cases, the information will be no more than anecdotal. There will also be misunderstandings. Kuchar (1989) tells the story of learning that the local name recorded on a herbarium label of *Leucas urticifolia* from Somalia translated from the local language as 'It's just a plant'. Familiarity with the local language is an absolute requirement for the collecting of names in particular and ethnobotanical information and indigenous knowledge in general. Burkill *et al.* (1985) discuss further the problems involved in documenting vernacular names.

Botanical and ethnographic expertise come together, however, in the growing ranks of specialized ethnobotanical and economic botany studies, perhaps the most typical example of which is the 'useful-plants work'. Useful-plants works range from those with a regional (e.g. Burkill *et al.*, 1985) or country-wide scope (e.g. Abbiw, 1990) to those dealing with single ethnic groups (e.g. Riley and Brokensha, 1988). They may deal with all useful plants in a flora, as in these studies, or with a single category of:

- use: e.g. edible plants (e.g. Peters *et al.*, 1992) or medicinal plants;
- taxonomy: e.g. Balick and Beck's (1990) *Useful Palms of the World* or Stevels (1990) on the legumes traditionally grown in Cameroon;
- plant type: e.g. Maydell (1990) on Sahelian trees and shrubs.

One of the most thorough surveys of useful plants is that of the Plant Resources of South-East Asia (PROSEA) Programme. Based in Bogor, and a foundation under Indonesian law with an international charter, PROSEA collects, evaluates and summarizes knowledge on useful plants in southeast Asia. It produces handbooks by commodity (eight by 1994, see Chapter 10) and runs the South-East Asian Plant Resources Information System (SAPRIS), a documentation system which includes six linked databases (e.g. Jansen and Siemonsma, 1992). Though not basically ethnobotanical in character, the handbooks do include information on local names and uses, for example, as well as taxonomic, ecological and agronomic information.

One category of use – medicinal plants – has given rise to a particularly extensive specialist literature, evidence of the enormous importance of such plants in not just traditional but also modern medicine. This literature includes many very large-scale works, for example those in the *Medicinal Plants of the World* series and such monumental efforts as Schultes and Raffauf (1990). Smaller-scale research is published in specialized periodicals such as *Economic and Medicinal Plant Research*, *Journal of Ethnopharmacology*, *Fitoterapia* and *Planta Medica*. There is

a 'Bibliography of Herbal Medicine' in Lewis and Elvin-Lewis (1977).

To gain entry to the older specialized literature on useful plants on the basis of scientific name or plant product, a possible first step is Uphof's (1968) *Dictionary of Economic Plants*. Kunkel (1984) is an updating of Uphof (1968) and similar works, but the information it supplies is very limited (and restricted to plants that are consumed) and it quotes only secondary sources. Schultze-Motel (1986) also documents the uses of cultivated plants. It has a species index, a list of species according to uses and a bibliography which includes ethnobotanical works. None of these works concerns itself with the landrace level of variation, however.

Published ethnobotanical data at the landrace level within crops is in fact fairly limited, and is mainly to be found in the reports of investigations of single ethnic groups or small geographic areas. There are exceptions, however, for example Yen's (1974) wide-ranging ethnobotanical study of the sweet potato in Oceania, which draws on such disparate sources as ethnographies, dictionaries and other linguistic works, histories, archaeological works and *The Journals of Captain James Cook*. Small-scale studies of landraces, as well as of useful (including medicinal) plants, are published in periodicals such as *Advances in Economic Botany*, *Economic Botany*, *Human Ecology*, *Journal d'Agriculture Tropicale et de Botanique Appliquée* (continued as *Journal d'Agriculture Traditionelle et de Botanique Appliquée*), *Journal of Economic and Taxonomic Botany*, *Journal of Ethnobiology* and *Journal of Natural Products*. Another relevant journal is *Agriculture and Human Values*.

To keep track of the current literature, *Plant Genetic Resources Abstracts*, produced by CAB International (formerly the Commonwealth Agricultural Bureaux), and the International Plant Genetic Resources Institute (IPGRI), includes an 'Ethnobotany and socioeconomics' section. Nowadays, bibliographic databases can greatly simplify literature searches. Chapter 13 deals with agricultural databases, both on-line and on CD-ROM. The Royal Botanic Gardens, Kew, maintain an Economic Botany Bibliographic Database. Among relevant published bibliographies, Hawkes *et al.* (1983), also mentioned in Chapter 13, includes sections on 'Archaeology, palaeoethnobotany and ethnobotany' and 'Crop ecology, agroecology and agricultural systems' as well as on individual crops. Lawani *et al.* (1979), Graham (1986) and McCall (1988) are useful sources on indigenous farming systems. Mathias-Mundy *et al.* (1992) is a bibliography on indigenous tree-based farming systems, including home gardens. Niamir (1990) and Shepherd (1992) are bibliographies of traditional vegetation management and protection methods.

There is, unfortunately, no geographical guide to the worldwide literature on ethnobotany along the lines, for example, of what Frodin (1984) has done for the floristic literature, though Uphof (1968) includes a bibliography arranged by geographical area. There is, however, a useful geographical guide to the world's cultures, Price's (1990) *Atlas of*

World Cultures. This consists of a set of maps which physically locate some 3500 human cultures and an alphabetical index which points the researcher to the appropriate map(s) and to the literature. Using this atlas, collectors should be able to determine which cultural groups are found within an unfamiliar target area, and thus gain entry to the general ethnographic literature, which could in turn lead to more specialized ethnobotanical works. Each culture in Price's (1990) index is cross-referenced to its listing in Murdock's (1967) classic *Ethnographic Atlas* and his Human Relations Area Files (HRAF) (Murdock *et al.*, 1983). Rhoades (1988) notes that, in building up the HRAF, Murdock 'collected detailed data on the incidence and distribution of cultivated plants from over 2,000 ethnographic sources' for Africa alone. There is also information on technology, social patterns, economics, language, and so on. Originally called the Cross-Cultural Survey, Murdock's project was to compile a database of descriptive information on human cultures worldwide. HRAF has grown to a large-scale research organization devoted to the compilation of information that facilitates cross-cultural comparative study. Some of the material in HRAF is available on a series of CD-ROMs (*Cross-Cultural CD*).

There are also national-level ethnographic atlases and bibliographies. An example of the former is Merwe (1983), which, among other things, gives information on the distribution of different population groups in Namibia. Parry and Perkins (1987) review mapping (including such thematic mapping as ethnographic atlases) on a country-by-country basis (Chapter 9). Ellen's (1984) manual of *Ethnographic Research* has a section on 'Getting into the literature', which covers the *International Bibliographies of Social Sciences* series and ethnographic archives. Hopkins and Jones (1983) list national and regional bibliographies in anthropology and human geography. The Center for Indigenous Knowledge for Agriculture and Rural Development (CIKARD) at Iowa State University has a documentation unit and library that will be of help in searching the ethnographic literature (McKiernan, 1989). It produces a series of Bibliographies in Technology and Social Change, of which Mathias-Mundy *et al.* (1992) is one.

An important limitation of the literature, especially older sources, is the general neglect of women's knowledge, though exceptions do exist, such as William Lawson's *The Countrie Housewife's Garden*, published in 1617. Travellers' notes and ethnographies of the 19th and 20th centuries generally make no or only passing reference to women's knowledge of plant species and uses. More recent literature, such as *Rural Women in Pakistan Farming Systems Research* (PARC, 1988), is available for most regions of the world for the main crops, but collectors may need to access the probably unfamiliar territory of women's studies libraries. *Rural Women* (Kubisz, 1992) is an annotated bibliography of this literature. Similarly, agricultural and extension departments are often poorly informed concerning the role of women in farming, are staffed mainly by men and in general contact only few women farmers. Staff of home

economics departments might be of help, depending on their resources to run field-based activities.

Though wild plant lore and agricultural knowledge are for the most part transmitted orally through such varied channels as performing arts, deliberate instruction, debate and conversation, their writing down by a community itself is just as widespread and ancient a practice as that of travellers, anthropologists and plant collectors recording the names and uses of plants among the different communities they encounter. New Kingdom papyrus manuscripts from ancient Egypt, for example, list hundreds of medicinal herbs and preparations. In India, the medical system of the Ayurveda, known through a vast scholarly literature in Sanskrit and other languages, refers to over 3000 plant species, many still used in the same way today. It was not very long after the fall of the Aztec empire that two of the survivors wrote, in Latin, the book of medical botany now known as the Badianus manuscript. There are local texts describing farming practices and crop varieties from many ages and cultures, from Yemeni agricultural calendars to such Chinese treatises as *Skilful Hands Create the World*, a 17th century AD heir to a 3000-year-old tradition. Historical written sources such as these may be available in modern translations, but in many cases will need to be deciphered by experts. Nowadays, the informal sector (local NGOs and other grass-roots organizations) is very active in this field (e.g. Cooper *et al.*, 1992). An instructive example is provided by the agroecological project of the Agroecologia Universidad Cochabamba in Bolivia (Rist, 1991). Project staff have been collaborating with local people in documenting their local knowledge in the form of 'fichas', simple printed information notes. These 'have provided a method of horizontal, farmer to farmer and community to community, communication, thus increasing the communities' ability to support each other in dealing with common problems'.

Databases

Bibliographic databases have already been alluded to. There are also, however, factual databases bringing together ethnobotanical information from the literature, herbarium labels and expert opinion. One can keep track of developments in this field through various specialist newsletters (see next section).

At the farming system level, the International Centre for Research in Agroforestry (ICRAF) has developed a database on agroforestry practices (Oduol *et al.*, 1988). The Survey of Economic Plants of the Arid and Semi-arid Lands (SEPASAL), based at the Economic Botany Section of the Royal Botanic Gardens, Kew, compiles information on indigenous plant names and uses as well as taxonomy, ecology and distribution. Its publications include *Forage and Browse Plants for Arid and Semi-arid Africa* (IBPGR and Royal Botanic Gardens, Kew, 1984). A coding system for economic uses has been developed by SEPASAL (Chapter 19). The International Legume Database and Information Service

(ILDIS) has the aim of developing a database containing basic nomenclatural, distributional and descriptive information on the legumes of the world, from the literature and data at the Herbarium at Kew. Uses are also recorded, linked to bibliographic records. The checklist of Lock (1989) has been compiled from the data on African species.

Other examples of databases on a global or regional scale which include information on local uses and other ethnobotanical data are: the US Department of Agriculture (USDA)'s Minor Economic Plant Species Database (Duke, 1983); ICRAF's Multipurpose Tree Database (Carlowitz, 1984; Carlowitz *et al.*, 1991); ACSAD's Arab Data Bank for Arid Zone Plants; and PROSEA's SAPRIS, already alluded to. Some examples of databases specifically on medicinal plants are listed in Box 12.2. The database maintained by the gene bank of the Institut für Pflanzengenetik und Kulturpflanzenforschung at Gatersleben in Germany contains the local names and uses of the cultivated plants of Libya, North Korea, Cuba and southern Italy (Knüpffer, 1992; K. Hammer, pers. comm.). National and smaller-scale databases on indigenous plants and their uses are proliferating rapidly, as are taxonomic and biodiversity databases in general, to which they are often linked (Chapter 10). An early example among many is the database of Maya indigenous plant knowledge and useful plants of Mexico, which was developed in conjunction with the *Flora of Veracruz* Project (Gomez-Pompa and Nevling, 1988). Others are the databases being developed at the East African Herbarium in Nairobi, Kenya, from long-standing card catalogues of uses and local names, which have already been mentioned.

At the landrace level within crops, local name and some indication of uses and local management practices (for example, sowing and harvesting time) are commonly included as part of the passport information in the germplasm databases of national programmes and regional and international institutions involved in crop genetic resources conservation. The systematization in databases (electronic or otherwise) of the full range of IK associated with the landraces maintained by rural societies is only just beginning, however. Recent work on sweet potatoes in the Philippines and Irian Jaya by CIP User's Perspective With Agricultural Research and Development (UPWARD) is a notable example, but is still on a relatively small scale (e.g. Nazarea-Sandoval, 1990; Prain, 1993; Chapter 38).

Expert sources: a global community

Jain *et al.* (1986) have produced *A World Directory of Ethnobotanists*, which may help to identify experts on particular topics. Also useful in this will be professional societies such as the International Society of Ethnobiology and the Society for Economic Botany. The latter publishes the journal *Economic Botany* and a newsletter, *Plants and People*. There are also a number of important international programmes in the field of IK in general and botanical IK in particular. Unesco, the World Wide

Box 12.2
Some databases on medicinal plants

- The World Health Organization-funded Natural Products Information System database (NAPRALERT) has bibliographic references, numerical data and textual information on biochemistry, pharmacology and indigenous uses (Loub *et al.*, 1985).
- The regional bibliographic database and referral database of information sources, research institutions and experts of the United Nations Educational, Scientific and Cultural Organization (Unesco)-supported Asian Pacific Information Network on Medicinal and Aromatic Plants (APINMAP) bring together information from 11 national nodes.
- The database of the Istituto Mexicano para el Estudio de las Plantas Medicinales has data on the uses of Mexican plants in traditional medicine extracted from the literature (Loub and Farnsworth, 1984).
- The database of the Chinese University of Hong Kong contains information on traditional Chinese medicine (Loub and Farnsworth, 1984).
- PHARMEL is a database of information on medicinal plants collected on ethnobotanical expeditions organized by France's Agence de Coopération Culturelle et Technique (ACCT) in 11 countries, mostly in West Africa; a standard methodology for data gathering has been developed (Waechter and Lejoly, 1990).
- NEMOBASE holds fieldwork and literature data on traditional uses of plants in France (Dos Santos, 1990).
- The AYURBASE project aims to compile data from the Ayurveda system of Indian medicine (Mazars, 1990).

Fund for Nature (WWF)-International and the Royal Botanic Gardens, Kew, have recently launched the People and Plants Programme, for example. This supports ethnobotanists studying and recording plant uses with local communities in tropical countries. Unesco Canada/MAB (Man and the Biosphere Programme) is developing an international programme on traditional ecological knowledge, and a quarterly newsletter is being published (*TEK Talk*).

Perhaps the most important development, however, is the growth of a network of national, regional and international IK resource centres. CIKARD is collaborating with the Center for International Research and Advisory Networks (CIRAN) and the Leiden Ethnosystems and Development Programme (LEAD), both in the Netherlands, in publishing the *Indigenous Knowledge and Development Monitor*, a quarterly newsletter for this global network. First published in early 1993, this absorbed the CIKARD newsletter, *CIKARD News*. It gives information on current research projects, databases under development and being planned, recent publications, etc. A list of IK resource centres, taken from the latest issue, is provided in Appendix 12.1 at the end of this chapter. CIRAN is planning an inventory of existing databases containing information relevant to the global IK network – bibliographic, factual and relating to expert sources.

In addition to IK resource centres, universities, herbaria and museums are important sources of relevant expertise and publications. As for NGOs, periodicals such as *Ecoforum* (published by Environment Liaison Centre International, which acts as the NGOs' link to the United Nations Environment Programme (UNEP)), *EcoAfrica* (African NGOs Environment Network), *IRED Forum* (Innovations et Réseaux pour le Développement) and *Seedling* (Genetic Resources Action International) report on their activities and initiatives worldwide. *Development Education and Exchange Papers* is a periodic review of Food and Agriculture Organization (FAO) and NGO programmes and publications in agricultural and rural development. The September 1993 issue was entirely dedicated to plant genetic resources issues. An NGO networking system on indigenous technology and innovation is being established through the efforts of the Indian Institute of Management at Ahmedabad. Its publications include Gupta *et al.* (1990) and the quarterly newsletter *Honey Bee*. In collaboration with a committee of NGOs, IPGRI is developing a directory of African NGOs involved in plant genetic resources work, expected to be ready in 1994.

Another pertinent organization is the Information Centre for Low-External-Input and Sustainable Agriculture, which publishes *ILEIA Newsletter* quarterly (e.g. issue 4/89 is entirely devoted to IK), in addition to bibliographies and a register of organizations. *International Ag-Sieve* is a useful 'sifting of news about regenerative agriculture' published by the Rodale Institute.

Expert sources with a specific understanding of gender-related issues include: the Association of Women in Development, the International Federation of Women in Agriculture, the Associated Country Women of the World, the Women in Rice Farming Systems Network and the Association of Farming Systems Research-Extension. The Association of Farming Systems Research–Extension, an international society organized to promote the development and dissemination of methods and results of participatory on-farm research and extension, publishes the *Journal for Farming Systems Research–Extension*. The Rural Sociological Society has a Rural Women in Economic Production Research Group. The Rural Sociological Society publishes the journal *Rural Sociology*, the newsletter *The Rural Sociologist* and a directory listing members alphabetically, by geographical region, world regions of interest and area of competence.

Since 1993, CIKARD, CIRAN, the Honey Bee Network and several other organizations have been facilitating the electronic mailing list INDKNOW. This provides an open forum for discussion of IK and related issues. More information can be obtained from Preston Hardison at cied@u.washington.edu.

Conclusion: the need for participatory collecting

With increasing recognition of the fundamental role that farmers continue to play in generating and maintaining the diversity of landraces, and indeed of the role of traditional societies in general in developing the many uses of plants, wild and cultivated, has come the acknowledgement that they must be involved much more profoundly than has perhaps been the case in the past in the process of systematic germplasm conversation. On-farm conservation (e.g. Altieri and Merrick, 1987; Merrick, 1990; Brush, 1991; Worede, 1991; various papers in Cooper *et al.*, 1992) and 'memory-banking' IK of landraces within rural communities are clearly part of this (Nazarea-Sandoval, 1990), but *ex situ* conservation is no less important than *in situ* and IK is equally central to both.

Having collected whatever background ethnographic information on their target species and target region may be available, germplasm collectors – nationals as much as foreigners – can perhaps approach the task of documenting IK for themselves in the field with more confidence, and certainly with more sensitivity. Empathy and familiarity with (and respect for) the local culture are of course necessary for such work, but not sufficient. The active participation of the community is essential. After all, who is better placed to understand a culture than someone born into it? As pointed out earlier, there is nothing new about the documentation by a community itself, by the men and women who make it up, of its agricultural and botanical knowledge. Farmer participation (e.g. Farrington and Martin, 1988; Amanor, 1989) is increasingly recognized as a vital way not only of doing better, more relevant research, but of empowering communities at the same time. Chapter 18 discusses this more fully, and describes how participatory germplasm/IK collecting might work in practice.

Acknowledgements

I am grateful for the comments and suggestions of Janice Jiggins, Virginia Nazarea-Sandoval, Gordon Prain, Toby Hodgkin and Esbern Friis-Hansen. I would also like to thank all the participants of the Wageningen Agricultural University/ENDA-Zimbabwe/CGN/GRAIN Seminar on 'Local Knowledge and Agricultural Research' (Brodensbury Park Hotel, Nyanga, Zimbabwe, 28 September to 2 October 1992) and of the Intermediate Technology Development Group/Plan International Workshop on 'Collecting and Feeding Back Existing Local Knowledge' (Embu, Kenya, 27–30 September 1993).

References

Abbiw, D.K. (1990) *Useful Plants of Ghana.* Intermediate Technology Publications and Royal Botanic Gardens, Kew, London.

Alcorn, J.B. (1984) *Huastec Mayan Ethnobotany.* University of Texas Press, Austin.

Altieri, M.A. (1993) Ethnoscience and biodiversity: key elements in the design of sustainable pest management systems for small farmers in developing countries. *Agriculture, Ecosystems and Environment* 46:257–272.

Altieri, M.A. and L.C. Merrick (1987) *In situ* conservation of crop genetic resources through maintenance of traditional farming systems. *Economic Botany* 41:86–96.

Altschul, S.V.R. (1968) Useful food plants in herbarium records. *Economic Botany* 22:293–296.

Altschul, S.V.R. (1970) Ethnopediatric notes in the Harvard University Herbaria. *Lloydia* 33:195–198.

Altschul, S.V.R. (1973) *Drugs and Foods from Little-known Plants: Notes in Harvard University Herbaria.* Harvard University Press, Cambridge.

Amanor, K. (1989) *340 Abstracts on Farmer Participatory Research.* ODI Agricultural Research and Extension Network Paper No. 5. Overseas Development Institute, London.

Anon. (1992) Reaching the woman. *Indigenous Food Plant Programme Newsletter* 10:1–2.

Anon. (1993) A woman's rightful place? *Spore* 44:1–3.

Asfaw, Z. (1990) An ethnobotanical study of barley in the Central Highlands of Ethiopia. *Biologisches Zentralblatt* 108:51–62.

Ba'azara, M., L. Guarino, A. Miller and N. Obadi (1991) *Dirachma socotrana* – back from the brink? *Oryx* 25:229–232.

Balick, M.J. and H.T. Beck (eds) (1990) *Useful Palms of the World. A Synoptic Bibliography.* Columbia University Press, New York.

Barrau, J.F. (1989) The possible contribution of ethnobotany to the search for new crops for food and industry. In: Wickens, G.E., N. Haq and P. Day. (eds) *New Crops for Food and Industry.* pp. 402–410. Chapman and Hall, London.

Barrow, E.G.C. (1992) *Tree Rights in Kenya. The Case of Turkana.* ACTS Press, Nairobi.

Berg, T., A. Bjornstad, C. Fowler and T. Skroppa (1991) *Technology Options and the Gene Struggle.* NORAGRIC Occasional Papers Series C. Development and Environment No. 8. NORAGRIC, Aas.

Berlin, B. (1985) Contributions of native American collectors to the ethnobotany of the Neotropics. In: Prance, G.F. and J.A. Kallunki (eds) *Ethnobotany in the Neotropics. Advances in Economic Botany* 1:24–33. The New York Botanical Garden, New York.

Berlin, B. (1992) *Ethnobiological Classification: Principles of Categorization of Plants and Animals in Traditional Societies.* Princeton University Press, Princeton.

Bisset, N.G. (1990) The ethnographic approach to ethnopharmacology: a critique. In: Fleurentin, J., P. Cabalion, G. Mazars, J. Dos Santos and C. Younos (eds) *Ethnopharmacology: Sources, Methods, Objectives.* ORSTOM and Société Française d'Ethnopharmacologie, Paris.

Blench, R. (1989) The evolution of the cultigen repertoire of the Nupe of West-Central Nigeria. *Azania* 24:51–63.

Bonfiglioli, A.M. (1992) *Pastoralists at a Crossroads. Survival and Development Issues in African Pastoralism.* UNICEF/UNSO Project for Nomadic Pastoralists in Africa, Nairobi. Final Version, November 1992.

Boster, J.S. (1984) Classification, cultivation and selection of Aguaruna cultivars of

Manihot esculenta (Euphorbiaceae). In: Prance, G.F. and J.A. Kallunki (eds) *Ethnobotany in the Neotropics. Advances in Economic Botany* 1:34–47. New York Botanical Garden, New York.

Boster, J.S. (1985) Selection for perceptual distinctiveness: evidence from Aguaruna cultivars of *Manihot esculenta*. *Economic Botany* 39:310–325.

Brhane, G. and K. Yilma (1979) The traditional culture and yield potential of the Ethiopian high lysine sorghums. *Ethiopian Journal of Agricultural Science* 1:29–40.

Brokensha, D.W., D.M. Warren and O. Warner (1980) (eds) *Indigenous Knowledge Systems and Development*. University of America Press, Boston.

Brown, C.H. (1985) Mode of subsistence and folk biological taxonomy. *Current Anthropology* 26:43–53.

Brush, S.B. (1986) Genetic diversity and conservation in traditional farming systems. *Journal of Ethnobiology* 35:70–88.

Brush, S.B. (1991) A farmer-based approach to conserving crop germplasm. *Economic Botany* 45:153–165.

Brush, S.B. (1993) *In situ* conservation of landraces in centres of crops diversity. Paper delivered at the 'Symposium on Global Implications of Germplasm Conservation and Utilization'. 85th Annual Meeting of the American Society of Agronomy. 8 November 1993. Cincinnati, Ohio.

Burkill, H.M., J.M. Dalziel and J. Hutchinson (1985) *The Useful Plants of West Tropical Africa*. Royal Botanic Gardens, Kew.

Carlowitz, P.G. von (1984) *Multipurpose Trees and Shrubs: Opportunities and Limitations – the Establishment of a Multipurpose Tree Database*. Working Paper 17. ICRAF, Nairobi.

Carlowitz, P.G. von, G.V. Wolf and R.E.M. Kemperman (1991) *Multipurpose Tree and Shrub Database – An Introduction and Decision-Support System. User's Manual, Version 1.0*. ICRAF, Nairobi.

Carney, H.J. (1980) *Diversity, Distribution and Peasant Selection of Indigenous Potato Varieties in the Mantaro Valley, Peru: a Biocultural Evolutionary Process*. Social Science Department, Working Paper Series 1980–3. CIP, Lima.

Chambers, R. (1990) *Microenvironments Unobserved*. Gatekeepers Series No. 22. IIED, London.

Clawson, D.L. (1985) Harvest security and intraspecific diversity in traditional tropical agriculture. *Economic Botany* 35:70–88.

Conant, F.P. (1989) The Pokot way with thorny shrubs: a case example. In: McKell, C.M. (ed.) *The Biology and Utilization of Shrubs*. pp. 593–602. Academic Press, London.

Conklin, H.C. (ed.) (1972) *Folk Classification: A Topically Arranged Bibliography*. Yale University, New Haven.

Cooper, D., R. Vellvé and H. Hobbelink (eds) (1992) *Growing Diversity*. Intermediate Technology Publication, London.

Cromwell, E.A. (ed.) (1990) *Small Farmer Seed Diffusion Mechanisms: Lessons from Africa, Asia and Latin America*. ODI Agricultural Research and Extension Network Paper No. 21. Overseas Development Institute, London.

Cross, N. and R. Barker (eds) (1991) *At the Desert's Edge. Oral Histories from the Sahel*. Panos/SOS Sahel, London.

Dos Santos, J.R. (1990) NEMOBASE: Système d'informatique sur les usages populaires de la flore. In: Fleurentin, J., P. Cabalion, G. Mazars, J. Dos Santos and C. Younos (eds) *Ethnopharmacology: Sources, Methods, Objectives*. ORSTOM and Société Française d'Ethnopharmacologie, Paris.

Duke, J.A. (1983) The USDA Economic Botany Laboratory's database on minor economic

plant species. In: *Plants: the Potentials for Extracting Protein, Medicines and Other Useful Chemicals*. Workshop Proceedings. pp. 196–214. US Congress Office of Technology Assessment, Washington DC.

Ellen, R. (1982) *Environment, Subsistence and System*. Cambridge University Press, Cambridge.

Ellen, R.F. (ed.) (1984) *Ethnographic Research*. Academic Press, London.

Esquivel, M. and K. Hammer (1988) The 'conuco' – an important refuge of Cuban plant genetic resources. *Kulturpflanze* 36:451–463.

Farrington, J. and A. Martin (1988) *Farmers' Participation in Agricultural Research*. ODI Occasional Paper No. 9. Overseas Development Institute, London.

Frodin, D.G. (1984) *Guide to Standard Floras of the World*. Cambridge University Press, Cambridge.

Gilles, J.L. (1988) Slippery grazing rights: using indigenous knowledge for pastoral development. In: Whitehead, E.E. and C.F. Hutchinson (eds) *Arid Lands: Today and Tomorrow*. Proceedings of an International Research and Development Conference. 20–25 October 1985. Tucson, Arizona. Belhaven Press, London.

Given, D.R. and W. Harris (1992) *Techniques and Methods of Ethnobotany As an Aid to the Study, Use and Conservation of Biodiversity. A Training Manual*. Commonwealth Science Council, London.

Gomez-Pompa, A. and L.I. Nevling (1988) Some reflections on floristic databases. *Taxon* 37:744–775.

Graham, G.A. (ed.) (1986) *A Farming Systems Research Bibliography of Kansas State University's Vertical File Materials*, revised edition. Farming Systems Research Paper Series No. 4. Kansas State University, Manhattan.

Gupta, A., J. Capoor and R. Shah (1990) *Inventory of Peasant Innovations for Sustainable Development. An Annotated Bibliography*. Center for Management in Agriculture, Indian Institute of Management, Ahmedabad.

Hammer, K. (1991) Checklists and germplasm collecting. *Plant Genetic Resources Newsletter* 85:15–17.

Hamon, S. and P. Hamon (1991) Future prospects of the genetic integrity of two species of okra (*Abelmoschus esculentus and A. caillei*) cultivated in West Africa. *Euphytica* 58:101–111.

Harlan, J.R. (1989) Self perception and the origins of agriculture. In: Swaminatham, M.S. and S.L. Kochhar (eds) *Plants and Society*. pp. 5–23. Macmillan, London.

Hawkes, J.G., J.T. Williams and R.P. Croston (1983) *A Bibliography of Crop Genetic Resources*. IBPGR, Rome.

Hopkins, S.T. and D.E. Jones (1983) *Research Guide to the Arid Lands of the World*. Oryx Press, Phoenix.

IBPGR and Royal Botanic Gardens, Kew (1984) *Forage and Browse Plants for Arid and Semi-arid Africa*. IBPGR, Rome.

IDS Workshop (1989) Farmers' knowledge, innovations, and relation to science. In: Chambers, R., A. Pacey and L.A. Thrupp (eds) *Farmer First. Farmer Innovation and Agricultural Research*. pp. 31–38. Intermediate Technology Publications, London.

Jackson, M.T., J.G. Hawkes and P.R. Rowe (1980) An ethnobotanical field study of primitive potato varieties in Peru. *Euphytica* 29:107–113.

Jain, S.K., P. Minnis and N.C. Shah (1986) *A World Directory of Ethnobotanists*. Society of Ethnobotanists, Lucknow.

Jansen, P.C.M. and J.S. Siemonsma (1992) PROSEA. Data gathered on plants in Southeast Asia. *Prophyta* 46:52–55.

Jiggins, J. (1986) *Gender-related Impacts and the Work of the International Agricultural*

Research Centres. CGIAR Study Papper No. 17. World Bank, Washington DC.

Jiggins, J. (1990) Gender issues and agricultural technology development. In: Altieri, M.A. and S.B. Hecht (eds) *Agroecology and Small Farm Development*. CRC Press, Boca Raton.

Johnson, A. (1974) Ethnoecology and planting practices in swidden agricultural system. *American Ethnologist* 1:87–101.

Khalil, M.H., W.V. Reid and C. Juma (1992) *Property Rights, Biotechnology and Genetic Resources*. ACTS Press, Nairobi.

Knüpffer, H. (1992) The database of cultivated plants of Cuba. In: Hammer, K., M. Esquivel and H. Knüpffer (eds) '... *y tienen faxones y fabas muy diversos de los nuestros* ...' – *Origin, Evolution and Diversity of Cuban Plant Genetic Resources*. Vol. 1. pp. 202–212. Institut für Pflanzengenetik und Kulturpflanzenforschung, Gatersleben.

Kubisz, K.M. (ed.) (1992) *Rural Women*. CAB International, Wallingford.

Kuchar, P. (1989) *The Plants of Somalia: an Overview and Checklist*. Central Rangelands Development Project Technical Report No. 16. CRDP, National Range Agency, Mogadishu.

Kunkel, G. (1984) *Plants for Human Consumption*. Koeltz Scientific Books, Koenigstein.

Lawani, S.M., F.M. Alluri and E.N. Adimirah (1979) *Farming Systems in Africa. A Working Bibliography 1930–1978*. G.K. Hall & Co., Boston.

Lewis, W.H. and M.P.F. Elvin-Lewis (1977) *Medical Botany: Plants Affecting Man's Health*. John Wiley & Sons, New York.

Lock, J.M. (1989) *Legumes of Africa. A Checklist*. Royal Botanic Gardens, Kew.

Loub, W.D. and N.R. Farnsworth (1984) Utilisation de l'informatique pour la mise au point de produits naturels. *Impact* 136:371–381.

Loub, W.D., N.R. Farnsworth, D.D. Soejarto and M.L. Quinn (1985) NAPRALERT: Computer handling of natural product research data. *Journal of Chemical Information and Computer Sciences* 25:99–103.

McArthur Crissman, L. (1989) *Evaluation, Choice and Use of Potato Varieties in Kenya*. Social Sciences Department Working Paper 1989-1. CIP, Lima.

McCall, M.K. (1988) *Indigenous Technical Knowledge in Farming Systems and Rural Technology: a Bibliography on Eastern Africa*. Working Paper. Technology and Development Group. Twent University of Technology, Twent.

McCorkle (1989) Toward a knowledge of local knowledge and its importance for agricultural RD&E. *Agriculture and Human Values* 6:4–12.

McKiernan, G. (1989) The CIKARD international documentation unit and library of indigenous knowledge for agriculture and rural development. In: Warren, D.M., L.J. Slikkerveer and S. Oguntunji Titilola (eds) *Indigenous Knowledge Systems: Implications for Agriculture and International Development*. pp. 86–90. Iowa State University, Ames.

Marchenay, P. (1987) *A la Recherche des Variétés Locales de Plantes Cultivées*. PAGE-PACA, Hyères.

Martin, G. (1994) *Ethnobotany and Plant Conservation*. Chapman and Hall, London.

Mathias-Mundy, E., O. Muchena, G. McKierkan and P. Mundy (1992) *Indigenous Technical Knowledge of Private Tree Management: A Bibliographic Report*. Technology and Social Change Program, Iowa State University, Ames.

Maydell, H.-J. von (1990) *Arbres et arbustes du Sahel: leurs caractéristiques et leurs utilisations*. Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), Eschborn.

Mazars, G. (1990) Le projet AYURBASE. In: Fleurentin, J., P. Cabalion, G. Mazars,

J. Dos Santos and C. Younos (eds) *Ethnopharmacology: Sources, Methods, Objectives*. ORSTOM and Société Française d'Ethnopharmacologie, Paris.

Merrick, L. (1990). Crop genetic diversity and its conservation in traditional agroecosystems. In: Altieri, M.A. and S.B. Hecht (eds) *Agroecology and Small Farm Development*. pp. 3–13. CRC Press, Boca Raton.

Merwe, J.H. van der (ed.) (1983) *National Atlas of South West Africa (Namibia)*. Directorate Development Co-ordination, Windhoek.

Mooney, P.R. (1992) Towards a folk revolution. In: Cooper, D., R. Vellvé and H. Hobbelink (eds) (1992) *Growing Diversity*. pp. 125–138. Intermediate Technology Publication, London.

Murdock, G.P. (1967) *Ethnographic Atlas*. University of Pittsburgh Press, Pittsburgh.

Murdock, G.P. *et al.* (1983) *Outline of World Cultures*. 6th edition. Human Relations Area Files, New Haven.

Nazarea-Sandoval, V.D. (1990) Memory banking of indigenous technology of local farmers associated with traditional crop varieties: focus on sweet potato. In: *Proceedings of the Inaugural Planning Workshop on the User's Perspective With Agricultural Research and Development*. pp. 180–195. CIP, Los Baños.

Nazarea-Sandoval, V.D. (1991) Ethnoagronomy and ethnogastronomy: on indigenous typology and use of biological resources. *Agriculture and Human Values* 8:121–131.

Niamir, M. (1990) *Herders' Decision-making in Natural Resources Management in Arid and Semi-arid Africa*. Community Forestry Note 4. FAO, Rome.

Oduol, P.A., P. Muraya, E.C.M. Fernandes and P.K.R. Nair (1988) The agroforestry systems database at ICRAF. *Agroforestry Systems* 6:253–270.

Opole, M. (1991) Women's indigenous knowledge base in the translation of nutritional and medicinal values of edible local plants in western Kenya. In: Prah, K.K. (ed.) *Culture, Gender, Science and Technology in Africa*. pp. 81–96. Harp Publications, Windhoek.

Osemeobo, G.J. (1992) Land use issues on wild plant conservation in Nigeria. *Journal of Environmental Management* 36:17–26.

PARC (1988) *Rural Women in Pakistan Farming Systems Research*. PARC, Islamabad.

Parry, R.B. and C.R. Perkins (1987) *World Mapping Today*. Butterworths, Borough Green.

Peters, C.R., E.M. O'Brien and R.B. Drummond (1992) *Edible Wild Plants of Sub-Saharan Africa*. Royal Botanic Gardens, Kew.

Plotkin, M.J. (1989) Traditional knowledge of medicinal plants – the search for new jungle medicines. In: Akerele, O., V. Heywood and H. Synge (eds) *The Conservation of Medicinal Plants*. pp. 53–63. Cambridge University Press, Cambridge.

Prain, G.D. (1993) Mobilizing local expertise in plant genetic resources research. In: de Boef, W.S., K. Amanor, K. Wellard with T. Bebbington (eds) *Cultivating Knowledge: Genetic Diversity, Farmer Experimentation and Crop Research*. Intermediate Technology Publications, London.

Price, D.H. (1990) *Atlas of World Cultures*. Sage Publications, London.

Quiros, C.F., S.B. Brush, D.S. Douches, K.S. Zimmerer and G. Huestis (1990) Biochemical and folk assessment of variability of Andean cultivated potatoes. *Economic Botany* 44:254–266.

Rhoades, R.E. (1988) The reference file method: an eclectic approach for improving agroecological and crop data of developing countries. In: *The Social Sciences at CIP*. Report of the Third Social Science Planning Conference. pp. 118–128. CIP, Lima.

Rhoades, R.E. (1990) The coming revolution in methods for rural development research.

In: *Proceedings of the Inaugural Planning Workshop on the User's Perspective With Agricultural Research and Development.* pp. 196-210. CIP, Los Baños.

Richards, P. (1985) *Indigenous Agricultural Revolution.* Unwyn Hyman, London.

Richards, P. (1991) Mende names for rice: cultural analysis of an agricultural knowledge system. In: Tillmann, H. (ed.) *Proceedings of the Workshop on Agricultural Knowledge Systems and the Role of Extension.* Institut für Agrarsoziologie, Universitaet Hohenheim, Stuttgart.

Riley, B.W. and D. Brokensha (1988) *The Mbeere in Kenya. 2. Botanical Identities and Uses.* University Press of America, Lenham.

Rist, S. (1991) Participation, indigenous knowledge and trees. *Forests, Trees and People Newsletter* 13:30-36.

Schultes, R.E. (1986) Ethnopharmacological conservation: a key to progress in medicine. *Opera Botanica* 92:217-224.

Schultes, R.E. and R.F. Raffauf (1990) *The Healing Forest: Medicinal and Toxic Plants of the Northwest Amazonia.* Dioscorides Press, Portland.

Schultze-Motel, J. (ed.) (1986) *Rudolf Mansfeld. Verzeichnis Landwirtschaftlicher und Gärtnerischer Kulturpflanzen.* Springer-Verlag, Berlin.

Shepherd, G. (1992) *Managing Africa's Tropical Dry Forests. A Review of Indigenous Methods.* Overseas Development Institute, London.

Stevels, J.M.C. (1990) *Légumes Traditionels du Cameroun.* Wageningen Agricultural University Papers, Wageningen.

Tabor, J.A. and C.F. Hutchinson (1994) Using indigenous knowledge, remote sensing and GIS for sustainable development. *Indigenous Knowledge and Development Monitor* 2:2-6.

Tabor, J.A., D.W. Kilambya and J.M. Kibe (1990) *Reconnaissance Survey of the Ethnopedology in the Embu, Meru, Machakos and Kitui Districts of Kenya's Eastern Province.* University of Missouri and USAID, Nairobi.

Tyler, B.F., K.H. Chorlton and I.D. Thomas (1992) Activities in forage grass genetic resources at the Welsh Plant Breeding Station, Aberystwyth. *FAO/IBPGR Plant Genetic Resources Newsletter* 88/89:37-42.

Uphof, J.C.T. (1968) *Dictionary of Economic Plants.* Verlag von J. Cramer, Lehre, Germany.

Vellvé, R. (1992) *Saving the Seed.* Earthscan Publications Ltd., London.

Waechter, P. and J. Lejoly (1990) PHARMEL: banque de données de médecine traditionelle et de pharmacopée. In: Fleurentin, J., P. Cabalion, G. Mazars, J. Dos Santos and C. Younos (eds) *Ethnopharmacology: Sources, Methods, Objectives.* ORSTOM and Société Française d'Ethnopharmacologie, Paris.

Warren, D.M. (1991) *Using Indigenous Knowledge in Agricultural Development.* Discussion Paper No. 127. World Bank, Washington DC.

Warren, D.M. (1993) Using IK for agriculture and rural development: current issues and studies. *Indigenous Knowledge and Development Monitor* 1:7-10.

Warren, D.M., L.J. Slikkerveer and S. Oguntunji Titilola (1990) (eds) *Indigenous Knowledge Systems: Implications for Agriculture and International Development.* pp. 86-90. Iowa State University, Ames.

Warren, D.M., D. Brokensha and L.J. Slikkerveer (1994) (eds) *Indigenous Knowledge Systems: the Cultural Dimensions of Development.* Kegan Paul International, London.

Waterman, P.G. (1989) Bioactive phytochemicals - the search for new sources. In: Wickens, G.E., N. Haq and P. Day. (eds) *New Crops for Food and Industry.* pp. 378-390. Chapman and Hall, London.

Worede, M. (1991) Crop genetic resource conservation and utilization: an Ethiopian

perspective. In: *Science in Africa: Achievements and Prospects*. pp. 103-123. AAAS, Washington DC.
Xolocotzi, E.H. (1987) Experiences leading to a greater emphasis on man in ethnobotanical studies. *Economic Botany* 41:6-11.
Yen, D.E. (1974) *The Sweet Potato in Oceania*. Bishop Museum Press, Honolulu.

Additional reading

Agar, M. (1980) *The Professional Stranger: An Informal Introduction to Ethnography*. Academic Press, New York.
Carroll, C.R., J.H Vandermeer and P.M. Rosset (eds) (1990) *Agroecology*. McGraw-Hill, New York.
Conklin, H.C. (1956) An ethnoecological approach to shifting agriculture. *Transactions of the New York Academy of Science, Series II* 17:133-142.
Crick, M. (1982) Anthropology of knowledge. *Annual Review of Anthropology* 11:287-313.
Hunn, E. (1985) The utilitarian in folk biological classification. In: Dougherty, J. (ed.) *Directions in Cognitive Anthropology*. University of Illinois Press, Chicago.
Inglis, J.T. (ed.) (1993) *Traditional Ecological Knowledge. Concepts and Cases*. International Program on Traditional Ecological Knowledge and IDRC, Ottawa.
Johannes, R.E. (1989) *Traditional Ecological Knowledge: A Collection of Essays*. IUCN, Gland.
Knight, C.G. (1980) Ethnoscience and the African farmer: rationale and strategy. In: Brokensha, D.W., D.M. Warren and O. Warner (eds) *Indigenous Knowledge Systems and Development*. University of America Press, Boston.
Metzer, D. and G. William (1966) Some procedures and results in the study of native categories: Tzeltal firewood. *American Anthropologist* 68:389-407.
Sturtevant, W.C. (1964) Studies in ethnoscience. In: Romney, A.K. and R.G. D'Andrade (eds) *Transcultural Studies in Cognition. American Anthropologist* 66:99-331.
Warren, D.M., L.J. Slikkerveer and S. Oguntunji Titilola (eds) (1990) *Indigenous Knowledge Systems: Implications for Agriculture and International Development*. Iowa State University, Ames.

Useful addresses

Some international and networking NGOs, northern and southern

African NGOs Environment Network (ANEN)
PO Box 53844
Nairobi
Kenya
Tel: +254 2 28138
Telex: 25331 ANEN KE

Consorcio Latinoamericano Sobre Agroecologia y Desarollo (CLADES)
Casilla 97
Correo 9
Santiago
Chile
Tel: +56 2 2341141
Fax: +56 2 2338918

Environment and Development Action in the Third World (ENDA)
BP 3370
Dakar
Senegal
Tel: +221 225565
Fax: +221 222695
Telex: 51456 SG

Environment Liaison Centre International (ELCI)
PO Box 72461
Nairobi
Kenya
Tel: +254 2 562015
Fax: +254 2 562175
Telex: 23240 ELC KE

Genetic Resources Action International (GRAIN)
Jonqueres 16
6° D
08003 Barcelona
Spain
Tel: +34 3 3105909
Fax: +34 3 3105952

Honey Bee Centre for Management in Agriculture
Indian Institute of Management
Ahmedabad-380015
India
Fax: +91-272-427896
E-mail:
anilg@iimahd.ernet.in

Information Centre for Low-External-Input and Sustainable Agriculture (ILEIA)
ETC Foundation
PO Box 64
3830 AB Leusden
The Netherlands
Tel: +31 33 943086
Fax: +31 33 940791
Telex: 79380 ETC NL

Innovations et Réseaux pour le Développement (IRED)
3, rue de Varembe, case 116
1211 Geneva 20
Switzerland
Tel: +41 22 341716
Telex: 289450

Overseas Development Institute (ODI)
Regent's College
Regent's Park
London NW1 4NS
UK

The Panos Institute (publishers of the sustainable development periodical *Panoscope*)
9 White Lion Street
London N1 9PD
UK
Tel: +44 171 2781111
Fax: +44 171 2780345
Telex: 9419293

1717 Massachussetts Ave.
Suite 301
Washington DC 20036
USA
Tel: +1 202 4830044
Fax: +1 202 4833059

31 rue de Reuilly
75012 Paris
France
Tel: +33 1 43792935
Fax: +33 1 43799135

Rodale Institute
222 Main St.
Emmanus, PA 18098
USA

Rural Advancement Foundation International (RAFI)
130 Slater Suite 750
Ottawa
Ontario K1P 6E2
Canada
Tel: +1 613 5650900
Fax: +1 613 5948705

South-east Asian Regional Institute for Community Education (SEARICE)
PO Box EA31
Ermita, Manila
Philippines
Fax: +254 2 742352

Some other relevant organizations

Associated Country Women of the World
50 Warwick Square
London SW1V 2AJ
UK

Association of Farming Systems Research-Extension
Dr T. Finan, Secretary
Bureau of Applied Research in Anthropology
University of Arizona
Tucson
AZ 85721
USA

c/o Dr C. Lightfoot
International Center for Living Aquatic Resources Management (ICLARM)
MC PO Box 1501
Makati
Metro Manila 1299
Philippines

Human Relations Area Files (HRAF)
755 Prospect Street
PO Box 2054
New Haven, CT 06520
USA

International Federation of Women in Agriculture
Dr C. Prasad, Secretary General
Krishni Anusandham Bhavan
Pusa
New Delhi 110012
India

Rural Sociological Society
P.C. Jobes, Treasurer
Department of Sociology, Wilson Hall
Montana State University
Bozeman, MT 59717
USA

Society of Economic Botany
New York Botanical Gardens
Bronx, NY 10458-5126
USA

International Program on Traditional Ecological Knowledge
Canadian Museum of Nature
PO Box 3443
Station D
Ottawa, Ontario
Canada K1P6PN

International Society for Ethnobiology
Ms Katy Moran
3521 S. St., NW
Georgetown, Washington DC.
USA

Women in Rice Farming Systems Network
IRRI
PO Box 933
1009 Manila
Philippines

Appendix 12.1
Indigenous knowledge resource centres

Established Centres

International

Center for International Research and Advisory Networks (CIRAN)
Dr G.W. von Liebenstein, Director
PO Box 29777
2509 LS The Hague
The Netherlands
Tel: +31 70 4260321
Fax: +31 70 4260329

Center for Indigenous Knowledge for Agriculture and Rural Development (CIKARD)
Dr D.M. Warren, Director
318 Curtiss Hall
Iowa State University
Ames
Iowa 50011
USA
Tel: +1 515 2940938
Fax: +1 515 2941708

Leiden Ethnosystems and Development Programme (LEAD)
Dr L.J. Slikkerveer, Director
Institute of Cultural and Social Studies
University of Leiden
PO Box 9555
2300 RB Leiden
The Netherlands
Tel: +31 71 273469 or 273472
Fax: +31 71 273619

Regional
African Resource Centre for Indigenous Knowledge (ARCIK)
Prof. A. Phillips, Director
Dr T. Titilola, Research Coordinator
Nigerian Institute of Social and Economic Research
(NISER)
PMB 5 – UI Post Office
Ibadan
Nigeria
Fax: +234 22 416129 or +234 1 614397

Regional Program for the Promotion of Indigenous Knowledge in Asia (REPPIKA)
Dr Evelyn Mathias-Mundy, Coordinator
International Institute of Rural Reconstruction (IIRR)
Silang
Cavite 4118
Philippines
Tel: +63 2 9699451 or 582659
Fax: +63 2 5222494
E-mail: iirr@phil.gn.apc.org

National
Brazilian Resource Centre for Indigenous Knowledge (BRARCIK)
Prof. D.A.J. Cancian, Director
UNESP, Dept. Biologica
14870.000 Jaboticabal SP
Brazil
Tel: +55 163 232500
Fax: +55 163 224275
E-mail: uejab@brfapesp.bitnet

Centre Burkinabè de Recherche sur les Pratiques et Savoirs Paysans (BURCIK)
Dr B.E. Dialla, Director
BP 7047
Ouagadougou
Burkina Faso
Tel: +226 362835
Fax: +226 336517

Cameroon Indigenous Knowledge Organization (CIKO)
Prof. C.N. Ngwasiri, Director
Private Sector Research Institution
PO Box 170
Buea
Southwest Province
Cameroon
Tel: +237 322685
Fax: +237 322106

Ghana Resource Centre for Indigenous Knowledge (GHARCIK)
Dr M. Bonsu, Interim Director
School of Agriculture
University of Cape Coast
Cape Coast
Ghana
Tel: +233 42 22409 or 24809
Telex: 2552 UCC GH

Indonesian Resource Center for Indigenous Knowledge (INRIK)
Prof. K. Adimihardja, Director
Department of Anthropology
University of Padjadjaran
Bandung 40132
Indonesia
Tel: +62 22 81594 or 832728
Fax: +62 22 431938

Kenya Resource Centre for Indigenous Knowledge (KENRIK)
Dr Mohamed Isahakia, Acting Director
The National Museums of Kenya
PO Box 40658
Nairobi
Kenya
Tel: +254 2 742131
Fax: +254 2 741424

Madagascar Resource Centre for Indigenous Knowledge (MARCIK)
Ms Juliette Ratsimandrava
c/o Centre d'Information et de Documentation Scientifique et Technique
BP 6224
Antananarivo 101
Madagascar
Fax: +261 2 32123/20422

Mexican Research, Teaching and Service Network on Indigenous Knowledge (RIDSCA)
Dr A. Macia-Lopez, Director
Colegio de Postgraduatos (CEICADAR)
Apartado Postal 1–12
CP 72130
Col. La Libertad
Puebla, Pue.
Mexico
Tel: +52 22 48088 or 480978 or 480542

Nigerian Resource Centre for Indigenous Knowledge (NIRCIK)
Dr J.O. Olukosi, Coordinator
Institute for Agricultural Research
Ahmadu Bello University
PMB 10044, Zaria
Nigeria
Tel: +234 69 50571
Fax: +234 69 50891
Telex: 75248 NITEZ NG

Philippines Resource Center for Indigenous Knowledge and Sustainable Development (PHIRCIKSD)
Dr R.C. Serrano, National Coordinator
Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCACRD)
Los Baños
Laguna
Philippines
Tel: +632 94 50015 to 50020
Fax: +63 94 50016
Telex: 40860 PARRS PM

South African Resource Centre for Indigenous Knowledge (SARCIK)
Prof. M.H. Cohen, Co-Director
The Institute for Indigenous Theory and Practice
110 Long Street
8001 Cape Town
South Africa
Tel: +27 21 242012
Fax: +27 21 262466

Sri Lanka Resource Centre for Indigenous Knowledge (SLARCIK)
Dr R. Ulluwishewa
University of Sri Jayewardenapura
Department of Geography
Gangodawila, Nugegoda
Sri Lanka
Tel: +94 1 552028
Fax: +94 1 500544

Uruguay Resources Centre for Indigenous Knowledge (URURCIK)
Pedro de Hegedus, Coordinator
CEDESUR
Casilla Correo 20.201
Codigo Postal 12.900
Sayago, Montevideo
Uruguay
E-mail: pdh@agrocs.edu.ey

Venezuelan Resource Secreteriat for Indigenous Knowledge (VERSIK)
Dr C. Quiroz, National Coordinator
Centre for Tropical Alternative Agriculture and Sustainable Development (CATADI)
University of the Andes, Nùcleo 'Rafael Rangel'
Apartado Postal #22
Trujillo 3102
Estado Trujillo
Venezuela
Tel/Fax: +58 73 33667

Centres being established

Regional/subregional centres: European Resource Center for Indigenous Knowledge, Trans-Andean Resource Center for Indigenous Knowledge

National centres: Australia, Benin, Bolivia, Colombia, Costa Rica, India, Namibia, Nepal, Peru, Tanzania, Zimbabwe