8

Biodiversity Management in Agricultural Landscapes*

Quite probably, the total area of plant biodiversity outside protected areas is higher than in protected areas. The two broad land-use categories potentially contributing to biodiversity management are cultivated lands, particularly highly diversified cropping areas in developing countries; and uncultivated lands, particularly community lands or common property resources (CPRs) including community forest, pasture, watershed drainage, etc. The farmer's fields qualify as a habitat for *in-situ* conservation and management of biodiversity, due to their following features, observed particularly in areas not affected by monocropping-dominated agriculture.

(a) Such cultivated lands are largely planted to local land races of diverse crops and help in their utilization and propagation, especially in relatively inaccessible and non-modernized agricultural zone.
(b) Their use is dominated by folk agronomic practices involving diverse combinations of crops, resource-regenerative practices including crop rotations, organic recycling, complementary uses of annuals and perennials, etc., all of which are conducive to conservation, and maintenance of biodiversity.
(c) Acting as a base for integrated farming systems, these lands facilitate effective and mutually reinforcing linkages between different components favouring *in-situ* biodiversity management through harnessing of annual–perennial complementarities; crop-livestock complementarities, farming forestry linkages, etc.
(d) They are well-recognized sources of diverse land races of major cultivars as any germplasm collection mission in the past would

*First presented as 'Social Dimensions of Biodiversity Management in Agricultural Landscapes', in a meeting on 'Mainstreaming Biodiversity in Agricultural Development', Environment Department, the World Bank, 1996.

support. Crop breeding continues to depend on breeders' access to these land races; and the latter's maintenance by the farmer is an important contribution to biodiversity conservation.

(e) Such lands are generally dominated by small holdings, where diversification, use of local (often on-farm produced) inputs, resource regeneration and recycling constitute important components of farmers' adaptation strategy against risk and insecurity. Such strategy contributes to *in-situ* maintenance and utilization of biodiversity. The farmer's courtyard or home garden is another well-recognized area for promoting and using multiple plants and species, including medicinal herbs.

(f) 'Uncleared and crowded cropping plots', characterizing farming systems is another feature of such lands, especially in the case of small holders. This description implies: uncleared field borders habitated by shrubs, grasses and not currently used plants; only selective removal of 'weed' in the field; bush fences acting as natural shelter for wind-carried and bird-carried germplasm and its propagation as well as periodical use, especially during scarcity; and lack of thorough clearing and preparation of soil comparable with commercialized sole-cropping systems, where every plant except the chosen crop or species is treated and removed as a weed.

In keeping with these features of crop-lands we use the term 'biodiversity in backyard' while referring to them. They effectively complement the uncultivated, common lands as habitats of local-level biodiversity (Box 8.1).

Recognition of non-cultivated areas (including community forests, pastures, watershed drainages, sacred groves, community dumping grounds, common shelterbelts, wastelands, etc.), clubbed under common property resources (CPRs) as habitats for *in-situ* management and utilization of biodiversity by people is much easier. Unless CPRs are devolved into open access resources and degraded by unregulated use, they are under natural vegetation and depending on the soil-climate conditions serve as a rich source of biodiversity at local or community level (see Chart 8.1). Besides meeting people's multiple needs, they act as support lands for crop lands by offering organic input (e.g through farming–forestry linkages), regulate micro-level nutrient and moisture flows and (wherever relevant) act as buffer zones for protected areas. People have formal or informal institutional

BOX 8.1. THE WORLDWIDE INTEGRATION OF FARMLAND AND WILD-LAND RESOURCES

Indonesia: Complex home gardens in Java have been found to contain hundreds of species within a single village (Soemarwoto and Conway 1991). A range of annual and perennial crops are grown together complementing the main rice crop. There are several different types of gardens: intensively managed home gardens, the village/forest gardens and the forest fringe gardens. The importance of wild foods increases in gardens toward the forest fringe (Michon 1983).

The Philippines: Home gardens are also important for experimentation with new varieties derived from wild species. The Hununoo traditionally considered over Swidden 1,500 plants to be useful and cultivated about 430 of these in their fields (Conklin 1954).

Botswana: The use of a diversity of species is not limited to forested areas. The agro-pastoral Tswana use 126 plant species and 100 animal species as sources of food (Grivetti 1979).

Brazil: A study of the agro-forestry systems of a Brazilian family living in the Amazon estuary shows how they harvest various native and exotic species from a house garden, and managed flood-plain forest and unmanaged flood-plain forest and within the managed area, some vines, shrubs and trees are cut. The unmanaged area contains economically important species such as the ace palm (*Euterpe oleracea*) and rubber (*Hevea brasiliensis*). Together these three zones provide fish, game, fruits, medicines, household items and oilseeds, for home consumption and for sale. With the cash, the family is then able to buy other staple goods (Anderson et al. 1985).

United Kingdom: In the Middle Ages manorial estates appear to have been highly sustainable systems. This sustainability was not achieved as a result of high productivity but because of the integrated nature of farming and the great diversity of produce, including wild resources. Wild resources were important for food, fodder for livestock, green manuring and various household goods. They were carefully managed at the local level through by-laws that varied from village to village. The expansion of agriculture into common property lands led to increased gross agricultural production but declining woodlands, pasture and marshland resources and critically a loss of buffers for the rural poor. This contributed to agricultural recession and the eventual decline of the manorial system (Pretty 1990).

Note: References as cited in the source document.
Source: IIED 1995.

Chart 8.1. Important Interrelated Features of Community Management of Biodiversity

Feature	Implications/Imperatives vis-à-vis Recent Changes
Local management biodiversity (BD) is largely usage driven (i.e. its presence and promotion directly linked to meeting people's production/consumption needs).	Non-usability, distortions or change in use of biodiversity as input or output (through external substitute) weaken the community management of biodiversity; 'usage' of BD needs to be integral part of biodiversity conservation strategies.
Biodiversity is seen more as an integrated bundle of resource and services to meet multiple needs rather than a sector or product-centred phenomenon.	Distntegration or breakdown of functional linkages of different components of biodiversity (as resources or services) through segregated sectorial or product centred interventions, which weakens the local management of biodiversity; BD promotion strategies should start with conceiving the integrated picture of services/products it could offer to local people.
Biodiversity management especially the set of institutional practices is strongly linked to site-specific local knowledge; autonomy and access to resources; and participatory practices.	Imposition of external arrangements insensitive to local needs and circumstances weakens the local management of biodiversity; use of traditional knowledge systems and user participation should be integral parts of BD promotion strategies.
Biodiversity management is strongly context specific, i.e. it is effective under diversified, and extensive type or resource use systems linked to low pressure and diversity of demand.	Recent changes, due to population growth and pressure of market demand, reduce the scope for people-managed biodiversity unless measures to promote diversification with intensification are evolved; incentives and pay-offs are ensured for biodiversity-friendly, diversified, low intensity, often low productivity activities (e.g. through organic certification and premium on organic products).

Source: The author. Also see Chart 8.4 for specific practices reflecting people's concern and action for biodiversity conservation.

arrangements to protect, develop and use CPRs and in the process promote usage-driven management of biodiversity.

SOCIAL DIMENSIONS OF BIODIVERSITY MANAGEMENT

The recent attention to social dimensions of biodiversity conservation recognizes the centrality of people and their approach to biodiversity resources. This also represents a stage in the evolution of formal approaches to biodiversity conservation promoted by the international community and national governments. Gradual recognition of the role of local communities in biodiversity conservation is manifested by successive stages in biodiversity conservation policies and programmes. Accordingly, the initial focus on 'protected areas' was subsequently supplemented by attention to buffer zone; this in turn at a still later stage has been supplemented by emerging focus on rural commons and finally on the private crop lands in non-modernized areas, as biodiversity habitats at local levels.

Strengthening of the biodiversity conservation (management) strategies at lower (micro) levels may contribute to strengthening of biodiversity management at successive higher (macro) levels, both by reducing the pressure on them and by promoting the culture of conservation through the bottom-up approach it involves (Box 8.2). The need for restructuring biodiversity policies/plans by incorporating human and social dimensions and designing approaches to implement the same, are now increasingly emphasized by both social scientists and natural scientists dealing with the subject (Miller 1995).

In keeping with the thematic focus of our discussion, the social aspects elaborated below are confined to the last two areas of biodivers-

Box 8.2. Genetic Diversity for Future Agriculture

Much of the genetic diversity on which the improvement and future sustainability of agriculture must depend is found in and around farmers' fields, in village woodlands and in grazing lands.

In-situ management of wild genetic resources is likely to be the most effective conservation method in the long term.

Incorporation of indigenous crops and other native plant germplasm in the design of self-sustaining agro-ecosystems should ensure the maintenance of local genetic diversity available to farmers.

Source: IIED 1995.

ity management, i.e. commons and crop lands, comprising agricultural landscapes and the people's involvement therein. In a way, the discussion is focused on a few central issues such as: do people (i.e. local communities) have any understanding and concern for biodiversity conservation? If yes, then how do they respond to them? Despite people's stakes in local biodiversity management, why and how is rapid erosion of biodiversity taking place in agricultural landscapes? What are the possible approaches to arrest and reverse this erosion process? And finally, how to integrate these approaches into biodiversity conservation strategy at different levels?

People's Perceptions and Practices

While commenting on the rural people's perceptions of biodiversity and its management, it should be recognized that for a variety of reasons, the perceptions could be captured largely through understanding of the resource management practices followed by them rather than by formally recording of their views on the subject. The resource-use practices (and the institutional and technological arrangements to support them), based on the physical proximity and understanding of local resources, evolved through a process of trial and error over generations, in a way represent the codification of people's perceptions and concerns relating to biodiversity. Even when they have acquired the status of a routine or a ritual, the traditional resource management practices have usable scientific rationale behind them. Hence, closer understanding of biodiversity management practices can help capture people's perspectives on the subject (Gupta 1991).

A brief account of biodiversity-related practices followed by farmers in different areas covering both crop-lands and CPRs will illustrate the point. The biodiversity management practices followed by farmers on crop-land have already been indicated.

In the case of CPRs, protection of area and vegetation, and their regulated use through various social sanctions or group action, etc. constitute the key tasks. The extent and nature of the practices in terms of the basis and method of resource sharing, dispute resolution, penalty for violators of rules, periodic investment for their upkeep (without external assistance), etc., differ from region to region. However, despite variation in the nature and extent of biodiversity management practices followed in different areas, they do have broad similarities in their orientation and dominant features.

Dominant Features of People-Managed Biodiversity

A closer look at the people's biodiversity management practices recorded by different studies reveals their dominant features. These features may not only reflect on why and how people conserve biodiversity, but can offer important elements for incorporation into

Box 8.3. Social Conditions and Conservation Strategies

Social pressure is a major reason why natural forest management schemes are abandoned or disrupted mainly because the managed forest areas are invaded by local poor people. This was clearly seen in Colombia, where the Cartono de Colombia forest management project was disrupted when unemployed people proceeded to extract poles and to mine in the forest, thus destroying the regeneration capacity of the management circles. Similarly, community involvement, or sharing in the benefits, has often been one of the critical aspects leading to SNFM success.

The special need of local communities must be taken into account when designing forest management schemes so that they have an incentive to protect the forest and maintain the scheme. Where local communities hold traditional claim to forest land, secure land rights are a prerequisite to ensure that benefits from forest management flow to them. This was demonstrated in the ejidos of Quintana Roo, Mexico and in Palazcu, Peru. In both cases, job security and community economic stability improved as a result of the projects. The BOSCOSA project in Costa Rica is likely to lead to the same results. On the other hand, the Carton de Colombia example shows what can happen when local people do not benefit from the management programme. Thus, the private concessionaire, as well as the public sector, must consider local needs and develop mechanisms to channel revenues accordingly. While efforts to involve local communities in forest management schemes may initially appear difficult and time consuming, in fact, protection by local people usually costs less than government protection, and is believed to be more efficient.

Local people generally have knowledge of the forests and of the non-timber forest products that can be incorporated into management schemes. In fact, traditional forest management is generally criticized for not taking into account other forest products. Where possible, more reliance on extraction of fruits and gums and less on timber should help to reduce the environmental impact of extraction activities and create incentives for sustaining the natural capital. A good example of this harvesting chicle and honey, along with mahogany, in Quintana Roo, Mexico.

Source: Kirmse et al. 1993 as cited by IIED 1995.

national biodiversity conservation strategy and also ensure cost reduction as well as people's participation in the process (Box 8.3).

As summarized under Chart 8.1, people-managed biodiversity is: (a) highly use-driven in the sense that they protect and promote biodiversity because they use it: and for the above reason; (b) biodiversity is conceived as an integrated bundle of services and products to meet their multiple needs rather than a sectoral or product-centred phenomenon; (c) local resource knowledge (especially on the part of women), autonomy and access to resources significantly influences the status and management of biodiversity by the people as shown by a contrast between relatively inaccessible, externally less impacted areas and the mainstream urban-impacted, commercialized agricultural areas; (d) management of biodiversity conservation is strongly context-specific, accordingly, its feasibility and efficacy are very much linked to factors such as lower pressure on resources and diversified demand for products, which in turn promote diversified and low-intensity use of land resources conducive to biodiversity maintenance; (e) because of the above features, local biodiversity management practices and measures tend to acquire the status of routine and ritual, and become invisible to the mainstream decision-makers. This in turn influences the public policies and programmes in terms of their indifference and unfavourable orientation toward biodiversity management by the local communities.

THE CHANGING STATUS OF PEOPLE'S BIODIVERSITY MANAGEMENT SYSTEMS

Undoubtedly, people-managed biodiversity management systems are rapidly weakening. Chart 8.1 summarizes the implications and imperatives of dominant features of people-managed biodiversity. They also reflect on the incompatibility between some features of biodiversity management systems, and the present-day changed circumstances. For instance: (a) reduced dependence on or usability of local biodiversity; (b) breakdown of integrated farming system (and resource-use systems) affecting usable biodiversity as a bundle of services and products; (c) marginalization of local communities and knowledge systems by interventions from above; (d) changed demographic, institutional and technological context undermining the feasibility of farmers' practices (e.g. low-intensity and diversification-oriented resource use, etc.) that promoted biodiversity maintenance; (e) policy-

Chart 8.2. Creating Space for People's Biodivesity Management Systems (PBDMS) in the Mainstream Work

Project the Relevance and Usability of PBDMS for Mainstream Work	Develop the Approaches and Methods to Document and Utilize PBDMS
(a) For general BD conservation: Contribution of BD in 'bush' and 'backyard' to global stock of BD Usage driven focus of PBDMS as a case of win-win situation and its other features as input for national strategies	(a) Information generation on: Status of PBDMS Its changes over time Factors causing change Ways to strengthen PBDMS Using PRA/SA[a] method; and relevant records/statistics
(b) For agriculture: Entry point for action on participatory, community-based initiatives in agricultural R&D and natural resource management BD in 'backyard' and in 'bush' as source of usable germplasm for R&D People's (specially women's) knowledge and experience with agro-diversity as untapped resource for R&D	(b) Identification of good practices: Using above methods and experiences of new initiatives by NGOs and others
	(c) Awareness generation and advocacy, focus on targeted agencies: Policy-makers, donors, R&D planners, NGOs Target group specific dissemination approaches
	(d) Action research and application: Involve people, R&D groups, BD and agricultural planners Incentive systems for people (e.g. premium on organic products, etc.)

[a]Participatory Rural Approval/Social Assessment.
Source: The author.

makers' persistent interventions, etc., are some of the changes which despite their possible other gains have adversely affected the people's biodiversity management, both in 'bush' and 'backyard'. Chart 8.3 provides an indicative list of public interventions adversely affecting biodiversity 'bush' and 'backyard'. Table 8.1 provides quantified information on the impact of land reforms in India on biodiversity status through decline of CPRs. In the light of these changes and unlikelihood of reversal of the above in the near future, advocacy of people-managed biodiversity systems may appear a futile exercise (Brandon 1995).

BOX 8.4. PROTECTION OF SEEDS BY PEOPLE

Though slowly declining, a few practices followed by the people in rural areas of India to protect and regenerate biodiversity are worth reporting:

(a) The practice of planting all available types of crops (whether fully used or not by the farmer) to maintain diversity of crops offered by the nature is still in vogue in many areas. For instance, in parts of UP hill region practice of planting ***barahanaja*** (lit. twelve types of seeds) is still followed. ***Navdhanam*** (lit. planting nine crops) in dry Telengana region of Andhra Pradesh.

(b) To restore and guard against the disappearing plant species the people in different villages follow practices as indicated below:
- Scattering in the fields the soil collected from below the thorn or bush fence, where germplasm accumulates and remain sheltered (and even regenerates and spreads) without any disturbance for years or even decades.
- Scattering of accumulated fine dust containing germplasm which settles overtime in the feeding structures meant for stall feeding of animals.
- There are sacred groves in villages (called Orsan in some areas) where cutting of trees or shrubs or even grass is ritually prohibited. People periodically sweep these areas to seek the favour of deities. The swept material (soil containing germplasm of different plants) is scattered around the crop fields and grazing lands. This helps in regenerating plant species already lost from the field due to overuse.
- Similarly sweeping of spots and scattering of swept material in the fields is periodically done in the case of places where unthreshed crops or fodder reserves are stocked or crop threshing is regularly done.
- In dry areas like Rajasthan, people hang waterpots on trees for

(Continued)

Box 8.4 continued

birds especially during the non-crop season. The soil and bird-dropping (containing seeds of different plants) are collected and scattered in the fields/pastures.

- In some villages the soil from around ants colonies are also collected and scattered in the fields and grazing land (believed to kill poisonous plants?)
- In frequently droughts affected villages, people carry seeds with them during outmigration and back. Purity and security of seed are said to be the main consideration behind this practice.
- In relatively cohesive and animal husbandry-dominated villages, the practice of protection of parts of village pasture on rotation basis against grazing until after formation and maturity of seed (to ensure regeneration in the successive years) is still popular.
- Finally, in several areas (including ecologically better endowed areas), there is a concern and effort toward biodiversity conservation. These efforts are based not only on concerned NGO efforts but the people's rising consciousness of seed as symbol of security, freedom and self-reliance. Such sentiments were visible in several areas (especially UP hills, Karnataka and Gujarat villages). The controversies relating to Dunkel proposal on intellectual property rights as part of GATT discussion and efforts of the farmer's lobby have also contributed to this. NGOs dealing with environmental and indigenous knowledge systems have helped in enhancing the consciousness on biodiversity conservation.

Source: Jodha 1995b.

Nevertheless, the following may be stated. Though there are very limited areas where one can see people-managed systems in their totality, their individual components are still practised in wider areas. In several cases, out of necessity their modified forms have emerged, representing: (i) compromise between (a) intensification and diversification; (b) productivity growth and conservation; or (ii) responses to external pressures/incentives and internal needs for resource protection. Furthermore, the hope for people-managed system is sustained by continuation and revival of traditional practices (Boxes 8.4, 8.5, 8.6) as well as a few emerging new possibilities (Kothari 1997). The latter are reflected by: (a) rapidly accumulating evidence on greater effectiveness and lower costs of participatory management of natural resources; (b) experiences of limited and scattered but quite impressive success stories of revival of people-managed

Chart 8.3. Indicative Dimensions of Public Policies/Programmes Influencing Local Resource Users' Actions Affecting Biodiversity

Indicative (interrelated) components of public policies and programmes	Aspects of local level biodiversity represented through changing situation of crop-lands (CL) and CPRs					
Policies/programmes with unfavourable side effects on the people's biodiversity management systems*	Habitat context (landscape/ land-use changes)		Species context (product types and their extraction patterns)		Management context (local control, knowledge and need-based options)	
	CL	CPR	CL	CPR	CL	CPR
Land Policies Land tilling, distribution, curtailment of CPR area (privatization) for transfer to crop farming		✓				✓
Agricutural Intensification Narrow focus on limited crops/ attributes disregarding diversification and reduced need of input and services from local biodiversity, regenerative/integrated farming systems			✓	✓		
Agricultural R&D External input focussed product-centred rather than resource-centred R&D and technologies; focus on limited food crops rather than food system supported by CPRs and diversified cropping; focus on homogenization of cropping and agronomic practices	✓		✓		✓	✓

External input focussed product-centred rather than resource-centred R&D and technologies; focus on limited food crops rather than food system supported by CPRs and diversified cropping; focus on homogenization of cropping and agronomic practices	✓	✓		✓	✓
Pricing and Trading Focus					
External linkages and marketing focused on extracting niche, disregarding diversity/minor crops		✓	✓		
Centralized, Top-down Impositions of Generalized Interventions					
Administrative, legal, fiscal and technical measures disregarding: local knowledge, autonomy and participation, folk agronomy, and regenerative practices	✓	✓		✓	✓
Biased Fiscal and Infrastructural Systems					
Taxes, subsidies, incentives, foreign aid, support systems, etc. directed to reduced diversification, supporting limited crops and land-use types		✓	✓	✓	

Note: Policies and programmes with orientation opposite to the following can also be put in the same format of a bi-variate table.
Source: The author.

Table 8.1. Some Indicators of Loss of 'Biodiversity in Bush' (CPRs) Following the Land Reforms Intervention in India[a]

Indicators of Changed Status and Context for Comparison	States (with number of villages)						
	Andhra Pradesh (3)	Gujarat (4)	Karnataka (2)	Madhya Pradesh (4)	Maharashtra (3)	Rajasthan (4)	Tamil Nadu (2)
CPR-Products collected by villagers:[b]							
• In the past (no.)	32	35	40	46	30	27	29
• At present (no.)	9	11	19	22	10	13	8
Per hectare number of trees and shrubs in:							
• Protected CPRs[c]	476	684	662	882	454	517	398
• Unprotected CPRs	195	103	202	215	77	96	83
Number of watering points (ponds and protected catchments) in CPRs (also promoting BD):							
• In the past	17	29	20	16	9	48	14
• At present	4	13	4	3	4	11	3
CPRs (as BD habitats) as proportion of total village area[d]							
• In the past (%)	18	19	20	41	22	36	21
• At present (%)	11	11	12	24	15	16	10

[a]Table adapted from Jodha 1992 (Also see Box 8.4).

[b]Includes different types of fruits, flowers, leaves, roots, timber, fuel, fodder, etc. in the villages. 'Past' indicates the period preceding the 1950s. 'Present' indicates the early 1980s.

[c]Protected CPRs were the sacred groves (called 'oran') where for religious reasons live trees and shrubs are not cut and grazing is restricted.

[d]This information relates to many more villages than the ones indicated in row one. Total number of villages covered was 82 from 21 districts of the above 7 states.

BOX 8.5. SAVE THE SEED MOVEMENT IN UP HIMALAYAS

This initiative acquired visibility and farmers' attention during 1990–1, really started as a result of a social worker-cum-farmer's concern towards emerging crop crisis in Hemval valley region of Tehri Garhwal (Himalayas) in UP. In this mountain valley where introduced high-yielding varieties of rice and white soyabean (supported by agricultural research and support systems) had made a considerable headway, the drought and pest attack of 1987–8 came as a major shock. While these crops completely failed, the local varieties of crops in remote areas of the region did quite well. Impressed by this, a social worker, Mr Vijay Jardhari of Jardhargaon in the valley collected seed of 15 local varieties of rice from remote areas (where modern varieties were yet to replace the local land races), and planted them on his field. During the next season while introduced rice varieties faced several pest damage the local varieties were not affected by pest. This convinced the local farmers about the superiority of local varieties in their context. By the third year about 90 per cent of the area was cropped by local land races. Already influenced by Chipko movement chugging trees to save them from logging contractors) in the region, a save the seed movement emerged, with a number of NGOs and volunteers participating in it. According to the Save the Seed reports they have identified and multiplied some 126 types or varieties (land races) of rice, 8 of wheat, 40 of finger millet, 6 of barnyard millet, 11 of kidney beans, 7 of horse gram, 8 of traditional soyabean and 10 of French beans. They are being grown and used by the farmers. The monoculture encouraged by new technologies is again replaced by Barahanaja (mixed cropping of twelve grain crops).

Sources: V. Singh, 1995 and Kothari, 1997.

biodiversity/resource-use systems; (c) possibility of higher financial gains from diversified organic farming compared to the conventional, largely external input-dependent agriculture; and (d) prospects (though quite dim at this stage) of fair pricing of high-value products (e.g. herbs, etc.) from CPRs, and building a value-adding diversification strategy (through processing, etc.) on the components of local biodiversity.

To harness the emerging possibilities through sustained work, the first precondition is to create space for the people's biodiversity management systems in the mainstream work on the subject. Once again, lest the possible provision of space and resources for people-managed biodiversity is treated as a charity, it will be useful to: (a) project its relevance for and usability by the mainstream work under biodiversity conservation strategies, and (b) indicate the approach or methodology for understanding and integrating the

preceding the 1950s. 'Present' indicates the early
'Protected CPRs were the sacred groves (called 'oran') where for religious reasons
grazing is restricted.
This information relates to many more villages than the ones indicated in row one. Total number of villages covered was 82
from 21 districts of the above 7 states.

BOX 8.6. CROP DIVERSITY IN THE ECUADORIAN AMAZON: MIMICKING TROPICAL FOREST ECOSYSTEM

Survey data collected in the upper Ecuadorian Amazon show that settler farmers within their new farming systems incorporate the broad elements of polyculture-based farming methods, and practices. The share of gross cropped farm areas (cleared land minus land devoted to pasture and fallow) allocated to each crop varied substantially across sample farmers, suggesting that most farms had a mixed system of landuse.

Accordingly, 16 per cent of the farm area is planted to perennial crops (including mainly coffee, but also cacao, African palm oil, and fruit trees); 5 per cent to annual and semi-annual food crops (including plantains, corn, manioc, rice, vegetable and others); 22 per cent to pasture (which includes areas of fallow or *rastrojo*); and 57 per cent remained in undisturbed forest.

Settler plots in this area of the Amazon mimic tropical ecosystems in at least two ways (a) the great diversity of crops grown gives some protection, as pests are seldom able to build up to destructive proportions on the few isolated plants of each species. Also the closed canopy consisting of some trees left standing and tall crop species such as bananas and papayas reduce losses to pests and weeds; (b) selective burning rotation, intercrossing and shading help reduce losses to pests and weeds. As only relatively small plots are cleared, biological agents can easily enter from the surrounding jungle. Settlers also select for host resistance by using seed and vegetative parts from the most successful crop plants which survive in the harsh environment.

Although it may be premature to draw conclusions abut the long-term sustainability of this agricultural system in north eastern Ecuador, the polycultural system seems to promote greater stability and conservation of biodiversity, in contrast to the rapid turnover of colonists and resource degradation observed in most other agricultural frontiers, where boom and bust economies dominate small farmers' psychology.

Source: F. Pichon, 1996. (Personal communication based on his Ph.D. Work.)

people's biodiversity management systems into the mainstream work on the subject.

CREATING A SPACE FOR PEOPLE'S BIODIVERSITY MANAGEMENT SYSTEMS

The advocacy of people's biodiversity management systems can be supported by projecting their importance in different contexts, as indicated below (see Chart 8.2):

(a) Even when the biodiversity managed by people in 'bush' and 'backyard' is not as rich as the one in the untouched protected areas, the former when aggregated at different levels, may significantly contribute to the global stock of biodiversity. Thus improved local management of biodiversity has clear global gains. This does provide a channel of linking local and global perspectives and action on biodiversity conservation.

(b) The use-driven focus of people-managed biodiversity conservation reflects a dual-purpose strategy of the communities, where conservation for the future is combined with meeting current needs. This represents a type of situation where, often repeated advocacy for win-win approach to environmental management materializes by ensuring not only positive biodiversity conservation outcomes but also yielding tangible social utility.

(c) In the context of increasing recognition of the need for involving people for cost-effective and sustainable natural resource management including biodiversity conservation, the people's existing systems focused to biodiversity in 'bush' and 'backyard' can prove a useful entry point. Understanding of people-managed initiatives and their knowledge systems can serve as a useful input in evolving biodiversity conservation strategy at higher levels.

(d) Furthermore, an understanding and application of dominant features of people's systems (e.g. use-driven biodiversity management) can help evolve conservation approaches readily acceptable to the people to ensure their participation.

(e) The significance of biodiversity conservation in 'bush' and 'backyard' is probably the greatest for mainstreaming biodiversity in agricultural development. The conventional agricultural development approaches, characterized by over-emphasis on limited crops as well as monocropping and disregarding diversified cropping and resource use, can borrow a lot from people-managed biodiversity systems in 'bush' and 'backyard'. Most importantly, the latter are a potential source of varied land races and wild relatives of already used cultivars. People's knowledge and practices can offer some usable insights for developing approaches to diversified and high-productivity agriculture (Altieri et al. 1988).

If these considerations are able to justify greater attention to people-managed biodiversity, the next step should focus on the development and adoption of measures directed to: (a) controlling the factors and processes which are contributing to the rapid decline of people-

Chart 8.4. An Indicative List of People's Practices Reflecting Biodiversity Management Focus

Land Use
Extent of CPR (area under natural vegetation)
Intensity use of CPR—through density of grazing animals plus some idea of fodder/fuel pressure
Area under cropping and cropping intensity
CPR Management
Their extent
Arrangements for area protection, usage regulation, etc.
Oral history of changes including underlying factors
Cropping Patterns
Major crops and minor crops planted
Source of planting material
Extent of intercropping, rotations and other agronomic practices, especially using/regenerating local inputs
Diversity of cropping— number of crops per hectare
Multiple uses of crops
Extent of external seed/input, commercialization
Qualitative Dimensions
Folk agronomy and oral history of change and impacts
Food systems and agricultural product demands—food preferences, self-provisioning
History and processes of new initiatives promoting BD

managed arrangements for biodiversity conservation, and (b) designing and use of methods to understand, document and use the elements from people-managed systems for strengthening both the national biodiversity conservation strategy and agricultural development strategy.

Controlling the Factors and Processes Adversely Affecting People-managed Biodiversity: Focus on Public Policy

Our focus in this context is only on public policies/programmes, designed and implemented by the national governments. The governments are not only the signatories to the Biodiversity Conservation Treaty, but they alone have the authority to alter the public policies/programmes and create an environment conducive to promotion of people's biodiversity management systems. Chart 8.3 provides a preliminary structure to list the important public policies/programmes

having unfavourable orientation toward people-managed biodiversity in both habitat and species contexts. They include land policies, agricultural intensification strategies, responses to population pressure and poverty problems, product and resource pricing and trading policies, centralized and top-down approach of public intervention, and biases characterizing the fiscal and infrastructure systems. The recognition and reversal of approaches indicated in Chart 8.2 would constitute the key steps toward initiating new policy and programme strategies directed to people-managed systems. The actual steps to identify relevant policies and programmes and their implementation will be very much location-specific. Nevertheless, a broad approach to them should also form a part of the methodology. Chart 8.5 can help to provide a broad framework for the purpose.

METHODOLOGICAL AND OPERATIONAL ISSUES

Task-determined Methods

Methodology for a task is largely determined by the goals it has to serve. Defined in terms of major and minor goals, the tasks to be served by proposed methodologies would include recognition and promotion of people's biodiversity management systems and their use in national biodiversity conservation programmes with specific focus on agricultural and natural resource development. The broad steps it would involve are:

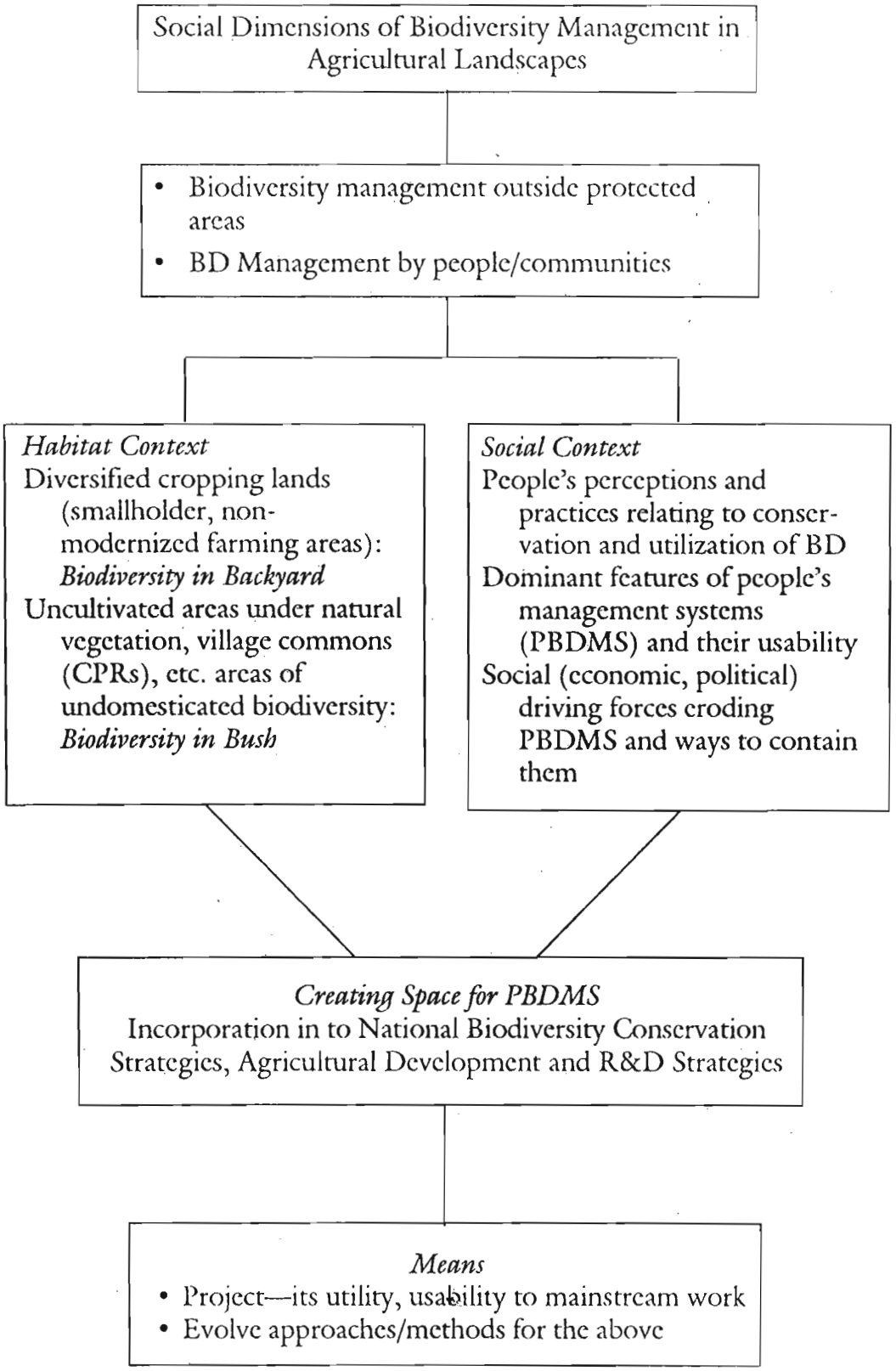
(a) Accumulation and synthesis of information about the people's systems and its dissemination for awareness generation as well as policy dialogue and decisions. This has to be done in the context of predetermined typologies of situations in terms of agro-climatic and social (especially population density) conditions.

(b) For information generation and analysis, a simple step could be to see through the records or secondary data on variables which could be used as proxies for key aspects of people's biodiversity management.

(c) Statistics on changes in land-use patterns and cropping pattern may give an idea of the changing status of 'backyard' and 'bush' (in aggregate terms) as biodiversity habitats.

(d) The broad understanding provided by the above can be validated with micro-level focused studies using PRA (participatory rural appraisal), etc.

Chart 8.5. Social Dimensions of Biodiversity Management in Agricultural Landscapes



Source: The author.

(e) However, to have both qualitative (and to some extent quantitative) assessment of the situation, application of social assessment (SA) methods may prove very helpful. Through this not only can one capture the oral history of changes in a micro-context but can also collect people's views on the factors or processes behind the change, as well as possible ways to control negative consequences of such changes on the people's biodiversity management systems, etc. One can also get a better idea of people's valuation of biodiversity through SA and PRA (IIED 1995).

(f) The use of secondary data as well as synthesis of available knowledge, and use of PRA and SA methods in their respective domains can be applied to any of the areas of inquiry listed below. For example, if government's land policy or agricultural R and D are identified as factors adversely affecting people's biodiversity management, information on them too can be built up through formal statistics (if available) and interactions with relevant communities.

(g) Similarly, information on different aspects (e.g. usability, valuation, changing status, etc.) of the people's biodiversity management systems can be assembled through PRA/SA.

(h) To illustrate the approach, a structure to cover the major aspects is given in Chart 8.4. The data sources and their situation-specific analysis as given in the chart can help in identification of 'good practices' of people-managed biodiversity for incorporation into conservation strategy.

(i) To identify major contexts in the area-specific situations, the broad conceptual framework can be developed using Chart 8.5.