Part I. TOWARDS A CONTEXTUAL FRAMEWORK

Chapter1. MANAGING NATURAL RESOURCES: A STRUGGLE BETWEEN POLITICS AND CULTURE

1.1 From local livelihood strategies to global agro-industrial markets

Filder is at work in the family's *shamba*. She is harvesting cassava today, and worrying about the disease that seems to have attacked so many of the new plants. Wondering what she could do to prevent further spreading, she resolves to discuss the problems with some of her village friends later in the day. In her mother's *shamba* on the outskirts of Kampala, cassava still grows well. Perhaps she could walk there, one of these days, and get some of her mother's cuttings to try in her own fields.

The new portable machine has been set under a shack on the side of the grazing fields and Tobias is gathering the cows for milking. The machine could easily service many more cows than he has, but his quota for the year is already filled. Fortunately, the farmers' political lobby in Switzerland is very strong. Tobias and colleagues just celebrated their most recent victory against a motion to lower agricultural subsidies in the country. With subsidies at the current level, twenty cows are enough to gain an excellent income.

Erika has just survived one of the two annual meetings of the Consultative Council of the Protected Areas Authority of which she is in charge. She is exhausted but satisfied. The discussion was lively and the people had so much to say. The new local administrators seemed not entirely at ease, but the representative of the cattle owners and the one of the environmentalists were extremely vocal and everyone now clearly knows where *they* stand. She goes back in her mind to the pictures of the degraded areas she showed in the afternoon, against the backdrop of the whitest peaks and one of the most untouched old-growth forests in Romania. These were impressive images and she is sure they will be discussed by the working group in charge of developing a draft management plan in their forthcoming meeting, just a week from now.

The *minga*, a weekly day of communal work, has just ended. Colourful people scatter back home on the chequered green and brown landscape of the Andean hills. Rosario and twenty other people representing all the village households gathered in the morning to plant lentils and oats in the plot of hard soil they are all recuperating together. For some months they moved the earth and fertilised it with animal manure, and are now halfway into the process. Once the oat and lentils are harvested, they will mix the remains into the soil, and add some more manure. In the next growing season they will be able to plant maize and potatoes. They will finally have managed to add some productive land to the meagre resources of their community.

This is one of the most important deals of Mark's stockbroker career in New York. He puts down the phone having reached an agreement that will change the price of cocoa for some time, and his client will profit from it. The new price will eventually encourage more people to produce and process cocoa, and the supply may rise too much in a not-so-distant future. This is not his immediate concern. He just needs to call his client and announce the good news of the deal.

For some [natural resource managers], the interaction with natural resources and the environment is a direct and intimate affair.... For others, it is an acquired and rather distant power....

Fatima had just gathered the yews and she-goats within the stone enclosure. As she milks the animals, she thinks about the quality of grass in the pasture. The nomadic pastoral elders are about to meet and decide the date, length, itinerary and size of the migrating herd for the entire Qashqai sub-tribe, one of the largest tribes in Iran. Some months ago she and several other women collected a good quantity of quality grass seeds. Tomorrow they will place them in perforated goatskins, and append those to the neck of the lead goat. As the animals roam, the seeds will come out gradually and will be ploughed under and fertilised by the marching flocks. The rangeland will improve after the next rains and better quality pasture will be available on their return from the summering grounds.

What do Erika and Filder, Fatima and Tobias, Mark and Rosario have in common? Not much, seemingly. Yet, the daily work and decisions of all of them impact upon the natural environment. They are all "natural resource managers".

For some of them, the interaction with natural resources and the environment is a direct and intimate affair. Learned in the household and the community, it is an integral part of what makes life normal, convivial and safe, what makes them a member of a group and a culture. For others it is an acquired and rather distant power, mediated by technology, sophisticated information systems and big money.[1] Still for others, in rapidly growing numbers in the urban sprawls of the

[1] We do not wish to express judgments here on the relative merits of one or the other type of interaction, but some cultural critics and environmentalists do, at times very powerfully. See, for instance, Wes *et al.*, 1983; and Berry, 1990.

world, that interaction is both distant and relatively uninformed. Many of us eat food we have not grown, consume electricity unaware that it comes from burning fossil fuels or from nuclear power plants, use and pollute water without considering that we are subtracting it from environmental functions with no known alternative.

For the vast majority of time in which our species roamed the planet, the interaction between humans and the environment has been of the first kind. Early groups of *Homo sapiens* may have impacted upon the environment in a substantial manner (mostly through the use of fire)[2], but were also in the front-line to see and feel the results of their own action. More recently, modern technology and the globalisation of the economy allowed for some on the planet to have an interaction with natural resources that is at the same time very powerful and very remote. This is a unique characteristic of modern times, built up in recent millennia through social diversification, the diffusion of travelling and exchanges, the intensification of agricultural and industrial production and the progressively imposed domination of the market economy.[3] Below we will discuss, on the basis of field examples, how such intimate and remote interactions with the environment co-exist today, and how they clash or integrate with one another. To arrive at that, however, we will start from some general considerations.

[Many cultural differences can be interpreted in the light of specific] environmental factors, such as landscape, climate, water availability, type of soil, and the existing flora [and] fauna....

A human culture is a set of institutions, practices, behaviours, technologies, skills, knowledge, beliefs and values proper to a human community. As such, a human culture is usually received, lived, refined, and reproduced at any given moment in history. In traditional societies, many of the features proper to a culture can be interpreted primarily as a response to the specific natural environment where they need to gain their livelihood. Much of what differentiates Ugandan peasants from Mongolian herders, French wine makers, or Japanese fisher-folks can be traced back to environmental factors such as landscape, climate, water availability, type of soil and the existing flora, fauna and mineral wealth. By no means are these the only determinants of the cultures that developed in their midst, but they provided the crucial set of external conditions around which different cultures developed their characterising features. Among those features are the organisations, rules, practices, means, knowledge and values allowing communities to exploit and conserve their natural resources. We will refer to these as "natural resource management (NRM) systems". Another term used to represent the set of conditions that regulate the reproduction and use of natural resources is "NRM institutions". In this work we will use the term "institutions" with reference to NRM systems strongly characterised by social rules and organisations.

An NRM system regulates the interplay between human activities and the natural environment. Its major outputs include:

- human survival and the satisfaction of economic needs through productive activities, such as hunting, fishing, gathering, agriculture, animal raising, timber production and mining;
- the transformation of portions of the natural environment into a domesticated environment, more suited to being exploited (*e.g.*, clearing of agricultural land, irrigation, management of grazing land and forests);
- the control of natural environmental hazards (*e.g.,* preventing floods, fighting vectors of disease, distancing dangerous animals from human communities);
- the control of degradation and hazards caused by human pressure on the envi-

[2] Simmons, 1989.

[3] See the far-looking analysis of Polanyi, 1944. See also Esteva, 1992; and Farvar and Milton, 1972.

ronment, through more or less intentional forms of conservation of biodiversity and sustainable use of natural resources.

The technological and social capabilities to exploit natural resources (in particular food resources) are a major factor in shaping the size and density of human populations.

A feature closely related to NRM systems is the social regulation of population dynamics. The technological and social capabilities to exploit natural resources (in particular food resources) are a major factor in shaping the size and density of human populations. For instance, communities featuring an NRM system based on agriculture and animal husbandry are usually larger in size and more concentrated than hunting-gathering communities. In general, an increase in human productive capability may result in an increased community size. Yet, that same increase is one of the main problems NRM systems need to face. If a population grows beyond a certain limit, the existing territory may become unable to support it. Some common solutions involve the migration of a sector of a community towards uninhabited areas and the intensification of local production by adoption or invention of newer or more effective technologies and practices.[4] Dominant neo-Malthusian theories maintain that these solutions are far from being available to all communities, and many NRM systems are today stressing their environment, at times beyond the point of recovery. More balanced analysis would show, however, that in nearly all such cases, some social, economic and political factors outside of local control are playing a dominant role. Too often, unequal terms of trade, land grabs and natural resource alienation by governments and private actors impinge on the community NRM systems and drive them to stress their resources much beyond the traditional sustainable practices.

...control over land and natural resources— in particular closure and limitation of access and use— has also been a pervasive area of social struggle.

All NRM systems include elements explicitly addressing the conservation (including wise use) of natural resources, such as knowledge of the local environment, technology and know-how. Examples of these elements are hunters' knowledge of animal behaviour and self-restraint in time of mating and growing of the offspring, regulation of grazing and fishing rights in indigenous communities, modern farmer capacity to use fertilisers, and community— or state-promoted watershed management schemes.

...a religious taboo preventing hunting during the breeding period, on the surface not inspired by a preoccupation for the conservation of game, may still be an effective means of avoiding over-hunting.

Many conservation features embedded in NRM systems, however, are not explicitly meant for the purpose. Rather, they are embedded in other components of a culture (social organisation, magic and religious beliefs, prevailing values) but have a significant impact on the interaction between a human community and the environment. For instance, a religious taboo preventing hunting during the breeding season, on the surface not inspired by a preoccupation for the conservation of game, may still be an effective means to avoid over-hunting and over-fishing. A rule establishing distribution of the camel herd among the children of a Bedouin head of household may be meant to ensure a fair share of wealth among the community, but could also be useful to avoid unsustainable grazing in given locations. The belief that land is a "gift from God" is a religious sentiment, but it may also motivate farmers to practice sound land husbandry. A sweeping land reform may be a political move to pacify the rural and urban poor, but may also have important consequences on the type and intensity of agricultural practices.

In fact, the distinction between "natural resource management" and the rest of human life may make more or less sense according to the socio-cultural point of view. Most traditional societies formed relatively closed systems in which natural resources were managed though complex interplays of reciprocities and solidarities. These systems were fully embedded into local cultures and accommodated

[4] Boserup, 1981.

for differences of power and roles, including decision-making, within *holistic systems* of reality and meaning. A telling example is described in Box 3.3, in Chapter 3 of this volume. In all cultures, on the other hand, one can also find some explicit social institutions directly related to the management of natural resources. These generally include:

- *inclusion/ exclusion rules* limiting *access* to natural resources to communities and individuals belonging to special groups based on kinship, residence, citizenship, economic capacity (ownership of land), personal skills or other criteria;
- *customary regulations or written laws* aimed at making individual use of resources compatible with collective interests (*e.g.,* reciprocity and solidarity customs, taxation system, "polluter pays" principles);
- *social organisations* in-charge of establishing and enforcing rules, through persuasion, negotiation, coercion, etc.

Often, such elements coalesce around specific use regimes (Box 1.1)

Box 1.1 **Natural resources, property and access regimes**
(Adapted from Murphree, 1997a)

Natural resources are those components of nature that are being used or are estimated to have a use for people and communities. In this sense, what is a "resource" is culturally and technologically determined. Cultures shape demand: until they create a use for it, a resource remains latent. Similarly, the development of technology can promote new uses and thus discover new resources (*e.g.,* oil and natural gas). Demand and scarcity– perceived or actual, present or future– are the complementary and primary incentives to regulate resource use, and they are usually present side by side with the management and use regulations that characterise a society.

Property, or ownership, is the faculty of disposing of certain resources. Contrary to common interpretations of the term, however, ownership is never absolute. It is, rather, a set of entitlements to use a territory or set of natural resources with some limitations— different in different social settings— regarding the entitlements of others. Entitlements of longer duration ("tenure") and subject to fewer conditions are obviously stronger than others. The legitimacy and conditions of resource entitlements arise from a variety of social factors, including formal legislation, cultural norms, kinship, and socio-economic interaction. These multiple sources explain the frequent discrepancy between the *de jure* and *de facto* entitlements of resource users, *i.e.,* between what is prescribed by norms and laws and what actually happens in real life. Types of property regime include:

Communal property

A common property regime under the jurisdiction of a community of users. The term "community" can be defined spatially, socially, culturally or economically. Often— although not always— it is used to refer to a residential group small enough for the sanction and pressure of peers to be significant in self-regulation. To be sustainable, communal property regimes must have a defined membership, with rules for inclusion and exclusion, and rules to regulate internal competition. In other words, they must have the institutional means to ensure that the collective good is not eroded by particular interests. Communal land property in peasant and pastoral nomadic societies and the kinship-based property of a well among dry land herders are examples in point. Common property has been the predominant form of land tenure in traditional societies.

The right of using, modifying and/ or selling the concerned land and resources according to the will and interests of the private (individual or corporate) owner. Other social actors are usually unable to have a say on the management and use of privately owned resources. Only in particular and rather extreme circumstances the neighbours or public bodies have negative rights, *i.e.,* can forbid a private owner of a piece of land to use the resources in a certain way. For instance, they may forbid a landowner to build a skyscraper, raise dangerous animals or drain a unique wetland. Private property is the prevailing form of land tenure that regulates "modern" capitalist production systems (agriculture and industry).

State property

A common property regime under the jurisdiction of the state. In contemporary societies, this type of regime pertains to a great proportion of a country's forests, rivers, wildlife and mining resources. State property is also the legal foundation of most conservation laws. The may rent, sell or assign part of its natural resource wealth to other social actors. Forestry and mining concessions are typical examples of this kind of arrangement. In many socialist or other "statist" countries common or private property has been expropriated by the.

Open-access

Open-access resources are available to any one and effectively the property of no one. This condition arises when there is no demand for, or perceived scarcity of the resource concerned, and thus no collective attempt to control its use. Frequently, open access situations are the result of ineffective property regimes, which claim authority over a resource but lack the means to fulfil the responsibilities involved. This can apply to individual, communal or state property regimes, although a *de facto* open access situation is most frequent for state-owned resources that a state has not the capacity to manage.

...a basic feature of NRM systems is their continuous striving to adapt in response to demographic, economic, social and cultural changes affecting environments and human communities.

The inclusion/ exclusion rules are a fundamental feature of NRM systems but also an important source of problems. First, rules may work only to a limited extent. There is a need to survey that they are respected, and to enforce them if necessary. Second, rules may not ensure equity and fairness in access to resources. Sooner or later, such rules will be challenged by the excluded and disadvantaged, with both overt and hidden means. Third, new social and political subjects may enter the picture… and the rules may be challenged by them! In fact, NRM systems are a political arena *par excellence*, intertwined with social clashes fuelled by economic interests, ethnic and cultural differences, ideological and religious values. How do these clashes get solved?

In many traditional societies, social values such as caste, predestination, religious authority or historical continuity have determined NRM decisions and their relative sharing of costs and benefits among individuals and groups. In others, dialogue and discussion of field-based experience (what some, today, refer to as "co-management") were widely and effectively practiced. In most cases, culture-based relationships of solidarity and reciprocity, the prevalence of communal property regimes and the collective building of local knowledge and skills through extended experience in managing the resources, succeeded in producing cohesive and sustainable systems. But control over land and natural resources— in particular closure and limitation of access and use— has also been a pervasive area of social struggle.

Throughout history, wars and violent conflicts have produced innumerable changes and substitutions of one group by another in the control of natural

resources. This has been mostly true between outsiders and insiders to a community, but at times also within a community, which could weaken and even split—sometimes also as a direct consequence of population expansion or accumulation of wealth. External actors, however, were the ones to intrude most often in a violent and uncompromising way. The expansion of the Roman Empire to control grain production in Northern Africa, cattle raiding among pastoralist groups in Madagascar, the recent wars in Kuwait and Iraq over oil fields, Israel's occupation of a joint Jordanian-Syrian dam site during the six-day war or the imposition of colonial rule or national government rule over community resources in countless countries are just some poignant examples. Outright violence, however, has not been the only way of gaining control over natural resources, nor has always succeeded. In many instances, the "weapons of the weak" included powerful non-overt means of resistance, such as hiding, deceiving, cheating, stealing, or spreading false rumours and ridicule.[5] These means allowed them to maintain access over at least part of the natural resources they needed. While this situation of conflict may be perceived as typical, there are, nonetheless, striking examples of societies based on relations of solidarity, hospitality, magnanimity and mutual aid. See Box 1.2 for one such example in south-western Sudan.

Box 1.2 The Beni Halba Tribe— accommodating "foreigners" in resource management
(field observations by M. Taghi Farvar, 1988-90)

Beni Halba is one of the Baggara (cattle pastoralist) tribes of South Darfur in Sudan. The tribe consists of 12 clans, one of which is composed of "foreigners"— immigrants, refugees and others who, throughout the ages, came to be welcomed and accepted locally. Rather than fighting them or depriving them of access to natural resources, the Beni Halba recognise the status of foreigners who come as refugees or through other events, and consider them as legitimate and equal partners with their original 11 clans. The chiefs of the 12 clans participate in the tribal Council and have common access to the rangelands and territories of the tribe that extend into neighbouring Chad.

The majority of NRM systems strive to be relatively efficient (*i.e.,* capable of generating good results with acceptable effort) and sustainable (*i.e.*, capable of maintaining a flow of benefits through time). Many, indeed, beautifully succeed. For instance, communal grazing has supported human livelihoods in very inhospitable natural environments generation after generation, and water-sharing systems have sustained for centuries abundant agricultural productions in dry lands. Yet, even successful natural resource management systems are not free from contradictions, inefficiencies, wastes and errors. Such imperfections make any management system much more of an experimental, trial and error process than a stable state of affairs. In fact, a basic feature of NRM systems is their continuous *striving to adapt* in response to the demographic, economic, social and cultural changes affecting all environments and human communities. For example, population growth may lead hunter-gatherers to engage in agriculture. The market economy may urge peasant communities to abandon a traditional labour sharing system. Overgrazing may lead cattle ranchers to adopt agro-forestry techniques. Concern for the preservation of biodiversity and the recreational value of wilderness, may lead a government to establish a National Park. In general, the necessary adjustments of NRM systems are done via progressive fine-tuning of interests, concerns, influences and decisions within any given community and/ or between community insiders and outsiders. This process needs to take advantage of con-

In an absolute sense, it is impossible to assess whether a management system has a positive or negative effect on the environment.

[5] Scott, 1985.

sultation, negotiation and conflict prevention and resolution mechanisms, which in the ideal case are embedded in the relevant NRM institutions

...each property of an ecosystem may favour some interests and actors in society, but displease others.

In an absolute sense, it is impossible to assess whether a management system has a positive or negative effect on the environment. This is true because there is no "optimal" state in which a given environment could or should be. What does this mean? An ecosystem can be described by many properties, such as: capacity to sustain a certain *quantity of biodiversity* (many different species) or *quality of biodiversity* (presence of highly sensitive, endemic species), *wildness* (for instance as defined by low dependence on human interaction and extensive presence of endemic species), *productivity for given species* (including species capable of sustaining the life of human inhabitants), *resilience* after stress, *structural variety*, *maturity* (average *age and size of some important species*), matrix distribution of *habitats*, *aesthetic values*, and so on. Many of these properties can be optimised only one at a time, or even one at the expense of the other, but not all together. Thus, if we wish to maximise the total quantity of biodiversity we may do so at the cost of the quality of biodiversity, for instance the disappearance of a few species, endemic and fragile. If we opt to maximise productivity we may pay the price in terms of resilience or wildness. And so on.

The problem is compounded by the fact that each property of an ecosystem may favour some interests and actors in society, but displease others. For instance, the presence of important biodiversity in a given patch of forest may please some university researchers, herbal healers, and scouts of medicinal plants for pharmaceutical companies, but the local youth may be more interested in gaining revenue from an environment managed for the maximum production of coffee or cocoa. For some tourists it may be interesting to spend time in an unspoiled and wild tropical watershed, but for the urban planners it may be crucial to transform it into a water reservoir for energy production. Who should decide?

When different cultures clash… management decisions end up reflecting the priorities of the most powerful parties in the controversy.

The question is particularly problematic as peasants and pharmaceutical companies, tourists and urban planners indeed belong to *different "communities" and cultures*. Within a self-contained society, existing institutions and cultural norms generally provide their unique answers to their internal conflicts of interests and concerns. When different cultures clash, however, matters are thorny and eminently political: management decisions end up reflecting the priorities of the most powerful parties in the controversy. Thus one option is the oligarchic or dictatorial control by the few (be they the "scientific experts", the ones with the guns, the rich, the conservationists, or the dominant elite). Another option is the pluralist/ dialogue/ democratic way. This is based on the acceptance of various entitlements in society, the gathering of the best available information on the consequences of various possible decisions and a negotiation process among the parties possessing entitlements, interests and concerns. This, at least in theory, is what collaborative management— the subject of this volume— is all about.

Livelihood systems

For most of its existence on the planet, humankind got its subsistence from hunting, fishing and gathering. Some contemporary indigenous societies (such as the Kung bushmen of the Kalahari Desert, the Eskimos, fishing communities in remote islands in the Pacific and some Aboriginal communities in Australia) still rely on this livelihood system to a significant extent.

A hunting/ fishing and gathering economy is based on the exploitation of wild natural resources in a wide territory or sea area. The people do not control the reproduction of resources but they take advantage of everything nature can offer. Low population density, diversification of the diet (according to seasons and sites), and nomadism are common characteristics of hunter-gatherer societies. They are facilitated by a flexible social organisation, which allows human groups to change size according to food availability.

Hunters-gatherers possess an impressive knowledge of animals, plants, and local ecology, and some of their practices aim at preventing overexploitation of resources and facilitating the reproduction of significant species. This expertise— together with a highly co-operative attitude within human groups— is essential for their survival. As hunting and gathering activities do not always procure enough food, food security depends on the generous sharing of whatever has been gathered and hunted among the households in the same group.

In these egalitarian societies, access and use of natural resources are not regulated by any economically significant exclusion rule. Every member of a human community has the same right to exploit the hunting and gathering territory, and the same duty to contribute through his/ her activities to the common livelihood. A wide demographic dispersion diminishes competition over natural resources. As a consequence, relationships among hunter-gatherer groups are usually peaceful. Contact with more aggressive human groups is avoided. At times, this may even involve abandoning a well-known territory and moving into a new one.

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Throughout millennia, most of the world's hunting-gathering societies have transformed themselves into societies based on agriculture and animal husbandry. This has been a complex process, which proceeded at different paces in different environments. Indigenous tropical forest societies in the Amazon, Central Africa, Asia and Papua-New Guinea represent some contemporary examples of a "transitional" situation in which hunting and gathering still play a key role.

The subsistence of tropical forest societies is based on a mix of shifting horticulture (tuber-focused), which provides the caloric basis of nutrition, and of hunting, fishing and gathering activities, which supply proteins, other qualitative elements of the diet, fuel and raw materials. This livelihood strategy is usually associated with a relatively sedentary settlement pattern. Communities live in long houses or clusters of long houses, hosting about 150-200 people each, scattered over a wide area. Each human settlement includes the dwellings, the surrounding fields, and a hunting territory.

The NRM systems of tropical forest hunters-horticulturists usually include strict territorial control through feuding and warfare (often ideologically promoted by complex, highly elaborate rituals such as headhunting or witchcraft). Such strong exclusion mechanisms limit human pressure on the forest. Often the buffer territory between one community and another becomes a *de facto* "no man's land" where game and other forest resources reproduce without human disturbance. These undisturbed territories and their own sophisti-

cated knowledge of soils, species and ecotypes allow tropical forest hunters-horticulturists to make sustainable use of the fragile tropical forest ecosystem and resources.

About eight thousand years ago, many human communities started to concentrate their productive effort on cereal and leguminous cultivation (often coupled with small-scale animal raising). This peasant way of life is practised today by innumerable rural communities, in both developing and industrial countries. In comparison with hunter-gatherers, tropical forest hunter-horticulturists, and nomadic pastoralists, peasants feature a more intensive way of exploiting the natural environment. Their technology and know-how allow them to get all they need for survival from a small but efficiently exploited territory. Furthermore, in the absence of special catastrophic events such as droughts, floods, famines or major wars, peasant societies are also able to accumulate surpluses relatively rapidly. This may provide livelihood opportunities for larger and more concentrated human communities.

Most nomadic pastoral societies ...rely on complex pasture and water tenure regulations, which usually include rangeland conservation measures. The enforcement of these measures is entrusted to tribal elders and authorities, called to act as mediators in conflicts that may arise among local groups.

Traditional peasant NRM systems focus on arable land. The arable land surrounding a settlement is usually under some form of communal property regime. Plots are periodically assigned for cultivation by village authorities such as the Councils of Elders, according to kinship and other customary rules. Often, these authorities are also in charge of conserving and enhancing productivity of common land. To this end, for instance, communities mobilise to implement erosion control and flood prevention or management works (the agricultural areas of Hadramaut in Yemen are an excellent example of this). Land husbandry regulations (such as respect of fallow time, crop rotation or terracing) are promoted and, when necessary, enforced. Similar practices are sometimes extended to the near-by forests and grazing areas, which are kept in a state of semi-cultivation similar to that advocated by modern agro-forestry practices. There the peasants collect fuel wood, fodder and other wild natural resources. Peasant cultures deliberately seek to transform the natural environment into a human-made environment. At times, this includes attempts to control unpredictable factors (such as weather and climate) through magic and religious means.

Most peasant NRM systems are not stable. For instance, under the pressure of climatic change between 9000 and 3000 years ago, groups of Central Asian farmers were forced onto horseback to experiment nomadic pastoralism, a livelihood strategy which was subsequently adopted in many arid areas of the world. Nomadic pastoral societies (such as those existing in Southwest Asia, Central Asia and North, sub-Saharan and East Africa) base their economy on the exploitation of domesticated animals, such as cattle, horses, camels or sheep and goats. Their NRM system is geared towards providing the herds with a constant supply of fodder and water and thus they adopt a mobile life-style, which allows them to track rangelands and water resources throughout the year. Seasonal displacements are often combined with cyclical migrations taking place over longer periods, which

distribute grazing pressure over a large territory. Overgrazing is prevented also by the periodic sub-division of human communities into smaller sub-units, a phenomenon that facilitates the de-stocking of the animal herd. Needless to say, the sedentarisation policies of many national governments severely disrupt this livelihood system, with resulting extreme social and environmental stress.

Nomadic pastoral communities usually possess impressive capabilities in managing the constraints and hazards of the semi-arid environment, as well as the health of their animals. Their NRM systems, however, can function only if strong social control is ensured over rangeland and water resource use. Most nomadic pastoral societies, in fact, rely on complex pasture and water tenure regulations, which usually include rangeland conservation measures. The enforcement of these measures is entrusted to tribal elders and authorities, called to act as mediators in conflicts that may arise among local groups. If negotiations are not successful, open struggles for the control of water and pasture may ensue.

Peasants who do not adopt pastoral nomadism are usually forced by population growth to expand and intensify the exploitation of arable land. This exposes them to environmental hazards and conflicts with neighbouring villages. To overcome the above limitations, some peasant communities join in confederations of rural villages ruled by a common authority, which can regulate land tenure conflicts and ensure a region-wide control over land husbandry practices. In the ancient world, this process took an especially rapid pace on the shores of the Nile, the Tigris, the Euphrates, the Indus, the Ganges and the Yellow River.

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In these areas, the quality of soil was high (benefiting from river water and sediments), a fact that prompted peasants to solve land disputes locally rather than disperse (a common response in areas were natural resources are distributed over large territories). In addition, the advantages of a central authority are rather evident among the inhabitants of large river watersheds, where public works are necessary to control the floods and to make water available outside the natural edges of the alluvial plain.

Starting from 4,000 BC, the village confederations of the south-west Asian rivers developed fairly stable "hydraulic states", which acquired their legitimacy from their capability of implementing flood-control and irrigation works. A variant of this watershed management-based form of state is the one developed by some Andean civilisations such as the Inca. Due to the specific ecological conditions of their territories, the water management activities promoted by the Inca focused on erosion control, rather than on water-stream control. A huge amount of peasant labour was mobilised to establish impressive terracing works— the still observable and functioning *andenes*— which made suitable for agriculture the steep hills of the Andes, highly prone to erosion. The hydraulic states also entailed the development of complex sets of rules for access to land and resources (especially water), legislation for water management (often encoded in religion)[6] and the rise of a centralised bureaucracy and military force in charge of enforcement and defence. In this process, individual, community, and state property were differentiated and many NRM systems were institutionalised, *i.e.,* codified in specific rules and organisations under central control. This notwithstanding, local knowledge, skills and institutions continued to be central to the water and irrigation systems, at least in the oriental world (see Box 1.3).

[6] See Box 3.3 Chapter 3.

Box 1.3 **Community tapping and management of ground water**
(Adapted from CENESTA, 2004)

The land of west and central Asia is dotted with an ingenious community-managed technology for the tapping of ground water. Known as *Karez* (Afghanistan, Iran and Chinese Turkistan), *Qanat* (Iran), *Fouggara* (North Africa), *Surangam* (India) and *Falaj* (Arabian Peninsula), this ancient technique has supplied water for irrigation and social life for millennia. Tapping into the renewable hydrological reserves of the hills and mountain, the *karez* provides abundant water for local uses under the control of local community councils and often in defiance of the central authority.

Even the water of the centrally-organised irrigation systems of the great rivers (the so-called hydraulic states), once flowing in secondary and tertiary irrigation canals, has been treated the same way as the water from the ground. The *karez* system, initially transferred by the Arabs to the Spaniards, can be found today in places as far apart as the Philippines (the *sanjeras* system), Mexico and Peru.

In other areas, possibly less characterised by very important river basins, the focus of state development and expansion was more urban than rural. Confederations of peasant villages developed into states that progressively expanded their area of influence through warfare and built vast political units. This was the case for the Roman Empire (and for the development of most states in continental Europe), which made some effort to plan agricultural exploitation in selected rural areas of Italy, Southern France, Spain and Tunisia, but always perceived its expansion as a process of colonisation, based on road building, military control, collection of tributes, trade, and pillage of local resources. The Empire was in need of progressively larger agricultural harvests to sustain its densely populated towns. This was achieved through the introduction and extension of technological innovations (*e.g.,* diffusion of crops from one place to another, small-scale irrigation schemes, and progressive improvement of tools) rather than via major public works and state-controlled policies. This approach was consistent with the overwhelming importance attributed to private property in Roman laws.

An early momentous role... was played by the appropriation and partition of common lands by private individuals and, later, by the state...[this] goes under the name of "enclosure of the commons".

In more recent times, the emphasis on technological innovation and private (or corporate) land property has become an overwhelming characteristic of natural resource management in the Western world. A case in point is the transformation of most European rural inhabitants into urban proletarians or overseas settlers that took place in the last couple of centuries and was closely intertwined with the development of capitalist agriculture. Technological innovations— originally coming to Europe from the East— became very important, including the practice of crop rotation, improved crop varieties and breeds and safer storage systems. Later on, new methods such as mechanical cultivation and harvesting, more sophisticated irrigation techniques and new crops (*e.g.,* potato, tomato and maize) tended to minimise losses, decrease the need for labour and increase the overall output of the productive process for a given unit of land.

An early momentous role in this process of transformation was played by the appropriation and partition of common lands by private individuals and, later, by the state. The phenomenon, which goes under the name of "enclosure of the commons", was a by-product of the monetisation of feudal life. It started in England as early as the 13th century and reached its climax in the late 18th and early 19th centuries, when *half* of the arable land of England, previously held as

feudal commons and used by peasants to grow food crops or graze their flock, was "enclosed" and reserved for cash-oriented production (initially mostly for sheep rearing and, later, also for tillage) for the benefit of the landowner aristocracy.[7] Trees were cleared, marshes were drained, efforts were made to improve the fertility of the soil and large portions of land were offered for lease at competitive rents. Among the consequences of the enclosures was an increase in economic productivity of the land, coupled with benefits for the landlords and the ones who could afford to buy or lease land. In parallel, however, the human cost for the small peasants reached tragic proportions. In some estates nine-tenths of the peasant population were forced to leave the land and went to feed a mass of wandering poor— the labour pool for the industrial revolution to come and for the migrations to the "New World". This wrenching human dislocation proceeded at different pace throughout the European continent and did not go without rebellions. Thousands of peasants were slaughtered in the process, which was at times slowed down by the intercession of kings and the Church and even by specific legislation, but basically never stopped. As aptly described by Polanyi[8]:

"Enclosures have appropriately been called a revolution of the rich against the poor. The lords and nobles were upsetting the social order, breaking down ancient laws and customs, sometimes by means of violence, often by pressure and intimidation. They were literally robbing the poor of their share in the common, tearing down the houses which, by the hitherto unbreakable forces of custom, the poor had long regarded as theirs and their heirs'."

The new post-colonial independent states are also extremely comfortable with the practice of "enclosures"....

The "enclosure" model, centred on private property, a monetary economy and efforts to increase land productivity has not remained confined to the lands of noble aristocracy. Policies of deforestation and "enclosure" by order of the state have been the rule in European countries throughout recent centuries. In northern Italy, for instance, the new national state did not spare efforts at alienating, splitting up and privatizing the collective property of the village communities (woods, pastures, etc.), a process still in the making as late as 1927.[9] This was sooner or later accepted for the land most suited to the profit-oriented agriculture in the plains (with consequent creation of important landowning possessions), but encountered fierce resistance for the more mountainous and marginal lands of the upland communities, to the point that some special legislation was carved to allow some of them to maintain a collective, solidarity-oriented— and, incidentally, very successful— form of control over those resources.[10]

...changes in natural resource management... lead towards the expansion of cultivated land at the expense of forests and wildlife habitats, the replacement of use values by market/monetary values and the substitution of experience-based, culture-embedded and often highly productive production systems by the "science-based" decisions of merchants, bureaucrats and experts.

The "enclosure" model has not remained confined to Europe either. It was well applied in the colonies, with individual land conquest and appropriation as a pathway (*e.g.,* for the *haciendas* of South America[11]), but also with land appropriation by the colonial powers as an explicit effort to "scientifically manage" the so-called wastelands of India.[12] In Africa, the colonial triad of taxation, export cropping and monetisation took care of tearing apart local peasants from their kin and community affiliations and obligations in the commons, creating

7 Heilbroner, 1968.

8 Polanyi, 1944.

9 On this date the Italian government passed Act No. 1766 aimed at liquidating collective property: the woods and pastures had to be handed over to the communes and the agricultural land to the farmers.

10 Merlo *et al.*, 1989. Many of these collective property systems continue to this day (see Box 11.10 in Chapter 11).

11 Burbach and Flynn, 1980.

12 In 1865 the Indian government passed such legislation with the Indian Forest Act, which expropriated the individual and collective rights of local communities.

the social and environmental crises at the roots of many modern famines.[13] The new post-colonial independent states are also extremely comfortable with the practice of "enclosures", which they have set to work without much re-thinking or change. In Kenya, for instance, the Registered Land Act makes the individual title deeds to prevail over all sorts of customary collective rights[14] considered contrary to modernisation. In West Africa, where cultural resistance to land privatisation is strong, the state policies have favoured state ownership or individual ownership of agricultural land also with the support of foreign aid projects.[15] State control, however, too often revealed itself a euphemism for unregulated, "open access" regimes through which both the state and others appropriate resources with no concern for sustainability. In Nepal, for instance, unqualified state control of village forests prompted a break down of traditional management practices that damaged both the resources and the people.[16] Likewise, in Iran, Syria, Jordan and other countries, the "nationalisation" of rangelands have caused their alienation from the nomadic pastoralists and the further degradation of these productive, albeit marginal, natural resources.

…a progressively smaller percentage of the population of a country remained employed and/ or in control of agricultural production.

The last centuries have thus seen progressive changes in natural resource management all over the world. Prompted by technological innovations and the enclosure of the commons, these changes lead towards the expansion of cultivated land at the expense of forests and wildlife habitats, the replacement of use values by market/ monetary values and the substitution of experience-based, culture-embedded and often highly productive production systems by the "science-based" decisions of merchants, bureaucrats and experts. In parallel, a progressively smaller percentage of the population of a country remained employed and/ or in control of agricultural production. This "taming of nature" obtained spectacular results but also left behind degraded soil and water, polluted air, depleted resources because of excessive extraction (first among all from the sea and forests) and a sustained loss in biological diversity (habitats, species, and genetic variety).

Far from being a mere economic or environmental phenomenon, this is principally a political one. It happened first as a consequence of the expansion of the power of landed aristocracy, then through colonisation and colonial enterprises and later as a consequence of the globalisation of the world economy and the coming to dominance of one, or a few, superpowers. In this, subsistence peasants have been progressively involved in cash crop production, nomadic pastoralists have been forced to settle and hunters-gatherers have been constrained to become farmers. In other words, many existing customary and community-based rights and traditional NRM systems have been overlooked, negated or simply crushed in the name of the "higher" goals of modernisation and development.

…customary and community-based rights and traditional NRM systems have been overlooked, negated or simply crushed in the name of the "higher" goals of modernisation and development.

Today, the agro-industrial-market system is the dominant, "modern" NRM system at the global level. Every day, the international trade and market system moves huge financial resources (real and virtual) that have all too real effects on land and resource uses and practices. This process is effectively dominated by a few countries, a few international corporations and a few banking giants. Many countries are seriously dependent on foreign imports of food and other natural resources (raw or processed) and virtually exist under the patronage of the few who dominate their markets. Crucial resources, such as oil, are internationally and nationally controlled, by virtue or vice. In fact, specialisation of local production and

13 Watts, 1983a and 1983b.

14 In fact, a registered land owner in Kenya is immune to challenge, no matter how the property was obtained, a fact discussed by Alden Wily and Mbaya, 2001.

15 Franke and Chasin, 1980.

16 See the story of a specific village masterly narrated in Kuchli, 1997.

local dependence on inputs from outside increasingly appear as the two faces of the same coin. These phenomena sprout in part voluntarily and in part imposed by a variety of socio-economic constraints. They have in part healthy results, such as increased communication and friendly relationships among people belonging to different backgrounds and histories, and in part pernicious results, such as loss of autonomy, diversity and sense of people's identity and culture.

The "collateral ecological damage" intrinsic to the taming of nature is possibly the most ominous consequence of the agro-industrial market system. Only recently, as environmental damage began to affect private and collective interests throughout the world, environmental concerns have come to the fore. Principles such as "polluter-pays" start clamouring for attention, as societies become conscious of the costs of un-regulated exploitation of natural resources. Some state-enforced conservation and sustainable use policies are slowly becoming part of the modern agro-industrial NRM system. Societies are not even close, however, to the extent and depth of change they should make in order to reverse and repair existing negative trends. In addition, too often even the positive measures remain as far from the interests and concerns of local communities as the economic motivations that force them to plant one crop as opposed to another or spray all of them with pesticides. Decisions taken in capital cities or even distant continents have a dominant influence on the interaction people have with their local environment.

To a significant extent, the history of contemporary rural development efforts can be seen as the history of the encounter— or clash— between the indigenous NRM system and the modern, agro-industrial market system.

1.2 The interface between indigenous/ local NRM systems and the modern/ a-local agro-industrial market system: five field examples

To a significant extent, the history of contemporary rural development efforts can be seen as the history of the encounter— or clash— between the indigenous NRM system and the modern, agro-industrial-market system. Such a clash originates in the profound differences existing between the two in terms of goals, values and means (see Table 1.1). It also originates in the power struggles that accompany the process, cutting across both the centre and the periphery of the world order.

Table 1.1 Agro-industrial market system and indigenous NRM systems compared

Agro-industrial market system	*Indigenous NRM systems*
Supra-national/ international; global, large-scale, similar everywhere	Local, relatively small-scale, many context-depending features
Focus on the generation of private, corporate or state wealth	Focus on community livelihoods
Innovative, often recently tested only outside the area in different social and environmental settings	Traditional, tested at the local level, in the relevant area, for a long time
All market-oriented	Mostly subsistence-oriented
Based on the control of energy sources (*e.g.,* oil), mineral sources and water.	Based on the control of land, biological resources and water.
Requires sophisticated technological inputs and major capital investments, including for transportation	Based on soft technology and small capital investment, including for transportation
Tenure and use of natural resources focus on private and state property regimes, regulated by written law	Tenure and use of natural resources focus on communal property regimes, regulated by customary laws
Promoted by the state and private businesses and backed by military power	Supported by the social organisation of communities and by forms of reciprocities with other communities
Managers are economically-tied individuals, corporate or state decision-makers, dispersed and acting on a global scale	Managers are tightly knit social organisations, closely interacting with society and acting in the local sphere
Separation between exploitation and conservation	Integration of exploitation and conservation (conservation-by-use approach)
Politically and economically powerful on the large scale	Politically and economically weak on the large scale
Mostly explicit, *i.e.*, based on intentional strategies	Mostly implicit, *i.e.*, working on the basis of feedback from other cultural elements
Aims at relatively short-term, precisely measurable results	Aims at long-term sustainable livelihood (defined in a rather general sense)
Based on "objective science" aiming at the reduction of subjective decisions and uncertainties	Based on local knowledge and skills, the recognition of indeterminacies, risk-aversion behaviour and an emphasis on experimentation and adaptation
Conservation mostly understood as preservation of biodiversity and maintenance of ecosystems for aesthetic, recreational and scientific purposes	Conservation mostly understood as sustainable production to sustain livelihoods
Little religious or symbolic value attached to nature	Important religious and symbolic value attached to nature

Nothing is more illustrative of the interaction, or clash, between modern and indigenous NRM systems, than some actual field examples. Five such examples are given below.

Field example 1.1 The Shuar and the colonisation frontier[17]

The Shuar are a 40,000 people Amerindian group settled along the rugged valleys of the Upano, Morona, Santiago, Zamora and Pastaza rivers, in the Ecuadorian Amazon. Since the beginning of the last century, they have been known as *J□varos*, a term that in Ecuadorian Spanish denotes fierce, rebel and savage people. This reputation relates to head-hunting, raiding, witchcraft feuding, and indomitable hostility against outsiders, which— after a brief period of Spanish rule between 1549 and 1599— made the Indian territory off-limits to Ecuadorians and travellers for about three hundred years.

By the beginning of the nineteenth century, the Shuar were living according to their tropical forest hunting-horticulturist pattern. They were settled in clusters of 5 – 10 long houses, scattered over an immense and de-populated region and separated by rather large "buffer" areas. Each long house corresponded to an extended family and each cluster to a local group of about 150 persons. Each group was named after a Big Man acting as a military and ritual leader in headhunting (against non-Shuar Indians) and feuding (against other Shuar settlements). They practised a subsistence economy based on manioc and plantain horticulture, pork breeding and hunting. Most technology was indigenous, with the exception of iron tools, introduced during the sixteenth century, which were bought from *mestizo* traders settled on the Western border of Indian Territory. Pigs, handicraft (*e.g.,* baskets, blowguns), forest products (*e.g.,* dart-poison), and small agricultural surplus were bartered with implements such as machetes, knifes, axes, and, after 1920, muzzle-load shotguns and powder.

In the early 1930s, gold was discovered in Western Shuar territory. Gold miners coming from the Azuay highlands used gifts, alcohol, fraud and violence to make their presence accepted. Once the gold fever was over, several miners settled in the area, established cattle ranches and started to employ Shuar labour. The Ecuadorian Army came to protect colonists' property and life, and missions were opened to pacify the *J□varos*.

In 1950, the Ecuadorian Government, with the aim of responding to highland peasants' claim for land— without affecting landowners' interests— started to actively promote the colonisation of the area. This process reached its climax in the sixties, when a special institution— the CREA (*Centro de Reconversi□n Econ□mica del Azuay, Ca□ar y Morona-Santiago*)—was created to build the infrastructure needed for a massive colonisation of the Shuar territory.

To resist this mounting pressure on the Western valleys, many Shuar migrated towards the inaccessible region located east of the Kutuk□ Mountains, where it was still possible to practice their indigenous way of life. Others, however, adapted to the new situation, seeking protection from the missionaries against colonists' abuses. They converted to Catholicism, allowed some of their sons and daughters to learn Spanish and be "civilised" in boarding schools, and started to combine indigenous slash-and-burn agriculture with cattle breeding on behalf of the church fathers. Some of them became traders and supplied the "wild Shuar" of Transkutuk□ with an increasing quantity and variety of western goods. This, of course, increased Eastern Shuar dependence on trading relationships with the frontier. Thus, in one way or another, all the Shuar became increasingly involved in the national market and society.

[17] This case example has been provided by Patrizio Warren. See also Warren, 1992; and Warren, 1996.

By the mid-sixties, some "educated" Shuar started to realise that little chance was left to their people to escape this process. Based on this awareness, an ethnic organisation called the Shuar Federation was founded. Its objectives were defending indigenous land rights, ensuring that benefits of development would be made available to Shuar communities, and preserving indigenous cultural and ethnic
identity.

With these goals in mind, the Shuar Federation (supported by missionaries and international non governmental organisations – NGOs) started to promote the modernisation of indigenous society through the following strategy: registration of Shuar settlements as legally acknowledged co-operatives (called *Centros*); procurement of agricultural land titles; provision of credit and technical assistance for extensive cattle breeding; provision of bilingual education, health and transport services.

During the following twenty years, the Federation was successful in achieving its development objectives. However, by the early 1990s, it became clear that the modernisation process was spoiling the indigenous NRM system, and, eventually, was having a negative impact on the physical and human ecology of most Indian communities. Why was this happening?

Since its establishment, the Shuar Federation had decided to work *with* the existing laws and procedures. Unfortunately, these were colonisation rules, based on the assumption that there was no "Indian land" in the Amazons but only state property, which could be distributed to individuals or legally recognised groups (*i.e.*, colonisation co-operatives) in accordance with their exploitation capability. Among colonists, this policy had already made clearing the forest and opening pastures an especially popular (and inexpensive) way to get into the position to claim huge extensions of land.

By adopting the same tactics, the Shuar Federation was able to secure significant land titles to many Shuar *Centros*. This slowed down the occupation of indigenous land. Furthermore, cattle rearing helped people to create some savings, which could then be used to purchase commodities and basic services. Nonetheless, the substitution of forest cover with grassland had a major impact on bio-diversity and soil, and thus on indigenous subsistence practices. Game, forest materials (such as vines, thatching and poles), and good arable land were becoming scarce. An increasing amount of labour had to be invested in cattle raising and pasture management. Even in the eastern plains, where colonists were still few and large untouched forest areas persisted, men started lacking the time for hunting, fishing or looking for forest materials. As a result, tin roofs became less expensive than thatched roofs and nylon rope cheaper than jungle vines.

At the same time, the improvement in the standards of living, modern services and commodities were performing well in decreasing under-five mortality, which fell from 267 per thousand in 1976, to 99 per thousand in 1992. Related to this trend, the total population grew at a rate of about 4% a year. By the early 1990s, the population density was already 5.2 persons per square km of entitled land (*i.e.,* four to five times higher than before contact with the frontier), and it was expected to reach 10.6 persons per square km in 2006. Nobody in the Federation really knew whether the land would be sufficient to sustain the livelihood of all these people. For sure, however, the poor quality of most Shuar soils and the increasing land tenure conflicts occurring among families and settlements suggested that hard times might be coming.

In the late 1990s, based on the above elements and under the influence of several co-operation agencies, the Shuar Federation included environmental sustainability as a major objective in its fight for development and cultural survival. Moreover, new Ecuadorian conservation laws allowed the

Shuar Federation to negotiate their entitlements in two major national parks, in which they would be free to practice hunting, fishing and gathering in exchange for conservation works and surveillance. Currently, agro-forestry is also being promoted at the farm level and new income-generating activities based on indigenous know-how, and diversification of production are being tested. Family planning services are also being introduced, despite their poor cultural acceptability and missionary resistance.

All together, the above initiatives may be useful in improving the human ecology of the Shuar, and in preventing an environmental catastrophe. None of them will however be able to restore the demographic and ecological conditions on which the indigenous NRM system was originally based. After three centuries of strenuous resistance, the increased pressure of the national society and economy on their land brought the Shuar to adopt the particular variant of the "modern" NRM system promoted by the national government. This allowed them to survive as an ethnic group, to increase their wealth, and to get basic services, but did not prevent them from eventually clashing with the problems of demographic growth and unsustainable development.

The impact of the national economy and market on indigenous NRM strategies is not always as dramatic as in the Shuar case. Less comprehensive and abrupt changes take place when indigenous strategies are less culturally distant and can coexist with "modern" strategy with minor adjustments. Significantly enough, however, these adjustments often result in less sustainable use of natural resources. The following case, concerning a Mediterranean peasant community, provides a good example of how modernisation may spoil indigenous practices, without being able to replace them with feasible "modern" NRM solutions.

Field example 1.2 **Erosion control, indigenous know-how and economic change in Oued Sbahiya watershed**[18]

Oued Sbahiya watershed is located in Zaghouan Governorate, Northern Tunisia. It is a small catchment of 62,000 ha, featuring highly deteriorated forest and rangeland areas in the upper part, and over-exploited agricultural land in the lowlands. It hosts a population of about 1,300 Arabic-speaking peasants who originally migrated from the fertile Zaghouan plain towards this less favourable area under the pressure of early twentieth century French colonisers.

Sbahiya inhabitants practice typical subsistence Mediterranean farming: they grow cereals (wheat, oats and barley) and leguminous crops (broad beans and green peas), cultivate olive and some fruit trees. They also breed sheep and goats, and tend small kitchen gardens. Dwellings are nucleated in small hamlets, according to lineage segments known as *douars*. *Douars* own collectively the arable land surrounding the settlement. Several small parcels (as small as 0.25 ha) are however assigned for exploitation to households.

Erosion is a major problem in the ecology of Oued Sbahiya, originated by both natural factors (such as slope, climate, and soil texture) and human-made factors (including population growth, over-

[18] This case-example has been provided by Patrizio Warren.

exploitation of agricultural land, grazing, and firewood pressure on the forests). To tackle the problem, the *Centre Régional de Développement Agricole* (CRDA) of Zaghouan started in the early 1990s to promote soil management works in the area. Bulldozers were made available to the farmers for erosion control works on their land. This intervention, however, rapidly made soil conservation authorities unpopular with the peasants. Bulldozers were simply too big to operate efficiently in the patchwork of micro-parcels owned by Sbahiya peasants. Inter-property borders could not be respected and tracks scrapped away amounts of soil which (given the parcel size) farmers perceived as significant. Passive resistance mounted against the programme, which eventually led CRDA technicians to think that Sbahiya peasants were not aware of the consequences of erosion on their farming system, nor willing to take any measure to counteract it, unless forced by authorities.

In 1996, researchers from a participatory watershed management project supported by the Food and Agriculture Organisation of the United Nations (FAO) tried to face the issue from a different prospective. In the framework of a participatory appraisal exercise, the project team visited a highly eroded area together with a group of peasants and asked them what they knew about erosion. People defined erosion as "fertile soil going away, leaving bad land behind". This was related in part to the will of *Allah*, who created the *djebels* (mountains) and the steep slope; and, in part, to the behaviour of *abdallah* (literally, "*Allah's* servant", *i.e.*, the peasant), who does not take appropriate care of his land.

The peasants were then asked to describe what could be done to avoid soil loss. They said that in the past they used to stabilise soil by constructing check-dams with stones and planting prickly pear cactuses on the gullies. They also used to build embankments made of tree branches and earth, consolidated through the plantation of fig trees, for collecting and deviating running water.

Technicians realised and agreed that these measures were sound and asked why they were abandoned. People explained that this depended on changes in their lifestyle. New needs (including agricultural inputs, household commodities, and expenses related to education and health) have made their households increasingly dependent on cash. Yet the price paid for their agricultural products is far less than the salaries that can be earned by masonry workers in the tourist areas of the coast, by wage labourers in big agricultural estates, or by migrants overseas. Moreover, city lights are attractive for youngsters. That's why most men (and some unmarried girls) migrate elsewhere in search of better chances, leaving the burden of agriculture on the shoulders of old people, women and children. In these conditions of local labour scarcity, the household economy can not anymore afford conservation works. The fields are worked as fast as possible, trying to squeeze out of them maximum yields with little concern for loss of fertility.

These considerations had a very practical immediate implication. The erosion control authorities were urged to consider the opportunity to reinvest part of the money allocated to mechanical erosion control works, to pay cash incentives to farmers willing to implement manual works in accordance with local know-how. It was also stressed that such an option would bring two additional benefits: contributing to lessening seasonal migration, and revitalising some elements of the indigenous farming system that are essential for sustainability.

The case, however, tells us more than that. It shows that current attitudes and behaviours of Sbahiya peasants towards land husbandry could not be considered independently from some embedding economic and political factors, such as land tenure policies, structure of the local market, and social marginalisation. The shrinking of arable land per household (related to population growth), the poor prices paid locally to local production, the increased social needs, and the presence of off-farm income generation opportunities, have all resulted in decreased availability of labour for indigenous

soil conservation works. At the same time, the modern alternative (mechanical works) is not appropriate to the prevailing land tenure pattern. In other words, as far as land husbandry is concerned, Sbahiya peasants are stuck between the old and the new— between the indigenous and "modern" NRM systems— without being able to find a satisfactory solution to their soil conservation problem.

Modern influences on indigenous NRM systems do not always result in destruction (as in the Shuar case) or a loss (as in the Sbahiya peasants' case). The following example from Iran demonstrates the strength and resilience of some traditional NRM systems in the face of powerful agents of change.

Field example 1.3 **The Qashqai: nomadic pastoral livelihoods against all odds…**[19]

A hundred years ago, the Confederation of Qashqai Tribes was one of the largest nomadic pastoralist groups of Iran. At that time, most of the population of the country (probably over one-half) was composed of nomadic pastoralists. The most significant ethnic groups were the Qashqai, Shahsavan, Baluch, Turkmen, Bakhtiari and other Luri peoples. Besides them there were seven hundred large and small tribes and independent clans of pastoralists. Since time immemorial, the pastoralist tribes constituted the backbone of the political structures governing the region. Typically, a number of such tribes would form a coalition and take hold of political power in the land. The chief of the dominant tribe in the coalition would be named King of Kings and start a new dynasty. If people became unhappy with the ruling dynasty, a new coalition of tribes would take over and form a new dynasty. This is the essence of the political history of Iran over the past twenty five centuries. Some fourteen centuries ago, Arab tribes took over the land as part of the Islamic expansion. Having defeated the Sasanid dynasty, they took over the country and ruled it for four centuries until about 1,000 years ago, when some Turkish-speaking tribes liberated Iran from Arab colonial rule. Various Turkic tribes then ruled the country nearly all the time until about 1920 when the Pahlavi dynasty took over the Kingdom. This was the first non-tribal, non-pastoral dynasty to rule the country since the domination by Arab regimes had been overthrown.

The Qashqai tribes have likely been living in southern Iran for over a thousand years. For all practical purposes they are "indigenous" to several provinces in the south, including Fars, Bushire and Hormozgan. These pastoralists, like most of the others in Iran, have depended on grazing rangelands in an extensive manner, migrating from wintering grounds to summering grounds and back. The wintering grounds are usually lower planes and hillsides, while the summering grounds are higher up the mountains. The distance between these two ranges is usually several hundred kilometres. Most of the tribes have an agreed migration route through which they pass twice a year: in the spring and in the autumn.

The landscape over which these tribes migrate is held and managed under a typical common property regime. The allocation of land follows the customary laws and each unit of the tribe knows the territory over which it has the right of grazing. They take great care to insure that the rangelands are healthy. Men take care of larger animals that can move over large distances without water, while women take female and lactating animals grazing closer by. Women are also in charge of milking the animals twice a day and processing the milk into butter, yoghurt, and many other products. Children, too, are a productive part of the system, as they usually take the young animals to pasture. Managing the common property resources is the responsibility of the Councils of Elders, usually through a sophisticated and complex process. Barring unusual events and disasters, the system assured the sus-

[19] This case example has been provided by M. Taghi Farvar.

tainable use of pasture *for centuries,* maintaining the ecosystem in a state of dynamic equilibrium.

In the 1920s and 1930s, however, the rule of Reza Shah brought drastic and disastrous changes. Reza Shah was not of nomadic origin. He actually held the nomads in contempt and thought that they were a huge impediment to his imitation of the style of development of Europe. In his mad rush to dominate and "modernise" the country (by modernisation he simply understood Europeanisation) he mimicked Ataturk, who was busy dismantling the traditional social structures of Anatolia at the same time. Reza Shah used military force against the nomadic pastoralists to smash any resistance to his designs, and did not hesitate to use treachery where he could not succeed by the use of force. The landscape of the Qashqai nomads is scattered with the reminders of this very unfortunate epoch. Most of these take the form of ruins of mud housing projects that the King ordered built in the middle of nowhere. Finding themselves confined at gunpoint to a very limited area for grazing, many pastoralist groups perished together with their livestock. The powerful rural police of Reza Shah managed to keep them effectively under the siege of forced sedentarisation.

With the abdication of the King in the middle of World War II, his son Mohammad Reza Shah took over. During the 1940s the nomadic pastoralists felt a relative lessening of the iron rule over them, which unfortunately was soon to be re-established. The Qashqai took full advantage of the temporary situation, as the government in Tehran was weak and ineffective: they simply took to their migration routes again! They collected the surviving sheep, goats, donkeys, horses and camels and started again to take care of their rangelands and flocks of livestock. They managed rather well until 1953, when a well known USA-UK-backed coup d'état ousted the nationalist and popular Prime Minister Dr. Mohammed Mosaddeq and brought the self-exiled Shah back to power. Throughout their history, the Qashqai have shown to be defenders of the land, particularly against British colonialism. In support of the popular deposed prime minister they actually took up arms and fought for the next ten years a hard war against the government of the Shah. In the end the Qashqai were defeated and their tribal chiefs expelled from the country.

Already in the 1950s, a new law for foreign aid had passed in the Parliament of the United States of America and an agreement of cooperation had been signed with the government of the Shah. A young man from the Qashqai tribe was recruited by the Point Four (foreign aid) Administration and taken to the United States of America. This young man, by the name of Bahman-Beygi, was shown the school system in the American Indian reservations, designed to assimilate the Indians into the American lifestyle and alienate them from their land and traditions. It was assumed that the nomadic pastoralists of Iran were equivalent to the "Indians" of the United States. Bahman-Beygi was instructed about how to brainwash the minds of the young students in order to alienate them from their tribes and implant in them an insatiable thirst for the modern, urban life far removed from the realities of nomadic pastoralism. He came back to Iran and convinced the Shah to let him organise an innovative tribal school system, based on mobile schools held in tents. The tents were white against the backdrop of the black tents of the nomads. The white tents were to symbolise, in the very words of Bahman-Beygi "purity and enlightenment against the darkness and ignorance of the evil black tents!"[20] The methods of learning were harsh and rote, reminiscent of a fascist system of education, and were inculcated into selected tribal teachers, recruited from the very tribes. Each teacher was given a white tent and was armed with tools for conditioning the innocent children. When hearing criticisms of his rote methods of learning, for instance that they were not conducive to encouraging thinking, Bahman-Beygi would retort: "these children are not supposed to think; they are simply supposed to carry out the programme I have implanted in them."[21] Mohammed Reza Shah had effectively replaced the bullets of his father with American-inspired chalks. Both were instruments for sedentarisation and the second was even more pernicious than the first in undoing the very basis of nomadism in Iran.

[20] Expressed publicly to M. T. Farvar by Bahman-Beygi in the 1977 National Seminar on Nomadism, Kermanshah, western Iran.
[21] Bahman-Beygi expressed these words to M. T. Farvar in 1977 in the same Seminar.

Two more events took place in these years and were extremely harmful to the life styles and livelihoods of the Qashqai nomads. The first was the exile of their chiefs, who took refuge in Germany until after the Islamic revolution of 1979. This amounted to the virtual beheading of the tribes. In their place the Shah's security apparatus appointed colonels from the dreaded SAVAK, the secret police, who controlled every movement of the tribe and commanded their migrations. The other was the much heralded land reform laws, which included among other things the nationalisation of all natural resources in Iran. According to these laws, forced through the handpicked parliament, all rangelands, which amounted to ninety percent of all usable land in the country and which had been treated and managed under a common property regime throughout history, became henceforth state property. Instead of dealing with rangelands as a collective responsibility and privilege, individuals had to apply for short term licenses for grazing and all customary rights and laws were ignored. This action was tantamount to removing the base of survival for the nomadic tribes of Iran.

As a matter of fact, even other national policies were designed without any consideration for the needs and capacities of pastoral societies, and had a powerful weakening effect on them. Animal products such as meat, skin, dairy products and even live sheep were imported from abroad for the benefit of national merchants, undercutting the production systems of the pastoralists who had been able to supply the needs of the country with much surplus for export to boot. With their chiefs exiled, the economic base seriously weakened and the minds of the young changed fundamentally, the once powerful tribes of Iran were firmly headed towards annihilation. One of the immediate consequences was that the integrity of the rangeland ecosystems, which they had so carefully maintained through time, began to erode. On a positive note, a number of groups, often based in universities, succeeded in early 1970s in designing and testing a different kind of mobile services for pastoral nomads. These included veterinary services (veterinary assistants recruited from the tribes and trained, returned to them to provide mobile epizootic and vaccination services) and mobile health services (health assistants, also called "barefoot doctors", recruited from the tribes and trained, returned to them to provide primary health care and a referral service to clinics and hospitals).

The 1979 Iranian revolution presented another chance for the nomadic tribes of Iran to exercise once again their freedom of movement. The Qashqai tribes took once again to migrate in their greatest glory. One should imagine the joy and sense of liberation of these people who were regaining their simple right to livelihoods. The Qashqai exiled chiefs had returned from Germany and were attempting to get back their functions in their tribes. Having lived for nearly two decades in the west, they had adopted new ideas, and included democratic governance into their world view. They talked about human development, and environmental integrity of the rangelands. They were also concerned about the social responsibility of tribal chiefs. One of them— the late Khosrow Qashqai— was eager to introduce the concept of ecodevelopment into the Qashqai tribes. This same chief was elected Member of Parliament. To his dismay, when he attempted to take his seat in Parliament, some extremist elements prevented him from doing so. Shortly afterwards he was kidnapped, submitted to summary justice and executed without the benefit of an appeal to the supreme leader, who would surely have protected him.

Under the new Islamic regime, the cultural intrusion continued via the same tribal schools mentioned above, now run by the national Ministry of Education. This meant even less autonomy for the tribal educational system. At this time, issues of natural resources, especially rangelands, were dealt with by the Forest and Rangeland Organisation (FARO) of the Ministry of Agriculture, which continued the alienation of the nomadic tribes through the endorsement of the practice of rangeland ownership by the state.[22] At that time, verses from the Holy Koran— originally dealing with the spoils of war (*infal*)— were interpreted by none other than the very progressive Grand Ayatollah Taleqani as applying to all natural resources, making them state property. No one understood at the time this was

[22] This happened despite the fact that the late Imam Khomeini, in 1963, had led the rebellion against the land reform laws of the Shah, including the nationalisation of rangelands and other natural resources.

spelling out a sure breakdown in rangeland management and the further alienation of the nomadic pastoralists from their rightful heritage. The government finally realized something to this effect in the 1990s, but even then decided to privatise rangeland management rather than return it to its original rightful owners. Rangelands were and still are given away by FARO for everything— from military bases and oil refineries to urban development and speculative operators. One of the Governors-General of the province of Fars boasted in a public statement in 1991 that he had *purposely* caused the blocking and destruction of tribal migration routes in order to uproot nomadic pastoralism, which he considered a backward way of life. The same Governor admitted to playing a key role in the trapping and summary execution of Khosrow Qashqai, the popular tribal chief mentioned earlier.

While the technical capacity of government institutions, including FARO, was progressively weakened as a result of attrition and ideological purges of highly qualified personnel, when the Iranian Government finally realized the value of technical expertise, it was expertise of the wrong kind that was available. In the case of rangeland ecology and management, the old school promoted in Iran by the Utah State University— to whom the management of natural resources had been entrusted by the Shah— became the dominant ideology despite its repeated failures to respond to the needs of the Iranian ecology. The non-equilibrium ecosystem conditions that characterise most of Asian arid regions had not yet been understood by the relevant establishment of the country. Alien concepts of carrying capacity were applied, including for a major government project called "Livestock and Rangeland Equilibrium," imposed all over the country. The main purpose of this project was to reduce livestock on rangelands, and to eliminate many of the pastoral producers, obliging the nomads to settle permanently. The sedentarisation of nomads, in fact, became the main focus of the Organisation for Pastoralists Affairs (OPA), which had originally been created in the office of the Prime Minister to support nomadic pastoralism. Another post-revolutionary institution, called "Rural and Pastoral Service Centres", was later reduced to *rural* service centres only, and its job degenerated mainly into writing extravagant prescriptions for pesticides.

At the time of this writing the Iranian legislation is still not suited to meet the need of the pastoral communities. The important provision for Local Councils has not been enacted for pastoral communities, and a law in Parliament, which would allow for the creation of Tribal Councils, did not take into consideration the specificity of tribal nomadic societies and their traditional organisations. In the end, even this law was vetoed by the powerful Council of the Guardians that is charged with supervising the Parliament. Hopefully, the Fourth National Development Plan has a chance to remedy this ill and to respond in a positive vein to the needs of the nomads, who still number some 1.5 million souls and who can still play an invaluable role as the guardians of the semi-arid ecosystems that cover most of the country.

Despite the most discouraging experience of the past century, there are new seeds of hope among pastoralists. For instance, a recent agreement between the Iranian Government and the Centre for Sustainable Development, a national NGO, has made it possible for pastoral communities to start participatory planning sessions for sustainable livelihoods and rangeland conservation. This work brings together supporting agencies at the national and international levels and holds some hope for reversing some past negative trends. It is also encouraging that a group of national legislators are now interested in supporting pastoral communities in their quest for cultural survival and sustainable livelihoods. New models for the sustainable development of pastoral regions and communities are obviously needed and the Iranian NGO is promoting rangeland management based on concepts and practices of non-equilibrium ecosystem and community-based sustainable livelihoods tailored to the country's specific characteristics. As part of the mentioned project, one Qashqai sub-tribe has organised its own tribal council in March 2003 and hopes to register as a community-based organisation (CBO) endowed with a community investment fund. With the help of wealth generating activities a

surplus is expected to be created, which will be used to help other sub-tribes jumpstart their own process of endogenous development. A nomadic pastoralist model for a community conserved area at the heart of their migratory route has also being elaborated by the sub-tribe currently leading the way and presented at the 2003 World Parks Congress in Durban (South Africa). All this does not mean that traditional nomadic pastoralism is continuing unchanged. Commercially acquired fodder is now part of the subsistence system of the herds and several habits of sedentary people have become widespread among the pastoralists. And yet, the diversification in the production system and the newly acquired habits do not seem to have altered the main character of the tribes' livelihood— herding as primary production, social solidarity, communal care for the pasture— nor their proven strength, resilience and pride.

In some instances, indigenous and rural cultures have been able to place market-oriented production at the heart of their traditional NRM system. The sustainable use of wildlife resources in Southern Africa provides a powerfully telling example.

Field example 1.4 **Managing the sustainable use of wildlife**[23]

Chapoto Ward is an administrative sub-unit of the Guruve district in Zimbabwe. It spans an area of 300 square kilometres and is sandwiched in between national parks estate land on the south and west, the Mozambique border on the east and the Zambezi River, which forms a boundary with Zambia, on the north. A meeting took place there, in February of 1998, between the Chapoto Ward Wildlife Committee and a few international visitors. The Wildlife Committee arises from the ward's inclusion in Zimbabwe's Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) programme, a national programme that encourages rural development and sustainable natural resource use through the devolution of management responsibility and access rights to "producer communities".[24] To date, the expansion of the programme has rested largely on the exploitation of high-value species through sport hunting, with concessions leased to commercial safari operators. Although formally introduced in 1989, the programme did not achieve implementation momentum in Chapoto until 1992. By 1996 wildlife had become the largest collective economic enterprise of the ward with revenues at household levels equalling those of cash cropping. A party of two trustees and regional representatives of an international donor foundation constituted the visitors.

The chair of the Wildlife Committee opened the meeting by outlining the background and history of the Programme in Chapoto. Being an astute politician he put the programme forward in its best light. For decades of colonialism the people of Chapoto had suffered government neglect, without the roads, schools and clinics, which the communities closer to the capital had received. Living in an agriculturally marginal environment they had had to eke out an existence by cultivation of riverine alluvium, supplementing their diet with foraging and hunting. Even hunting was however difficult, since government claimed the wildlife which raided their fields and gardens as its own. Local hunters were subject to harassment and arrest by National Parks staff. Wildlife had become an unmitigated liability for all, except for the few poachers who were adept enough to evade detection.

With the coming of the CAMPFIRE programme things had changed. Wildlife became a collective asset, to be communally managed. Poaching dropped and wildlife populations increased, since individual off-takes became a theft of communal property and the community made use of its own knowledge and peer pressure mechanisms to suppress deviance. Revenues from the sale of wildlife

[23] This case-example has been provided by Marshall Murphree. See also Murphree, 1997b.
[24] See Metcalfe, 1994.

escalated annually and the community built a school, a clinic and a grinding mill from the proceeds. One of the foundation's trustees opened the question time. "We are pleased," she said, "to learn that you are getting large sums from your wildlife which has contributed dramatically to your development. But what is the impact of this exploitation on the biodiversity of your area? How do you count your animals to ensure that you are not driving certain species to extinction?"

After the interpreter attempted to translate the word "biodiversity" into the local language with some complex phrases, the chair rose to reply. With a smile he commented, "We know that you people from overseas want to count animals by aeroplane, and have many papers with figures before animals can be used. But I must be honest and tell you that we do not count each of our animals. Even if we had an aeroplane, we could not count animals in the thick bush here. But we know that wildlife populations have increased because we see more of them and they are raiding our fields more intensively than before." "But," he continued, "you should know that a general increase in wildlife is not our main concern. Yes, we like to see more kudu and bushbuck around, but they are not central for our management objectives. What we are really concerned with are two species: elephant and buffalo. They are our focus, because it is these two species that produce high safari revenues. Since they are so important we monitor them closely." "The way we monitor them," he said, "is by watching trends. And to examine trends we look at trophy quality. Each trophy taken is carefully measured; for elephant it is tusk weight, for buffalo the horns are sized by Rowland Ward measurements. These measurements are taken in each instance by the safari operator, the National Parks staff and our own game scouts. Since 1992 we have kept these records and over time can determine trends in trophy quality. If you want to see a paper with lots of figures," he added with a twinkle in his eye, "we can show it to you."

By this time the chair was full stride. "Now," he said, "if we see that trophy quality is improving we increase the quota slightly for the following year. But if we see that it is dropping, we decrease the quota since quality is a greater determinant of our safari revenues than quantity. We want to continue to receive high wildlife revenues indefinitely, and limiting quotas is our investment in the future. In our last assessment," he went on, "we saw that buffalo trophies were continuing to improve and so we increased the quota. However, we saw that tusk size of elephant trophies was declining and so we have cut the quota."

"What about generating income from your wildlife through photographic tourism?" was the next question from the visitors. "By all means," replied another committee member, "but it is difficult to show the tourists elephant and buffalo in our thick bush. However, we can show them rare birds, and visitors are interested in the beauty and the fishing opportunities that they find on the Zambezi. We have already leased land on the river to two tourist operators and we are maintaining the riverine habitat and restricting settlement patterns." A number of other questions were posed on issues like problem animal control, strategies in times of drought, compensation for crop depredation, control of fishing and wood-cutting, the ivory trade and locally managed tourism. To each the community had a reply that showed insight and previous discussion.

"What are your other problems?" was the final question. "There are three main ones," was the reply. "Firstly, this business of managing wildlife takes time and transport. We have to constantly meet with the safari operator, the National Park staff and the District Council. Secondly, it is difficult to manage our money. We are not trained in book-keeping and there is no bank here." For the community, in fact, the biggest problem was uncertainty about the future. "We don't really know how long government will allow us to keep these animals and the revenues they generate. We don't know how long government will allow us to lease sites on the Zambezi and keep the proceeds. Government knows, as we have learned, that these things are extremely valuable and government may take them back. If that were to happen we would abandon our quotas and self-imposed restrictions and take what we can without being caught." With this the meeting closed.

The conversation did not cover all aspects of Chapoto's sustainable use programme. The Wildlife Committee's presentation did not reveal the internal divisions that exist within the community or the ongoing disputes it has with the District Council, since these are not matters to be discussed with visitors. However, the dialogue clearly illustrates some elements of cultural dissonance between the local people and their visitors, including at least five main areas.

The first of such areas is about *values*. The people of Chapoto were concerned with sustainable productivity. For rural farmers and pastoralists as they are, conservation is an investment (in direct or opportunity costs) for present and future value, the goal being the maintenance or enhancement of their livelihoods. The visitors were instead concerned with species preservation, "biodiversity" and "ecosystem maintenance" for aesthetic, recreational or scientific purposes. As a matter of fact, there is nothing inherently incompatible in the two sets of values. Dissonance arises, however, when one stance is accorded privileged status, as it is at present for international valuations. This does not work. Aside from their inherent merits, local perspectives have a powerful veto dimension. Unless they are accommodated, international values and goals will be subverted by local responses ranging from defiance to covert non-compliance. From an international perspective, conservation, sustainable use and equity are distinct and separate issues, with distinct associated activities while local perspectives roll these three into one interactive bundle. Programmatic interventions are unlikely to work if they are not responsive to this synthesis.

The second area is *proprietorship*. The devolution of a direct authority over the use and benefit of land and resources has been the catalyst to mobilise action in Chapoto. It stimulated a sense of responsibility and launched the community into a new mode of management requiring skills in handling the exchange values of their natural resources. The conferment of proprietorship had, however, been one of programme and not legal entitlement. It was therefore incomplete, lacking tenure or long-term security of access. This insecurity led the people of Chapoto into gloomy prognostications of the future. Without proprietorship their incentives for conservation would falter and fail. Unfortunately, this clashes with the bureaucratic mind, disposed to the centralisation of authority,

against the technocratic mind, disposed to see devolution as the surrender of professional management to the vagaries of cost/ benefit decisions by unsophisticated peasants, and with the interests of the central political elite and their private sector allies. The answer lies neither in community autarky nor state autocracy. It lies instead in a redefinition and acceptance of complementary and mutually supportive roles. Local organisation can assume the authority and responsibility necessary to carry through local incentives. The state can take on a supra-local coordinative role with its arbitrative, regulatory and extension functions.

The third area of dissonance is *science*— what is it and how should it be used. International conservationism relies on high-tech quantitative modelling to monitor and predict ecological status. In the process, biological scientists gain a powerful clientele, while governments and agencies "seek to find a scientific algorithm to reduce subjective decision-taking and uncertainties". Rural farmers such as those in Chapoto have a similar goal. Dealing with uncertainty is a continuing factor in their lives and risk-aversion a pervasive feature of their farming strategies. When given the opportunity, they use a methodology of the highest scientific credentials: *experimentation*. Chapoto's monitoring of trophy trend is elegant in its simplicity, robust in its empiricism and striking in its tight application to management decisions. It is also pregnant with potential for the development of locally based environmental science, which moves beyond issues of species off-take. Such science, flexible in its foci and dynamic in its analysis, is far more important than the static domain of "indigenous technical knowledge," the box to which we condescendingly assign local insight and experience. People like those at Chapoto have problems with the scientific environmental "technicism". It involves for them a significant loss of control and can be applied to stop use, which their own science indicates is viable. And they have a healthy scepticism of its ability to produce the predictive certainties that are expected of it. (In this they have major allies amongst scientists concerned with evolutionary biology, system approaches and adaptive management.) Most environmental regulations demand certainty and when scientists are pressured to supply this non-existent commodity there is frustration, poor communication and mixed messages in the media. One can also add that this pressure is a perverse incentive for the integrity of science itself, since it carries with it the temptation to assert as definitive that which is tentative. Fortunately, both conservation biology and local science tend now to converge to acknowledge indeterminacy and emphasise experimentation and adaptation in NRM.

Potential "lack-of-fit" between *social and ecological topography* is another area of dissonance. The institutional requirements of a local natural resource management regime such as Chapoto include social cohesion, locally sanctioned authority and co-operation, and compliance reliant primarily on peer pressure. This implies a tightly knit interactive social unit spatially located to permit this. However, while social topography suggests "small-scale" regimes, ecological considerations tend to mandate "large-scale" regimes. This may arise from ecosystem needs or when key resources are widely dispersed or mobile, as in the case of Chapoto's elephant and buffalo. Economic considerations may also dictate "large-scale" regimes where market factors require that several owners of resource units manage and tender their resources collectively. There is no inherent reason why social and ecological topographies cannot be harmonised, although this requires context-specific institutional engineering through negotiation. Often this will involve nested systems of collective enterprise by owners of resource units. The units of management will have a built-in incentive to spread. Dissonance arises when larger ecosystem regimes are imposed rather than endogenous. Such impositions, often in the form of ecologically determined projects, concentrate on ecological sustainability at the cost of ignoring the institutional sustainability on which it depends.

Projects and programmes are the principal, though not exclusive, contexts bringing together interna-

tional and local incentives for sustainable use. These contexts juxtapose two cultures of planning and implementation. The one is reductionist, bureaucratic, directive and contractual, operating through the rigid time and budget frames of a "project cycle." The other is incrementalist, personalised, suasive and consensual, operating through experiment and adaptation set in indeterminate time-frames. For various reasons governments and donor agencies typically operate in project cycles far more condensed in time than that required for the institutional learning which must take place before local regimes can harmonise their modes of implementation with those of external partners. Such institutional learning goes far beyond the impartation of knowledge and skills by external agents. More fundamentally it is about experiential adaptation of roles and norms in new circumstances within local social units themselves. Knowledge and skills required by individuals do not suffice on their own; institutional learning is a collective process of adaptive interaction responsive to external and internal change. It takes time. At whatever point in the learning curve we place Chapoto, we should bear in mind that their perspectives were the product of a nine year evolution in status and experience.

The demand for safari experiences— a phenomenon originating in countries and cultures very far from Chapoto, seems thus to have successfully integrated the local livelihood system of rural communities in Southern Africa. Technical innovations have also been integrated with relative success by indigenous and rural cultures in their traditional NRM system. This is especially true for rural cultures born from an encounter between native people and foreign colonists, which is a widespread phenomenon in Latin America and the Caribbean. The *Ribere□o* farmers of the Peruvian Amazons are an excellent example.

Field example 1.5 Don Emiliano's farm[25]

The ethnic roots of the *Ribere□o* people are heterogeneous in the extreme. Some of them are the heirs of the sixteenth and seventeenth century Spaniards and Indian river-people. Others originated from inland Indians, Peruvian Creoles, and European adventurers, who were involved in exploitation of different types of natural rubber in the period 1880-1950. Others are a mix of recently acculturated Indians, colonists coming from the upper course of the river, soldiers from other areas of Peru who married local women, indigenous protestant missionaries, and town-dwellers escaping from the law.

The Ribere□o culture is a real melting pot of indigenous and exotic elements. The local language, for instance, is strongly influenced by *Quechua* (the Andean language spread in the Upper Amazon by Jesuits in the seventeenth and eighteenth centuries). The social structure includes both Indian features (such as cousins' marriage) and Spanish-Peruvian elements (such as ritual *compadrazgo*). Symbolic culture combines folk-Catholicism (or sometimes revivalist Protestantism), Amazonian shamanism, and elements of sixteenth and seventeenth century European magic, with a major interest in global media culture (all *Ribere□o* households own a radio, and some own a colour TV).

This trend of mixing and melting different cultural influences is especially evident in the *Ribere□o* farming systems, which are based on a combination of subsistence and market-oriented agriculture, hunting and fishing, cattle raising, and agro-forestry activities. An example of how the complex ecology of the Amazonian riverbanks is managed through such a diversified NRM strategy is provided by the farm owned by Don Emiliano (in Barranco, Mara□on River).[26]

[25] This case study has been provided by Patrizio Warren.

[26] These observations were made by Patrizio Warren between 1982 and 1986.

As for any *Ribere□o* household, the basis of Emiliano's household subsistence is the cultivation of plantains, manioc, and other tubers on never-flooded *restinga* lands. This activity is carried out with traditional slash and burn techniques of Indian origin, and according to the indigenous division of labour by gender lines (with men in charge of clearing the fields and women responsible for their cultivation). The fields (*chacras*) are cultivated for two or three years and, when weeding becomes too hard, are left to lie fallow during 5 to 10 years (depending on *restinga*'s soil quality). These patches of secondary forest (*purma*) have always had a significant value for a household: they are a place where wild fruits, special materials, medicinal plants and narcotics can be collected.

Following the indigenous livelihood strategy, Don Emiliano's household complements its starch-rich tuber and plantain diet with river proteins. In times of shallow waters, Don Emiliano and his sons go fishing in the river and surrounding lakes, using a technology in part of indigenous origin (canoe, paddle, spear), in part introduced by the Spaniards (hook, *tarafa* net) and in part modern (nylon line, outboard motor). According to a practice of Spanish origin, part of the catch is salted to secure *pango* (the *Ribere□o* fish and plantain soup) for the time of the flood, when fishing becomes difficult and dangerous. Unlike some of his neighbours, however, Emiliano has been resistant to engaging in commercial fishing and is against dynamite fishing because of its negative environmental impact. Rather, inspired by an ancient Indian practice he learned from a folk-tale, he experiments with river turtle breeding in a pond near his house.

Hunting is a marginal practice in Emiliano's subsistence strategy, because of the scarcity of game in the surroundings of the farm. This is due to the overexploitation of edible mammals (such as wild pork, tapir and deer) in the last 50 years by soldiers from the neighbouring military camp. However, during the flooding season, at night, Emiliano's sons hunt the big rodents, which haunt *chacras* to eat tubers. To this end, the *Ribere□o* gun-and-lamp hunting technique (based on instinct of rodents to stop cold when sharp lights are focussed on them in the dark) is used, as well as pit-and-stakes traps, which Emiliano has learned to build from the Indians.

As in any other *Ribere□o* household, Emiliano's family is engaged in income generating activities. The main business is supplying the military camp (and other customers) with beef and pork. To breed *zebu* cattle, the hill on the back of the house has been cleared from the forest and sown with *gramalote* fodder grass, a species recommended in the area for its soil retention capability, despite its low nutritional content. Applying extension information heard on the radio, Emiliano decided to leave a patch of primary forest on top of the hill. To prevent erosion, provide shading to the cattle, and fulfil household timber and fruit needs, he also planted valuable cedar specimens and fruit trees on the slope. Made aware by the same source of the low nutritional value of his pasture, Emiliano is striving to prevent his herd from increasing, by timely selling of calves.

In contrast with such a modern approach to cattle breeding, pig breeding is managed according to the indigenous pattern. In order to prevent pigs from spoiling crops, animals are kept on a small *restinga* (island in the middle of the river) where they can run free in search of food. A child brings household garbage to the pigs every day. According to Don Emiliano, daily feeding by humans is essential to prevent the animals from becoming wild and unmanageable at the time when it becomes necessary to catch them.

Finally, Emiliano and his family engage in cash cropping. To this end, as many other *Ribere□o* households of the area, at every shallow water season they receive credit from the Agriculture Bank and sow rice on the fertile soil of river mud banks. This is a risky enterprise, because young rice is highly exposed to parrots and insects, and, what is worse, nobody in the Amazons can really foresee when the floods will come. However, with good luck, significant gains can be made through this activity.

Emiliano believes that this is a "crazy business, which is spoiling so many farmers." However, he allows his sons to engage in it, because, as he says, "the trunk of our farm is solid enough to afford the loss of some branches."

Don Emiliano's story illustrates the complexity and sophistication of the *Ribere□os*' NRM system. It shows their diverse and specific uses of the Amazonian wetlands— the never flooded *restingas*, the rivers, the lake, the hills, the mud-banks— in accordance with seasons, subsistence needs, and market opportunities. It also shows how such diversification is promoted by the *Ribere□o* cultural capacity to combine in a new synthesis elements originating in a variety of cultural environments and historical experiences. Emiliano's farming system is indeed a mix of reminiscences of pre-Colombian Amazonian wetland society, old Spanish and European legacies, contemporary Indian influences, twentieth century technology and modern agricultural extension advice. Its success witnesses the capability of contemporary Amazonian people to build an alternative to the development model which national colonisation agencies and the global market are striving to impose on them in the name of progress.

1.3 Contemporary indigenous NRM systems and co-management

From the field examples illustrated above, a few lessons can be derived concerning the structure of NRM systems currently practised by indigenous and local communities and their relevance for sustainable development and conservation initiatives.

The lesson here is that most NRM systems of contemporary indigenous and local communities are puzzles of old and new knowledge, practices, tools and values of different cultural origin. Building upon the characteristics of diverse political and economic contexts, the combination of indigenous and modern elements in these NRM systems varies and leads to different outcomes. The indigenous system may be almost completely replaced by a variant of the agro-industrial market system promoted by the state (as in the Shuar case). Change in the indigenous system could be only partial, but powerful enough to affect the community's capability to manage the local resources in a sustainable way (as in the Sbahiya peasants' case) or apparently overpowering but unable to destroy the heart of the livelihood system, as in Iran. Eventually, an innovative and more complex NRM system can develop by combining indigenous and modern elements (as for Chapoto's community and in Don Emiliano's farm and, to a certain extent also in Iran).

...most NRM systems of contemporary indigenous and local communities are puzzles of old and new knowledge and practices, tools and values of different historical and cultural origin.

Process and outcome variations on this theme are indeed as diverse as human cultures and communities on earth. But— local differences notwithstanding— practically no NRM system observable in the field at the beginning of the 21st

Century can be claimed to be purely "indigenous." On the contrary, NRM systems featured by contemporary ethnic and rural communities are *syncretic constructions, i.e.,* more or less consolidated syntheses of knowledge and practices of different historical and cultural origins, which previously might have even been considered incompatible.[27] As such, they represent attempts made by local people to adapt indigenous NRM systems to cope with new environmental conditions, market economy requirements, and tenure regulations imposed by the national society and the state.

The merging of features from different cultural origins is not a unidirectional process. Elements of modern NRM systems are integrated into an indigenous background and, at the same time, the indigenous background contributes to shape the particular variant of the modern system that is actually implemented in the area. For instance, the shifting horticultural knowledge and practices of the Shuar (the only component of the indigenous NRM system still alive in the area) has substantially influenced the colonists' subsistence agriculture. Zaghouan soil and water management authorities are considering the opportunity of providing incentives to Sbahiya farmers to implement conservation works on the basis of indigenous know-how. Diversified exploitation of multiple ecosystems and ecotypes, as experimented in Don Emiliano's farm, is increasingly promoted among tropical forest farmers by rural development agencies and experts. The pragmatic approach to sustainable use of the Chapoto community has now been studied and advocated by the World Conservation Union's (IUCN) Sustainable Use Initiative and the pastoral practices of nomadic communities are being re-discovered as a most effective and careful way of managing rangelands in non-equilibrium ecosystems.[28]

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As in any process of cultural change, the development of this syncretism is somehow chaotic and unsystematic. It mostly takes place through a trial and error process, whereby new elements are adopted, old elements dismissed, and system structures re-arranged. At times, and especially when trial and error is transformed into a more or less conscious form of "adaptive management"[29] this succeeds in identifying creative and effective solutions. Unfortunately, most contemporary indigenous NRM systems are not as well integrated, efficient or sustainable as the traditional ones. This is because most of them are in a phase of transition in which much testing takes place, often unsuccessfully. Furthermore, the rapid evolution of the relationship between local communities and the national society, new development and conservation policies, innovative technologies and the omnipresence of the global market, make the building of combined NRM systems a tricky endeavour under ever-changing rules. In some ways, the development of NRM systems that uniquely combine elements from different origins is a worldwide laboratory in which communities experiment with options for sustainable development. Everyone concerned

27 The term "syncretic" is used in religious and philosophical contexts to signify the merging of rather opposite positions, at times bordering on heresy.

28 See Behnke and Scoones, 1993; Niamir-Fuller, 1999; Farvar, 2003; Sullivan and Homewood, 2004.

29 Lee, 1993.

with sound environmental management— on matters of both policy and practice— may learn from these experiences while, hopefully, positively contributing to them.

…NRM systems that uniquely combine elements from different origins [are] a worldwide laboratory in which communities experiment with options for sustainable development.

Understanding and supporting the efforts made by communities to experiment and combine old and new elements as part of their NRM systems is essential for programmes or projects willing to improve the use of natural resources in a participatory way. Such combined (syncretic) NRM systems share with participatory natural resource management both the basic objective (*i.e.*, improving the management of local natural resources according to people's needs, expectations and values) and methods (community driven processes, in which local actors play a major role in making decisions and taking action).

A second key lesson to consider regards indigenous knowledge and know-how. Many "modern" natural resource managers and sustainable development practitioners are now well aware of their importance. Unfortunately, however, several of them focus their attention and appreciation on the traditional wisdom of indigenous and peasant communities but neglect the new economic, political and environmental conditions in which indigenous knowledge and know-how exist today. As a result, the dynamics of change in indigenous NRM systems are overlooked in pursuit of an unrealistic and anachronistic purity of values, understanding and practices.

In fact, insistence on research on indigenous knowledge may lead far from the needs of the people. Shuar elders' knowledge of forest trees and plants is fascinating, but it is rather useless in a situation in which there is no more primary forest in the surroundings of the settlements, and no forest exploitation.[30] For sure, however, resources and time could be effectively spent in appraising what the last two generations of Shuar (and colonists) have learned on range management, agro-forestry and diversification of agricultural production. Furthermore, the "traditional wisdom" approach can lead to missing the structural conditions needed to turn indigenous knowledge into actual NRM practice. For instance, Sbahiya peasants' indigenous land husbandry cannot survive the shortage of agricultural labour affecting the household economy– tackling this problem is essential to adapting indigenous know-how to the new conditions and to making the syncretism viable. On the other hand, if the traditional livelihood system is resilient enough, it will withstand all sorts of blows, incorporate change and maintain its unique essence and sense of identity, as in the case of the Qashqai of Iran.

...the dynamics of change in indigenous NRM systems [should not be] overlooked in pursuit of an unrealistic and anachronistic purity of values, understanding and practices.

The third key lesson, linked and in fact derived from the above two, is the present opportunity to engage a multiplicity of social actors in a dialogue and joint action-research about natural resource management. Through it, a multiplicity of capacities and comparative advantages can be recognised, understood and hopefully harmonised and reconciled. Traditional knowledge and skills, in particular, can be set to work within changed environmental, political and social contexts, including the presence of the new social actors which historically emerged in the NRM scene. The safest route begins with a thorough understanding of the indigenous and traditional NRM systems, and only integrating modern practices into them in a careful and reversible way, if absolutely necessary. Some science-based innovations do not stand the test of time, and long-

[30] This said, local knowledge should also be preserved for an unknown future, as the conditions of its usefulness may present themselves again. Losing such knowledge may be equivalent to losing entire livelihood alternatives.

term studies end up just confirming the wisdom of the traditional systems.[31] When the dialogue and action research are conducted with equity and integrity, however, they can produce concerted agreements and institutions capable of meeting the challenges of modernisation through the wise merging of features of different historical and cultural origins— what earlier we referred to as "syncretism". Such a process of dialogue and action-research— which we call "co-management"— is the very subject of this work.

[31] Cases in point are the nomadic lifestyle of Qashqai pastoralists-first denigrated and opposed and now re-evaluated (see case example 1.3 in this chapter), and the prohibition of grazing from Keoladeo National Park (Rajastan), later found to be essential for the birds habitat (see the discussion of freshwater wetlands in Chapter 3 of this volume).