

Knowledge Systems in Agroforestry¹

Wieland Kunzel²

Abstract: Pacific Islands agroforestry has evolved into sustainable, diverse and productive a land use systems in many areas. We marvel at these systems, and the scientific world is trying to catch up with the traditional knowledge. At the same time, Pacific Islands farmers are abandoning their agroforestry systems in great numbers. It is mainly intensified agriculture for cash crop production that follows. Soil erosion and soil fertility deficiencies are close companions of this intensification. Why do land use systems that have been operative for centuries disappear so easily? Can “modern” agroforestry systems lead to the destruction of “traditional” ones? The paper explores the importance of knowledge systems in agroforestry innovations.

Taro, yams, cassava and four other annuals, pandanus, bananas and vanilla, all expertly intercropped. Over 360 coconut palms on 3.3 ha of land, together with 85 more trees of 16 species, providing food, fuel, income and medicine. My ecological senses were fully alert, trying to grasp an understanding of the marvelous agroforestry system I was looking at. It would be a delight to interview this farmer!

Two weeks later, a third of the system was gone, pulled apart by a hired tractor. A monocrop of cabbage, would only survive with heavy doses of agrochemicals, while the missing tree cover would allow the sun to dry out the soil and the wind to blow it away. The farmer had spent hours explaining the inner workings of his traditional system to me, how crops work together to ensure successive and good yields. He did not see the ecological implications of his cabbage plot.

The observation that farmers can turn overnight from experts on traditional sustainable agriculture to land abusers under intensified agriculture is not new. Technology that is alien to a culture requires its own, new set of information and understanding, and to buy a tractor does not mean that the owner will be able to use it successfully on his land without further information. But how does it work in agroforestry? Can we rely on the store of knowledge farmers have collected in their traditional systems once they implement innovations like hedgerows, or will we face a breakdown of ecological understanding as “modern” agroforestry techniques are introduced? In this paper, I would like to examine some concepts relevant to this question.

Traditional Land-Use Systems Are Based on Detailed Environmental Knowledge

Our view of peasant farmers has changed considerably over the last ten or so years. Before that, rural societies were considered as static, governed by traditions rooted in the past, unable to adapt to changing circumstances without a major restructuring. Farmers were regarded as having little information and control

over their agricultural systems, precluding them from independent experimentation and innovation. Only social anthropologists believed otherwise.

Today, by contrast, scholars from all fields accept that the peasant farmer is an independent, rational decision maker, who strives constantly to maximize the returns from his farming enterprise. The values attached to the various utilities that can be maximized (income, leisure, social status, etc.) may change from place to place, but ultimately each farming system reflects the purposeful allocation of resources by its managers, achieving the best possible satisfaction of their needs under given circumstances. When dealing with farmers, we are dealing with experts in resource allocation. This view is so established that today it forms the base of many aid agency project planning procedures (Hoben 1980:343).

There is no question that rational resource management necessitates a detailed knowledge of the environment. Traditional knowledge is based on long-term observation. Recurrent events and their consequences are known, regardless of whether they are regular, like the seasons, or unpredictable, like cyclones. Spatial variations in soils and microclimates have been observed and incorporated into the pattern of land use. In traditional agricultural systems, the body of knowledge about the environment is immense.

Traditional Land-Use Systems Are Environmentally Stable

Even among scientific circles it is not uncommon to believe in myths. That traditional societies live in harmony with nature is one of them. Of the many examples of ecological degradation caused by traditional land use practices that have been reported, quite a number are in the Pacific region. The most common impact has been deforestation, with the cleared forests often being replaced by fire-maintained fern/grassland savannas on infertile, eroded soils. This distinctive plant-soil complex is known as *toafoa* in several Polynesian islands and as *talasiga* in Fiji (Clarke 1990:235). Although farmers may closely monitor the present state of such degraded land, they are largely unaware of the dynamics that led to their creation. Bolabola (1989:22) reports from Fiji that there are no vernacular terms to categorize the various degrees of slopes, and no vocabulary to differentiate a 12 degree slope from one of 30 degrees:

Community leaders and members consulted were unaware of the relationship between farm husbandry and soil erosion nor the rationale in soil conservation measures. Likewise, women were not aware nor informed on soil erosion, soil conservation and its relationship with agricultural production and income.

While it is evident that most traditional agricultural systems have been able to achieve production under sustained resource protection for centuries, there are also sufficient examples to show that this is not automatically so.

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² Fiji-German Forestry Project, P.O. Box 14041, Suva, Fiji

Traditional Land-Use Systems are *Aimed* at Environmental Stability

It is sometimes argued that even if traditional agriculture at times may fail to be environmentally sound, it is still geared towards resource protection in principal. The argument goes that, because traditional farmers know their environment intimately, they are aware of its limitations and have a natural interest in sustaining its vitality. This is largely another myth, except for some habitats which are extremely harsh and simple. According to Leach (1972:39, cited in Chapman 1985:218):

... it is only in the most extreme kinds of environment, such as those found in Australian deserts or Greenland icefields, that the simpler peoples have become in any way aware of the possibility of ecosystem balance. It is only in such extreme circumstances that human beings of the past have been in any way motivated to achieve balance between their society and the environment.

In the South Pacific context, the use of *taboos* is often seen as a regulator of exploitive food gathering, aimed at ensuring the protection of a resource. In Tonga, the small population of flying foxes is still protected by a taboo, as were common resources like banana and pigs in the advent of major feasts or wars. As Chapman (1985) points out in her paper, however, environmental conservation may not have been the original motive for the establishment of taboos—but, rather, greed, political power, prestige, resource allocation, or conflict resolution. The detailed ecological knowledge obtained by traditional societies does not necessarily induce the desire to protect their environment. Tongan farmers have developed impressive agroforestry systems that are environmentally sustainable—but the reason for their creation is the desire to minimize work loads, rather than any concern for the environment. If machines are available to assist in clearing, Tongan farmers are quite happy to do away with their agroforestry (Kunzel 1990). If traditional agricultural practices are environmentally sound, we can not automatically assume that they were developed with this goal in mind.

Traditional Land-Use Systems Are Based on Scientific Concepts of Ecology

To hear a seminar in a university about modes of production in the morning, and then attend a meeting in a government office about agricultural extension in the afternoon, leaves a schizoid feeling; one might not know that both referred to the same small farmers, and might doubt whether either discussion had anything to contribute to the other (Chambers 1983:29).

Communication breakdowns among professionals are common, even when the individuals are compatible in terms of language, years of scientific training, race, and social background. Let a social anthropologist and a forester discuss the management plan of a communal forest—they may start shouting at each other within minutes.

It should therefore be expected that the problems of communication between scientifically trained personnel and farmers are of equal, if not greater proportions. Yet this is a concept often disregarded in the field. I am not talking here about technical problems like translation—these can be solved by careful double checking. Conceptual differences in language begin to be more

tricky. Terms (and concepts) for things like “slope” or “contour” may simply not be present in the local language and culture. The most difficult aspect of communication barriers, however, lies at the level of knowledge systems.

Knowledge systems are the structures that govern the interpretation of information by the individual. If my world view is based on science, and therefore structured by logic, the information that a given area was covered by rainforest fifty years ago and is now bare and badly eroded sets off a train of thought evolving around land-use, rainfall and the greenhouse effect. None of this may be relevant to the local farmer. His indigenous knowledge system may prompt him instead to explore recent cultural misbehavior, wrong choice of ceremony, or the marriage patterns of past land users, in order to explain the dramatic ecological events he witnesses. Separating out and describing different knowledge systems is bound to do violence to the subtleties and overlaps of realities. Nevertheless, trying to be brief and clear, I will describe two contrasting ways of explaining reality, concentrating on the extremes. It should be clear that no values are attached to either approach. To believe in objectivity is in no way superior to believing in miracles.

Structured knowledge systems, which are the foundation of scientific explanations of events, rely on fixed rules. Steeper slopes will always lead to more erosion, all other factors being equal. Observations can be replicated, regardless of the social or spiritual surrounding. Modification of techniques leads to improvement, and innovation is seen as progress. Observed events can be explained, and in order to achieve a better understanding we are happy to discuss, and argue our ideas.

Indigenous knowledge systems tend to explain results of actions rather than the rules that govern them. Each place is unique, and certain behavior will lead to a certain result only there. The reasons for this are often contained in secret knowledge, held by precisely defined groups of individuals. A change of behavior may lead to unexpected results, and is therefore discouraged. Disasters indicate that some rule has been violated. The location of the violation and the resulting effects can be widely separated in space and time. Table 1 summarizes some of the characteristics of structured and indigenous knowledge systems.

Table 1-Comparison of indigenous and structured knowledge systems

Knowledge Systems	
Indigenous	Structured
Results are fixed	Rules are fixed
Each place is unique	Replication is possible
Routines are given	Habits can change
Customs are specific	Modification is success
Reasons are secret	Reasons are logic
Failure is punishment	Failures are part of progress
Change is destabilizing	Innovation is development
To argue is to criticize	Arguing is understanding

What does this mean for agroforestry? The famous phrase that it is “a new science, but an age-old practice” also means that we have farmers with indigenous knowledge systems talking to scientists with structured ones. It means that the potential is great for communication breakdowns between the two groups.

A more extended example suggests how even ordinary interaction between two individuals requires the ability to think in each other's terms, a process Gladwin and Murtaugh (1980) call “preattention.” On one occasion, a farmer was working in the field when a second farmer approached him and said simply, “How sad.” The other farmer replied, “I don't care how it looks, it rots to save me money.” The visiting farmer had noticed that the legumes in this field had been pruned vigorously - a “sad” look for a tree. Since the owner of the field shared the basic knowledge system of the visitor, he was able to understand the remark, and to answer appropriately. His own remark implied that he had pruned the trees for mulch, which was now decomposing on the ground. The visiting farmer could also infer that the other mulched to add organic fertilizer to the site, that the rate of application of commercial fertilizer would later be reduced because of this, and that this method was used to minimize cash expenditures for fertilization.

A thorough understanding of farming systems is only possible if the corresponding knowledge system is understood as well. Many of the methods of agroforestry, like planting on contours and pruning for mulch, are based on scientific principles, whose understanding requires competence in structured knowledge systems. This means that farmers will have to learn some scientific principles if they want to incorporate “new” agroforestry techniques into their farms successfully - even if they have practiced “traditional” agroforestry for centuries, and can rightfully be called experts in managing their environment.

Unless practices are rooted into a system of knowledge and meaning which supports and justifies them, those practices will not be maintained in the way that an ecologist would like: there would be no cultural ballast keeping the practice steady in the face of changing circumstances (Chapman 1985:227).

Agricultural extension requires a sender of a message, a message, and a receiver of that message. It must originate from an area of common knowledge if it is to be understood. Areas of common knowledge in agroforestry can be established by discussion of basic questions like “What is erosion?”, or “Why do certain trees grow faster than others?” If the farmer and the extension agent agree on such basic facts, talk about agroforestry techniques can begin. If not, it will be necessary for both to learn. It needs to be stressed that *both* sides need to learn. It is not enough if only the extension worker understands the local scene.

As agroforestry techniques are based on scientific principles, the adopting farmer will have to know (and agree to) some of the underlying ecological concepts. In other words, he will have to acquire some structured knowledge. Evening classes for farmers are a way to provide the necessary information. At the same time, agroforesters should be very aware of their role as agents of change.

Conclusion

A knowledge of basic ecological principals is present among all agriculturalists. Only when this information can be called up within structured knowledge systems, however, will many of the principals of agroforestry make sense to the farmer. Basic environmental training will enable him to make an informed choice between reliance on proven methods of the past and promising techniques of the future. Indigenous and modern knowledge can indeed be combined, and the cabbage farmer mentioned at the beginning of this paper would not need to do away with his traditional agroforestry system just because a tractor was hired.

Advances in agroforestry, taking knowledge systems into account, hold the promise that the indigenous technologies can be preserved, at the same time that equally sustainable “modern” land use practices make their way into the minds and onto the fields of the farmers.

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