**fertility will increase and newborn animals will have a greater chance of surviving.**

## ANIMAL CARE AND LOCAL CULTURES

**The treatment an animal receives is in part a reflection of the cultural influences on those who take care of the animal. A system that goes against local beliefs may be unacceptable to that community.**

**Methods of livestock management must fit cultural beliefs. For example, in some cultures a child is taught to care for and respect animals in preparation for later assuming a responsible role in the community. A livestock management program that plans for a gradual increase in responsibility for the child is appropriate. In other cultures, the child is told not to talk to animals because, if they answer, the world will end. In this culture sheep dogs are not trained to follow commands, because it would not be culturally appropriate.**

## PLANNING QUESTIONS

*** What are the local sources for water?**

*** Are water sources polluted or contaminated by disease organisms?**

*** What are the health problems of animals in the area? What human health problems may be the result of livestock management practices?**

*** Are there diseases in the area that prevent or inhibit the production of certain kinds of livestock?**

*** How are these diseases transmitted and what are their life cycles? Is there a way to break the cycle?**

*** What are the local traditional beliefs about the origin of disease and specific diseases? Will proposed management practices conflict with these or other cultural beliefs?**

*** What effective methods of disease control are currently used?**

*** Are affordable veterinary services available locally?**

*** What are local animal breeding practices?**

*** Will the goals of a new breeding program be compatible with local needs?**

*** Is artificial insemination practical? Is it currently used in the region?**

*** Are livestock managers cooperating in support of a breeding program or veterinary services? Would they cooperate with some management assistance?**

## Chapter VIII

## AGRICULTURAL SYSTEMS: PUTTING IT ALL TOGETHER

**Effective livestock management systems must be integrated into the total agricultural and social system. The farming/pastoral system should conserve and regenerate nutrients, water, soil, and energy, and where possible, these should be recycled through the system. A well-planned integrated system protects the air and water from contamination, shelters vegetative cover against damage and irreversible alteration, and prevents exposure of the soil to wind and water erosion.**

**In a stable system, specific livestock food requirements match food availability. The crops grown are adapted to soil conditions and the animals and crops fit local needs, labor availability, and marketing possibilities. Several different activities spread the labor requirements evenly through the seasons.**

## LEVELS OF INTEGRATION

**Progressive levels of integration depend upon the amount of**

**interaction with other parts of the system. For example, on a simple level animals might eat grass on land unsuited for farming. On another level animals can help transport crops to markets. On a higher level residues from crop production can be fed to farm animals. Beyond that, animals can harvest leftover crop residue in the field or orchard.**

**A major consideration in the integration of livestock into the farming system is the availability of labor. In many small farm systems, labor is scarce during certain seasons. An animal project that competes for labor during this time has little chance for success. In addition, livestock production may demand greater management skills for a reasonable return on money, labor, and land investment. New skills may have to be learned.**

**Both in the introduction of livestock and the maintenance of the system, timing becomes a factor. For example, the introduction of a project should coincide with a period when other labor demands are low. Also, seasonal variations in disease cycles, climate, and crops need to be considered.**

**Improvements in one part of the system may cause a problem in another part. For example, rice straw from some of the new varieties of rice have lower nutritive value. Animals fed this straw will need additional supplementary feeding. Some new maize varieties have tougher stalks to resist corn borers. These varieties are shorter and therefore produce**

**less fodder. The stalks also have a higher content of lignin, a substance that adds stiffness and rigidity to cell walls that makes them less digestible by animals.**

**The following are examples of existing integrated crop-livestock systems.**

**In Taiwan, rice is grown on terraces with separate areas designated for fruit, tea, and vegetable gardens. Milk cows are kept in stables above the gardens, so that their liquid manure flows down to the gardens.**

**In coastal regions of Asia, farmers grow coconuts, cassava, cacao, and rice. They feed coconut by-products to pigs, and fish scraps to ducks. Cattle and goats graze under the coconut palms and on the slopes of near-by hills.**

**In fertile soils, farmers grow rice, maize, wheat, sorghum, and beans. The rice is milled at the village-level and by-products are fed to animals. Farmers may have swine, poultry, cows, buffalo, sheep, or goats. The cattle are used to plow and transport crops, and are tethered at night. The swine are tethered or penned. Rice and grass are fed to swine, which are a source of additional income. Manure is collected and composted with crop residues. Old draft animals may be sold for meat. The ducks glean the rice paddies after the harvest, and also eat insects and weeds. Poultry meat and eggs are eaten by the family or**

**sold to other community members.**

## WILD ANIMALS IN THE FARMING SYSTEM

**In less developed areas, wild animals may be an important source for meat and other products. Expansion of domestic livestock enterprises may result in the reduction of habitat for wild species. Farmers may exterminate wild species that act as a disease reservoir or as pests. On the other hand, wild animals may complement domestic species by eating different plants, existing where domestic species cannot survive, and requiring little labor except hunting at the time of harvest. A farming system that makes room for and finds advantage in the preservation of wild species contributes to the ecological balance and preserves the legacy of the natural ecosystem.**

**Some researchers claim that, in Africa, after man cleared, fenced, plowed, seeded pasture and introduced cattle, total meat production fell to 1/60th the natural level. The reason, they say, is that local animals, by their varied food needs and other habits, were more adapted to the local environment.**

**Those who believe there may be potential for wild animals as a complement to livestock in the farming system have shown interest in the eland as well as other wild ruminants in Africa. The eland thrives in droughty areas unfit for**

**cattle, staying in the shade during the day and feeding at night to avoid the hot sun. Preliminary studies indicate that the eland can go without drinking water by taking advantage of the higher moisture content of plants at night; they also can digest plants that would be poisonous to cattle. Although they do not seem to be a replacement for common species of livestock, elands are being used as game animals on game ranches.**

**On ranches in the Amazon Basin of South America, the capybara is a valuable wild species. The capybara, or carpincho, is the largest living rodent, about the size of a sheep. Adults weigh up to 73 kilograms (160 pounds). They live near water in the savannahs, an area with severe dry and wet seasons, and swim well, submerging up to 10 minutes at a time. They eat grass and aquatic plants but sometimes raid grain fields.**

**Studies have shown that capybaras are more efficient at converting grass to protein than are sheep or rabbits. They live in social groups of up to 20 animals. Females are ready to breed at 15 months of age, producing three litters every two years, with an average of four young per litter.**

**In the dry season, capybaras gather around the water holes. It is at this time that ranchers in Venezuela can round them up like cattle. The meat is fried and salted, selling in cities at the same price as beef. It tastes like a combination**

**of beef and pork. The value of the wild capybara within the farming system means that it may be given the chance to survive along with domesticated livestock and even be given some measure of protection.**

**Wild iguanas have long been highly prized as stew meat and boiled iguana eggs are a delicacy. As the forest is cleared for pasture, however, the wild iguana's habitat is destroyed. At the Smithsonian Tropical Research Station in Panama, researchers have developed a way of artificially incubating and hatching iguana eggs and 60 of these animals can be raised to maturity in an enclosure 11 meters square. They eat tree leaves with an efficiency comparable to cattle. If iguanas can be raised in captivity, there may be less danger for those that remain in the wild. It also means that if their natural habitat is totally destroyed, they may still exist in the region as a semi-domesticated species.**

**AGROFORESTRY**

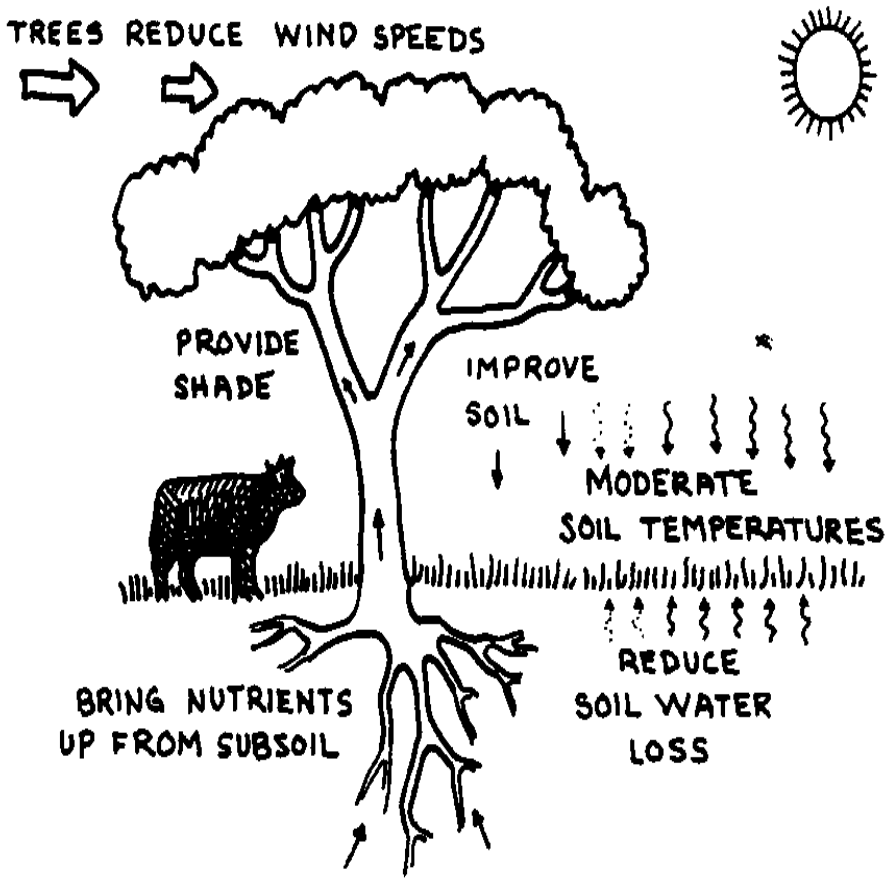
**As land is cleared for crops and pastures, villagers cut the few remaining trees for firewood. As goats nibble the remaining sprouts and seedlings, the land is exposed to wind and rain. Soil is washed away and the land becomes a desert. Halting this process requires the integration of forest or grassland tree habitat with livestock and other agricultural needs.**

**The concept of multiple-use of land for tree, livestock, and crop production is often called agroforestry. A well-integrated agroforestry system is sustainable and regenerative.**
**The system increases the overall yield of the land.**
**It makes best use of resources while protecting against environmental degradation.**

**Trees modify light, heat, litter accumulation, and moisture at the soil surface, and thus have an effect on forage production. Trees provide shade for animals and also serve as windbreaks. They protect the soil from temperature extremes and bring nutrients up from underground, later to be deposited at the soil surface. The use of trees in a farming system make possible two-story or even three-story agriculture, creating a simulation of the natural tropical rain forest or other local ecosystem.**

**<FIGURE>**

**04p116.gif (437x437)**




**A further integration receiving limited attention by agricultural researchers is the use of perennial tree crops to replace annual plants in the production of feed supplements for animals. This idea was well described in the book Tree Crops, A More Permanent Agriculture by J. Russell Smith, listed in the bibliography at the end of this book. Tree crops can provide forage, firewood, and nutrient-rich nuts and seeds. In addition, legumes such as Leucaena glauca are**

**nitrogen fixers, and add nitrogen availability to the soil.**

**The practice of alley cropping is growing rows of trees intermittently between bands of crops. This serves several purposes. The leaves provide forage, organic matter for the soil, or material for mulching. The wood provides fuel or construction material.**

**Grains are annual plants. Each year the farmer must plow the field to plant the crop, exposing the top soil to erosion. The crop depends on total rainfall and weather patterns of a short season for grain production. Trees, on the other hand, can produce crops when annuals fail. Their deep roots find moisture far below the surface. Trees can grow on steep hillsides where plowing is difficult or impractical .**

**In 1972 it was estimated that there were as many as 30,000 people working full-time cutting down the Amazonian rain forest. At the same time, agricultural researchers were advising against widespread conversion of forests to pastures or single-crop use. They recommended more emphasis on tree crops -- for example, rubber, cacao, fruits, pepper, and guarana (a tree berry used in medicine and soft drinks).**

**Tree crops are particularly difficult research topics:**

*** Long reproduction cycles from seedling to tree production**

**slow breeding experiments.**

*** Establishment of tree-crop research projects requires considerable time, labor and land.**

*** Long-term research projects may be abandoned as funding, personnel, and research interests change.**

*** Survival of tree seedlings may be threatened by droughts, grazing animals and grasses competing for limited soil moisture.**

**Although finding or developing tree crop systems adapted to the local environment is complicated, various agroforestry systems are now being developed throughout the tropical and temperate regions. For example, in Colombia, cattle graze on Kikuyu grass under alder trees that fix nitrogen and increase total forage production of the pasture.**

**In Paraguay, farmers leave Mbocaya palms in pastures. The coconuts are sold to manufacturers of soap and oil, and the coconut pulp is used for animal feed. Plants that spring up in the pasture are allowed to grow with appropriate spacing.**

**In Peru, waste water is used to grow the algorrobo tree, a legume. The pods of the algorrobo are used for cattle feed and the wood for charcoal. In desert regions, Prosopis leaves and pods are relished by sheep and goats. Under**

**favorable conditions, the trees will produce as much as 50 tons of pods per hectare. The Prosopis pods are considered nutritionally superior to corn.**

**Forestry and agriculture traditionally have been considered separate areas of study, concentrating on lumber and food production, respectively. Combinations of these two land uses, however, has been practiced traditionally in many parts of the world where local people have been more aware of integration possibilities than technically trained personnel. Pressure for multidisciplinary study on an academic level has increased only recently, as forest technicians admit that the rate of forest harvesting is exceeding regeneration and as agriculturalists look to forest lands to reduce the demand on limited land resources.**

**Benefits from tree/pasture systems are now being studied. For example, research has shown that plants grown beneath the rain-tree, Pithecolobium saman, have greater nutritive value than the same plants grown in the open.**

**Satisfactory development of agroforestry systems will depend more on increased understanding of environmental interactions than on mechanical manipulation or other high-energy management practices. Although livestock can protect tree crop areas from fire by altering the vegetative structure and can eliminate low-value species and harvest crop residues to help reduce tree pest problems, they also can**

**overgraze the area, eat valuable young seedlings, and expose the soil to erosion. Goats can stunt growth or kill young trees by stripping the bark, but they also are useful for removing underbrush. Cattle are considered less of a threat to the forest, whereas pigs will eat young seedlings and uproot the floor of the forest. Domestic animals allowed to graze forest lands will replace the wild species that use the same food sources.**

**Some agroforestry management practices for livestock are similar to those used in a pasture or range management system:**

*** Stocking levels should be low enough to allow sufficient plant regrowth.**

*** Animals should be kept out of the area during the first period of new growth.**

*** Uniform use can be encouraged by constructing fences and making trails.**

*** Use of areas should be rotated to give plants a chance to regenerate.**

*** Exposure of the soil surface by overgrazing should be avoided.**

*** As another option, animals may be kept in pens and the forage brought to them.**

*** Careful placement of salt and water sources will help distribute animals.**

**Agroforestry concepts may be applied to natural forest, combination tree-pasture lands, or to artificially established plantations. The planner may choose to select species already existing in natural stands and progressively eliminate those species that appear to have little value. We know little about the myriad interactions that occur in the tropical forest; thus we must plan carefully to prevent mistakes such as those in a recent attempt to grow Brazil-nut trees in groves. The trees grew, but failed to produce nuts because pollinating insects preferred trees distant from the plantation.**

**Suitable trees to retain or introduce should:**

*** grow well in the local environment**

*** resist disease and insect pests**

*** grow quickly**

*** withstand browsing by sprouting readily**

*** have forage with high nutrient value**

*** have no toxicity problems**

*** be acceptable culturally**

**Stocking rates can affect regeneration of tree seedlings in several ways. For example, goats and cattle, and elephants spread the seed of various leguminous trees through their droppings. When manure containing these seeds is applied to cropland, seedlings will sprout. Trees will not become reestablished in heavily stocked pastures, because the young seedlings are relished by many livestock species. Seedlings that escape grazing pressure for three to four years may be able to survive.**

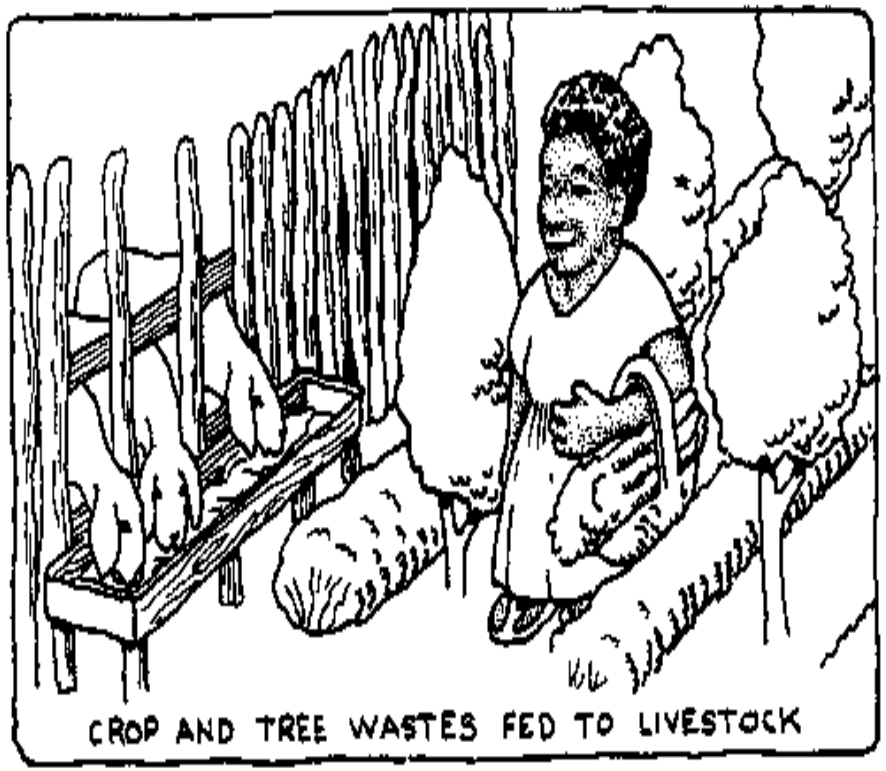
**Vegetative changes might be made with little change in labor requirements, if, for example, animals are rotated daily between tree areas and other areas during periods of pod drop. Where trees are to be established, animals need to be kept out while seedlings are becoming established. Grazing pressure could increase as the trees matured or to assist with thinning.**

**Better survival rates are achieved if tree seedlings are given care, such as weeding and watering, during the first few years after they are planted. Because immediate returns are not expected, however, tree plantings are often ignored**

**when other crops and livestock demand attention. Thus the trees fail to grow and farmers are hesitant to try again.**
**If annual crops are planted between the rows of trees, the trees may have a better chance of survival. Cultivation of the annual crop will reduce weed and grass competition, and the trees receive more attention because the farmer visits the field more often. He also makes sure that livestock are kept away from the area.**

**<FIGURE>**

**04p122.gif (393x437)**




**Tree crop researchers may focus on the kinds of trees to use, light requirements for growth, tree spacing, and combinations of trees which work well together. Researchers also are concerned with interactions between livestock, trees, ground cover and wildlife in order to determine how to integrate agroforestry and tree crops into the total farm system.**

**At the local level, or in nearby regions, the planner can identify potentially useful tree species and agroforestry**

**practices as well as land that might be used for experimentation. Data gathered through several years observation of forest and livestock interaction are of value in designing future projects.**

**Agroforestry is not a quick-fix technology and requires commitment from all concerned -- planners, producers, and policy-makers -- who must have some faith in the possibilities for success and the perseverance to continue the project.**

## AQUACULTURE

**Aquaculture is defined as the raising of fish and other fresh- and salt-water organisms for use in the agricultural system. An aquaculture system reclaims agricultural wastes, while producing food for humans. Aquaculture ponds, for example, may benefit from animal wastes or sludge from a biogas digester. Nutrients in the waste stimulate the growth of algae that, in turn, will be eaten by small aquatic organisms that eventually are eaten by fish. Usually, several kinds of fish are stocked, each eating different plants or microorganisms produced. Pond water also can be used to irrigate and fertilize fields.**

**In Malaysia, pig pens are located next to ponds. Water flushed through the pens washes the manure into ponds, which are stocked with tilapia and Chinese carp. The fish eat the**

**algae and insects that grow and thrive in the manure. In addition, a fast-growing water plant is harvested from the pond and fed to the pigs. Sometimes pigs are kept in pens right over the water.**

**In other areas, ducks are part of the aquaculture system. The ducks scavenge part of their food, eating water plants and small fish. The ducks are fed on platforms over the water so that scattered feed falls into the water and is not wasted.**

**Aquaculture practices focus on producing fish with the least amount of labor and feed input. Some of the fish commonly used are tilapia, and silver, black, common, and mud carp. Introduction of aquacultural techniques has been disappointing when planners have failed to consider the effect of lower water temperatures on fish production. In areas where water-borne diseases are a problem, aquacultural systems should involve practices which break the disease cycle.**

**Other ideas related to livestock management currently in experimental phases are increasing the variety of products utilizing the by-products of livestock. Genetic engineering aimed at improving breeds and crossbreeds has introduced embryo transplants.**

## GUIDELINES FOR INTEGRATION

**Agroforestry and aquaculture are introduced here as examples of interacting livestock production with other parts of the agricultual system. The following guidelines may assist in promoting further integration:**

*** Examine existing levels of integration.**

*** Minimize labor input.**

*** Maximize recycling of wastes.**

*** Break disease and parasite cycles in ways that do not pollute the environment.**

*** Design farm layout to encourage links between farm systems.**

**PLANNING QUESTIONS**

*** How do local types of vegetation fit into the total farming system?**

*** What are current livestock production systems?**

*** What are the seasonal variations in labor requirements of present systems?**

*** How is labor divided among members of the family and community?**

*** Are livestock integrated into the total farm system? How?**

*** In what ways could they be further integrated?**

*** Would a new livestock type increase integration?**

*** How can the preservation of wild species be made compatible with an improved farming system?**

*** Is agroforestry practiced already to some extent in surrounding areas? What lessons can be learned from these practices?**

*** What wild plants and animals are or could be important to the local population as a source of food or other benefit? Would they be useful in an agroforestry system?**

*** How can improvements in agricultural practices be introduced without damage to biotic communities? Are there practices that can be introduced that might help preserve biotic communities?**

*** Is land available on a long-term basis for experimentation**

**and demonstration?**

*** What successful aquacultural methods are used in the area or under similar conditions?**

*** How will proposed alterations in farming systems affect community health and nutrition?**

**Chapter IX**

## MAKING THE PLAN WORK

**Earlier chapters have considered the first steps in planning: collecting information, generating community participation, and considering certain environmental and social guidelines. Study of each chapter and answering of the accompanying questions should he useful in identifying many of the technical, economic, social, and environmental factors that limit the success of a project. Community members and planners work together to define their local needs and the issues concerning these needs.**

## IDENTIFICATION OF PROJECT OBJECTIVES

**The community participants must identify those needs with the highest priority. A project with objectives that addresses these needs can then be formulated. Objectives should be clearly defined, measurable, and feasible. An objective should indicate what is to be achieved, when it**

**will be completed, and how success will be measured. The objective should state actual numbers, such as, the number of livestock involved, the amount of livestock products to be produced, the number of wells to be constructed, land area involved, and so forth. Here is an example of a measurable objective:**

**By the end of the second year, all members of the 25 participating households in the community of Toma will have diets that satisfy the daily minimum requirement for protein as established by the National Nutrition Board.**

**This objective states what is to be achieved and when the objective will be reached. It gives us a measure by which to judge achievement of the objective. A valuable outcome of stating objectives is the clarification of information needs. When objectives are clearly stated, project planners can more easily determine the kind of information that must be collected. For instance, with this objective, planners would need to make quantitative assessments of family diets both now and two years from now in order to evaluate achievement of the objective. Planners might also decide to monitor seasonal variations in diet and family eating patterns. Other important questions also may become apparent. For example, do children eat the same foods as adults? Will an increase in food availability ensure an improvement in diet, or will cultural restrictions or**

**dietary habits limit food innovations?**

**Notice that the objective does not say exactly how the project goal will be accomplished. Once project objectives are clearly established, then ways to reach these objectives can be considered.**

**It may be easier to develop objectives if the planner first answers each of the following questions.**

*** What is the long range goal? (example, increase income, improve health)**

*** Who will be responsible for moving toward that goal?**

*** Are these the same people that will benefit from the project?**

*** How can steps toward goal achievement be measured?**

*** What results would indicate that the goal was reached?**

*** In what time frame can these results be expected?**

*** Over what geographical area will the project extend?**

**If planners answer all these questions, they should be ready to combine these answers into one or more coherent objectives.**

## DEVELOPMENT OF ALTERNATIVE DESIGNS

**Once objectives are defined, planners and members of the community can decide on alternative methods to reach these objectives. At this stage, planners can make use of assistance from people with specialized knowledge of various aspects of livestock management. Informed and constructive opinions are always helpful in reaching decisions.**

**For each alternative proposed, predictions should be made as to probable impacts, both negative and positive, of the proposed activity. Choices often involve trade-offs; a choice that has strong positive benefits may also have negative effects. For this reason, the costs and benefits of each alternative are often compared with each other, using a standardized format. This is called a cost-benefit analysis. The Ecological Mini-Guidelines included in the appendices of this book also can be used as a format for analyzing trade-offs for small projects. This format emphasizes ecological impact, but also considers socioeconomic, cultural and technical factors.**

**The weights and the measurement scale of the mini-guidelines are given for illustrative purposes. The weighting system is determined through a well-defined process. Sometimes the process of attaching weights to the costs and benefits is the most informative part of the cost-benefit exercise. It**

**is anticipated that the variables listed in this sample would be adapted to make them appropriate for the project being planned.**

## IMPLEMENTING THE PROJECT

**After alternative designs have been examined, the sequential steps needed to put the plan into action should be finalized and a tentative timeline established with the help of community or livestock managers. Meeting the objectives of the project depends in part, upon continuous community participation, development of local leadership, and consideration of community dynamics. A plan that is adapted to the local environment should highlight local materials and local expertise. It also should include training in new management methods and other skills needed for project realization, while taking advantage of local knowledge of the environment.**

**Many case studies show that herdsmen and their families have a good understanding of the needs of their livestock in their immediate environment. Livestock husbandry techniques are highly site-specific and local people usually have developed practices that take into account the local climate, topography, available feed, and vegetation, as well as diseases and pests. For instance, in the Sahel of West Africa, during the drought of the late 60s and 70s, herdsmen frequently moved cattle into the tsetse fly zone, risking**

**the effects of trypanosomiasis as they sought to reach available forage. Cattle were moved at night, when the tsetse flies were not active and during the day they were herded into pole corrals, where smoky brush fires rid them of flies. The cattle and herders avoided the tsetse fly, and the more brush they cut and burned, the more they reduced the tsetse fly habitat.**

**Training Programs**

**When planners know local practices, they can determine what training is needed. For example, training is essential when larger or more complex systems are planned, when new animals or forage crops are to be introduced, or when new methods are to be adopted. In every community some farmers or livestock producers are more innovative, more productive, and (or) more tolerant of change than others in the community. These producers consistently increase yields and are usually well-known or easily identified. If such people are given special training, they can help in the training of other members of the community and can demonstrate project benefits.**

**Funding**

**Funding of projects can be critical. Small farmers usually have few resources and little money or time to invest in a new enterprise. They may be reluctant to enter a loan agreement in an untried venture. However, the more sustainable**

**projects are those in which the beneficiaries have made some sacrifice such as a loan, or reducing consumption. Financial assistance sometimes may be needed from the local community, government, or other organizations. In some projects, animals are loaned to participants with the agreement that the animals will be returned after offspring are obtained. In other programs, animals are given to one family that, in turn, gives a first-born young animal to new participants.**

## MONITORING THE PROJECT

**Plans for monitoring the project should be part of the original design. When project managers monitor results systematically, they may find unexpected or negative impacts and modifications of project design can be made.**

**Because environmental and human interactions are complex, all project effects cannot be predicted and changes may not be immediately apparent. Therefore, it is important to continue to monitor the project in operation to observe both expected and unexpected results.**

**Planners may want to monitor effects on vegetation, water quality, soil fertility, land use, diet and cultural practices. Such data also will help to identify maintenance procedures that will ensure project continuation.**

## PROJECT EVALUATION

**A project plan should outline the evaluation methods to be used, and ensure that the evaluation is carried out. Too often this process is ignored, especially when the project may not appear to be achieving its objectives. However, project evaluation is important for all who were involved in a project. Every project involves a certain amount of risk for project participants. In the event of project failure, these participants must not be abandoned by planners or they will hesitate to try any future projects.**

**Evaluation must be a joint effort of planners and community members. Outside evaluators may add fresh insight or see solutions to problems overlooked by those close to the project. However, they also may judge the project from their own value system that may not fit project purposes. Evaluators observe and measure how well objectives have been achieved. They determine if there also have been other expected or unexpected benefits. They investigate the causes of success and failure to help future planners improve project designs.**

**Evaluations are especially helpful if the project methods have been experimental, with no past history of success or failure in a similar environment. Also, planners and project managers should exchange information with those in nearby regions in order to compare methods and results.**

**FINAL CONSIDERATIONS**

*** Are project objectives measurable and realistic?**

*** Are they compatible with community needs?**

*** Were community members involved in establishment of project objectives?**

*** Was a cost-benefit analysis which includes an environmental analysis used to determine the best project design to achieve objectives?**

*** Is an effective technical assistance and training program integrated into the project design?**

*** What assistance can be provided by financial, governmental, and other institutions or groups?**

*** Is there a reasonable plan to monitor and evaluate the project?**

**APPENDIX A**
**ECOLOGICAL MINI-GUIDELINES FOR COMMUNITY DEVELOPMENT PROJECTS**

**The following short-form version of the CILSS/Club du Sahel Ecologic Guidelines has been developed to meet the needs of**

**development workers at the community level. The original version is available at cost from the CODEL Office, Environment, and Development Program. This paper is a response prepared by Fred R. Weber as a result of discussions with private development assistance agencies at CODEL workshops on Environment and Development.**

**In its basic form, the guidelines presented will permit analysis of proposed activities and a design that will minimize negative impacts. It is designed for small-scale projects under $250,000. The Mini-Guidelines is being circulated to PVOs to invite reaction and response. It is hoped agencies will try out the Mini-Guidelines in the field and report back on the experience. Responses should be addressed to Mini-Guidelines, Environment and Development Program, CODEL, 475 Riverside Drive, Room 1842, New York, New York 10115, U.S.S. All communications will be forwarded to Fred Weber.**

**The general approach is the same as for the complete CILSS/Club du Sahel Ecologic Guidelines. Methods and procedure, however, have been condensed in a form that is less time consuming and can be carried out by project design personnel not formally trained or experienced in environmental analysis.**

## INTRODUCTION TO THE GUIDELINES

**Begin with any project in the community development area: wells construction, school gardens, poultry raising, village woodlots, access roads, and so forth. Any community activity will, in one form or another, affect the environment somehow. Especially if "environment" is regarded in its broadest form, not only the physical aspects are affected but also health, economics, social and cultural components.**

**The objective of this exercise is to try to predict as far as possible, the various impacts the proposed activity will have in both negative and positive terms. A project normally is designed with specific results in mind. An attempt is made to provide well-defined, "targeted" inputs to bring about some improvement to the people in the field. What is less clear is the nature and extent of incidental consequences these activities might bring about that are less desirable, in fact often adverse or negative.**

**In reality, more often than not, the good will have to be taken with some bad. Choices often involve trade-offs. The trick then consists of developing a system where these trade-offs ultimately are as favorable as possible in terms of the people involved.**

**INSTRUCTIONS**

**To identify areas where possible adverse effects may occur,**

**the basic question that should always be asked, is:**

**How Will Proposed Project Activities Affect ?**

**If we insert in this question the components that together make up the environment, we will get answers (and possible warning flags) for those situations where otherwise negative consequences "inadvertently" may result.**

**Explanation of Columns**

**In the table on page 140, ask yourself the basic question for each of the 18 lines (described below) and assign the following values in Column 3.**

**Very positive, clear and decisive positive impact +2**
**Some, but limited positive impact +1**
**No effect, not applicable, no impact 0**
**Some definite, but limited negative impact1 -1**
**Very specific or extensive negative impact -2**

**A brief explanation of the factors in columns 1 and 2 follows:**

**Surface water -- runoff: peak and yields. How does the project activity affect runoff? How does it affect the peaks (flood discharges)? How does it affect the amount of water that will flow (yield)?**

**Groundwater -- Its quantity, recharge rates, etc. Also, does the project alter its chemical composition?**

**Vegetation -- Accent on natural vegetation. Will natural cover be reduced (bad) or increased (good)? How will natural regeneration be affected? Will there be additional (or fewer) demands on trees, bushes, grass, etc.?**

**]Soils -- Will the project increase or drain soil fertility? Where land surfaces are affected by the project, is "optimal" land use affected favorably or adversely? Will erosion be more or less likely?**

**Other -- Basic questions dealing with improvement or deterioration of factors such as wildlife, fisheries, natural features. Also does the project follow some existing overall natural resource management plan?**

**Food -- Will people have more food and/or a more complete diet?**

**Disease vectors -- A very important point and one that is often overlooked: Will the project create more standing water? Will the project increase (or create) fast flowing water? How will it affect existing water courses?**

**Population density -- How much will population density increase as a result of the activities? What contamination conditions will be altered? How? Will more Health Care Services be required?**

**Other -- Toxic chemical, exposure to animal borne diseases, etc.**

**Agricultural productivity -- Per capita food production (staples or cash crops), yields.**

**Volume of goods or services -- Will the project provide more goods (food, firewood, water, etc.) or less?**

**Common resources -- (Water, pasture, trees, etc.) Will the project require people to use more or less water, pastures, etc.? Will it eliminate any of these resources now available? Will it restrict access to these resources?**

**Project equitability -- How are benefits distributed? Who will profit form these activities? Special segments of the population? How "fairly" will the benefits be shared?**

**Government services, administration -- Will the project demand more work, "coverage" of government services?**

**Will it cause an additional load on the administration: more people, recurrent costs, etc.?**

**Education and training -- How will it affect existing education/training facilities? Strain or support? Or will it provide alternatives? What about traditional learning (bush schools, etc.)?**

**Community Development -- Will it encourage it, or will it affect already on-going efforts? If so, is this good or bad?**

**Traditional land use -- Will it restrict existing use, harvesting, grazing patterns? Many projects promote "better" land use but at the (social) cost of someone or some group being restricted from using land, vegetation, water the way they have been used to.**

**Energy -- How will the project affect the demand for (or supply of) firewood? Will it increase the dependency on fossil fuels?**

**Column 4: The content of this column is an arbitrary number based on experience.**

**Column 5: Choose an adjustment factor between 1.0 and 5.0 depending on whether a large number of people and/or large areas are affected. If a large segment of the population is**

**affected (say: over 1,000,people), use a factor of 2.5. If 1,000 ha or more are involved, use 2.5 also. If both large numbers of people and extensive area are affected, combine the two: use up to 5.0. Never use a factor less than 1.0.**

**Column 6: Compute the adjusted score by multiplying columns 3, 4, and 5. Enter result in column 6. Make sure to carry forward the positive and negative signs.**

**In Column 7: List all impacts that are positive.**

**In Column 8: List all impacts that are negative.**

**Now take another look at column 8. Here you'll find a summary of the negative aspects of your proposed activity. Beginning with the largest values (scores), determine what measures you can incorporate into your project, what alternate approaches can be followed to reduce these negative values, one by one. This may not always be possible, but try to modify your plans so that the sum of all negative impacts will be as small as possible.**

**(Tabulate the new, improved scores in Column 10.)**

**Modify, adjust, and redesign your project so that the total of all "negative impacts" is as small as possible. This is the essence of "ecologically sound project design."**

**<FIGURE>**

**04p140.gif (600x600)**

ECOLOGIC GUIDELINES

| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|---|---|---|---|---|---|---|---|---|---|
| PHYSICAL ENVIRONMENT | SURFACE WATER | | 2 | | | | | | |
| | GROUNDWATER | | 1 | | | | | | |
| | NATURAL VEGETATION | | 2 | | | | | | |
| | SOILS | | 2 | | | | | | |
| | other | | 3 | | | | | | |
| HEALTH | FOOD | | 1 | | | | | | |
| | DISEASE VECTORS | | 4 | | | | | | |
| | POPULATION DENSITY | | 3 | | | | | | |
| | other | | 2 | | | | | | |
| SOCIO-ECONOMIC | AGRIC. PRODUCTIVITY | | 1 | | | | | | |
| | VOLUME OF GOODS, SERVICES | | 1 | | | | | | |
| | USE OF COMMON RESOURCES | | 1 | | | | | | |
| | PROJECT EQUITABILITY | | 1 | | | | | | |
| | GOVMT SERVICES, ADMIN. | | 1 | | | | | | |
| CULTURAL | EDUCATION, TRAINING | | 1 | | | | | | |
| | COMMUNITY DEVELOPMENT | | 1 | | | | | | |
| | TRADITIONAL LAND USE | | 1 | | | | | | |
| ENERGY | ENERGY | | 2 | | | | | | |
| THE BASIC QUESTION: How will the proposed project activities affect the factors listed above? (Range from + 2 to - 2) | | BASIC SCORES | MULTIPLIER | PEOPLE / SURFACE FACTOR | ADJUSTED SCORES = 3 x 4 x 5 | POSITIVE IMPACTS | NEGATIVE IMPACTS | Measures to add which will reduce negative impact scores (and/or which will increase total positive impact) | REVISED SCORES |

## APPENDIX B
## SERVICES AVAILABLE FROM HEIFER PROJECT INTERNATIONAL

**AND WINROCK INTERNATIONAL**

**Heifer Project International provides the following services:**

*** resources for livestock projects**

*** technical assistance**

*** training, including the Institute on Livestock in Development, a week-long workshop**

*** information including responses to particular questions; a newsletter with technical information; and manuals Raising Goats for Milk and Meat and a Planning Guide for Small-Scale Livestock Projects**

**Winrock International Institute for Agricultural Development provides:**

*** technical expertise -- animal health, nutrition, breeding, management, facilities, marketing, forage supplies, production economics**

*** factsheets and other publications on animal agriculture**

*** a bibliographic database of over 15,000 entries in eight categories of animal agriculture**

*** an information service to answer technical queries about crop and animal agriculture**

*** specialized services in data collection, research designs, feasibility studies, germplasm evaluation, mating system design, designs for agroforestry, and range management programs**

*** technical library services, commercial bibliographic searches, agricultural policy, and communication networks**

*** short-term applied training opportunities**

*** project proposal development and project implementation backstopping**

## APPENDIX C
## BIBLIOGRAPHY

**The last item in each entry indicates the source from which each book and pamphlet may be ordered. The address for each source follows this listing.**

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## APPENDIX D
## ADDRESSES FOR REFERENCES

**Agricultural Information Centre**
**Box 14733**
**Nairobi, Kenya**

**Agriculture Information Service**
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**Gaborone, Botswana**

**CODEL (Coordination in Development)**
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**New York, NY 10115, USA**

**Cornell University Press**
**714 Cascadilla St.**
**Ithaca, NY 14851, USA**

**Council for Agricultural Science and Technology**
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**Dairy Goat Journal**
**14415 N. 73rd St.**
**Scottsdale, AZ 85251 USA**

**Devin Adair**
**143 Sound Beach Ave.**
**Old Greenwich, CT 06870, USA**

**FAO**
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**Rome, Italy**
**(FAO has local distributors in many countries)**

**Freeman, W.H.**
**4419 W. 1980 S.**
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**Schoolhouse Rd.**
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**Pownal, VT 05261, USA**

**Heifer Project International**
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**P.O. Box 808**
**Little Rock, AR 72203, USA**

**The Hen House**
**Box 492**
**Corvallis, OR 97330, USA**

**Intermediate Technology Publications Ltd.**
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**London WC2E 8HN, Great Britain**

**Interstate**
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**Danville, IL 61832-0594, USA**

**Longman, Inc.**
**19 West 44th St.**
**New York, NY 10036, USA**

**National Academy of Sciences**
**Office of Publications**
**2101 Constitution Ave.**

**Washington, DC 20418, USA**

**National Dairy Research Institute**
**Karnal-132001, India**

**Peace Corps**
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