Grassroots Restoration: Holistic Management for Villages

by Sam Bingham



Acknowledgments

Most of the information in this book and its organization are based on the the work of Allan Savory and The Savory Center and are presented here in a format adapted for use in teaching the basic principles of Holistic Management in a village context. However, this general guide does not pretend to cover all aspects of Holistic Management or enable the reader to practice it in all situations. It does reflect the experience of a member of The Savory Center's corps of Certified Educators in Southern and West Africa and was reviewed by The Savory Center staff. English, French, and Russian versions are available from:

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Introduction

Apart from a few rare cases where communities seem to have benefited from better organization and new methods, most attempts to improve the management of land in the Third World have failed. There is a history of frustration, problems, waste of resources, unsustainable projects, populations that refuse to participate in programs that violate their true desires, and occasionally conflict that has led to bloodshed.

The proof of this is clearly written in the soil, particularly where new technologies, new methods, and new social and economic forces have come into play. With astonishing regularity, projects intended to restore the productivity of soil have instead led to failure, often catastrophic failure worsened by secondary effects that were not foreseen.

Examples in Africa are well known. Recently in Tunisia, millions of dollars were spent to plant bushes (Atriplex spp.) on millions of hectares to replace native forage plants that had disappeared. How many of these bushes remain alive now? To benefit nomadic herders in Sudan, Kenya, Mali and Senegal, money was poured into organizing "livestock units" modeled on the ranches of Texas. How many remain operational or profitable today?

All across the semi-arid zones of Africa livestock wells and water points have been developed. After several decades, what is their condition now? What has happened to the land around them? And is there any place where natural water points - rivers, springs, lakes remain as abundant as they were a hundred years ago?

To raise agricultural production, the world's best experts, financed by the world's most powerful institutions, have overseen the industrialization of farming through the construction of dams and irrigations systems, miracle crops, and imported fertilizer. However, everywhere in Africa food production is falling. Many countries that fought hard to win political independence, now depend on foreign powers for food.

In many African countries and elsewhere, livestock has been banned from millions of hectares "to allow it to recover." But where has it actually recovered enough to offset the loss to the people? Thousands of the best races of sheep, cattle, and goats have been imported from Europe and America so that Africans might "increase production while reducing their herds" in order to restore the soil. But where has production really increased? How many of these imported animals have even survived?

The answers to these questions are almost all negative, and a good many people now look at development projects as an excuse for cash assistance that has little connexion to development.

The causes have been well analyzed and discussed. The critics denounce national bu-

reaucracies, development agencies, scholars and economists for continued failure:

- to gain the support of local people who often actively sabotage projects designed to help them.
- to consider the economic context, pushing people to produce crops that they can't use or buy inputs (fertilizer, machines, etc.) that they can't afford.
- to come to terms with the power of politicians, institutions, and special interests.
- to recognize or correct environmental degradation and the often dramatic consequences for the society.

Undeniably the people themselves and the state of their society bear some responsibility for the degradation of their land.

- the people have poor education and their customs and traditions are badly adapted to the modern world.
- extension services are poor, and people have little instruction in new technologies.
- the land is owned collectively or by the State instead of by the individuals who use it, so they have little reason to take care of it.
- capital and credit are hard to find.
- governments are corrupt.
- population is high and growing fast.

This list could fill a page or two. These conditions exist, but do they truly explain the problem? If they did, then the soil should be fertile and improving in places where you find the opposite conditions. In the west of Texas in the United States land is owned privately, and the owners have good education, capital, and the support of the best agricultural schools in the world. The rural population is thin and falling. The government, though not perfect, has served the interests of farmers and stockmen well. For over a century they have won support for and participated in countless government programs designed to aid them.

Nevertheless, the soil and the agricultural economy of West Texas have degraded and badly and probably faster than the worst examples in Africa. If children in Texas do not die periodically from kwashiorkor, it is because the industrial economy of the United States can feed them. Also, many Texans command enough capital to force the land to produce by means of ever more fertilizer, pesticide, irrigation, and other technologies. That cannot hide the fact that vast areas of pasture that once nourished immense herds of bison are hardly distinguishable from the most desertified ranges of Chad or Mali.

The water table is falling also in Texas, even in rainy years. Rivers once rich in fish have been dry now for decades except for the occasional flash flood. As in Sudan, you can find no end of fields sterilized by salt. And after the government has spent hundreds of millions of dollars to fight rodents, weeds, and brush that are blamed for ruining the land, they have retreated nowhere, while people, as in Africa, leave the land for the big cities. And there crime and poverty continue to grow.

If, during the same period of time, the same degradation of land has occurred in Texas and similar areas in Africa, we should look at the ways these places are alike, not how they are different. In both places people analyze their problems and make decisions in the same way. Recently scientists have had to admit that many traditional systems of using land were in fact extremely efficient and ecologically sound. Unfortunately, over the ages this knowledge has often become so ritualized in custom that even those who practice it have difficulty seeing the principles that made it work so they can adapt it to new conditions. Certainly scientists have done little better. In the face of a crisis or a new situation, we all, from the producers in their villages and tents to the administrators in the central government, usually think in the same way.

Maybe this is the cause of our failure - how we think and make decisions.

It is possible that the whole world fails to see things as they really are. Not long ago everyone "knew" that the sun circled around the earth and laughed at anyone who thought otherwise. We don't like to admit it, but often we see only what we expect to see or what we have been taught to see. We lack the imagination or the experience to see anything else.

Consider this drawing for example.



Is it a little girl looking at a glass of water or a woman with her bucket scrubbing the floor on her hands and knees (seen from the rear)?



Nature and ecology are like that. Here is a photo of a bare land at the end of the dry season. For these young people the scene is normal. Their ancestors saw a savannah rich in trees and thick perennial grass.

We see what we expect to see, what we are conditioned to see, and unfortunately we react according to reflexes conditioned by experience and instincts that we cannot always trust. In general we arrive at a decision by the following steps:

- 1. We set a goal, which is almost always to: produce something; eliminate, control or preserve something; or resolve a pressing problem.
- 2. We look at our resources, which we understand to be: energy, minerals, plants, animals, soil, and water.
- 3. We look for the expertise and financing to make and carry out a plan, and usually this plan calls for technology, rest (take the animals off the land until it recovers) or fire.
- 4. We evaluate the plan. Is it affordable? backed up by research? politically acceptable? likely to give quick results?
- 5. Finally we choose the best solution and pursue it until it fails.

We fail because this way of thinking and acting ignores several hidden truths. The first is that any plan touching natural resources affects the whole ecosystem. All actions aimed at a specific situation will produce unforeseen secondary effects. More importantly, nature, even without human intervention, is always dynamic so that an action that is correct today may be wrong tomorrow.

Consider different steps for making your plans.

- Instead of focussing on a situation in crisis, look at all the elements involved in your management - all the diverse people, financial and natural resources, and land. Having that in mind insures against a narrow point of view.
- 2. Instead of concentrating on a list of problems and special production concerns, work out a single goal, shared by all participants that describes what you want to achieve in terms of: quality of life, the production necessary to maintain it, and a realistic vision of a countryside that can sustain that production long term. Such a "holistic goal" assures a global vision and strong support and does not ignore the impact of your plan on the land.
- 3. Instead of think about your resources as static objects - energy, minerals, plants, animals, soil, and water, think about the dynamic processes of the ecosystem - the tendency of communities (human and biological) to develop themselves, the cyclical movement of water and minerals, the flow of energy through living organisms.
- 4. Instead of limiting ourselves to the conventional tools (technology, rest, and fire) why not use as tools the impact of animals (for manure, urine, and even the trampling of wild and domestic herds) and other living organisms whose populations we can nurture by our management.
- 5. Instead of judging our plans only by the ordinary criteria (affordability, research, politics, immediate results, etc.) add some tests to assure that the plan actually leads toward your holistic goal, and that it is socially, economically, and environmentally sound.

6. Instead of stubbornly following your plan until it fails, assume that it contains faults and that the dynamism of nature itself will soon make it obsolete. Then you will watch your progress with an eye to continually changing the plan so that it must succeed.

Biodiversity

"In holistic management, when we talk of the loss of biodiversity, we mean it in the most general sense - not only in relation to the number of species, but to genetic diversity, diversity of ages, and to the mass of living matter in general.

Allan Savory, Holistic Management Quarterly

When we speak of diversity in terms of age structure, we refer to the need for members of all ages. All "good" species may be present, but if we find only adult examples and no young ones, they are on their way to disappearing. This is true also

of the quantity of "living matter". We may find members of a species represented, but if there are only a few the situation is not healthy.

Agriculture cannot survive without biodiversity. When biodiversity drops too far, the crops and herds that support civilization and civilization itself will fail.

Without agriculture there would be no commerce, manufacturing, or government because everyone would have to hunt or gather wild plants for survival.

There is a widespread belief, particularly among

scientists, that technology will soon end our need for biodiversity. However, even if we produce all our food from special seeds grown in pure chemicals, that would not put an end to our problems. Soil erosion would continue to silt up our water courses, destroy our irrigation works and the life of our lakes and seas. The air on which all life depends would quickly become unbreathable unless



green plants renewed it constantly.

Poor land means poor people, political strife, and social decay. Biodiversity is the only true wealth that any civilization can claim. When we lose biodiversity we lose "capital". This is why management must be based on the "processes" in action in the ecosystem that give us diversity and why we should judge all actions by their effect on these processes.

A step ahead in the dynamics of a community, an increase in the flow of energy, or an improvement in the cycles of water and minerals are what build "capital".

Symptoms of biodiversity loss

As important as biodiversity may be for our planet, how do you recognize its loss? Here are a few signs:

- Creation and expansion of deserts (desertification).
- Increase in the frequency of floods and droughts.
- Drying out of the water table and natural water sources.
- Rapid soil erosion and silting of stream beds, dams, and estuaries.
- Appearance of dunes in sandy regions.
- Decline in the productivity of land and/or increase

in the cost of maintaining productivity.

- Infestations of weeds.
- Infestations of birds and destructive insects in great number.
- Increasing disease problems with plants and animals.
- -Conflict among people.
- Financial problems in villages, cities and towns.
- Failure and abandonment of cities and their industries.



Causes of biodiversity loss

Often when biodiversity loss is discussed, it is described as the result of ignorance, lack of financial resources, or too many animals. Sometimes we blame drought or the climate in general. Others accuse nomadic people, saying that they do not care well for land they do not own. That has often been an excuse for making them settle in one place. Finally we hear that the land itself is too steep, too rough, or the soil too fragile. But if you look at the loss of biodiversity around the world you quickly see that it is happening in environments of all kinds. In all parts of the world the variety of species is declining, and many species are less and less plentiful. *Evidently "economic development" itself - our management and exploitation of the environment threatens our natural wealth, EVEN THOUGH all true progress depends on that wealth.* Holistic Management tries to resolve this sad but ancient paradox.

Define the "Whole"





Holistic management means managing a "whole", not just parts. You must therefore decide what people, resources, land, and money makes up the whole you plan to manage. Every person belongs to many different wholes - a family, a community, a region, a nation. You can always go further and include in your "whole" the environment that influences your family and community. However, remember:

A piece of land by itself is never a whole, and you can't manage it holistically. You must also consider people who influence that land, people living elsewhere who are influenced BY that land, and the money or other wealth that comes from the land or can be spent on it.

To manage a "whole", think first about the people in it, because they will make the decisions, do the work, and judge the results. They fall into two groups - those who will set a holistic goal and are responsible for achieving it, and those will be resources and can help you achieve it. Look for reasons to include people rather than reasons to exclude them.

Whoever leads an effort to manage holistically - often government agents or community leaders should spend a great deal of time explaining what it is before trying to make any decisions. This may require many visits, meetings, conversations, and trips to other communities. Do not begin before building trust and open communications among all participants.

- Take time to explain and show why continuing the present way of doing things will lead to greater problems and that another way is open. Interested people should have time to talk about new ideas with their families and others, so their ideas also become part of community discussions. There may be some people or groups who have strong feelings but are afraid to speak out in public meetings. Every effort should be made to hear them in situations where they can speak freely and comfortably.



Making a Holistic Goal

Make no plans and take no action before the people of the "whole" understand holistic management, have decided that they wish to take action, and are satisfied that they will be able to participate. Then, the goal of the plan must come from the people. Very often a leader - land owner, government agency, forestry service - sets a goal and then asks for public support. This is backwards and leads to disaster. First find out what the public, the people of the "whole" want.

If the "whole" involves large numbers of people, representatives of different groups will have to set the holistic goal. Before any serious talk begins, however, it is important to create an atmosphere of trust and open communication. It must be clear that goal-setting is not an occasion for politicking against each other but finding a path that will benefit everyone. Two habits of human nature make this difficult.

Most people start talking at once about problems. "There's no water. Weeds are taking over the fields." This scatters the discussion. Everyone has a different problem. It also kills hope and the spirit of action. Nobody would start a meeting by saying, "The problem is that someday we're all going to die. What are we going to do about it?" Ask people what they want, not what's wrong.

Once people start talking about problems, they soon argue over what to do about them. This scatters the discussion even more because everyone has a different idea. Worse, once people fight for their own ideas they don't willingly work together to explore new ones. Ask what people want. They will have time later to think about how to get it, and you want them to look forward as well as backward to what they already know.

A holistic goal has three parts. Even where people do not read and write it is important to end the discussion of each part with a written statement that you can repeat and improve over time.

Quality of Life (Values)

Participants should describe what they consider a "good life". Most people will begin by listing "things" they want - money, animals, a good house. This is natural and not unhealthy. Most people are never allowed to dream in public. The person who leads the talking, however, must try to lead the discussion to the deeper meaning behind "things" and to questions that aren't "things" at all.

"Big herds and fields" become "food security". "A borehole" becomes "health and relief for women". And the quality of life will include items like education, friendly relations with neighbors, religion, keeping families together.



Forms of Production

This is a list of what the "whole" must produce to give people the life they desire. It will include "products" like crops, livestock, crafts, herbs, firewood, and wild game; but also people like teachers, mechanics, and healers; and activities like administration of justice, help for the needy, recreation for the young, communications with neighbors, and commerce.

Future Resource Base

This is a description of what the land *and people* must become to support the production necessary for the quality of life that people seek. It should describe water sources, rivers, soil, plants, and animals in a way that is realistic according to people's knowledge. It may well include things that disappeared before most participants were born but remain in the memory of old people and in stories.



The holistic goal should be discussed until everyone in the "whole" can embrace it. *The discussion is as important as the holistic goal itself*, and in a healthy community it never ends. As people and situations change, the holistic goal must change. You don't have to make it perfect to act, however. Start with a simple holistic goal that everyone agrees to, and build on it over time.

Guidelines for setting a holistic goal

1. Describe the life you want, not things you want to buy.

Example: Wealth and not worrying about food and water may describe quality of life in your holistic goal. Building a cement house and eating beef every day are details you can decide (and argue about!) later. When you have wealth, you can buy those things you want. Why worry about eating beef or chicken when you can't get either yet.

2. No numbers, hectares, kilograms, dollars, or anything else that you can count or measure should be in your holistic goal.

- Example: Meat and money from livestock is a form of production. Having 100 cows is, again, too much detail. You may have to sell and buy cattle a hundred times. You may find goats and sheep will bring you closer to your true holistic goal. If 100 cows is your holistic goal, you will miss these opportunities.
- 3. Do not put "tools" or "actions" in your holistic goal. Later you may test lots of tools and actions to find the best way to reach your holistic goal. Don't argue about them now.
- Example: Growing your own food is a form of production and may be important to your quality of life. Dreaming of a large field of maize will keep you from seeing other possibilities. You may choose to plant your fields in many ways with many crops. One big field of maize may not be the best idea.

4. Do not forbid any "tools" or "actions" in your holistic goal.

Example: Healthy soil and high biodiversity describe a future resource base. Never using chemical pesticides is a vow that may get in your way some day.. To have healthy soil and high biodiveristy you will probably try not to use chemicals, but a time may come when you should.

5. Make your holistic goal step by step in proper order.

- 1) Quality of Life your values
- 2) What you must produce to enjoy that life.
- 3) Your land and the way you must be regarded by the people in your resource base not as matters stand now but as they must become to give you and your grandchildren the quality of life they want.

Give special care to the land part of the holistic goal. Everything depends on that. In many countries of Africa and elsewhere people gave their lives for the goal of political independence, but without healthy land no nation can ever enjoy true independence. Many people today have never seen healthy land and do not believe that grass grew and water ran all year in places that are desert now. Often old people are the ones who can describe what the land could become in the future.



The Four Pillars of the Ecosystem

After all the discussion of a holistic goal and making decisions that respect the "whole" of human, natural, and financial resources some voices will still cry from the crowd, "It's because of the drought in these last years that the water level is falling. All we need is a borehole and a good diesel pump," or "It was the drought that killed all our trees. The government ought to make us a plantation of eucalyptus like they did at _____," or "The problem is that the ticks and worms weaken our stock, and they lose their young to brucellosis. We just need some veterinary help and a dipping program," or "Weeds and bushes are taking over our fields and grazing

land. We just need a way

How do you answer Without doubt they would quickly, at least for now.

First of all such rebecome goals in theminvolve technological have any connexion to the landscape foreseen in the importantly, the problems people present are often



to kill them back."

these requests? silence the complaints

quests must not selves. They all tools that may not quality of life or the holistic goal. More and constraints that symptoms of deeper

troubles in the ecosystem. Until these are healed, the pumps, plantations, medicines, and poisons will not keep the problems from coming back.

Nature is like a trick picture that seems simple, but the artist has hidden a more important picture behind the simple one. The true picture can only be seen by looking at the basic processes that actually produce everything that we see in nature - and human life.



1. The Water Cycle

Everyone knows that water circulates between the earth and the sky. This is the "Water Cycle". It keeps going all the time because of the power of the sun. Nevertheless, there is a big difference between a water cycle that passes through plants, animals, fields, and the village well before going back to the sky and a water cycle that runs off the land or dries off without benefiting life anywhere.

In most cases in the drier regions of Africa, a damaged water cycle is the main cause of degradation and poverty. The amount of water lost is astonishing. If only half of a yearly rainfall of 750 millimeters evaporates or runs off, every 100 hectares loses 375,000,000 liters



Signs of a poor water cycle:

- Bare ground that allows water to evaporate and run off quickly.
- A crust covering the soil. This crust may become very hard and cemented by algae. This stops water from soaking into the ground and makes it run off. It also keeps seeds from starting, so there are fewer plants to catch the rain and use it.

of water. Many areas, however, lose 95% of their water almost instantly. A true drought is a small matter compared to the disaster of a water cycle that poor.

THE IMPORTANT QUESTION IS NOT THE TOTAL RAINFALL, IT IS THE "EFFECTIVE RAINFALL." HOW MUCH WATER ACTUALLY SUPPORTS LIFE?

If the water table is falling, a new well will not make it rise. You will have to improve the water cycle over a wide area. Instead of making deeper wells a goal, it is better to have a holistic goal that calls for a healthy water cycle.



- Changing plant communities. Those that grow in dry places take the place of plants that need more water, even when rain seems plentiful.
- A falling water table and loss of springs and flowing streams.

The cure for a damaged water cycle is to cover the soil with plants and litter and break up the crust.

- Erosion

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The Mineral (Nutrient) Cycle

The mineral cycle is movement of all the nutrients that living things take from the soil and air as they grow and give back when they die. Green plants take them in through their roots and leaves. Animals may eat the plants, but in the end they go back to enrich the soil as manure, urine, or the leftovers of rot and decay and new plants will use them again. Obviously the richness of life in this cycle suffers if it is blocked at any point or if nutrients are lost from the cycle.

In "brittle environments" such as the drier regions of Africa, both problems occur often.

Except in the wet season and in the stomachs of large animals, these areas lack many of the microbes and small organisms that in wetter places cause old dead vegetation to decompose quickly. Old leaves and grasses may stay where they grew for years, blocking the cycle, because nothing goes back to the soil.

Worse, old rotted vegetation (organic matter) catches and holds nutrients, so when dead plants do not return to the soil, nutrients that were already there are washed away by water. This leaves the soil even more sterile.



Signs of a weak mineral cycle:

- Bare ground with little organic matter so that erosion and leaching carry off nutrients.
- Old vegetation, leaves, and grass that stay in place until they become grey and useless.
 Even plant litter and the manure of animals dries out and stays on the surface without decomposing and building the soil.

The remedies in brittle areas are to cover the soil and put old vegetation back into it with the trampling feet of heavy animals. Animals also help when they turn plants into manure, which is already partly decomposed and increases the number of small creatures that complete the process.



It also helps to encourage all forces that can bring nutrients from deep in the soil up where more plants can use them. Bushes and trees reach deep with their roots but drop their leaves on the surface where they help support crops and grass. Rodents, termites, and ants bring up grains of dirt from lower levels, which is one reason why termite hills make good fertilizer.

Mulch and compost help restore crop fields, and animals can also add their manure, although a herd must not stay too long in a bare field or it will compact the soil.

The Steps of a Succession

Succession follows a different path according to the climate, the condition of the soil, and the condition of the land at the start. Nevertheless, in semi-arid areas where the wild conditions of the past were forested savannah, the natural restoration of a crop field might well follow the stages described here. Each stage presents conditions that favor the development of the next stage.



One year after the field is left fallow, it is covered by annual plants that last only one season. Wild creatures are mostly insects and small animals and birds that come seeking seeds.



Five years later some bushes and perennial grasses appear but most of the plants are still annuals. You may also find ants and termites and the holes of rodents.



After a decade, perennial grasses begin to replace the annuals and true trees are growing here and there. Jackals and hares hide in the bushes and herds of larger game pass occasionally.



Finally the old field once more looks like the healthy savannah around it. You will find there all kinds of plants and animals large and small, including grazing animals and predators.

3. Succession - Community Dynamics

Succession is the process of development that happens in any living community because its members - animals, plants, and humans - are trying to better themselves. (When speaking about more than plants and animals you can also talk of Community Dynamics)

If no outside force stops succession, it will always lead toward a more complex and productive community. A simple community usually means a low level of succession. You will find few different *kinds* of plants, although there may be a lot of one or two kinds. Most of them will probably be annuals. Animal life also is likely to include big infestations of single species. These conditions are not stable.

On the other hand a community at a high level of succession will have many different kinds of plants and animals, even though none dominates. Biodiversity will be high. There will be a mix of soft and woody plants, many perennials, and young and old members of all species. As the level of succession rises, the community becomes more stable and resistant to infestations, drought, and flood.

Succession of wild plants and animals also has an echo in domestic animals and crops. For example, if the livestock in a community changes over time from -goats and camels to sheep and then to cattle, and cattle that produce lots of milk, you know that succession is moving forward. If fields that once produced maize and a variety of vegetables now only grow millet, succession is being pushed back.

Where bad management has pushed succession back, the cure is usually to improve the water and mineral cycles and to encourage biodiversity in all forms, including wild animals and predators. Nevertheless, succession is a powerful force all by itself. All communities will progress if the blockages are taken away, although it is difficult to predict exactly how they will change. After years of degradation, people often forget the landscape known by their ancestors and believe their land must always be the way they see it now. Then, restoring the landscape of the past might become part of a holistic goal. You can at least hope for that.

Succession advances by steps. Each stage prepares the way for the next one. This also explains why many development projects fail. Giving people milk cows will not help a village if the level of succession will only support goats. Tree planting will fail if the level of succession doesn't match the needs of the seedlings. They will die like a bulldozer in a village that has neither a mechanic nor spare parts nor money for fuel.



In this case the trees are succeeding thanks to the death of the badly adapted bulldozer!



All around this village, succession is retreating under pressure of bad management. The forest, still visible in the distance, gives way to annual grass (a light line in the photo). Nearer still, Caletropus bushes find an ideal home on the bare land. The energy of the sun, that once made the villagers rich in livestock and wild game in the cool shade of open woodland, now only bakes them in their poverty.

4. Energy Flow

Energy from the sun puts the other ecosystem processes into motion. The sun returns water to the sky. It gives green plants and all the living things that depend on them the force to grow. Without it there would be no succession. This is energy flow. It is not a cycle, because power from the sun is simply used up. It does not return to the sun.

All production and wealth depends on harvesting the energy of the sun through the leaves of green plants. Bright sun on bare ground of course gives us nothing but heat, but some communities harvest and use more energy than others. Dense plant communities catch more energy than scattered plants. Plants with broad leaves catch more than those with narrow leaves. Perennials that stay green long into the dry season catch more than annuals that die quickly and turn brown. In cold climates a mix of plants that enjoy both warm and cool weather increases energy flow.

The ecosystem is also more productive where the energy harvested by plants supports a rich animal life as well.



How to "See" Through the Ecosystem

In many villages around the world you will find the same "problems" and constraints.

- Wells and springs are drying up.
- Soil is losing its fertility.
- Some kind of weed is taking over fields.
- The livestock can't find enough to eat.

These "problems" can be easily solved.

Drill the boreholes deeper or build a dam.
Bring in some chemical fertilizer and clear more land for planting.

- Spray herbicides on the weeds.

- Exchange the skinny local livestock breeds for new breeds that will grow fast if you keep them penned and feed them cottonseed cake and forage crops that you raise, harvest, and carry to them.

On the other hand, if you look at the situation from atop the four pillars of the ecosystem, you will see it quite differently. Consider the case of a real village that we shall call Makuza which means "Hope" in several Bantu languages.



Water Resources

The villagers complain about the lack of water, but even though some years have been much drier than others the average has remained about the same for the last twenty. Their problem is a poor *water cycle*. If they can increase the infiltration even a small amount and save rain now being lost, their springs and streams, in time, will run again. Otherwise the water crisis will return in spite of the new boreholes and dams.

Fertility

Makuza farmers used to plant a field for three years and then leave it for five or six. Also, the fields were small and scattered about the community. Now the population has grown. Some fields never rest at all and the same crop, millet, is planted every year in big fields that cover vast areas.

The trouble is *the mineral cycle*. The new practices take much from the soil and put nothing back. If farmers cannot rest the fields and allow

succession to restore them, then they must find another way. They can add chemical fertilizer but this often destroys the organic matter that keeps nutrients in the cycle. Mulch, manure, rotation of crops, mixing several crops in the same field, planting legumes that produce nitrogen, are alternatives that respect the *cycle* as it works in nature.

Weeds

The villagers say that a certain plant that once grew only here and there is now destroying their fields. They say that it has changed character and become aggressive and evil-minded.

However, this is question of *succession*. The weed likes bare, dry, and poor, soil. When the land was covered and fertile it was hard to find, but when the people began to grow millet year after year without rest, their big fields all became a perfect home for it. Even hoeing spread it because the cut roots could grow new sprouts. Herbicide may kill the weed this year, but it will come right back until succession moves the crop land to a level it does not like.

The farmers might change crops from year to year, plant different crops side by side in smaller patches, and bring back the life of the soil with mulch and manure. If conditions are not the same everywhere, the weed will not grow everywhere.



Forage

Government experts are convinced that Makuza has too many animals, because two years out of three they run out of grass before the rainy season. The villagers, however, insist that the problem is lack of rain, because when the rain is good, they have enough grass. They want the government to give them cottonseed cake and grain in "bad" years.

Actually the problem is *energyflow*. Cutting down the livestock will not necessarily change the fact that the plants are not capturing as much energy as they might. Bringing in feed grain just means

bringing energy from elsewhere.

The best answer would be to increase *energy flow*. That means managing in a way that:

- Increases the number of plants.

- Improves water and mineral cycles to favor plants with bigger leaves.
- Allows succession to advance to the level of perennial plants that stay green longer and also grow some in dry years.



Even at the end of the dry season, these bunches of Andropogon are still growing green leaves, which you can see as dark spots in a dried out field.

Brittle and Non-Brittle Environments

African desert, South American jungle, and North European pasture look very different, but for a very long time, most people tried to manage all environments by the same rules. The first rule was, "If you harvest too much from any land, it will degrade." If you harvest grass with livestock, and your grass disappears, then you have too many animals. In all parts of the world where grassland is turning into desert, scientists and experts of all kinds blamed "over-grazing" and said reducing herds or taking the animals off the land entirely was the only cure.

However, it is now clear that the world is not so simple. If you take the livestock out of an English pasture or a jungle clearing, succession will soon turn it into forest. If you take them out of a low rainfall Africa grassland, succession may run backwards and turn the land to desert. The difference is "brittleness". "Brittle" is not the same as "fragile". The jungle is fragile, because it can be easily destroyed, but it is not brittle.

Most arid and semi-arid land is brittle, but low rainfall is not the only thing that makes it brittle. In brittle areas:

- The year is divided into wet and dry seasons.
- The air is generally very dry.
- The rains are often either far above or far below average.

In non-brittle areas:

- Rain may fall at any time of year.
- The air is usually damp.
- In most years the rain is close to average.



In **brittle zones** a healthy mineral cycle depends on large grazing animals to eat plants and return nutrients to soil as manure and litter. The microbes and many small creatures that cause dead grass and leaves to rot and decay cannot survive well in the long periods of dryness. Thus, people and their animals must take responsibility for the health of the land.



In **non-brittle** areas, such as northern Europe, the mineral cycle does **not** depend on people or their animals. Very active microbes thrive in the damp air and quickly turn dead plants back into soil. They are even building soil on the roof of this house, and one day the forest will cover it.

Bare Ground

In brittle areas, poor management often pushes succession backwards. Complex communities lose their variety of plants and animals until they come to a state of bare ground. Bare ground itself is a sign that the land is brittle, because you will seldom see it in non-brittle environments. Worse, bare ground means that all four of the ecosystem processes are in very bad condition. The life in the soil will die unless it is covered by plants and litter. They protect it as an animal's skin protects the meat from loss of blood and from the heat, cold, and dryness. Naked earth dies like a skinned animal.



- Bare ground dries quickly. It then becomes hard which means that the next rain dries and runs off even faster. The **water cycle** does not support life.

- Bare ground loses its fertility because nothing replaces the **minerals** lost to erosion and leaching.

- Bare ground means **succession** has gone back to zero, and the environment is extremely unfriendly to the seeds of most plants.

- Bare ground only reflects the **energy** of the sun back into the sky where it only serves to heat the air.

To free the power of succession and reverse the degradation of brittle land, NOTHING is more important than understanding and fixing the problem of bare ground. There are two key ideas to keep in mind.

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The Crust (Soil Capping)

In brittle areas, especially in the tropics where the ground never freezes, bare ground will develop a hard crust or cap. This closes the soil so that neither water nor oxygen can get down into it. It increases the runoff of water and the danger of floods and stops seeds from growing. The hardness and extent of a soil cap will tell you what will happen to succession **before** plants actually change. A heavy crust between plants always means danger.



1. The first crust forms after a rain. You can easily break it with your fingers.

2. After a few seasons, the crust will thicken, but will still break under your feet.



3. After several more years a mature crust may become extremely hard. If the soil has even a little clay it will become like cement under your feet. Often the same algae that grows on rocks will turn a mature crust dark.

Litter

In dry climates, succession may never cover the ground with living plants. This means that most of the cover will have to come from leaves and beaten down grass from past seasons. This cover is far more important to the **future** health of the land than the present condition of the plants.



Seen from a distance, this grassland seems healthy....



...however, if you look straight down into it, you will see that it is in truth degrading, because all the plants are mature adults, widely scattered on soil that is bare and capped.

On the other hand, this area where the old



grass has been beaten down will improve because the soil is well-protected. Toss a coin ten times and count how many times it falls on litter, on living plants, or on bare ground, and you will have a good idea about the ecological health of that place.

Animal Impact

This is absolutely essential for the health of grassland. It is even more important than stopping overgrazing!!

To break crusted soil and turn dead plants into useful litter few forces do better than the trampling hooves of livestock or wild animals. When this important relationship between animals and plants in brittle environments is broken, desertification usually follows. Energy flow, the water and mineral cycles and succession suffer without large grazing animals.

In wild conditions, antelope, buffalo and other herding animals spend much time crowded very close together because packs of predators (lions, wild dogs, wolves) always follow them. In these very dense herds the animals do not step carefully among the plants. They trample them down and stir up the ground as well, breaking soil crusts and grinding up litter and their own dung. Where domestic livestock are the only large grazers, it is up to people to make them break up crusted soil and beat litter down onto the ground. Animal impact can also break down brush and open the land for grass.

Without animal impact, soil in brittle environments will become more and more open to wind, sun, and rain. The flow of energy above and below ground will fall. Bare ground between plants will increase. Succession will stop, and in extreme cases slip back toward desert.

In these cases, tight herding and extremely high density followed by long recovery periods are sometimes the only way to restart succession. A herd as dense as the one pictured here will do much more to bring back perennial plants to this grassland than simply stopping overgrazing of plants.



Time, Grazing, and Rest

sheep.

Unfortunately livestock and big game can also badly damage rangeland, and it is important to understand exactly how this happens. When you hear people say that an area is "overgrazed" they usually mean that there are too many animals. "Look, the stock has eaten everything. You will have to reduce the herd, so that the land can restore itself." This opinion misses several key points.

Overgrazing

The difference between grazing that helps succession move forward and grazing that turns the land to desert has little to do with the number of animals. It is a question of *time*. These drawings show how overgrazing can happen



1. When grass is bitten off....



one plant at a time, even where there is only one

2. It uses energy from its roots to grow new leaves.



3. If the sheep is still there and eats the new leaves before the roots have grown back, the plant will borrow more energy from its roots.

4. If it has to do this many times without ever gaining its strength...it will die.

You will find overgrazing anywhere that ANY grazing animals spend too much time!
Why reducing the herd will not stop overgrazing.

Most people believe that overgrazing happens because of overstocking. However, as the last page showed, one sheep can kill some plants if it has the time. In the same time a hundred sheep of course will kill a hundred times as many, if they stay in the same place. In the end, however, it doesn't matter how fast this happens. Over time **any** killing

Here is a healthy range with a new water point and three kinds of plants.

Very nutritious grasses of a high level of succession.

Bushes and less desirable grasses of a lower succession.

Annuals that thrive at a low level of succession.

To keep plants from being overgrazed, you have to control the **time** that animals spend near them. These drawings show the process of overgrazing.









The animals only graze far enough from the water to satisfy themselves. They may choose many different kinds of plants to find the diet they need. Many of these will become even tastier when they begin to grow back because the leaves will be young and tender.



In time the plants that are grazed again and again begin to dissappear, and the animals go farther to find what they need.



Finally nothing is left but bare ground and plants wilth little food value. Often at this point, weeds and bushes move in that animals will not eat at all, and they are blamed for "taking over."



Running only half the number of animals will not change this process!! The smaller herd will only take twice as long to do the same damage.

Signs of overgrazing in brittle areas

Look for perennial grasses - those that grow back each year from the same roots. If you find few, ask old people of the area what plants they remember from their youth. If there has been a big

- If you find the lost plants still growing in protected places (in the middle of bushes and between rocks) overgrazing is one reason why they probably don't grow everywhere. change, overgrazing might be one reason, but it is probably not the only one. Fire and rest may also be to blame.



- During the growing season, look at the most desirable plants. Do you find most of them bitten down during most of the season?

- Look at the most desirable bushes. Overgrazed (overbrowsed) bushes often have dead branches. They hide their leaves in thorns or twigs. Sometimes they are deformed in a way that shows what animal is doing the damage horses, goats, camels, cows, etc.

- Bushes that do not suffer from overbrowsing will have longer straighter branches, softer leaves, and less dead wood.

Experiment

You can also demonstrate the principles of overgrazing with children instead of animals.

Put into a bowl:

- 20 large pieces of candy
- 20 small pieces of meat
- 20 pieces of bread

Let 15 children choose three items. Then look at what they have left.

If you ask only seven children to choose three things, what is left?

How many children would you have to eliminate to save the candy? Probably you would have to send away nine children to save a single piece of candy.

After the candy is gone, the children will "overgraze" the meat. After the meat, they will take the bread. The same thing happens with plants and animals. With them it doesn't matter if there are 50 or 500 head of cattle. The tastiest plants will be overgrazed anyhow.

Livestock of course aren't looking for candy meat and bread. To them some plants may be "tasty" in some seasons and not in others. They may choose some when they are young and tender but not when they are old. The point, however, is the same.

Overgrazing doesn't happen to places. It happens to plants - one at a time. Over time, more animals can overgraze more plants. Places with good water and soil often have the most desirable plants, especially in dry times. Because of overgrazing, however, these places that should have the best forage often have the worst.

Rest

Resting land means that no animals graze there and no fires are set. In brittle environments rest is the most frequent cause of bare ground. It is more



1. A healthy bunch of grass grows tall and produces seed, but nothing eats it, nor cuts it, nor burns it. Without **animal impact** to knock it down and turn it into litter, its stems and its leaves will remain standing until they become grey and useless. serious than overgrazing, because few people understand the danger.



2. The next year the old leaves block the sun and the growth of new leaves. You will often see them weakly sprouting around the base of a plant that is mostly dead. The roots may grow a bit deeper, but they don't spread as they do when the plant is healthy.



3. After several years, the old dead leaves become so thick that the center of the plant begins to die. Often the whole center dies and can be easily pulled out and all that is left is a ring.

A **total rest**, as you find where all livestock has been fenced out, can kill a vast number of perennial plants, if it continues too long. "Overrest" looks very much like overgrazing. In fact,

over-rest and overgrazing can happen at the same time, even to the same plant. This is called **partial rest**, and it is the most common cause of desertification.

Partial Rest

Partial rest can also be explained with candy and children.

Prepare your bowl every day, but after the children have made their choice, only replace the things they have taken. After a few days, they will get tired of the candy, but unfortunately they will find that the meat and the bread are spoiled and stale. Thus, they will continue to "overgraze" the candy. Soon everything in the bowl will be either "overgrazed" or over-rested. Changing the number of children only makes one problem worse than the other.

The same thing happens with grass. Grass that is not eaten or knocked down gets stale and weakened by over-rest. Plants that are bitten become overgrazed, because they will send up fresh new leaves. Many plants may die of both causes and the amount of bare ground increases.

Over-resting **soil** causes even more damage, even though we don't see it. Hard crusts seal out

water and keep seeds from sprouting. Dung and old leaves never get below the surface, and the life there begins to die.

This happens whenever animals are allowed to wander here and there over the same area without ever coming together in a herd that tramples the land. Unfortunately this is the most common way of managing livestock in all parts of the world. You see the difference when tracking an animal. When grazing quietly it hardly marks the soil and tramples few plants. The same animal in a herd hammers the ground. On the wild rangelands of the past, enormous numbers of buffalo and antelope always moved in dense herds to protect themselves from predators. Many traditional herding cultures produced the same effect with long migrations and herders who also had to guard against attack. However, many of these old customs have died away because of modern development.

Nevertheless, if you understand the principles of grazing, overgrazing, animal impact, rest, and partial rest you can rebuild the old

relationship between livestock and grass so that both grow well.

Here are some bunches of perennial andropogon that are being badly overgrazed (You can see the dark leaves at the bases of the plants) right next to tall stems and leaves that were rested until they became too tough for animals to eat.



Points to Remember

- Water and mineral cycles, energy flow, and succession produce nothing on bare ground.
- In *non-brittle* areas where the air is always damp and rain falls in all seasons, plants will quickly cover bare ground no matter what you do. Nothing can stop them.
- In *brittle* areas where the year is divided into wet and dry seasons, livestock or wild grazing animals are necessary to keep the grass healthy and to cover the soil with litter.
- In *brittle* areas, bare ground is caused by repeated fire, overgrazing, but most of all **rest**, both partial and total.
- Overgrazing is not caused by too many animals, but by **any** animal that spends so much **time** in one place that it can graze the same plants again and again **or** if any animals can return to the same place before the plants have recovered
- Many plants may suffer from over-rest even when grazing animals are present if they stay widely scattered, calm, and never move quickly in a tight herd.

Tools

Land is a living thing. It is always changing. The places where we walk today looked different when our ancestors walked there. Our great grandchildren will not see exactly what we see. Will their land be worse, or will it be the land of our holistic goal?

Only three things can change land:

- Natural events like floods, droughts, lightning fires, and frost.

- The succession of communities as the success of one kind of plant or animal makes a place for another.

- We ourselves - people.

What happened in the past that changed the land into what we see now?

Did the weather really change?

Did plants or animals start acting differently for some reason?

Did *people* do something that changed the land, AND the weather, AND the plants and animals?

You can answer these questions by looking at the "tools" people have used on the land during the time that it has changed. There are only six kinds of tools that directly affect the land.

The Direct Tools

Rest and Partial Rest

Rest (see page 38) means keeping livestock and other grazing animals from eating plants and trampling on the land. It is a "tool" because people can rest land or not rest land as they wish. *Partial rest* (see page 39) has a similar effect. In this case a few animals spread widely across the land for long periods of time will leave many plants untouched while overgrazing others.

In **non-brittle** areas where the air is always damp and rain falls in every season rest allows succession to go forward. In very non-brittle areas rested ground will succeed from bare ground to forest in a short time. Rest will also restore tired crop fields. In **brittle** areas where the year is divided into wet and dry seasons, rest causes succession to stop or go backwards.

- Grass often dies from over-rest.

- In brittle areas where the wet season is very wet, weeds, bushes and small trees will grow on the bare ground.

- In brittle areas where even the rainy season is not good, rested grassland will turn to desert.

- Annual grass will often grow after a good rain on over-rested land, but this is not as good as the perennial grass that was lost. In dry years it does not grow at all.



Look at your land

- Is it brittle? Is it non-brittle? Is it somewhere in between?

- Is perennial grass disappearing?

- Can you find old, grey grass that smothers new growth?

- Is bare ground increasing?
- Are weeds, bushes and small trees increasing?

Did rest or partial rest cause this?

Fire

Fire is natural. It is also a tool, because *people* can set fires whenever they wish. It does sixthings.

Fire burns up dry and dead plants.
Fire speeds up mineral cycling as ashes fall to the ground.
Fire sends many important nutrients into the air as smoke.
Fire sends the energy in the burned plants into the air as heat.
Fire kills seedlings and many small creatures as well as many weeds.
Fire starts some seeds growing and makes some bushes thicker.

- Fire pollutes the air.

People use the tool of fire to:

- Clear fields and kill weeds.

Burn over-rested grass, which grows back strong and green in the ashes of the fire.
Kill bushes and small trees that grow where rest or partial rest has weakened the grass. Fire, however, can damage all four ecosystem blocks, *especially when land burns nearly every year*.

- The water cycle suffers as fire burns up litter and leaves bare ground.

- Even though the ash fertilizes plants, fire hurts the mineral cycle because so much is lost in smoke.

- Even though fire may help old, over-rested grass plants succession suffers because fire kills seedlings and many small creatures that improve the soil. Annual grasses and weeds will slowly take the place of perennial grasses, and certain trees and shrubs that can survive fire will become thicker.

- Even though old grass may grow quickly right after a fire, the total energy flow over several years will be less because so much food goes up in smoke, and bare ground increases.



Look at your land

Are there no old dead leaves and grass covering bare ground?
Is the bare ground between plants hard and baked?
Are there no young plants?

-Are perennial grasses disappearing year by year?

Did burning the land many times in past years cause this?

Technology

Technology is everything that *people* make, buy, or invent to help themselves work the land. It includes: plows, hoes, axes, irrigation ditches, pumps, boreholes, fertilizers, drugs and medicines, poisons for weeds and insects, computers, grain mills, greenhouses, fences, hybrid seed breeding, genetic engineering, tractors, draft animals, and a thousand other things.

Surely, technology can be good or bad and do many different things, but there are some special dangers to watch out for.

- Technology usually costs money or requires labour.

Machines, especially, break and wear out, and caring for them and fixing them also costs money and often requires special skills.
Some technology is addictive. You start well, but you need more and more to do the same job. Then, if you stop, you suffer worse than ever. This is often true of fertilizers, for example.
Often technology solves one problem and creates another. Poison that kills weeds may also poison the water in wells nearby.



Look at your land

What kinds of technology were used here hoeing, cutting wood, building dams or erosion structures, fertilizers, pesticides? What was the effect on the ecosystem?

Living Organisms

Wild plants, insects, and animals are not usually called "tools". They become tools when *people* make them do things. Weeds and pests cause many problems, but often because *people* give them the opportunity. If you grow the same crops in the same place every year, the weeds and pests that enjoy that environment will increase every year.

On the other hand *people* can often use plants, insects, and animals to help. For example:

plants, insects, and animals to help. For example:
There are certain birds that eat ticks and parasites off cattle. If you give them places to nest, and do not poison them, your cattle may

- Bats eat mosquitoes and army worm moths (which fly at night). In some places people build "bat houses" near their fields where the bats spend the day. Then at night they protect the field against these pests.

- Certain plants, including some trees, put nitrogen into the soil. Planting them, or just not cutting them down will give you free fertilizer.



Look at your land

48 What are plants, animals, insects, and other

living things doing to change it?

What are people doing to help them or hurt them?

Grazing and Overgrazing

Grazing is a tool for changing land, because *people* can decide where and when their animals graze. People can often control wild grazing animals also. Sadly, most grazing now is *overgrazing*. Overgrazing happens when *any* animals spend a long time in the same area or return to it too soon and bite off the same plants again and again *while they are growing*. The number doesn't matter. (See page 33).

In non-brittle areas:

- Overgrazed grass plants often lie flat on the ground to escape animals, and grass that spreads through its roots or stems will take the place of grass that depends on seed.

- You will see more weeds and plants that animals don't eat, but the ground will not become bare.

- Patches of very overgrazed plants are often mixed among over-rested patches where succession is trying to rebuild forest.



In brittle areas:

- Overgrazed grass plants will lie flat on the ground to escape animals. Others, and many bushes, will grow thorns and thick branches. The most overgrazed plants will weaken and begin to die in the middle.

- Where overgrazing kills plants, succession brings in weeds and plants that animals don't eat. Bare ground will increase, but much of the bare ground may also be caused by partial rest.

- Where overgrazing is widespread, there will be less litter to cover bare ground.

Grazing as Tool for Improvement

If your holistic goal includes rich grassland, well-managed grazing is necessary.

The key is to harvest the grass before it chokes itself but then give it *time* to recover. In *non-brittle* areas, this will keep succession from turning the grassland into forest. In *brittle* areas you will use well-managed grazing to push succession forward toward diverse perennials. Together with the next tool, *animal impact*, grazing does most of the good things that fire does.



Look at your land

- Do you find overgrazed plants and other signs of overgrazing?

- Do animals stay in one area for weeks during

the growing season? In the past, has the land ever had a plan that reduced overgrazing?

Animal Impact

Grazing is what animals do when they eat plants. Animal impact is everything else that they do to the land - trample, dung, urinate, fight, sleep. Like grazing, animal impact is a tool, because *people* can control when and where and how much animal impact a piece of land gets.

Signs of unplanned animal impact are:

- Animal trails that are hard, bare, and often eroding.

- "Capped soil" wherever the ground is bare, because no animals have broken the crust.

- Manure that is scattered around and dry so it stays outside the mineral cycle.

With good planning, you can use animal impact to:

- Improve the mineral cycle by turning old leaves and grass in to fertilizer, and putting the fertilizer where you need it.

- Heal erosion and improve the water cycle by breaking down the steep banks of gullies and breaking the cap on the soil.

- Change succession by spreading and planting seeds and breaking down brush and weeds.

- Improve energy flow by using animals instead of fire to save over-rested plants.



Look at your land

- Can you see animal impact on your land?

Could you use animal impact better?

Indirect Tools

All the "direct tools" do nothing without human creativity and usually labour and money. These

"indirect tools" are maybe the most important of all.





Money and Labour

Money and labour are considered one tool, because all management requires one or the other and usually both together. When people say that they can't do a job, they most often complain about lack of money and lack of workers. Sometimes this is true, sometimes not.

Human Creativity

Very often communities have enough money and labour to at least begin to manage better, but they do nothing because of fear, anger, mistrust, or bad organization. Even children can usually invent something, if they want it badly enough.

A real example:

This happened in a real village, but we will again call it Makuza. The people wanted a borehole very much so they could water their livestock. They asked the government to drill one for them, but the government agent refused. "There are hundreds of cattle in Makuza," he said. "If every family agreed to sell some, according to the size of their herd, you would have enough money to drill several boreholes. Why do you ask us?!!" "We are afraid," they said. "There would be terrible arguments about the money. How much would each family give? Who would have the right to use this well? How would the money be paid back? Who will fix the pump when it breaks? Outsiders will think it is a government borehole and come to use the water. If the government digs us a borehole, then they will take responsibility for all those things."

They lacked the "tool" of creativity.



A symbolic example:

Without lifting your pencil from the paper, connect all nine dots with only four straight lines. Ask the smartest people you know to do this, and you will probably not find one who can. Most people quickly decide that it is impossible.



We are all trained to never go outside of the box we are given. Worse, we are trained to look for a box to lock ourselves in.



Many problems in life are not problems, if you think outside the square and find new ways to do what has to be done. Anyone can make a list of "squares" that keep us from even looking for new ideas: We're too poor Taxes are too high Politics Low prices Drought Not enough land Weak leadership No education

Look outside your box!!

Using "Tools" to "See" the Story of Land

Imagine Makuza Village, the village for all villages on a hill above a wide vlei. In a village meeting, the people are discussing their problems and the degradation of their land.

Water

- Fifteen years ago a lake that once had fish, a hippopotamus, and occasional crocodiles in it disappeared after a great flood cut a gully that emptied it.
- A stream that once flowed all the time now dries up three months before the rainy season.
- The principal borehole dried out five years ago. The government drilled it ten meters deeper and installed a diesel pump, but at the moment the community has no money to buy fuel for it.
- All the natural springs known in the past have disappeared. However, six years ago a new spring began to flow, which the people called "Surprise Spring". Unfortunately, during a drought in the last year, this one also failed.

The Vlei

- A gully has grown 50 meters a year for 20 years. At the lower end it is as deep as a man. It is this gully that emptied the lake. Now it has cut the community in two.
- At the lower end of the vlei there are no more perennial grasses, but small trees, especially ironwood are now thick.
- A carpet of very short perennial grass still covers much of the upper end of the vlei, but bare patches began to open up during last year's

drought. Small bushes that most livestock will not eat started growing here and there five years ago.

The Hillsides Below the Village

- The slopes were once forested, and large trees remain here and there, but no small ones.
- The soil on the slopes is completely bare by the end of the dry season. The surface is mostly sand, but in some places stones, over a layer of very hard soil.

The Bush

- Here also most of the perennial grass has left. There is much bare ground with a heavy crust.
- The brush has become much thicker. Large areas are difficult to enter.
- Although wild animals are never seen on village land during the day, lions, hyenas, baboons, and occasionally elephants come from a nearby national park and kill livestock and destroy crops.

Fields

- Recently people have begun to plant on much more land, much of it in the vlei where floods often ruin the crop. Several hundred hectares of brush have also been cut down and planted, even in places where the soil is not very good.
- In older fields the soil has lost fertility and harvests are smaller every year.
- A weed, which people once collected for medicine, has suddenly started to grow everywhere. Villagers say that hoeing "just makes it mad". Cut down one sprout and the roots will send up ten.



Why??



The Chief

"When I was a boy, the vlei was all grass. During the crop season, we took the animals to the bush, because the vlei was too wet and it was too close to the fields. When the grass grew tall, we cut all our thatch there. Then the animals were turned in. They stayed until just before the rains came. There were fenced paddocks, so no one from other villages used our land. The Government Administrator made us move our livestock from paddock to paddock every few weeks so plants wouldn't get overgrazed. At the end of the season, we burned the paddocks, to bring new grass and kill the brush.

"Then the war came, and independence, and all that stopped. They drove off the Administrator and burned his house. The fence wire was stolen. Under the new government, the chiefs don't have any power, so we can do nothing. People put their animals anywhere they want and at any time. They even plant in the vlei sometimes now. We fight all the time about that. And look at the land."



The First Wife of the Chief

"What he says is true, but the real trouble is the rain. We've had so much drought during the last ten years. When we were young it was so green around here. Now everything has dried out. Anyone can see it. Our crops have failed five times in the last ten years. The rains used to be long and gentle. Now, if we get any rain, it rains too hard and everything floods. Angry rain! Even the plants have turned against us. This weed! My mother says she used to hunt for that plant all day to make stomach medicine out of it. Now it is everywhere, and it is killing us.

But this is all our fault. We are not living right, especially the young people. They do not make their sacrifices. They laugh at our ceremonies and do not respect their parents. In the cities you see women wearing pants. And there used to be people who could pray for rain, and it came. Who even remembers how!? What can anyone do? And look at the land.



The Chief's Nephew

Those old people may be right in their way of seeing things, but the real problem is not enough land. They took our best land away from us to make that national park. And now there are twice as many people here. We can't make a living without more land. Look, thatching grass still grows in the park. If we weren't so crowded, it would grow here." All three of these people no doubt spoke some truth, and there were other opinions as well. However, all the discussion ended in fierce argument. The traditional leaders and the exfreedom fighters would never agree that the Popular Front political party had caused the trouble. Christians did not believe that only the old traditions could bring rain. Young people did not think rock music had caused the borehole to go dry. Those with jobs in the park said that the village would really starve during droughts without the money they earned there.

Unfortunately none of these arguments could lead to action. Everyone blamed outside forces that they could not change - climate, politics, other people, spirits, God. Why even talk about a holistic goal if we can do nothing?

It is always difficult to handle this situation, but it often helps to discuss the "tools" that have been used on the land. If people can agree on what tool has produced which effect, then they can talk about action. They can change the use of the tool or try another one. Action always leads to hope.

Tools Used in Makuza

The Vlei

Tools: First fire, then partial rest and overgrazing.

Expected result: Repeated fires make ground bare, kill grass seedlings and thicken some kinds of brush. Partial rest and overgrazing will kill perennial grass plants and succession will move to bushes and trees, especially in places that are brittle but not too dry, like most vleis. Worse, bare ground on the slopes and bush above a vlei sends water rushing down in floods that erode gullies. The gullies ruined the lake and dried out the land even more. At the upper end of the vlei, the gully has not yet drained the water from the soil. Perennial grass still grows there, but it will soon look like the lower end.

Bare ground means a bad water cycle.

The Slopes

Tools: Fire, overgrazing, and unplanned animal impact. Overgrazing and unplanned impact were especially bad around compounds, because goats and donkeys stayed in those areas all the time.

Expected result: Fire and overgrazing in a brittle area will make bare ground and slowly destroy perennial grass. At first bushes and trees may move in. Then, as the water cycle gets worse and overgrazing continues, they stop growing also. Unplanned animal impact will cause trails, erosion, and hard ground around all kraals.

The Bush

Tools: Rest, partial rest, overgrazing, and some fire. But most importantly, the war ended the old system of sending livestock into the bush in one herd with community herders. Now livestock rarely go there at all because of the lions from the park.

Expected result: In brittle areas, all of these tools increase bare ground and kill perennial grass plants. Water cycle, mineral cycle, energy flow, and succession all suffer.

Fields

Tools: New technology was used on the fields since independence. The main tools were ox-drawn plows and chemical fertilizer. Fire was used to burn weeds along the fences, and unplanned animal impact was used all through the dry season.

Expected result: The plows kill weeds and make planting easier, but they also dry and pack soil. This hurts the water cycle and increases erosion. With chemical fertilizer people can plant the same crops in the same fields year after year without rest. However, each year they need more

fertilizer as living things in the soil die. This also makes the soil hard and makes the water cycle worse.

Plows allow people to farm much bigger fields. Big fields planted the same way every year make a perfect home for weeds. Succession will always find one that takes over.

Water

All the tools used in all areas hurt the water cycle. It is no surprise that rainwater now runs off the land in floods and boreholes have dried up. That explains even the "Surprise Spring".

When the land was healthy, the spring did not flow because the grass and trees used most of the water. When the grass died and many trees were cut, water ran out of the ground. Then, as the bare ground became hard and the old dead plant roots disappeared, rainwater no longer soaked into the ground at all, and the spring died.



What happens now?

After much discussion, the people of Makuza could agree that they had to change the tools they were using on the land, if they wanted to reach their holistic goal. They would need creativity and maybe a little bit of labor and money. Most of all, they would need to trust each other and work together.

Certainly they will discuss many different plans. The next chapter tells how to decide which ideas will lead to a holistic goal.

Making Decisions The Seven Tests

In the spirit of Holistic Management you should consider using all the tools that allow us as human beings to manage the ecosystem in order to achieve our goals - something that other animals cannot do.

How do you decide which tools to use and how to use them?

In the folklore of people in all parts of the world there are stories that tell about a crisis or threat that defeats all the strongest heroes of the village. Then someone steps forward who is poorer or younger or smaller than others. Frequently the surprise hero is a woman who speaks after the men have failed. And that person passes all the tests and saves the village with new ideas and clearthinking.

The lesson of these stories is that it is dangerous to only consider the opinions of experts and powerful people. Better to gather ideas from all sides, from young and old, men and women, rich and poor. But then you still must decide what to do. How do you recognize the best idea? How do you know when an old tradition, long abandoned, should be revived? How can you tell when an ancient custom can no longer help solve today's problems?

Holistic Management is sometimes called a "way to make decisions", and in fact it is a way to choose tools and actions that will lead toward the quality of life, forms of production, and future resource base foreseen in a holistic goal. This chapter gives seven tests for finding the ideas that will save the village and guide it toward its holistic goal. Anyone young, old, rich, poor, wise, or foolish can ask these questions at any time, in the meetings of leaders, in family discussions, in conversations in the market. You may not need all seven questions for every decision, but you should consider them all.

Sustainability

The questions are:

What will the plan do to the four pillars of the ecosystem - water and mineral cycles, energy flow, and succession?

And

If you take this action, will it lead toward or away from the future resource base described in your holistic goal?

When your action will directly affect your land, you have to know two things to answer this question.

How brittle is the area?What "tool" will the plan use?

Remember, the six direct "tools" - Rest, fire, grazing, animal impact, living organisms, technology - are not the only ones. Do not forget the others -Money & Labor and Creativity. A small decision can often kill or unleash these forces

Consider:

A plan to lend money to farmers? A tax on livestock sold in the market? A subsidy for truckers who haul fire wood. Emergency food for drought relief? Building a school? Sending your children away to school? Keeping your daughter at home to work?

What would any of these ideas do for your land? The answers may not be clear, but thinking about them is important.

When a proposed action does *not* directly affect land, still test for sustainability!

Consider:

How might changing the quality of a product you sell affect your business in the long term? How might your participation in a community project affect relations with your neighbors?.

The Weak Link

Every chain has a weak link. That link will break, if the chain is pulled too hard.

Nothing you can do to the other links will make the chain stronger. The links in the chains that will pull you toward a holistic goal are made of actions, people, and plants and animals, and there are three chains to think about. Usually only one of the three is important in any decision. The question is always:

What is the weak link?

The Chain of Action (Social)

To do anything, even the *wrong* thing, usually means meetings, discussions, contacting authorities, settling arguments between people, finding money or labor or both, training people, learning rules, training, and many other small jobs. These are all links in the *Chain of Action*. The weak link might be:

- -Families fighting
- Problems with neighbors
- -Lack of training
- -Political opposition
- Poor organization in the community.

Find the weak link and fix that. Doing anything else first will be a waste of time.



The Chain of Wealth (Financial)

Most holistic goals list wealth and prosperity as part of a good quality of life. The *Chain of Wealth* leads from the sun to the land to the production from the land to the wealth needed for a good quality of life. It is really the same as *energy flow*.

The links in the chain of wealth are:

- Turning the sun's energy into plants.
- Turning plants into products for market (livestock, vegetables, grain, carvings, etc.)
- Turning products into money
- Turning the money into something useful, if possible something to fix a weak link.

To have more wealth, you must find the *weak link* and strengthen it.

Examples:

If your cows are starving, you must strengthen the sun-plant link by finding more land or growing more food (better energy flow). You should not buy more cows.

If much of your grass is wasted and over-rest is a problem, or if your land is full of plants that your cows can't eat, then you must strengthen the plantanimal link. Get more cows or get goats and sheep to eat plants that the cows don't. More plants will not bring more wealth, if you have no animals to eat them.

If you have plenty of animals, and they have plenty of feed, but you cannot sell them or use them, and they do not give you a better quality of life, then the animal-wealth link is weak. You must find a way to get more benefit from what you have.

The Chain of Life (Biological)

Life is a chain from birth to death. A seed falls. It sprouts. It grows up. It makes more seeds. It dies. Animals and people follow the same chain in their way. If you want to help a particular plant or animal, you must look at its *Chain of Life*, and strengthen the weak link. On the other hand in the case of a weed or a pest that you want to get rid of, look for the link that is easiest to break.

Examples:

Suppose you want to restore a forest to supply wood for building. Maybe there are no seeds. Maybe there are plenty of seeds, but animals eat them as soon as they sprout. Maybe the spouts grow but are cut for firewood when they are still bushes. If in fact all the young sprouts disappear before they grow because of unplanned grazing, then arresting people for gathering firewood will not save the forest. On the other hand, suppose you want to get rid of grasshoppers. Killing adult grasshoppers is difficult and usually too late. They have already eaten their fill. Many will have laid eggs. The weak link in the life chain of grasshoppers is the egg. Grasshopper eggs only survive well in bare, dry soil. If you can change your management to keep the soil covered and damp, most of the eggs die.

The next weak link is the time before young grasshoppers can fly. Birds, toads, chickens, spiders and other predators eat millions of them. Management that encourages these "living organisms" will break this link of the grasshopper chain.

Cause and Effect

Use this test when you want to fix a problem on the land or with people. You will make many decisions that are *not* about fixing problems. For example: You are not trying to solve a problem on the land when you ask, "Should I sell my maize crop or keep it for the family to eat?" However, "Should I buy fertilizer to make my tired field grow more maize?" is a decision about a land problem. The question is:

Does your idea cure the cause of the problem, or does in only make the effect less painful?

If rain comes through your roof, you can fix the thatch or you can move your bed. Fixing the thatch cures the *cause*. Moving your bed only makes the *effect* less painful.

Most land problems are *caused* by the tools used on the land. So, fixing land problems will mean changing the way the tools are used or using different tools.



Example:

The soil is bare on slopes above the vlei at Makuza village. That is the problem. Fire and overgrazing are the tools that *caused* the bare soil. You might improve the water and mineral cycles by digging erosion ditches across the slope. You might try to improve succession by planting grass and bushes. These ideas may make the effects of the bare ground less painful, but the problem will not go away until you change the way you use the "tool" of grazing. (Fires have stopped, because the ground is bare.)

Energy and Wealth, Source and Use

This test is most important for decisions about technology and spending money, especially when the holistic goal includes independence and sustainability. There are several questions:

Do the money and energy for this project come from the land itself (the chain of wealth), or must you borrow or beg from outside?

Example:

You can dig an irrigation ditch with oxen and hand labor or with a bulldozer and diesel shovel. Even though the oxen and men work slower, all of the energy and money comes from the land. The community will not have to beg or borrow money from outside or pay for machinery or energy like diesel. *Is energy and wealth taken from the land in a sustainable way?*

Example:

Firewood is energy from the land. It should pass this test better than diesel, paraffin, or coal that costs money and some day will be used up. However, cutting wood in a way that destroys the forest forever does not pass this test.

Sometimes, of course, you will use outside help, machinery, and fuel. Then the question is:

Does the money build something that will last for a long time, or will you have to buy the same thing over and over again?

For example:

With chemical fertilizers, you can grow the same crop year after year in the same field. *But*, every year you must buy more than the year before. Then, if you stop, the field dies. The same money spent on kraals, or fences, or an irrigation ditch, or a road, or drainage, would build something that would last for years. It would help turn more of the sun's energy into wealth every year without much more expense.



Marginal Reaction

This is a test for deciding between two ways of doing the same thing. A "margin" means "something extra" and "marginal reaction" is "what you get for doing something extra. The question is:

What will bring you farthest toward your holistic goal for the smallest extra amount of money, labor, or trouble, this year?

Example:

Your holistic goal includes enough food, even in drought. Should you use your time to mulch your field to cover the soil and improve water and mineral cycles or build a kraal so you can keep livestock. This year the mulch may give you the biggest *marginal reaction*. Later, when your soil is healthy, the kraal may give a bigger *marginal reaction*.

Gross Profit

If profit is in your holistic goal, you use this test to help decide what businesses to build. It is the only test that always requires numbers and mathematics. The question is:

For each business, how many extra dollars (or francs, rand, pound, etc.) will you get back for each one that you must spend on that business?

Example:

You are thinking of: a) buying a mill. b) planting cotton. c) buying cattle and placing them with a family to herd them. Each of these will require money. How much will you get back each year for each dollar (rand, pound) you spend. Remember, your labor is also a cost.

Society and Culture

The question is:

How do you and the other people in your "whole" feel about your decision?

This test is perhaps the most important of all because no project will succeed if many people have strong feelings against it. Often projects that are technologically and economically good touch a cultural, religious, or social issue that makes them unacceptable. Talking about these issues demands sympathy, honesty and trust, because many people don't like to discuss them publicly. However, if they are not settled, no action will succeed. The government offers to build fenced paddocks for a grazing scheme, but they insist that people pay \$200 to join a grazing cooperative before they use it. Also, only cattle can graze there. In that community only a few rich families own cattle and can pay the fee. Most families own goats. The scheme fails the *society and culture* test. No one in the village is surprised that every night some of new wire disappears until the whole scheme fails.

Example:



Using the Seven Tests

The seven testing questions will always make a decision better. They do not always make it easier. Practice helps, and there are a few rules.

- Always have a three part holistic goal in mind.

The best decisions come when the people of the "whole" agree on a written holistic goal, but you do not have to wait for that. You can test any decision, if *you* have a holistic goal.

Example: The community is discussing a new well. Anyone can say, "My goal is stopping fights with our neighbors who want to use our water (Quality of Life), because we all graze our animals in the same area (Production), and I'd like to see our dried out springs come back (Future Resource Base). Is this plan going to fix the cause of these problems (bare ground) or just make them less painful for a while?

- Gather all the information you can and discuss the decision in the familiar way before using the seven tests.

The tests do not substitute for understanding the situation or change the need to know all the facts. They only help decide which actons will get you to your holistic goal most quickly.

Example: You are considering starting a cooperative to gather, transport and sell firewood. You need to know all the regulations, prices, and other people who will be involved by this as well as their politics. While this information is collected and discussed it may become clear to everyone that this

project will*not* help reach their holistic goal. If you think it might, then use the tests.

- Be sure you test only one decision at a time, and take the simplest one first.

Example: Your daughter asks, "May I have money so I can go to the city and get training as a nurse?" That is several decisions:

> Should she get more training? Should she become a nurse? Should she go to the city? Should she have money?

Test these one at a time.

If you can't answer a test question quickly and easily, drop it and go to the next one. Especially, don't worry about cause and effect, if the decision is not about solving a problem. Also, there are three chains in the weak link test, but most decisions only use one of them. Example: Does sending your daughter to the city pass the *Gross Profit* test? Is her training going to fix the cause of some problem? These questions are interesting, but maybe there is no problem, and maybe her Holistic Goal includes helping others but not becoming rich.

- An argument often means no one has enough information to answer the question.

Example: You are arguing over whether to plant cotton or ground nuts. Which one will give you the best *Gross Profit*? You say ground nuts, because you made money last year, and your neighbor's cotton failed. Your son says cotton, because the price of cotton has gone up. You cannot begin to settle this argument, until you write down all the numbers and prices and learn why your neighbor's crop failed and think through all the risks.

- An argument often means you have forgotten your holistic goal or it needs to be changed or the whole needs to be bigger. Example: The leaders of a village decide to stop unplanned grazing. The holistic goal is to cover bare ground and let *succession* bring back grasses and other plants that have disappeared. However, fences are cut and stolen in the night, and some livestock is even killed. Did the *whole* include the people who cut fences? What was *their* goal? The holistic goal called for "prosperity" (Quality of Life) but the community really wanted "prosperity and harmony". The leaders had made a plan that would give most of the prosperity to people who were already rich.

 If an idea fails several important tests, look for ways to improve it before throwing it out. You may have to accept a bad idea, but you can often change it to help reach your holistic goal anyway.

Example: A small drought destroys village crops, because unplanned grazing and growing cotton in the same fields for too long has ruined water and mineral cycles. Fortunately, an international development agency sends free bags of grain. This may pass *Society and Culture*. Without help, the village will die. However, it fails *Cause and Effect*. Can food change bad grazing and farming?

Why not? If the holistic goal includes healthy land, the people who have no crops to harvest might work for their food by building fences or kraals to improve the grazing or spreading manure and mulch and stopping erosion in the fields. The food aid could also work in other ways. If the holistic goal included education the food could pay people to make bricks for a school.
Using Your Animals

Unplanned grazing and animal impact are the "tools" that cause many problems:

Bare ground Loss of perennial plants Weeds Erosion Starving animals during the dry season

These problems usually mean unhealthy water and mineral cycles and a weak energy flow. Succession goes down.

To reach a holistic goal of covered soil, perennial grass, healthy communities of plants and animals (high succession), and low erosion, you must change the way you use *grazing* and *animal impact*.

Grazing

The easiest and most important change you can make is TIME. To manage time well you don't need more land, and you don't need fewer animals!!

- During the growing season, give plants, especially grasses, enough *time* to grow back after animals bite them off, and the land may improve quickly.
- During the dry season you manage *time* so your animals don't eat the best forage at the beginning and starve at the end.

You manage time by:

- Putting animals together in large herds that stay together while they graze.
- Moving the herds from one grazing area to another - at least 10 areas but 100 or more, if you can.

For the growing season the key principle is:

<u>Fewer</u> herds and <u>more</u> grazing areas mean more <u>time</u> for plants to grow.

Even a big herd that does not stay long in one place cannot bite off new leaves while they are growing back.

The herd should move from one grazing area to another, and it should not come back to the same place before the plants are ready to be grazed again. These drawings show how more grazing areas make more *time* for plants to grow back.



<u>Ten</u> cows on the veld for <u>six weeks</u> will overgraze many plants as they look for the fresh new leaves that grow back on the plants they have bitten before. Other plants are over-rested.



<u>Ten</u> cows in the same veld divided into <u>two</u> grazing areas still eat the same amount of grass, but all plants now have at least three weeks of **TIME** to grow back.



The same ten cows still eat the same amount of grass in six weeks, but now all the plants have <u>at least five weeks</u> to grow back.



If a herder moves his animals every day for 42 days, plants have <u>41 days</u> to grow back.

The more grazing areas, the better. It is difficult to stop overgrazing with less than 10. With only five or six areas, animals must stay a long time in each one or they will come back too soon. *But*, when plants are growing fast, many will get bitten twice before the herd moves. When plants are growing quickly (2 cm/ day) a herd should move at least every three or four days. *But*, this quick-growing grass might be ready to graze again in 30 days or even less. When plants grow slowly, a herd may stay in one place much longer, and the longer they stay in each area, the more time each area will have before they come back. **During the non-growing season** the key principle is:

Manage time and grazing areas to make sure your animals eat well.

In each grazing area the animals will eat a mixture of rich and poor plants.

- As the herd moves through the grazing areas, you can easily tell how much forage they have eaten and how much they have left for the rest of the season.
- Even at the end of the season each new grazing area should have almost the same mixture of rich and poor plants that it did at the beginning.

These drawings show how animals graze. if they are scattered across the land.



First they will eat all the best food in terms of protein, energy, and fiber.



Next they will choose plants that are not so good, because they contain less of what the animals need to remain healthy.



At the end of the season only the least nutritious plants will be left, and during the season it is very difficult to see how much forage they really have eaten until it is all gone.

These drawings show how stock eats the same food when land is divided into grazing areas.



In each area they eat both rich and poor plants, taking what they need to balance their diets. Old Grass is likely to be trampled down in place.



Very soon, you can see if the food will last until the end of the season.



Even at the end, the animals still will have both rich and poor plants.

Animal Impact

Often succession will not go forward, even after overgrazing has stopped, because too much *rest* is causing the problem. If the animals are always calm when they visit a grazing area the "tool" is *partial rest*. All the rest of the year the "tool" is *total rest*.

A big herd that moves often, gives the land more animal impact than many small herds scattered over the land, but you can do more. Bad patches of bare ground, capped soil, overrested plants, weeds and bushes, or erosion may need more trampling. When you move the herd to water or from kraals to the grazing area, you can often plan to give *animal impact* to these special places.

Feeding maize husks, millet stalks, or salt in these places will also give them more animal impact.



Water

If you can manage your stock in a large and very dense herd that gives plants and soil a lot of animal impact, and if you move them over a large area so plants and soil get a lot of time to recover before the herd comes back, you will have the best land.

Often, however, water problems make this extremely difficult. A large herd drinks a lot. Also, they have to all drink at the same time, if you want to keep them together. If you are planning a new water or borehole or asking a government agency to construct one, you should think hard about where to put it, the storage tanks and drinking troughs required, and who will manage maintenance and use.

For big herds, especially in an area used by other villages, nomads, and wildlife, putting a new water point right next to your village may be a bad idea. Plan carefully with all the people who will use it, including your neighbors and any groups who use the area seasonally. A thoughtful plan also helps win support for the project.

Usually, however, you will have to do the best you can with what you have. It won't be perfect, and it will mean organizing PEOPLE. Every case is different, but here are some common ones. Problem: Many small springs and wells.

Solutions: Small herds are watered daily by owners, then combined in one herd for the day's grazing.

Storage tanks are dug by each water point (can be lined with cheap plastic sheet) and teams draw water in advance according to a schedule.

Problem: Big central water source where herds often wait for hours for their turn to drink.

Solutions: Schedule arrival times to eliminate waiting.

Problem: A lake or river bank turns to stinking desert because many herds crowd into it and stand for long periods.

Solution: Schedule big herds to arrive at different times and limit access with fencing. (Change this as needed to control animal impact and overgrazing and rest to areas where your holistic goal calls for brush and trees.



Aide Memoire for a Simple Grazing Plan

In holistic management you make a plan, evaluate your progress as you carry it out, and correct the plan as soon as you see it going wrong. You usually plan grazing twice a year - once for the growing season, and again for the non-growing season. In the first plan you want the land to produce as much forage as possible. In the nongrowing season plan you try to make your forage last until new growth starts. You make this second plan at the beginning of the non-growing season.

The planning can be very simple. You want to have your animals together in one herd if possible and move them from one grazing area to another. The grazing areas do not need fences, if herders agree on the boundaries, and they are well marked for others who may use the area. The time animals spend in each area will depend on the richness of the forage, the number of areas, and the rate of growth. You can also plan to create animal impact in key places by using salt, supplemental feed or herding.

The Growing Season

- You will manage the land, the animal, and wildlife so that:
- The veld grows as much forage as possible every year.
- Care of livestock, crops, and other activities all fit together
- You move toward your holistic goal.
- The plan passes the seven tests.

Step I - Make a map of the "Whole"

You may make this map in the sand as a group, but you must also make a copy on paper. It should show details like kraals, water points, houses, and landmarks. It should be close to real scale. Areas that are big should be big. Areas that are small should be small.

Printed maps and aerial photographs are helpful if the scale is large. You can cover them with plastic and draw on the plastic with felt pens. It is best to plan with special felt pens that you can erase.

The map should show everything that is important for management

Kraals Dips Water points Crop fields and gardens Vlei, bush, fallow land, forest, etc. Poison plant danger Special plant communities (medicines, thatch, etc.) Problem areas (floods, insects, fires, etc.) Driveways and roads.

Step II - Decide the grazing areas

Divide the land into grazing areas and mark them on the map. Make as many as you can, but try to have at least ten. For each grazing area think about:

- Water
- How animals will go there and come back
- Where animals will stay at night
- Care (Young animals, milking, breeding, etc.)
- Special problems (nearby crops, land arguments, flooding, etc.)
- How to mark the boundaries.

Give each area a name or number so you can discuss it with others. This step will need a great deal of thought and discussion. There are literally hundreds of possibilities for any situation. Most of them will not look at all like the drawing on the page 81. Grazing areas (paddocks) may fan out from central kraals or water points like the spokes of a wheel. You may have corridors for rapid movement of stock to water between crop fields. You may build new kraals far from settlements. Consider all possibilities. But remember:

Fences may be useful to protect crops and save labour costs in countries like the USA where herders are difficult to find, but they are expensive, your neighbors probably won't like them and may steal the wire, and you can't change them easily when you change your plans. But most of all, you would have to build a great many to handle animals as well as a few good herders can.

Example:

You have marked out 20 grazing areas (paddocks) with 20 approaches to water and kraals, but while your herders use each paddock they graze a different small piece of land each day. If they do this for ten days in each paddock, they will graze 200 places for one day each, and plants will have 199 days to recover. This should give good results on your land and good feed for your animals.

Step III - Decide recovery periods

A plant needs time to grow back after an animal bites it. In brittle areas where the rain is often poor it may need 150 days or more. In many non-brittle areas and when rainfall is good, it may need only 20 - 40 days. In irrigated pastures maybe 15 - 30. A drought of course changes everything.

This aide-memoire is based on a recovery time of 90 days. That is safe for most places, *but you must make your own judgement*. During times when plants are growing very fast (more than 2 cm a day that you actually measure) you may shorten the recovery time to as little as 30 days.

If you have ten grazing areas, and your herd stays 10 days in each one, then all will have 90 days recovery time, and the whole cycle takes 100 days. If you have more than 10 grazing areas, you get even more recovery time and shorter grazing times. For your first plan, it is usually safe to use a 100day cycle, but if you want more than 90 days recovery, use a longer cycle.



Step IV - Decide grazing times

Collect pebbles or markers for the days in the cycle (100 for a 100-day cycle) and distribute them among the grazing areas on the map. Give more to the areas that are richer or bigger. Give less to poorer areas. If one promises twice as much forage as another it will get twice as many days (pebbles) of grazing.

Step V - Plan the grazing

You need your map and a "time line". The time line can be drawn in the sand, on paper, or on a chalk board. It is a line marked off in days like a tape measure.

The map on page 81 is surrounded by a time line that shows a growing season that goes from October 1 to the middle of March, about 165 days.

Mark on the line the days that the herd will spend in each grazing area. From the pebbles you know how many days the herd should stay in each area when growth is slow. Identify the areas along the line so people can see on the map where the herd will be on each day. You may use symbols of some kind or push sticks into the sand. If you use paper do not use permanent pens or markers, because there will be a *lot* of discussion about this and you will make many changes.

- Is a grazing area really free?

- Do you want the herd in a certain area at a certain time?

- Where do you need to keep forage for the nongrowing season? (You will want to give that plenty of time to grow back.)

- Can you avoid starting in an area that you grazed at the end of the last growing season?

Check all the recovery periods on the time line. Are they all close to 90 days? Probably some

areas are grazed once and others twice. If you drew this line in the sand, copy it on paper and put it on a calendar.

Step VI - Following the plan

Dividing up the grazing times among several grazing areas will help stop overgrazing, but skillful herders who move their herd day by day (or even hour by hour) through each area will help the land very much more.

In the illustration there are only 15 main grazing areas, but in practice there may be 100 or more if herders keep their animals together and move them day by day.

By far the best plan is to move *one herd* to new ground every day like the illustration shows, but very often life is much more complicated. Maybe there are nomads that come through the area. Maybe there is one herd of goats and sheep and another of milking cattle. Maybe some families refuse at first to put their livestock into the community herd, but they share the holistic goal. With good herders these herds can stay separate but all go into the same grazing area according to the grazing plan.

Always be flexible and aware of reality. No plan will be perfect. At the beginning, many places may continue to degrade - water points and driveways for example. While you look for solutions, you can accept this if most of the land is improving toward your holistic goal. However, you must act to change the plan whenever your observations and common sense justify it. - Watch how fast plants grow after they are bitten. Perennial plants are most important. Put a stick in the ground beside grazed plants and look at them every day.

- The most dangerous mistake is to come back to a grazing area too soon. Especially in drought, the animals themselves will push their own herders to move quickly to new areas. In fact they must move slower! You can only give plants more recovery time by staying longer in each area.

- Also dangerous is staying too long in a grazing area when plants are growing fast. Plants will bite new leaves before the plants have recovered. This can happen when there are only a few grazing areas and you do not change the plan when plants grow fast. It is not a problem if you have more than 30 grazing areas or herders who move often.

- If you don't know if plants are growing fast, follow the plan for slow growth (150 days recovery or more).

- Don't forget animal impact. The grazing plan will stop overgrazing, but often most of your problems come from rest and partial rest of soil. If animals only visit an area three times a year and are always calm and slow, the land will get three short periods of partial rest and most of the time total rest. Use salt, extra feed, or herding as often as you can to make real animal impact wherever you need it most.



The Non-Growing Season

Step VII - The number of animals

Except in time of extreme drought, very few animals starve during the growing season, so the number of animals is usually not a problem then. With a good grazing plan you can feed many more animals than you did before, and you are now using them as a tool to reach your holistic goal. With more animals you can create more animal impact.

Nevertheless, if your livestock finish all the green food and begin picking up litter *well before* they are supposed to move to the next grazing area, you may have too many animals. Think before you sell any, however. Is the grazing area too small? Can you change the plan? Can you combine several herds together so you use more grazing areas?

Key Principles

- Plants don't stop growing at the same time. Perennial plants and the plants in vleis and wet places may keep growing after annual plants are already brown. Overgrazing is still a danger for these plants.

- Overgrazing is not a danger where plants have truly stopped growing, but management of time is still important for crop fields, wildlife, water resources, etc.

- As in the growing season, it is best to plan as many grazing areas as possible. Management is simpler if you keep the animals in a single herd, but you have more flexibility than during the growing season.

- Normally you plan for your animals to move through all your grazing areas only once. Otherwise, they will take the best forage from all of them early in the season and leave nothing for the end.

- Always plan a "time reserve". That means, you plan for the months until growth should start plus extra time in case it doesn't.

- If you plan to put the animals on crop fields be sure that a dense herd never stays in one place more than one or two days. Keeping many animals on the field for a long time will pack the soil.

Step I - Make a map of the "Whole"

You may use the same map as before, but think about differences.

- Water points that dry up.

- Land traditionally used only in the non-growing season.

- Crop lands that are now open for animals.

Step II - Decide your grazing areas

You may need to change your grazing areas. Put as many on your map as you can. Again, the best plan is to have herders that move a single herd day by day. But, grazing areas on a map will help you make a plan that fits your holistic goal. Also people can discuss the plan better when they can see a map.

When you decide on grazing areas, think about:

- Crop fields
- Water

- Fire, theft, wild animals, neighboring herds, etc.

- Areas already grazed at the end of the growing season.

Step III- Decide the length of the plan

You should plan for the time until you *hope* growth starts *plus* extra time in case it starts late.

Example:

Your plan starts in mid March, and you expect rain October 1 (200 days), but sometimes nothing grows before November 1. So you plan for 230 days.

Step IV - Decide how many days of forage each area must give

Gather stones or markers for the days in the plan (230 in the example), and distribute them among the grazing areas on the map according to the value of each one. Give the richest areas more, and the poorest areas less.

You now know how many days each area *must* feed your animals, so they will live until growth starts again. You don't know yet if the forage is really there, but you will soon find out.

Step V - Plan your grazing

You need your map and a "time line". The time line can be a line in the sand or on paper or on a chalk board. Mark the line like a measuring tape with the days in your plan.

Now, mark along the line the time you will spend in each grazing area. The stones tell you how many days you can spend in each area. Put sticks in the sand or draw symbols to show which grazing areas are marked.

Normally a herd should go through all the grazing areas once before new growth starts. For each grazing area save enough stones so your animals can go through them all a second time if growth starts late.

In practice, every plan will be different. If your herders can move all the animals day by day, they can graze the land in hundreds of different ways. However, they must be able to remember where they have been. Then they can always see how much land remains for the rest of the season.



Step VI - Use the plan to foretell the future

During the growing season, animals almost never starve. Hunger comes in the last months of the non-growing season. When you know that your forage will be gone two months before rains come you can:

- Make plans to take your herds to better land.
- Buy feed while the price is low.
- Sell animals while the price is still high.

By following your plan, you will quickly see how long your forage will last.

- Start in one of the smallest grazing areas in your plan.

- If your animals eat all the grass before you plan to move them, you should worry about problems later. (Animals should not have to eat all the litter off the ground.)

- If the same thing happens in the second and third grazing area, you can probably figure out exactly when you will finish all of them.

- On the other hand, if your herd stays in the first grazing areas for all the days in the plan and still leaves something, you can be sure that all will go well until the end of the season.

Example:

You have 15 grazing areas for 230 days from mid March to November. Your plan shows eight days for the first grazing area, but the feed is gone after six. This happens again in the second grazing area. If that happens in all grazing areas, you have forage for only 3/4 of your 230 days. It will be finished by the end of August, but you have over four months to prepare.

On the other hand, suppose the rainy season was poor. Everyone is panicking, but you have been through the first two or three grazing areas in your plan without any trouble. You will be happy to know that your animals will in fact survive.

