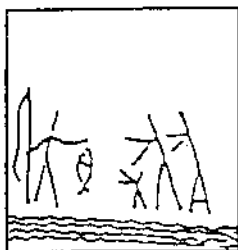


COMMUNICATION CENTRE OF SCIENTIFIC KNOWLEDGE FOR SELF-RELIANCE

Under the auspices of the United Nation University
with the participation of the International Council of Scientific Unions



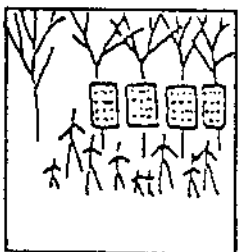
LAO TSE TOLD :
IT IS RIGHT
TO GIVE FISH TO THE
HUNGRY.



IT IS BETTER
TO TEACH THEM
HOW TO CATCH FISH.



BUT
WHAT TO DO
WHEN MANY MILLIONS
ARE HUNGRY?



IT IS BEST
TO TEACH THEM
HOW TO PRODUCE THEIR
FOOD THEMSELVES.

ENVIRONMENT AND SELF-RELIANCE

Yona Friedman & Eda Schaur

Communication Centre of Scientific
Knowledge for Self-Reliance

33 BD Garibaldi, 75015 Paris, France



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Environment and Self-Reliance

Yona Friedman & Eda Schaur

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FOREWORD

Vigyan Prasar has been bringing out a number of publications on a variety of topics of science and technology. Popular Science classics, India's Scientific Heritage, Natural History, Health, and Do-it-yourself are some of the series that evolved over the years. The emphasis has been on bringing out quality publications on various aspects of science and technology at affordable prices. Further, Vigyan Prasar is putting in efforts to bring out publications in major Indian languages for various target groups.

The present book, *Environment and Self-Reliance* by Yona Friedman and Eda Schaur is a reprint of the book originally published by Human Resource Development Foundation, New Delhi. We are thankful to Shri B. Khan, Managing Trustee of the Foundation, for the permission for its reprint. We are thankful to Shri Arvind Gupta for bringing this book to our notice. It is hoped that the book would prove to be useful for school children undertaking projects on environment and help in tackling environmental issues.

New Delhi
April 30, 2003

V.B. Kamble
Director
Vigyan Prasar

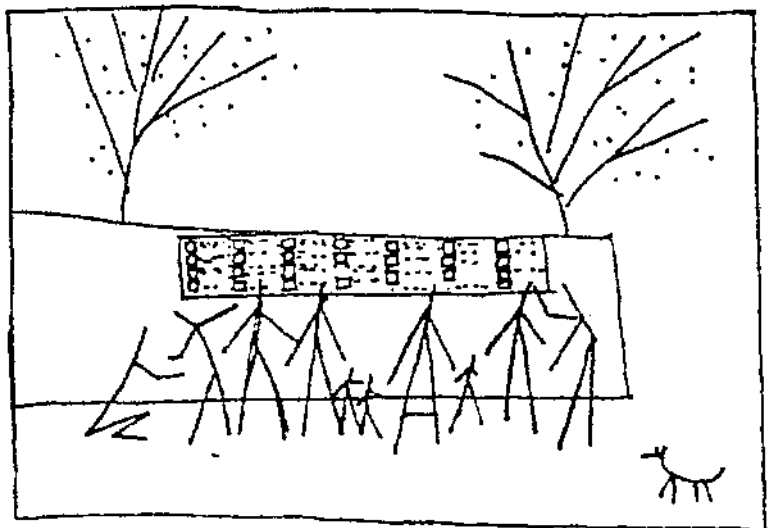
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INTRODUCTION



Communication for Self-Reliance

Today we find ourselves in a multifaceted, global crisis that touches every aspect of our lives: our health and livelihood, the quality of our environment and our social relationships, our economy, technology, our politics - our very survival on this planet. The nations of the world have stockpiled more than 50,000 nuclear warheads, enough to destroy the world several times over, and the arms race continues at an undiminished pace. While worldwide military spending is more than one billion dollars a day, more than fifteen million people die of starvation annually - thirty two every minute, most of them children. Developing countries spend more than three times on armaments as on healthcare. Thirty-five percent of humanity lacks safe drinking water, while nearly half of its scientists and engineers are engaged in the technology of making weapons. Economists are obsessed with building economies based on unlimited growth, while our finite resources are rapidly dwindling, industrial corporations dump toxic wastes somewhere else, rather than neutralizing them, without caring that there is no 'sink' on mother earth. Modern medicine often endangers our health. The scourge of HIV/AIDS is threatening to wipe out entire nations in Africa and Asia.

While the world's ten percent rich, corner and control over eighty percent of the world's resources, the poor are left to fend for themselves in shanties and ghettos. Diseased and ill fed, the poor in the Third World — deprived of any 'social security net' have been pushed to the very brink of survival. Amidst mounting foodstocks, the poor still starve to death, as governments often have no mechanism to even dispense 'charity'.

It is in the context of this grim social scenario that the work of Yona Friedman — a French architect and humanist of international repute, becomes so relevant. Friedman was born in Budapest, Hungary in 1923. He studied at the Technical University in Budapest, before continuing his training at the Technion in Haifa, Israel. In 1957, Friedman set up a studio in Paris and continued his work from there. His belief that an architect, rather than having an autonomous point of view, should instead be there to serve the users and offer advice on technical and organizational matters, gained him few allies among the professional fraternity of architects.

In the early 1960s, he made animation films for French television based on African folk stories; he developed a computer programme with which the user could design his own apartment; and he advanced the sociological definition known as the critical group-size, which dealt with the communication among groups of people.

Friedman also devised his own special visual language to communicate 'life skills' and 'survival skills' for self-reliance to ordinary unlettered people. 'A picture is worth more than a thousand words' — that people always think in images and pictures and not in words, is the bedrock of his strategy. To communicate scientific knowledge to the poor, Friedman uses a 'sign' language — a small hieroglyphic matchstick figure, accompanied by a few words. His nonthreatening, exquisite artistry, coupled with his humanism has blazed an entirely new path in the realm of science communication. His message, simple and direct goes straight to the heart.

Along with his able assistant Ms. Eda Shaur, Yona Friedman has been able to create over 300 picture manuals on a very diverse range of survival skills for the benefit of humanity at large. The topics range from environmental education, architectural self-planning, minimal kitchen gardens, growing food on shelves, fighting the drought, disaster prevention, health and nutrition, safe drinking water, basic sanitation, water harvesting etc.

These cartoon strips have been serialised in hundreds of newspapers and magazines across the world. Full credit goes to Mr. B. Khan — ex-editor of the science magazine *Invention Intelligence* for making a host of these picture manuals available to the Indian public for the first time. It is with the kind permission of Mr. B. Khan that the present volume is being printed. Like most visionaries, Yona Friedman's work is in the public domain, and it is hoped that the publication of this volume will inspire its translation into various Indian languages. These books have already been published in Hindi, Marathi, Oriya and the Tamil Nadu Pollution Control Board has recently commissioned the Tamil translation. It is hoped that these books will give fillip to the printing of Yona Friedman's other picture manuals.

Friedman was also commissioned by UNESCO to make various studies of housing issues in Third World countries. A few years back, Friedman won the coveted *Japan Award* for designing a low-cost roof for the Third World. Under the auspices of UNESCO, he built the Museum for Simple Technologies in Madras (India) in the early 1980s.

Friedman never actively allied himself to prominent groups or movements within the world of architecture or urban planning, but through his teaching activities and publications (over 500 articles and several books), his ideas have become widely diffused.

Today 'environment education' is the buzz word in progressive schools. Recent school campaigns in curbing the use of plastic bags, and crackers during the festival of Diwali have borne heartening results. Friedman's simple manuals could be very effectively used by school children for undertaking projects and tackling real environmental issues. For issues like Environment and Energy are too precious to be left to the mercy of experts. We all have a stake in the environment, specially the children.

As Chief Seattle — the wise and widely respected Red Indian Chief said in his most eloquent statement 150 years ago:

This we all know:

All things are connected like the blood that unites us.

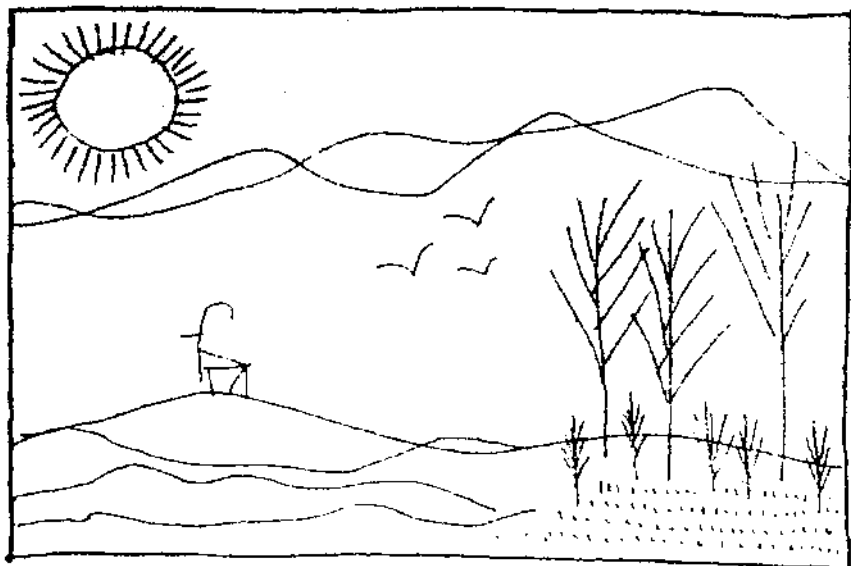
We did not weave the web of life,

We are merely a strand in it,

Whatever we do to the web, we do to ourselves.

- Arvind Gupta

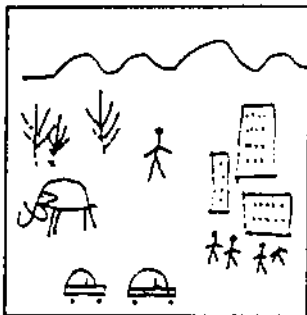
II. YOU AND YOUR ENVIRONMENT



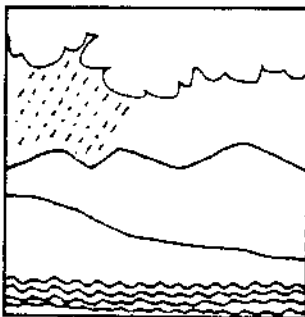
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- Waste into Food 42
- Grow Your Own Fuel for Cooking 48
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Your Environment is Important for You

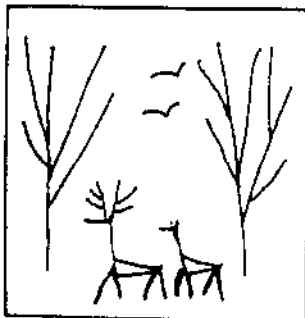
*All things around you
make up the environment
are interrelated,
and any imbalance in this
relationship can be harmful to you.*



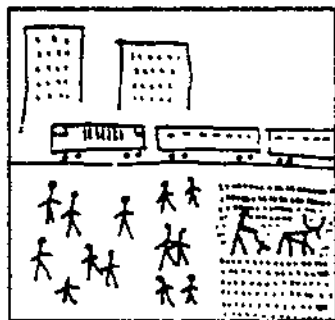
Environment is everything
around you :



physical matter
(like air, water, earth)

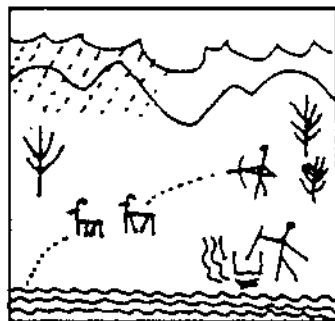


living matter
(like plants and animals)



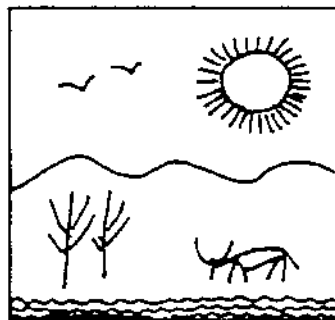
and all the other human beings and their different organisations.

Indeed, society belongs to the environment.

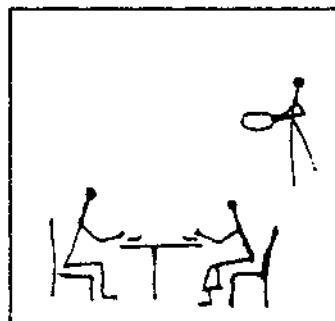


All those things that belong to the environment

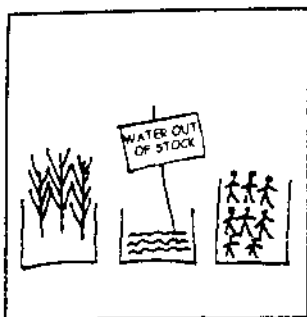
are interrelated among themselves :



thus, living matter could not exist without physical matter

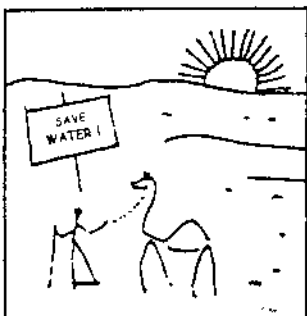


and you could not exist if both of them were not there.

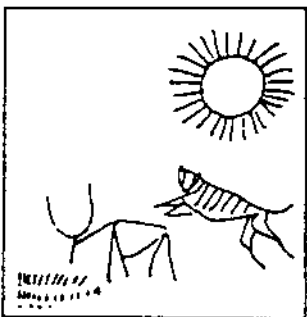


All those things that
belong to the environment

are not available
in unlimited amounts.

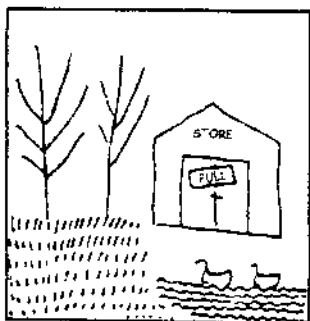


Only those relationships
which acknowledge this fact
will survive.



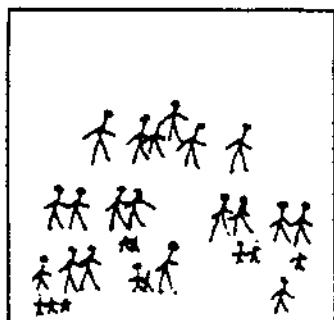
Both living things and physical
processes (for example)
dissipate energy and
transform matter

by what they feed themselves.

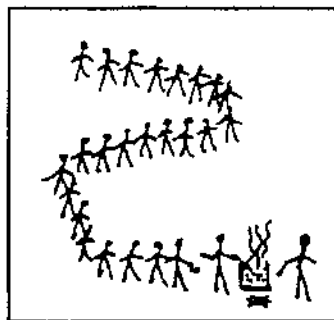


In consequence of this fact
they can exist only as long as

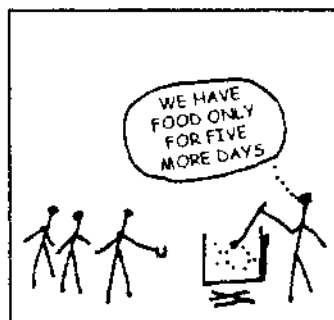
there is energy to disperse
and matter to transform.



Organisations of human beings
(we call them societies)

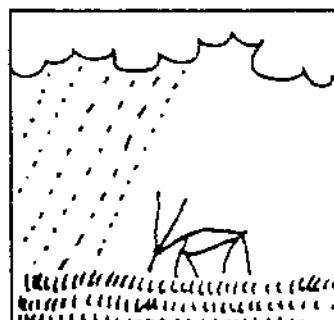


have as their main purpose a
more balanced distribution



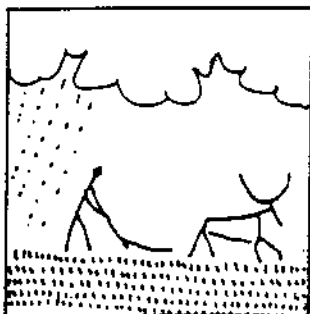
of resources limited stock

hoping thus
to prolong human survival.



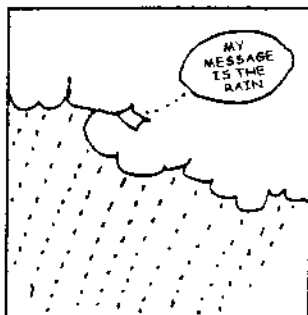
All this complicated system
(here sketched only in a few
frames)

is based on
COMMUNICATION—



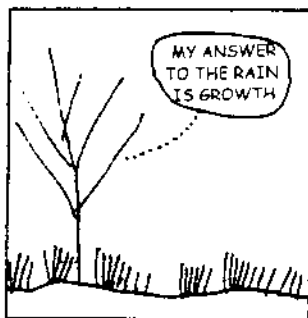
linking all elements
of the environment :

physical matter,
living things, and people.

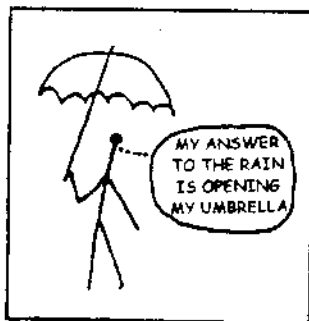


Each act or event provoked by
physical forces or by living
things or by people

is a message

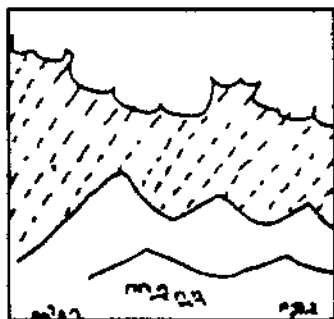


which triggers a response.

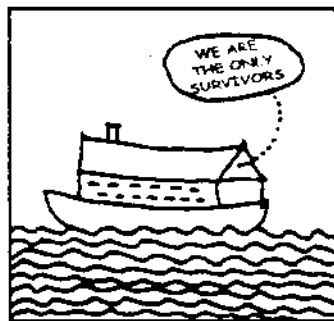


Responses of different
elements of the environment

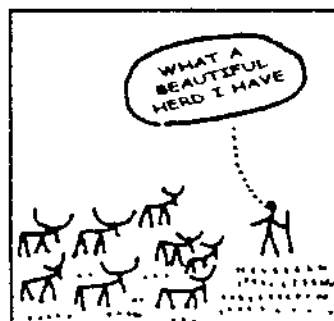
can be very different.



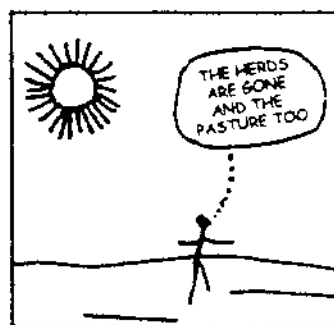
Thus physical events



can have tremendous
impact on living beings



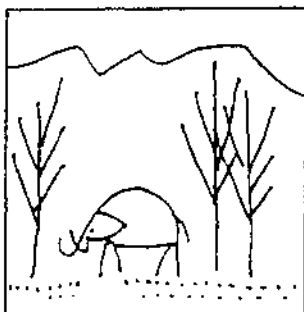
and acts of living beings



can trigger processes in the
physical world.

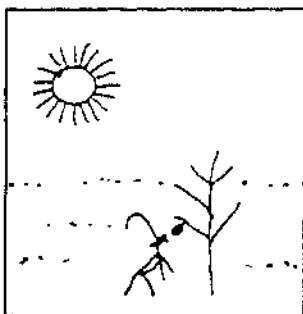


Communication about the communication process in the environment

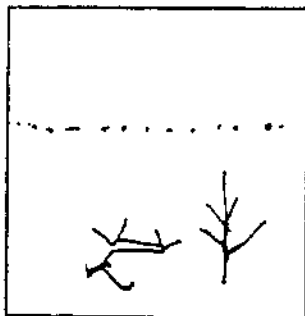


cannot be done by physical matter, neither by living beings other than humans

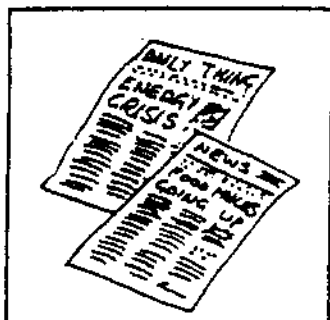
(at least, that is what we think).



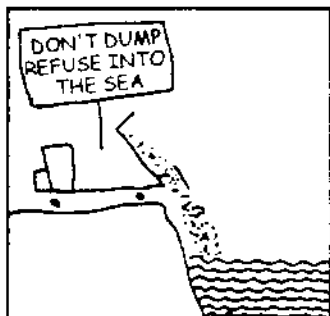
Physical matter or living things don't care about their effects on the environment



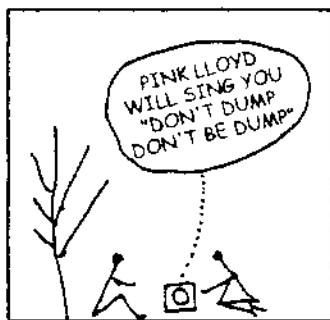
even if some of these effects are fatal to those who made the effects.



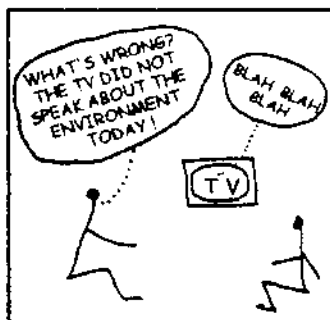
We human do care
about such effects (sometimes).



So we should not continue
to distroy the raft
in which we sail.



For this goal we have to use
our communication tools :

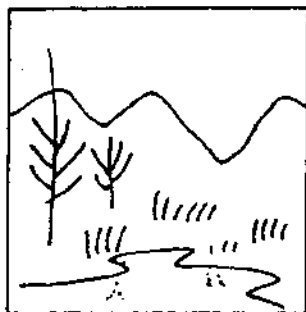


to remind us each day that the
environment is important to us

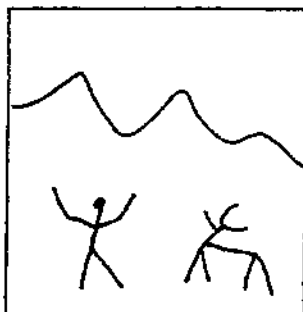
and that we must not trigger
an irreversible process.

It is your Own World you Pollute

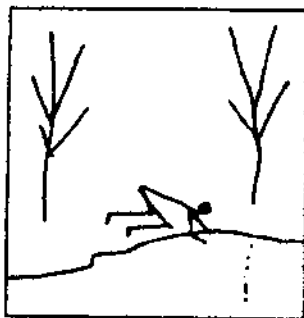
*When you pollute your environment
you risk your own health
as well as of all those
living beings around you.*



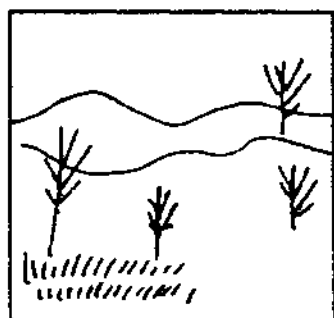
Natural environment
assures us, generally



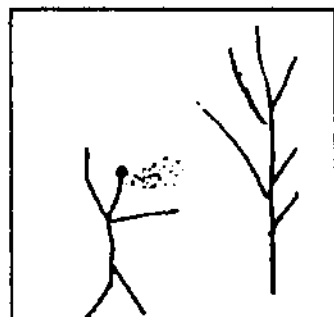
fresh air
good to breathe



fresh water
good to drink

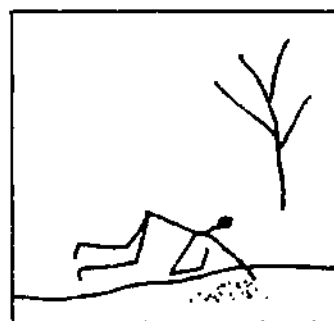


and unspoiled and clean land

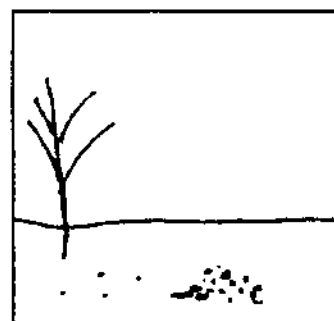


that retains its sustainability.

When we breathe,
we exhale an air already used;



when we wash ourselves,
we make the water less clean
with the dirt of our body;



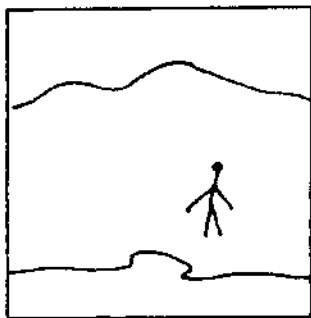
and all the garbage
we produce while living

spoils the land.

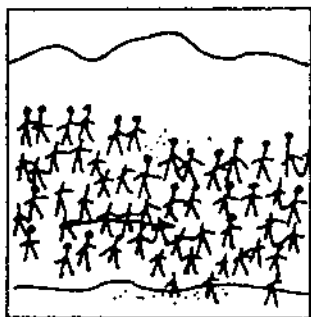


Living makes air, water and land

polluted.

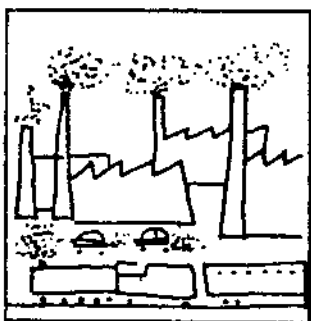


Air, water and land don't get really polluted by only one human living in a place.



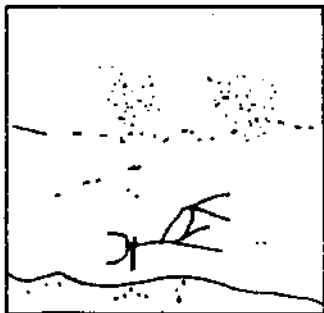
But when millions spoil the air, water and land

it becomes a matter of serious concern.



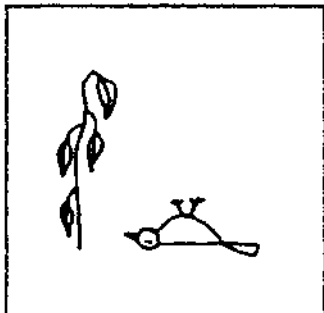
There are also the factories, the machines; the cars, which serve those millions

and which further, increase pollution.



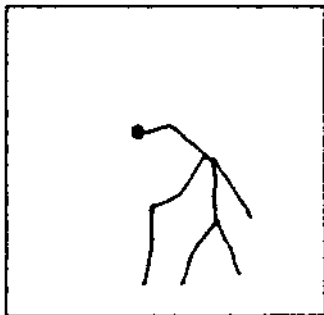
Air, water and land,
once polluted

become less appropriate for
supporting all sorts of life.

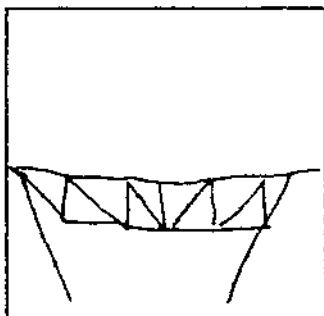


Polluted air destroys
plants and animals,

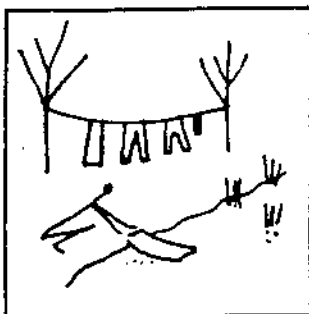
which might be vital
for our own survival;



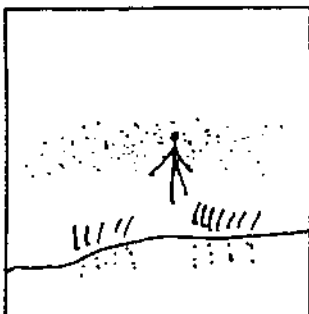
it can make people sick



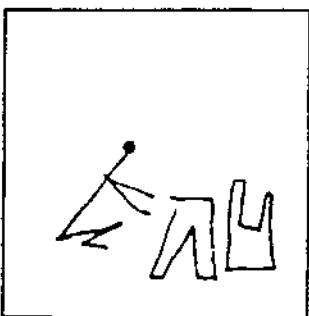
and often corrodes even
inanimate matter like steel,
stone or wood.



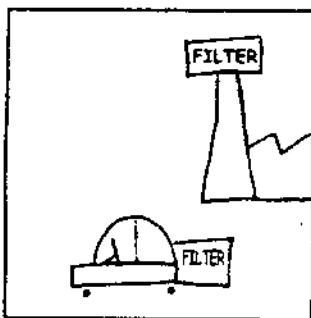
It is difficult work
to clean your clothes



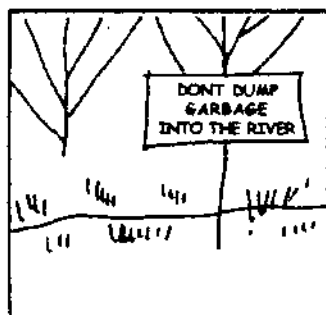
and it is far more difficult
to clean the air,
the water or the land.



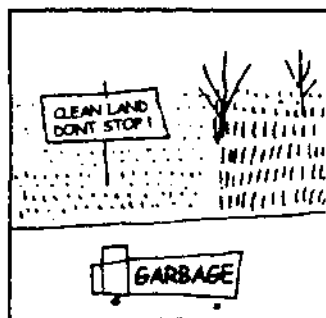
It is easier to keep clothes
clean than wash them.



The same is true with air,



with water,



with land:

it is better to keep them unpolluted than to clean them later.



You can do something yourself to keep your environment clean.

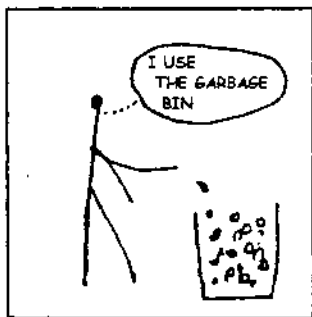


If you insist with officials, they will press industries to stop polluting the environment.



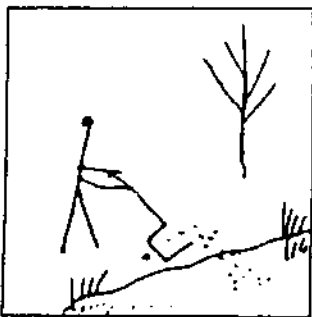
If you refuse to buy products of industries, which pollute the environment,

your protest might be seriously taken.

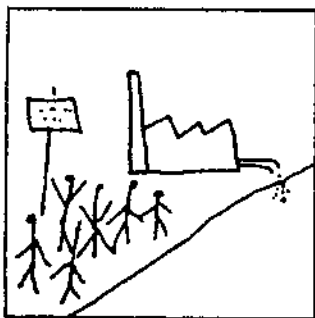


If you yourself, your neighbours and your friends don't contribute to pollution (beside the pressure you exercise on industries)

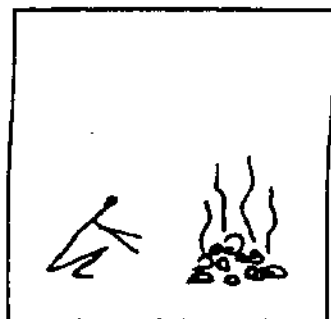
your air, water and land will remain unpolluted.



Don't dump garbage into water or into fields



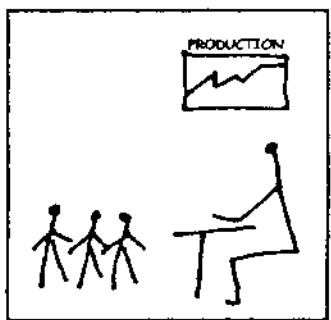
and oppose as strongly as you can if industrial plants dump their refuse there.



If you must burn refuse,
or if industrial plants do so,

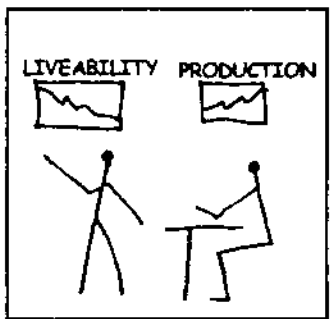


make sure the smoke
is not harmful

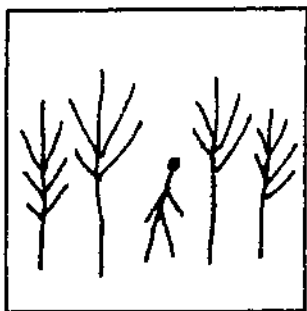


We live in a period when
industry is powerful

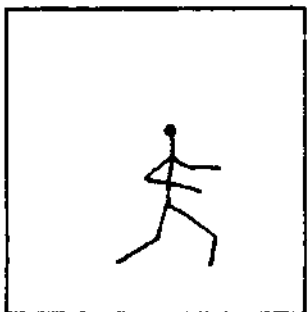
and often you will not be able
to stop environmental
pollution.



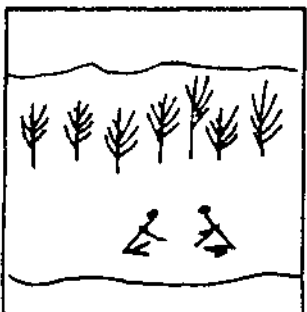
But you can make sure
that it is kept within limits



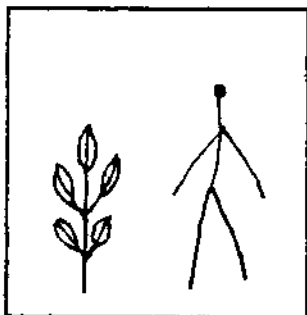
at least around the place
where you live.



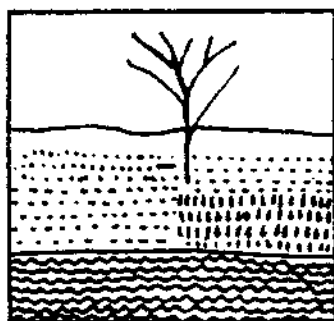
Your health is
important to you.



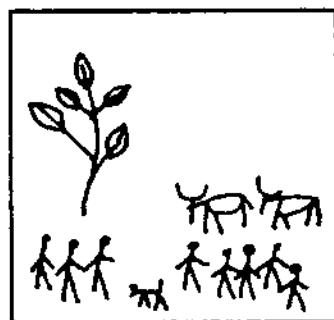
If you protect
your environment



you protect
your own health.



When air, water
and land are clean



plants, animals and people

live in an environment, which is
self-sustaining in every respect.

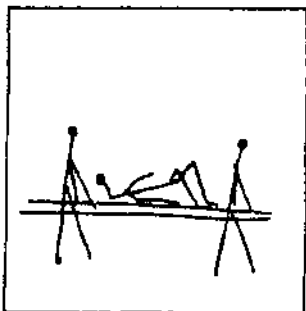
Don't Live with Garbage

*Garbage makes the environment
dirty and unhealthy
and it is in your own interest
to cart it to the dumping ground yourself.*

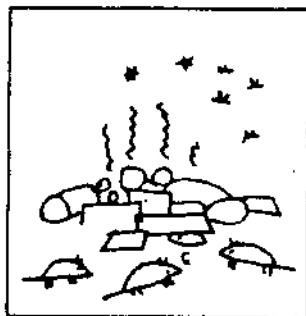


Garbage in the street

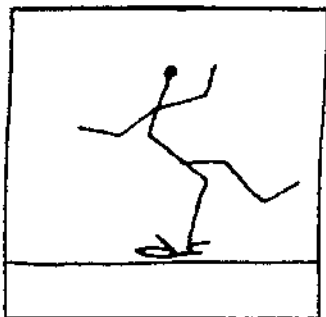
makes the living space
look ugly.



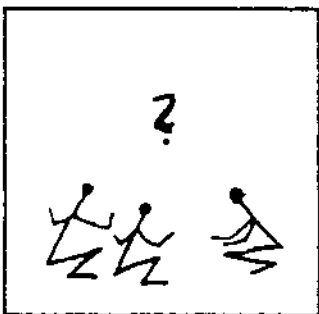
It can be a risk
to your health as well.



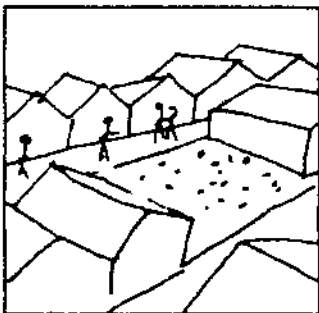
It smells,
it attracts flies and rats



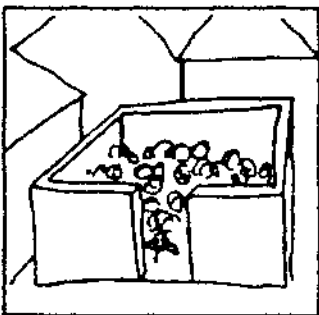
and it makes the footpath dangerous to walk.



What can be done to get rid of garbage?

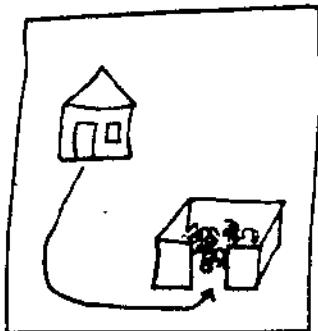


You first need to find a dumping place.

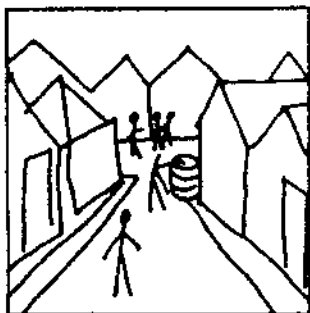


It is advantageous to fence the dumping place with walls

since garbage is not nice to see and it smells.

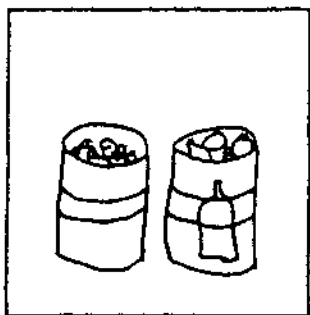


But how to get the garbage from the house to the dumping ground?



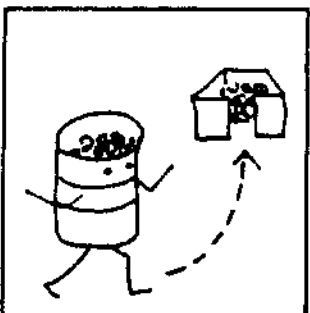
The best way is to collect it separately in each street

for example,
into an empty barrel.

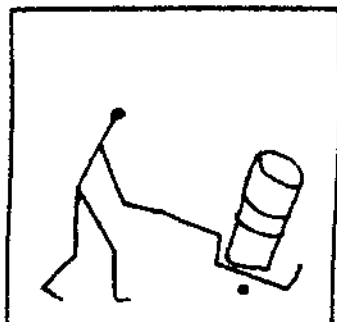


You can as well use two barrels:
one for garbage, which cannot
be used any more

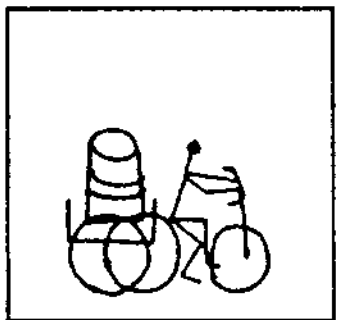
and the other for the garbage,
which can be, recycled
(bottles, conserve tins, etc.)



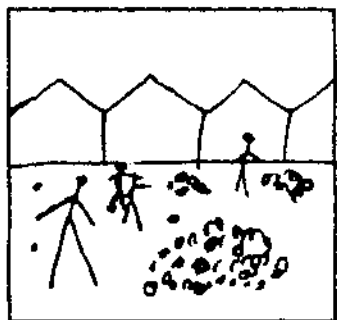
How could the barrel full of
garbage get to the
dumping place?



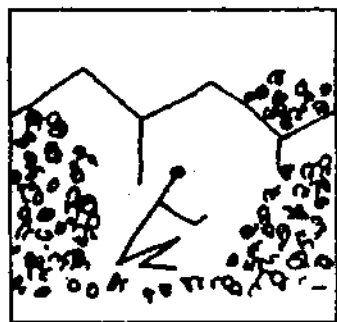
You can use a wheelbarrow



or a tricycle



It might be a little difficult to organize getting the garbage out of your locality

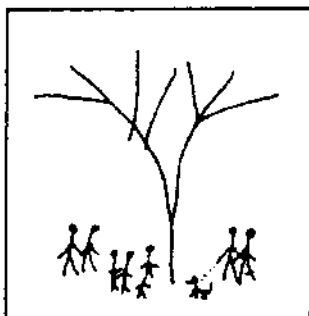


but if you don't start doing it yourself and now

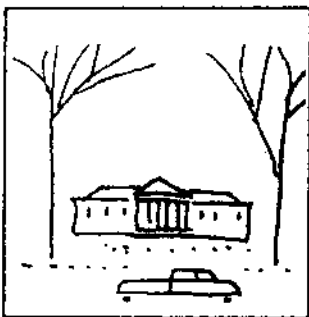
you might have to wait many years before the city authorities will do it.

Environment and Poverty

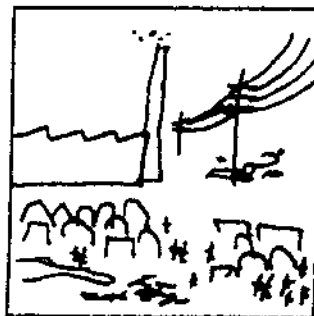
*While the rich try to live
in an environment pretty to look at,
the poor have to suffer an environment
polluted and degraded by the things,
which make the others rich.*



The environment belongs to
the poor and the rich alike.



But, while the rich tries to live
in an environment pretty to
look at



the poor is left with an
environment decayed
and polluted

by the installations, which
make the others prosperous.



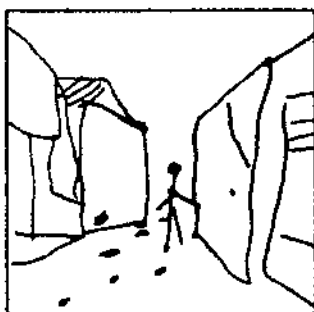
People who live
in a decayed environment

(because they are so poor)



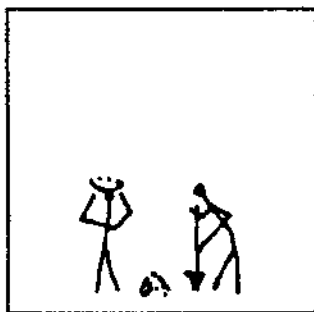
don't have the means or
the will to upgrade it

or even to stop further decay.



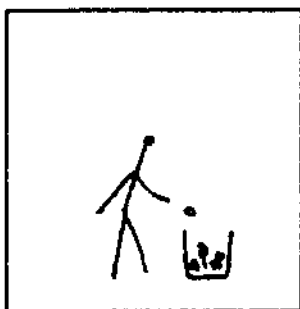
Thus, poor people's
environment becomes
more and more degraded.

But this degradation
is not inevitable.

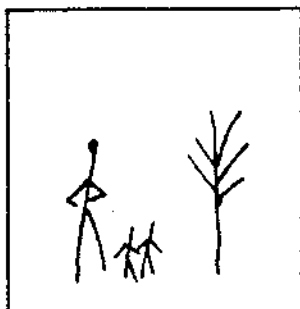


An environment can be
improved with no or
little investment;

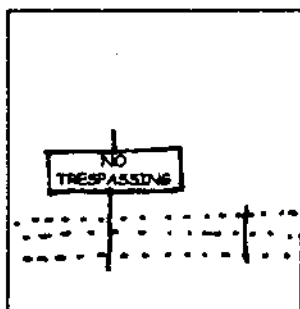
the community's own labour
can be enough investment
for this purpose :



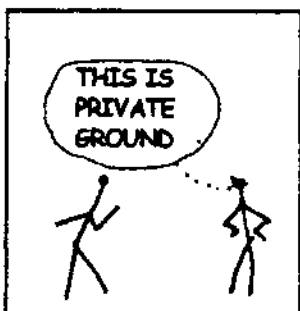
by accepting, for example,
certain self-discipline



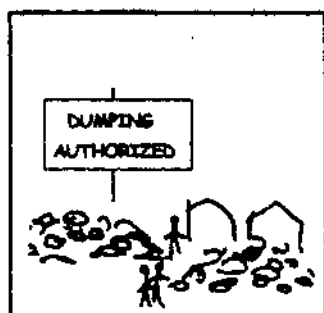
and bestowing upon the
environment a little care
and appreciation.



But, even in the poorest
neighbourhoods, it is often
forbidden to inhabitants



to alter positively
their environment,

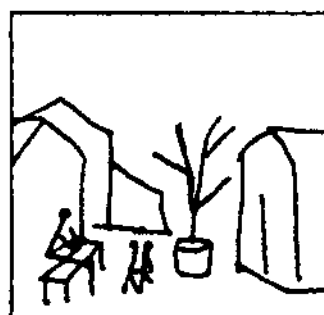


which is used as dumping ground by other communities.



Sometimes, on the other hand, speculators wait for the squatters to improve their neighbourhood

and chase them away (or buy them out) to profit from the results of the poor men's work.

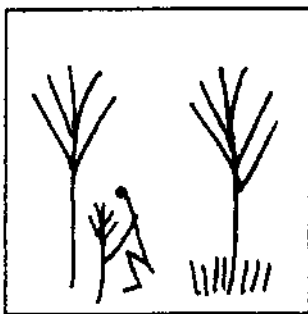


Upgrading the environment does not just mean making it more pleasant to look at;

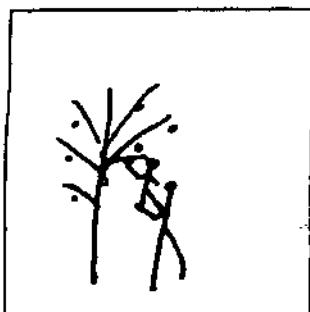


it means, as well, to make it more healthy

and more useful to those who live there.



The principal method of upgrading the environment is the planting of trees and other plants.



Plants can be useful in many ways :

they give fruits for children;

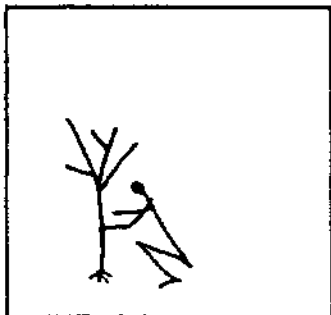


materials for building and mending houses
(for example, bamboo);

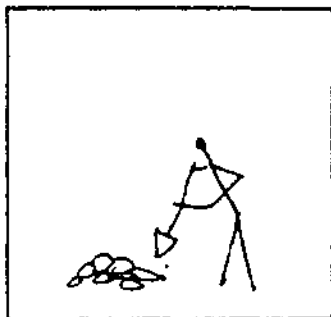


their branches and twigs can be used as firewood

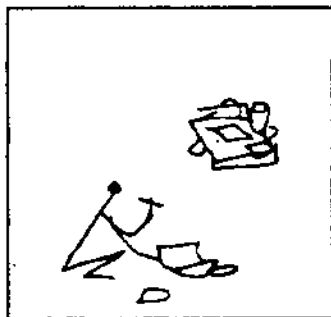
and their leaves can provide forage for domestic animals.



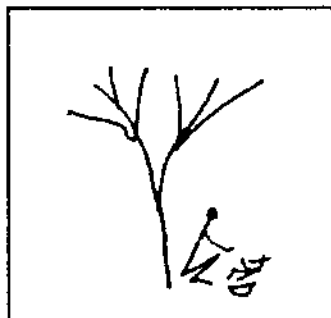
When you plant trees
in your neighbourhood



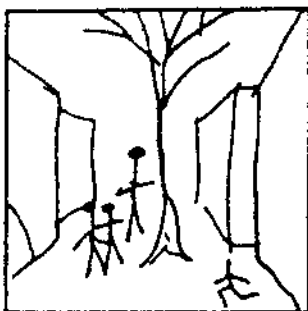
you must arrange to collect
leaves and other organic
waste in one place



Industrial waste, too,
can be kept separately
(cardboard, plastics,
scrap metal, wood chips)

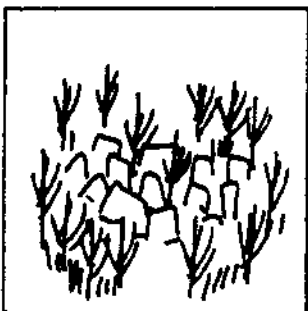


Such craftsmen can sit
under the trees.



Trees planted in the middle of the street make it easier to reserve the street

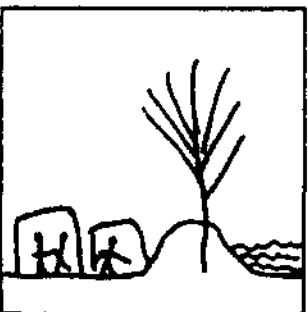
for the pedestrians alone.



It may be right to plant trees around the settlement

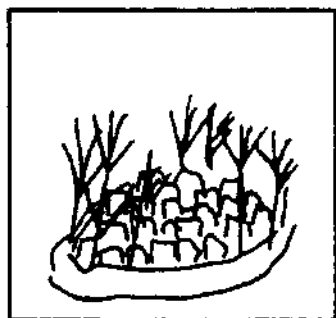


as a sort of protection against outsiders as also against wind storms.

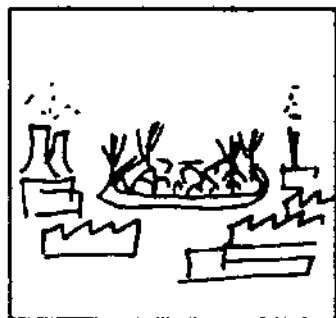


In flood-prone areas, trees could be so planted

as to build a dam

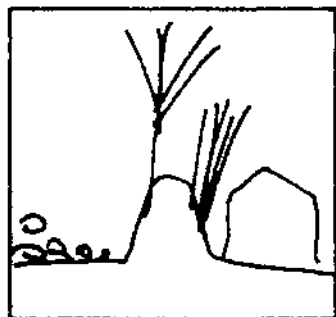


all around the settlement.



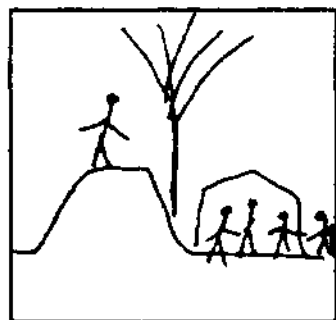
If a poor settlement
has not enough power

to improve its surrounding areas



it can at least make the
“inside” better

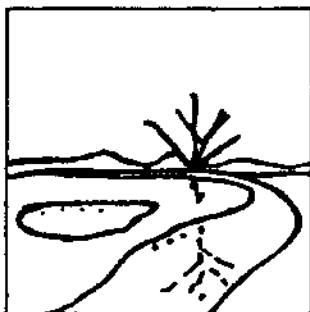
by separating itself from the
decayed outside



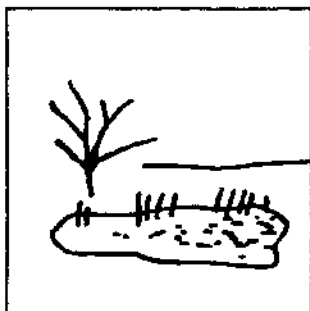
by a wall of trees or
by a dam.

Weed into Wealth

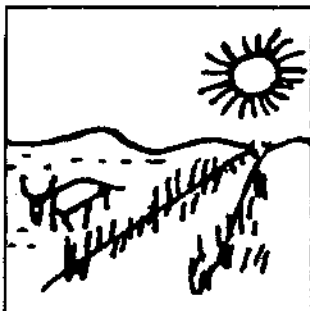
*The aquatic weeds,
often considered to be a nuisance,
can be used as cattle food, compost and fuel
and for making mats and baskets.*



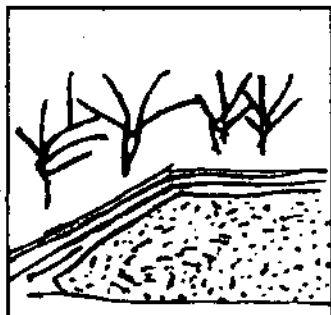
Ponds, tanks, lakes and rivers



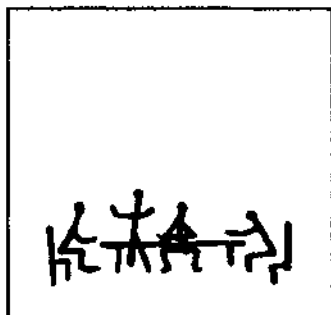
are often covered
by aquatic weeds



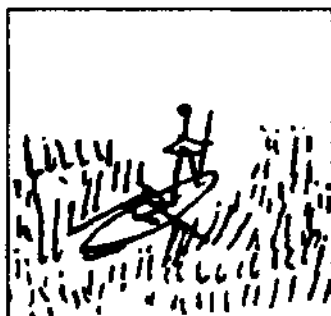
partially



or completely.

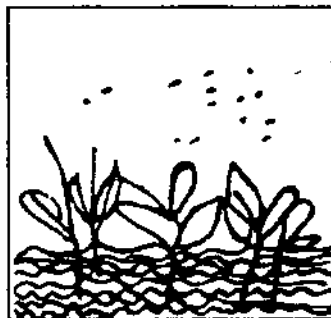


Many people
and most authorities



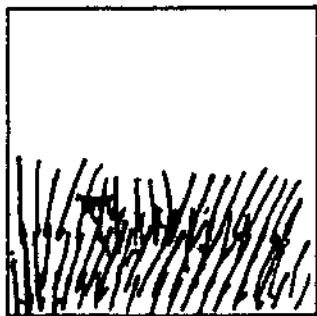
consider aquatic weeds
a nuisance:

they make the passage of
barges and boats difficult;



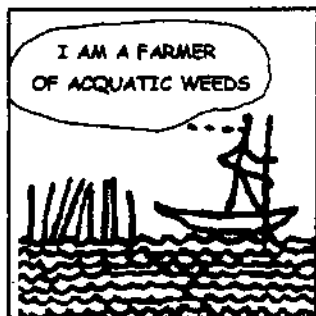
they facilitate
breeding of pests

for example, mosquitoes;



they might serve as refuge
for harmful animals.

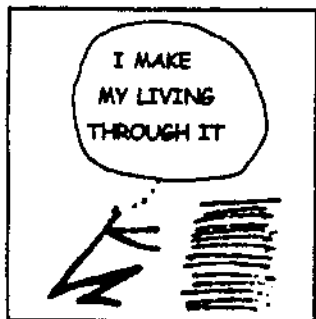
In general,
they pose many problems.



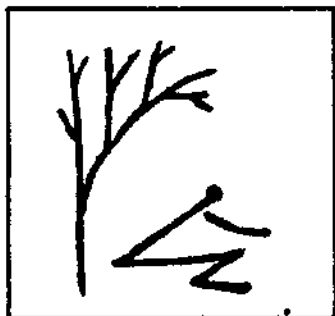
But aquatic weeds
could be made useful, too



They contain valuable
materials as all plants do

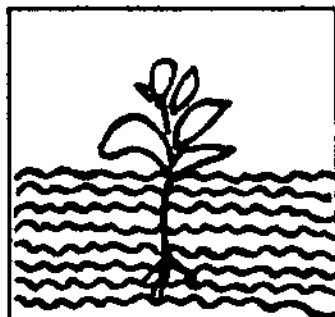


and can be used
for many purposes,
if used the right way



particularly
as they breed in mass

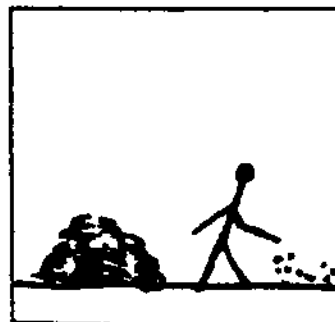
without much care or labour
and without occupying dry land.



Take an example :
the water hyacinth.



It can serve as cattle food,

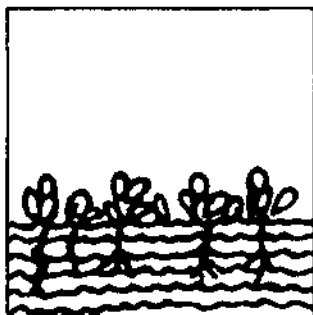


as compost
to fertilize your land,



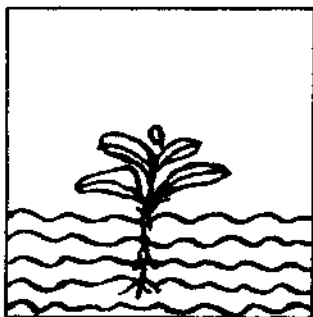
or even as fuel for
your kitchen

when dried,
or by generating biogas.

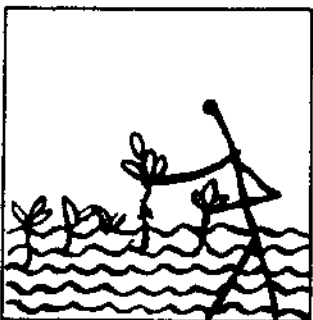


Water hyacinth
grows everywhere

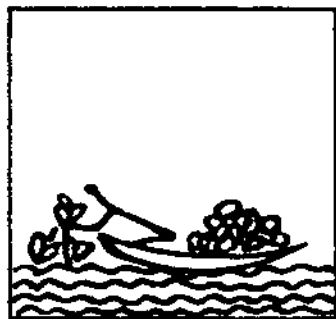
in shallow water
or in deep water.



It is a floating plant
with no fixed roots



so it can be
harvested easily

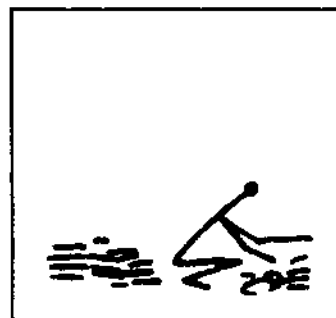


by collecting the plants on
boats, rafts

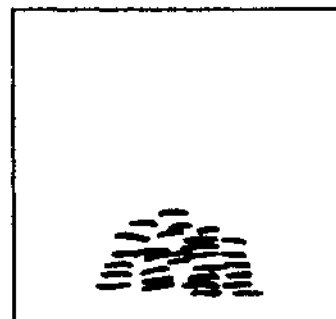
or simply by
wading in the water.



Water hyacinth,
to be used as cattle food

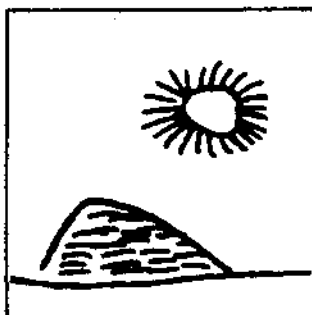


has to be chopped.



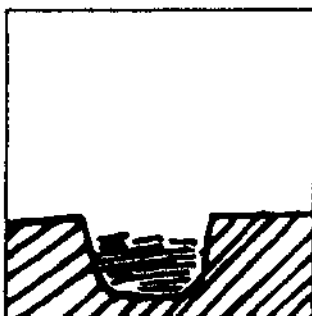
If you want to use
it for compost

you have to chop it



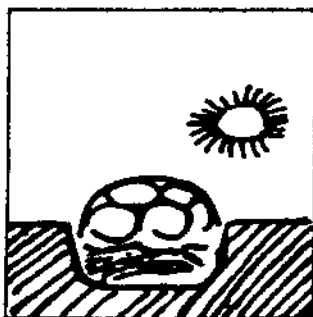
and then leave it to ferment –

but turn the pile often.



Water hyacinth can be used for the biogas plant as well.

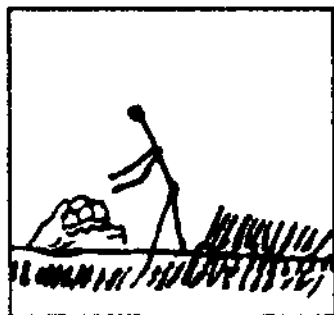
For this purpose you can ferment the chopped weed in a leak proof pit



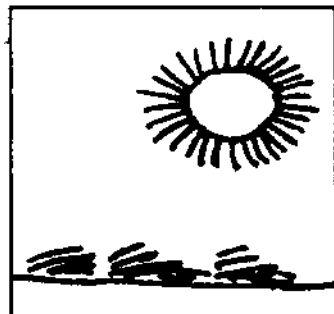
covered by a bamboo dome made airtight with plastic sheets.



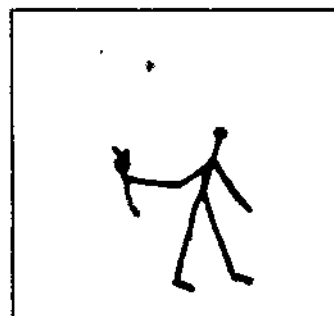
Once the biogas generated has been used say, for cooking or lighting



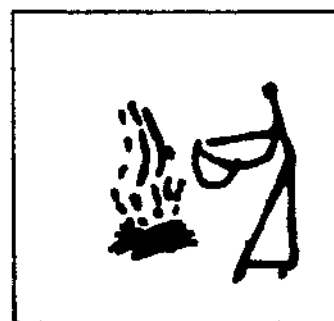
the rotten residues
can be used as fertilizer.



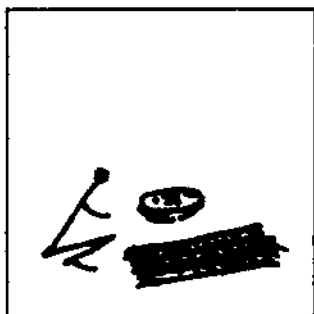
You can dry the harvested
water hyacinth in the sun.



The dried plant loses
9/10 of its weight.

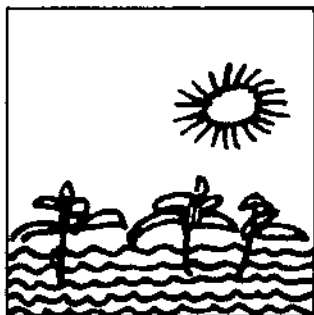


It can be used to make
fire for cooking



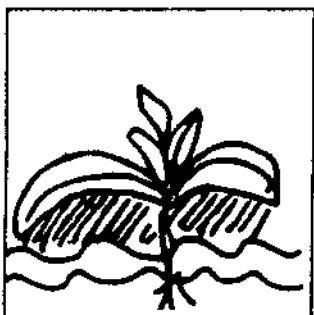
or the dry stems can be made into mats, baskets

or other similar objects.

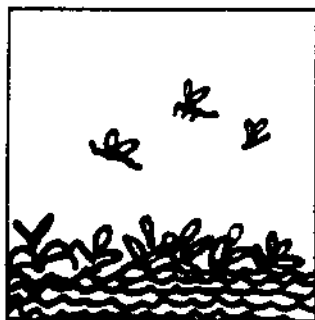


Water hyacinth can slow down the evaporation of water

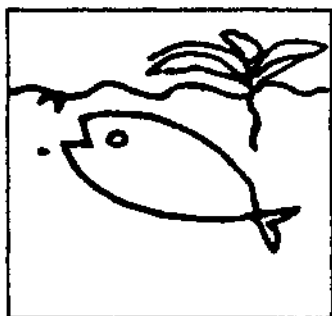
in your tank



by keeping the water surface under the shade of its leaves.

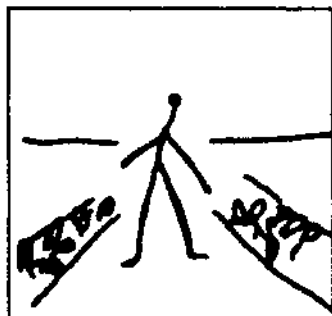


And, if a weed covered water surface becomes a breeding place for mosquitoes

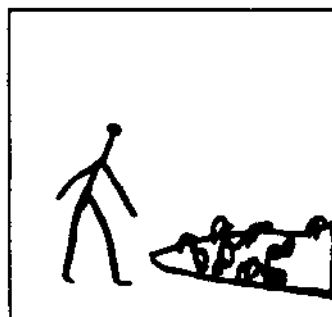


a few fish, which feed on
the mosquito larvae

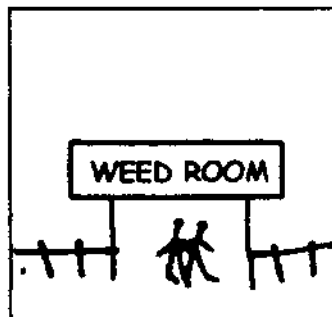
can solve this problem.



You find, around you,
water hyacinth in many places.



Don't consider it a weed



but rather as a new resource

to better the conditions
of your life.

Waste into Food

*How organic wastes,
which make our environment unhygienic,
could be converted into useful
manure for plant growth?*



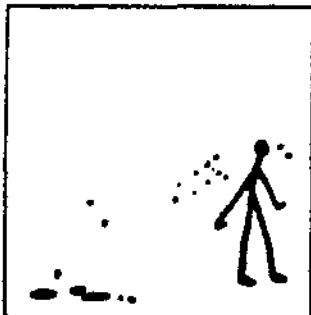
Every living being that eats
gives back a part of what
it has eaten

in the form of organic waste.

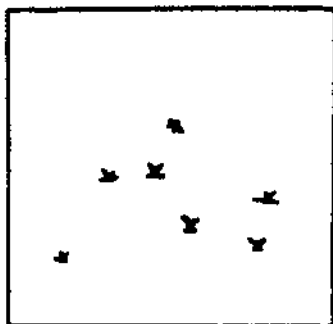


Organic waste is valuable,
as it can fertilize the soil

helping plants to grow.

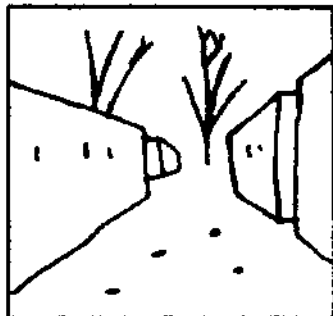


Organic waste
can be also harmful
as a source of diseases.



Flies and other insects,
for example, can widely
diffuse dangerous germs

to people living
in the proximity.

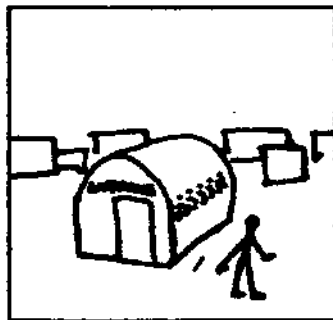


Human waste is organic waste
like that of all animals;
one cannot leave it on the
street or in the neighbourhood

because of the danger
of infection.

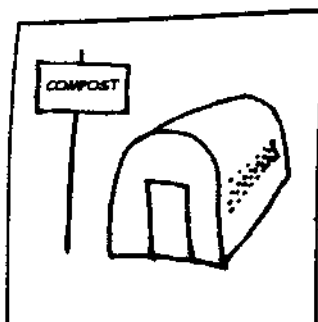


But human waste itself can be
transformed into compost and
used for growing food.

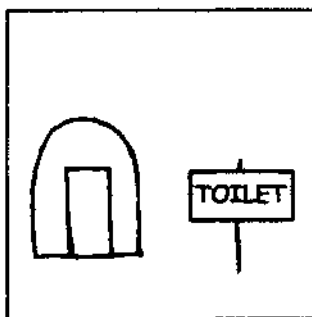


A public latrine can thus have
a double utility :

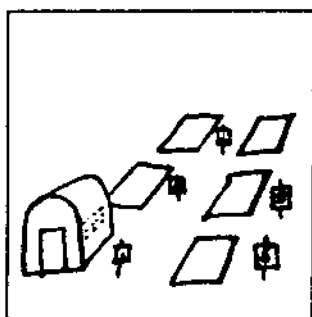
it keeps waste apart
from the community



and it can serve, at the same time, as a compost factory.

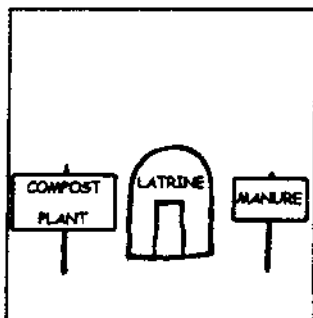


In order to be useful a public latrine should not necessarily be fixed to a specific place.

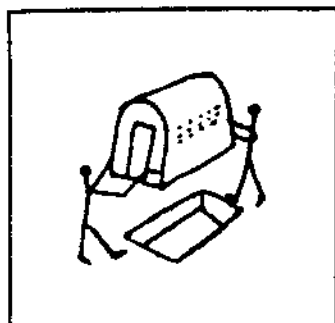


It would be better to shift it from station to station along the periphery of the settlement :

each station will be first a latrine site, to serve the inhabitants

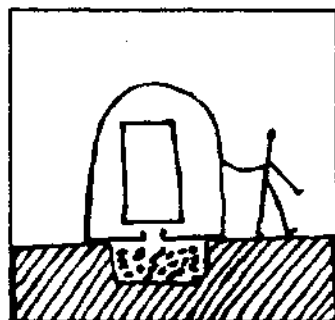


then, when the latrine is shifted, the site becomes a compost plant.



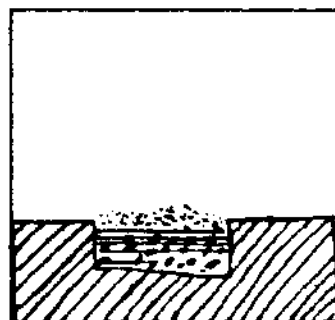
For this purpose the latrine has to be a light shelter, which can be moved by a couple of men

to be placed over a shallow ditch wherein waste can accumulate.

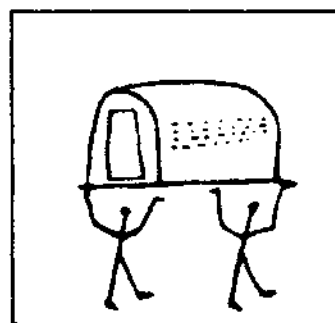


The ditch of the mobile latrine will be full in a few months

(depending on its depth).

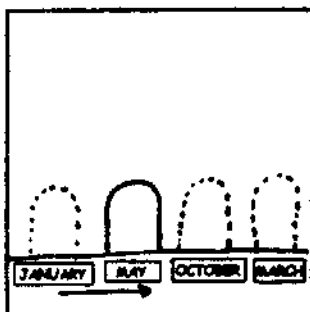


Once the ditch is full, it should be covered for a while



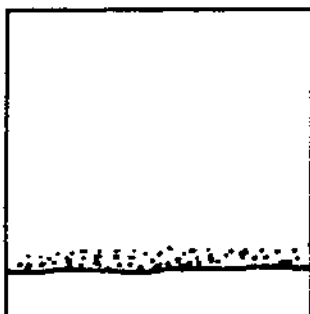
and, at the same time, the latrine (the shelter) should be transported to a new site

and installed over a new ditch.



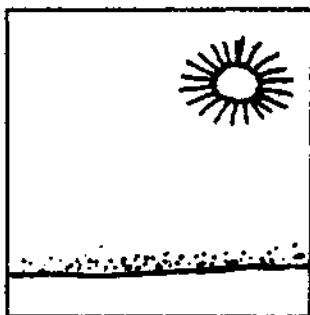
Thus the latrine
would move during the year

from one site to the other.

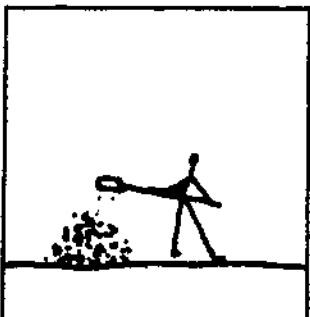


The waste from the old ditch
(which became liquid in the
meantime)

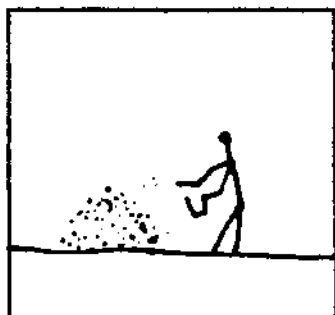
should be spread
out in a thin layer



and dried in the sun.

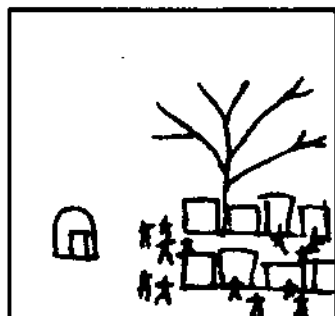


Once the waste is dry,
it should be mixed with earth

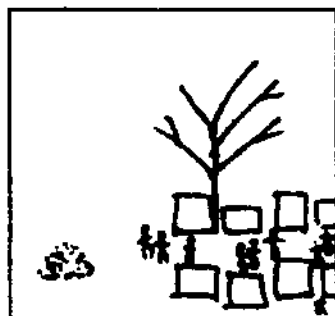


and the mixture should be
sprinkled with water,
remixed several times

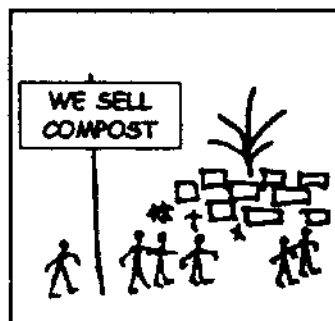
then let it dry again.



Thus the mobile latrine keeps
dirt outside the settlement



and produces compost
when disinfected :



it keeps, first,
the inhabitants in better health

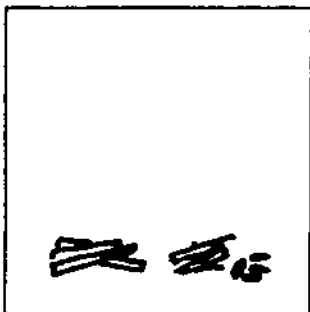
and it can assure, on the other
hand, a small revenue for the
community.

Grow your own Fuel for Cooking

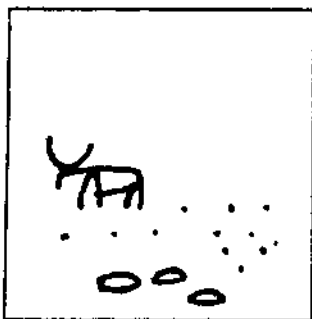
*Some fuel giving trees
could be advantageously grown
in the fields
along with the regular crops.*



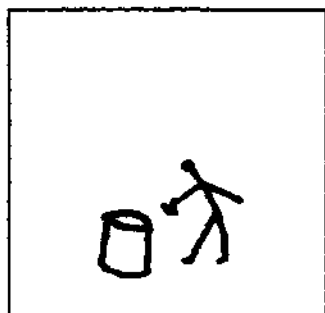
You cannot cook
your food without fire.



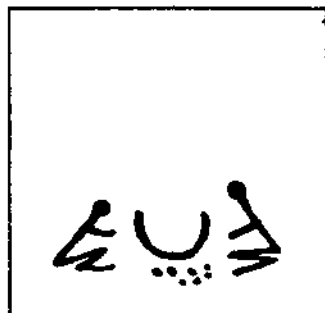
So, in order to
have hot food you burn



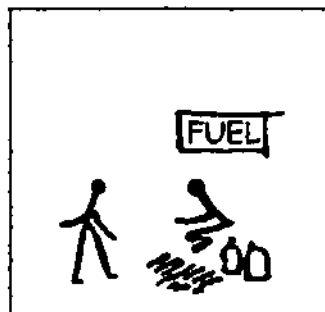
wood, bush or charcoal,
cow dung,



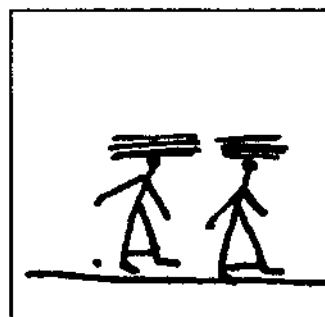
petrol or gas.



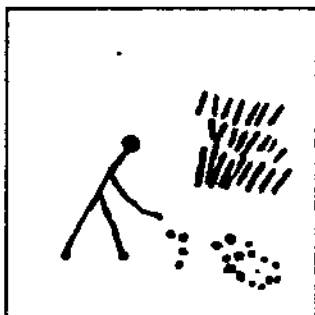
Cheap fuel to make fire



wood and charcoal
are expensive

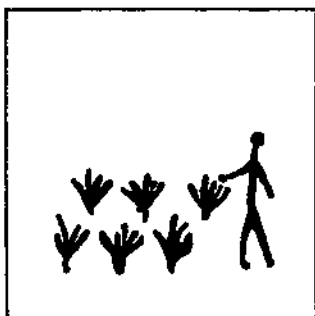


Bush wood or straw
you have to bring
often from far away.



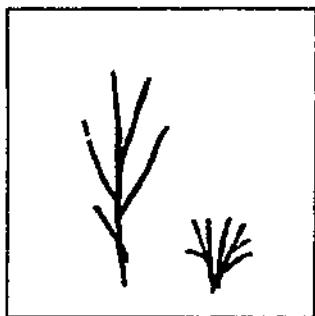
As for cow dung,
it should be better used

for fertilizing your land
instead of making fire.

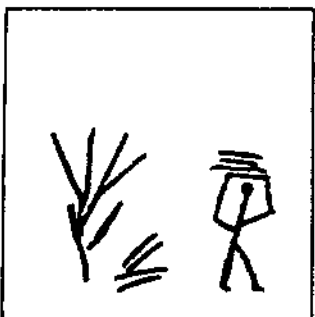


If you have a garden
or a field

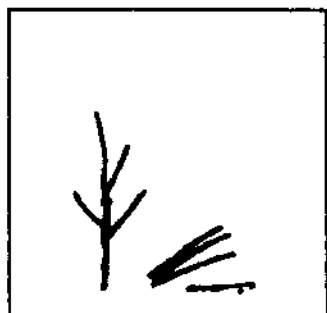
you can grow your own fuel.



There are many fast growing
trees or shrubs,

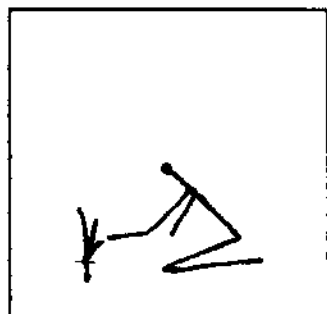


which can assure
your firewood,
supply for many years



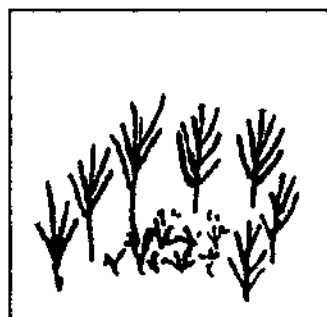
if you know how to collect
your firewood crop (how many
branches and how often)

without killing the plants.

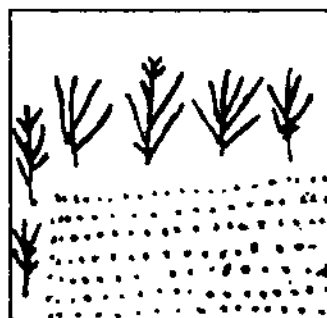


Firewood is a crop of value

and you can plant firewood
yielding plants
(trees or shrubs)



in the form of hedges around
your garden

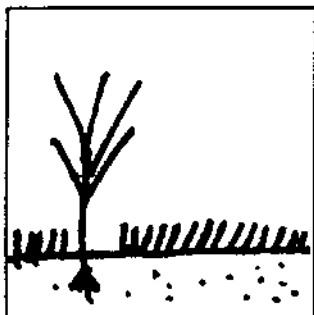


or around your field.

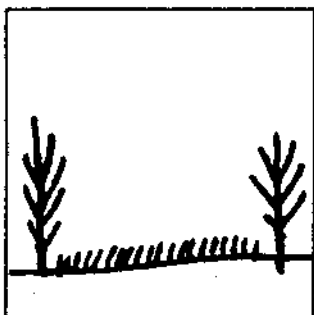


Planting firewood crop

around your land

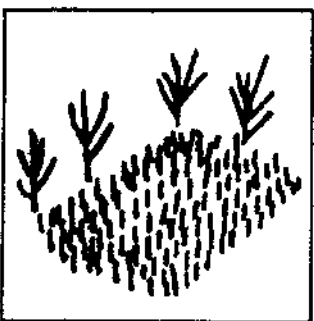


does not use up
too much space.

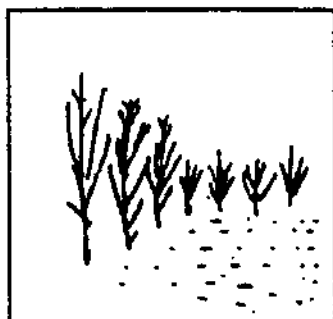


All the space inside
the hedge

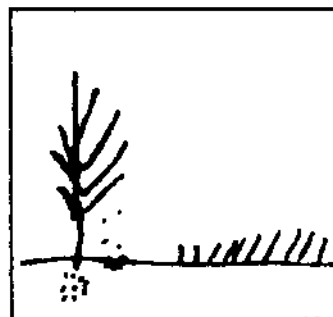
stays reserved



for your other crops.

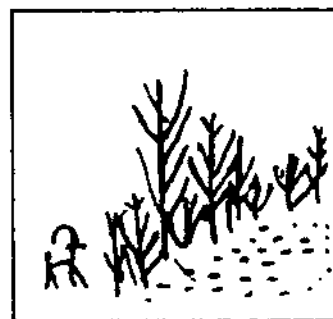


Hedges of firewood crop
have other advantages, too :



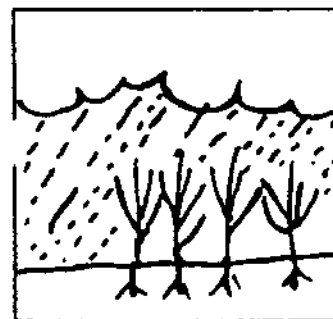
some firewood crops
improve your land and soil

(by supplying nitrogen and falling
foliage, in certain cases).

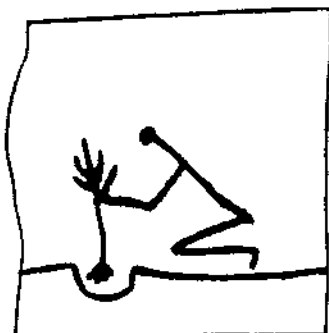


These hedges also keep out
the stray animals,

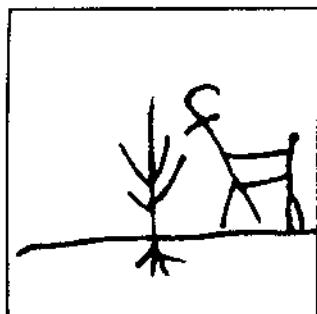
which would otherwise
damage your fields.



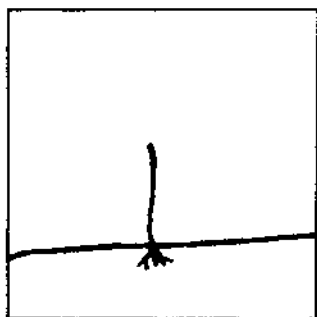
They also limit erosion,
and help maintain
more humidity in the soil.



When planting
trees or bushes for firewood

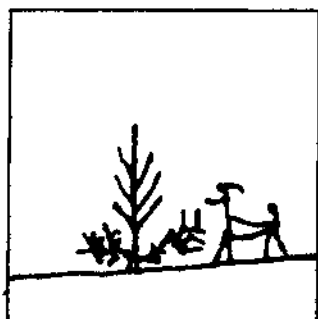


you have to protect the
young plants

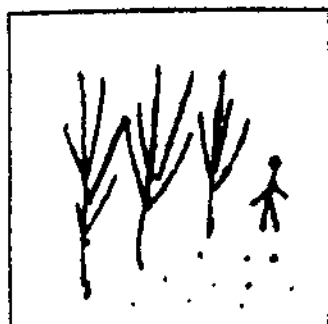


against herbivores

who could damage
the saplings.

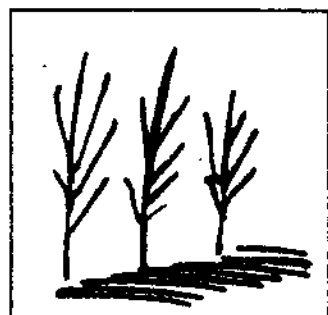


You can use for this purpose
barriers, made out of dry
thistle, for example.

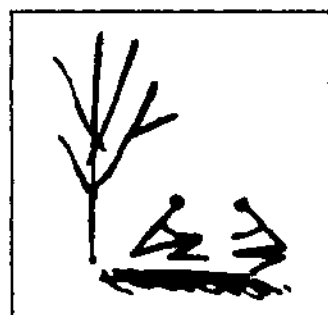


Finally,
hedges of firewood crops

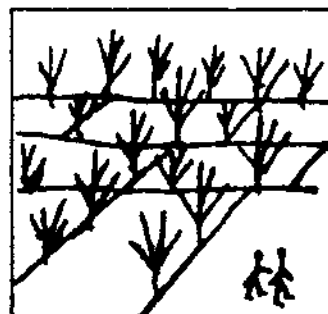
once sufficiently grown



give shadow



where it is nice to rest
during the hot hours.

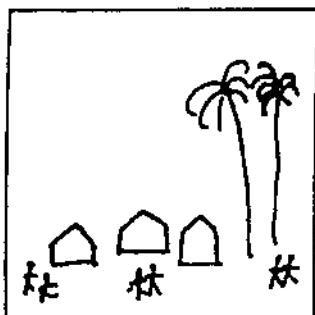


It might be a good idea to
combine the various crops
in your fields

with a few trees for firewood.

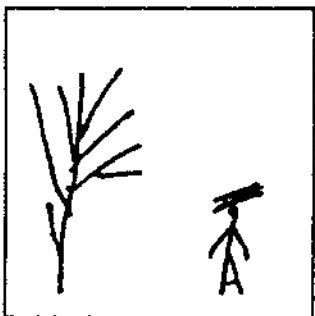
Urban Waste: a Valuable Resource

*Urban waste could prove to be a valuable resource
for extracting a variety of important materials
useful for constructing houses,
making household goods,
producing compost etc.*

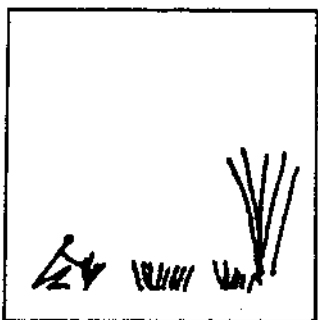


People living in the countryside
can find many resources
– space, materials,
etc –

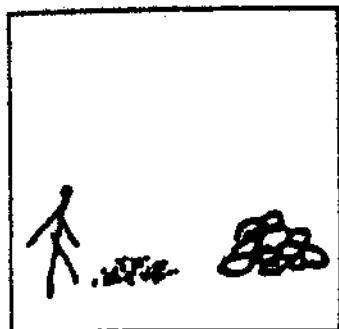
to which they have access
without spending
extra money.



They have free access
to trees (for wood)

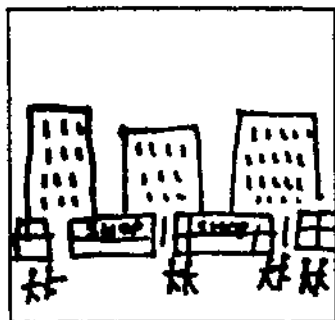


to plants (bamboo, grass)



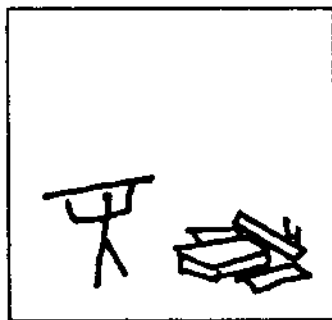
to clay and stones, etc

which they can use
as building materials, for instance.



People living in the cities,
however,
can find such materials

only at a price.

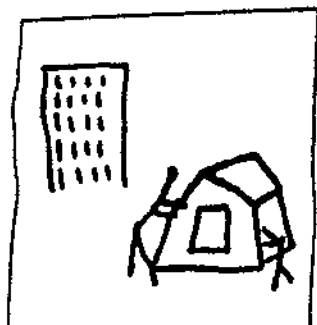


But in cities, too,
there are materials,
which don't cost money :



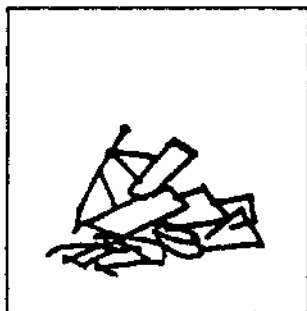
these are the waste products
and materials

thrown away by the rich
and the various industries.



This waste
doesn't need to be purchased

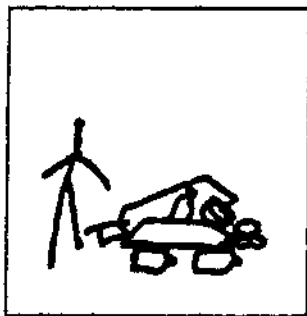
and can be made use of
in a variety of ways.



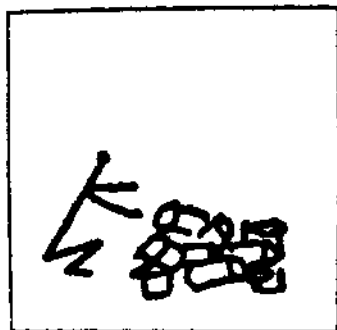
Materials, which are easy to
find in urban waste are



paper and cardboard,
woodchips,

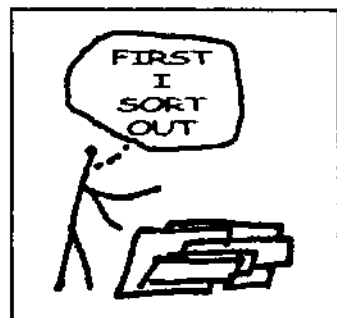


plastic products, metal sheets,
glass bottles

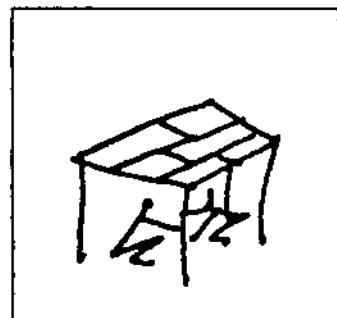


empty conserve tins

and similar stuff.

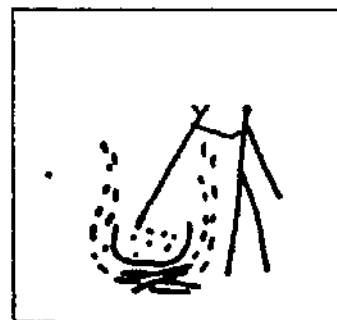


Many things can be made out of these materials.

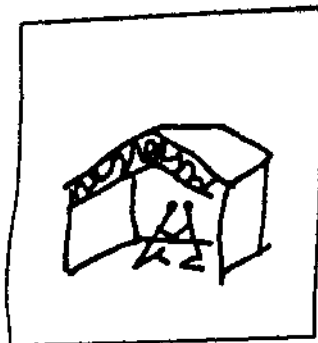


For example, paper and cardboard can be used directly

to make various objects out of them.



Paper can also be used as raw material for papier-mache

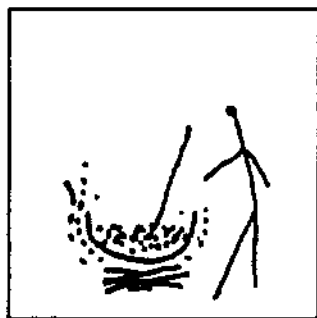


or it can be used as filler
(for insulation against heat,
for example).



To make papier-mache

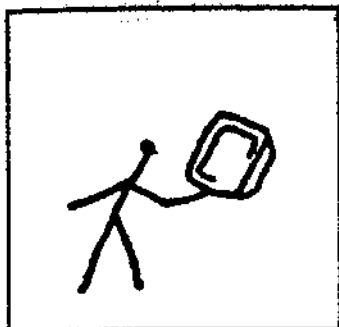
you have to boil scrap paper
in water, with some glue



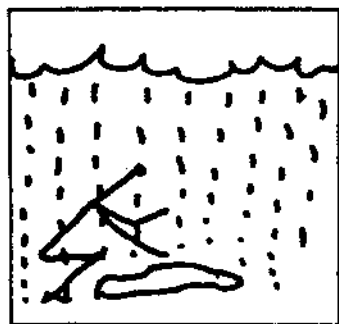
till it becomes a thick paste.



This paste can be shaped and
moulded the way you want.

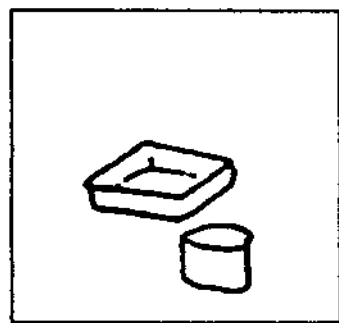


After cooling and drying the paste becomes hard and the moulded object retains its shape.



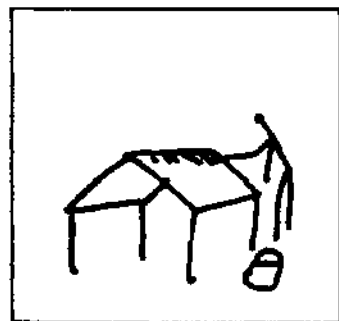
Papier-mache is vulnerable to water :

on getting wet it softens again.

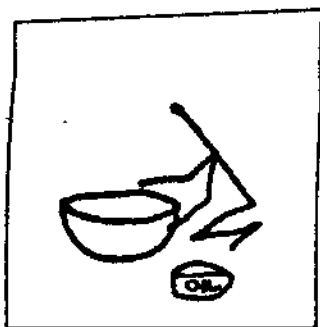


Therefore, it is suitable for applications where it does not get wet :

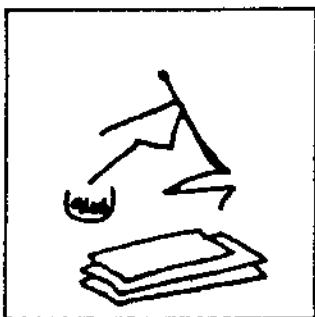
for example, as containers, cases or drawers.



You can protect papier-mache against humidity by water repelling materials

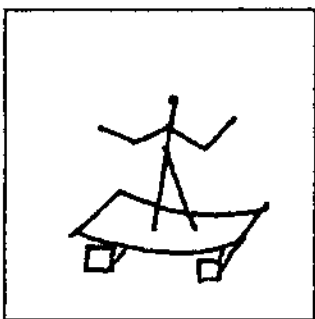


like grease, oil and paint.

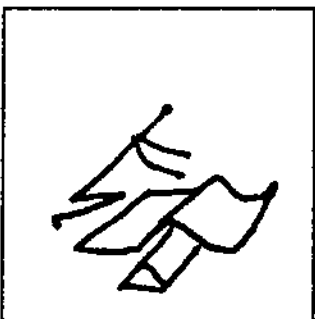


You can make stratified cardboard yourself

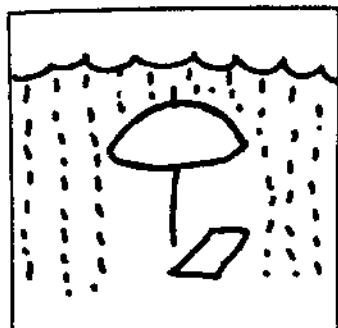
by gluing together layers of paper, papier-mache, or ordinary cardboard.



Stratified cardboard can be quite strong :

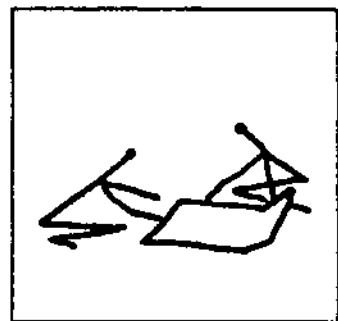


it can be easily cut or shaped before the glue gets dry.

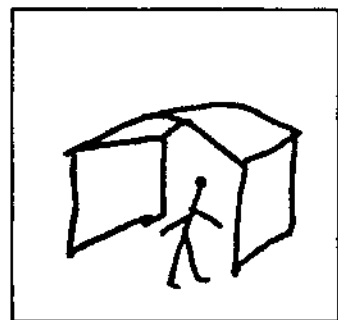


But, take care that it is not exposed to humidity

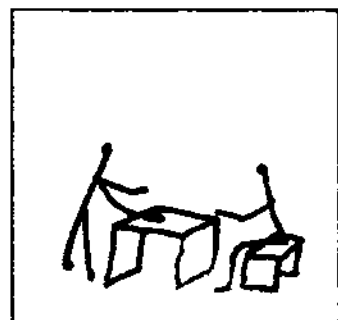
otherwise it gets deformed.



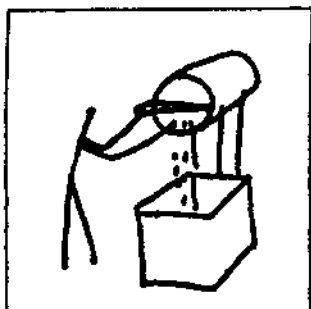
You can make many useful things out of cardboard :



walls, partitions, roofs
(but be sùre to protect the material against humidity)

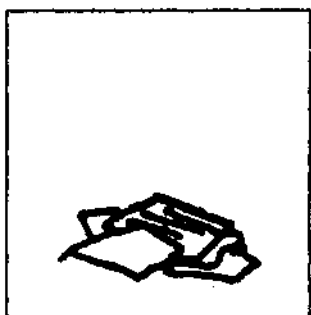


tables, chests,
and other furniture

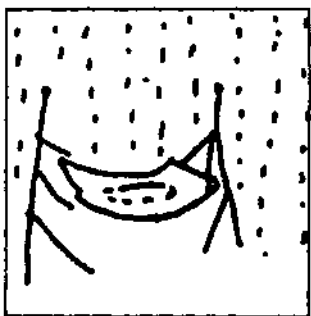


containers

and many
other things of daily use.



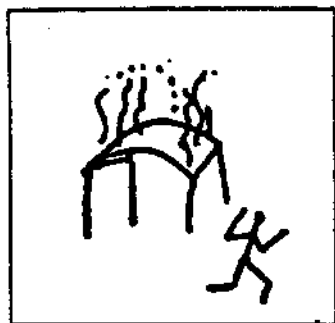
Plastic wrapping and casing is
today a commonplace waste.



Plastic foil is an excellent
waterproofing material,



which can protect
a cardboard roof adequately.



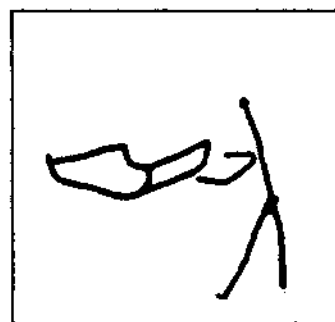
But some plastics are highly inflammable

and need to be safely used.

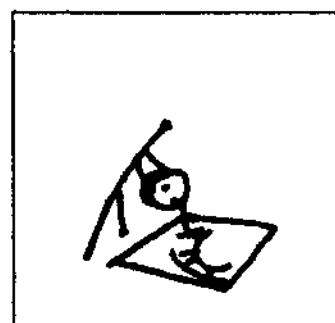


Many objects are made of plastics, which become soft when heated, carefully

(most plastics burn with toxic fumes, when excessively heated)



You can shape such soft plastics easily by hand



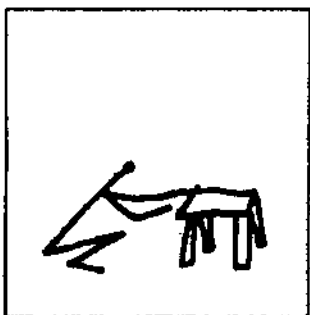
or by means of moulds.



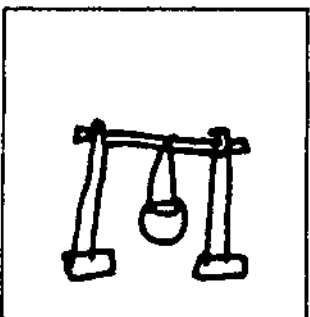
After cooling down,
the soft plastics (reshaped)
become hard again.



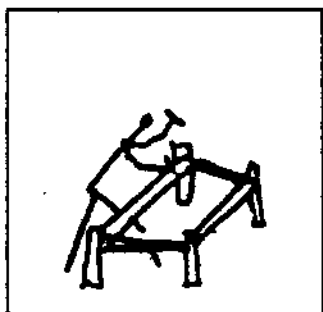
Pieces of wood,
broken crates, etc as well



are excellent raw materials
for many purposes



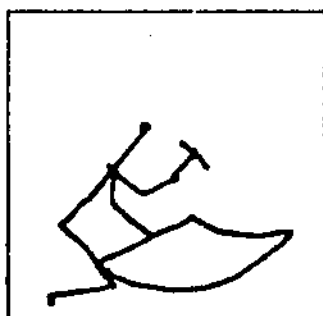
apart from being used
for burning in a stove.



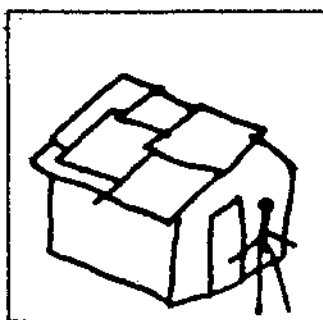
Most household objects
can be made of wood.



Empty tin cans

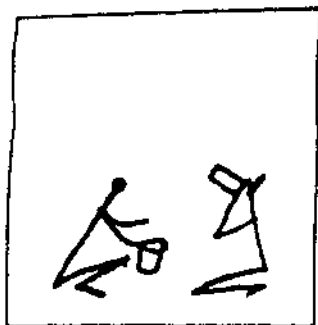


can be flattened



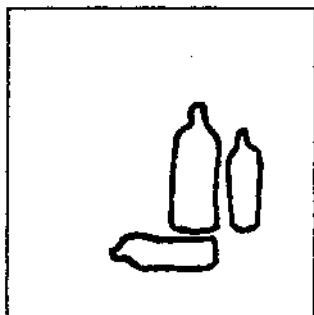
to be used as sheet metal

for the roof, for example.

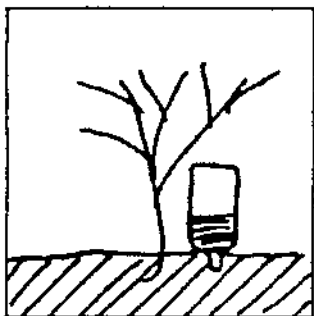


In their original form,
they can serve

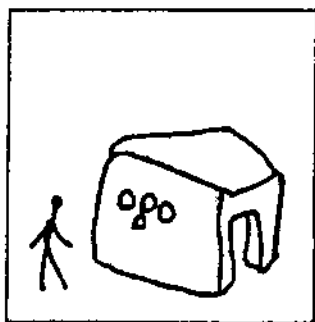
as plates, cups etc.



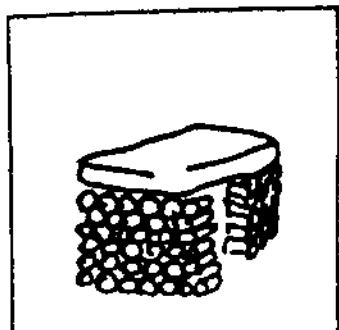
Glass bottles
can have their own uses :



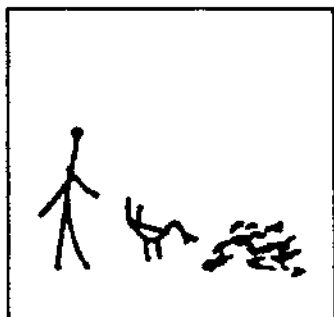
they can serve
as drip irrigators



as light inlet
in brick and mud walls



and if you have a lot of them,
as substitute bricks
for making a fancy wall.



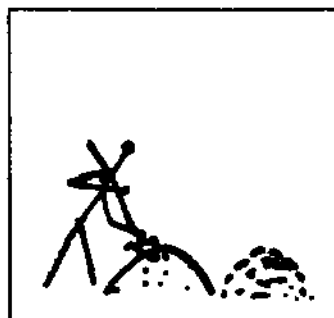
Besides these materials there
is another important resource :

the organic waste
originating from kitchens, etc.



After carefully removing
non-organic material
from this waste

it can be converted into compost.



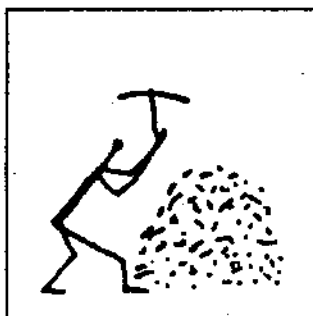
For this purpose you mix
the rotting organic waste
with humid earth,
sprinkled with water

and remix it repeatedly
over a period of time.

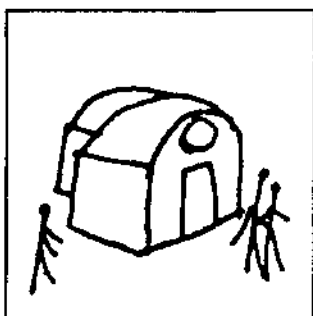


After a long while
you shall get good compost –

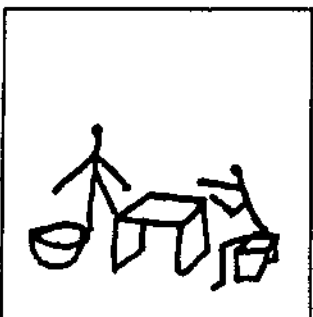
fertilizer for your garden
or for sale.



Urban waste is thus
a sort of modest mine of materials



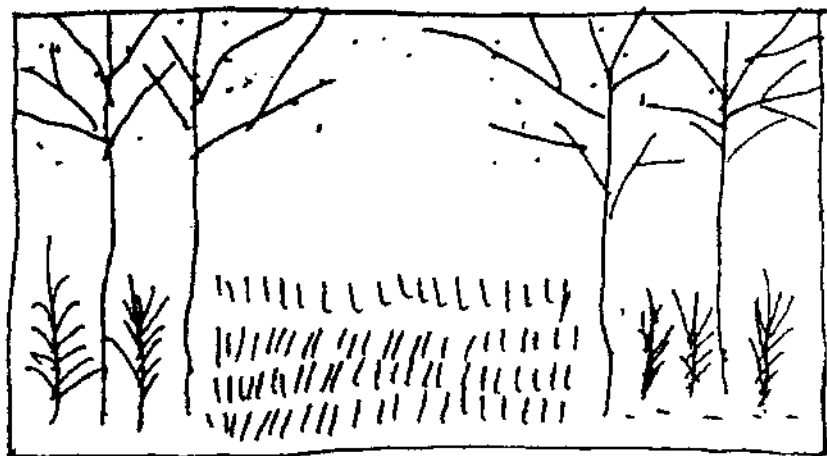
which can be used
for making shelters,



furniture
and other household goods

or for small handicrafts
to make a living out of them.

III. GROW MORE TREES

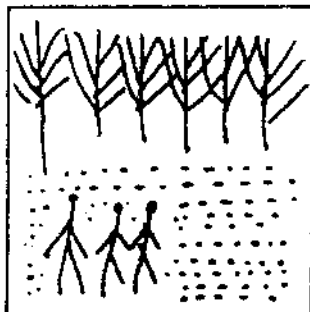


- What is Agro-Forestry? 72
- Agro-Forestry : Which Forests? 78
- Agro-Forestry : Which Crops? 85
- What Care Does a Woodland Farm Need? 89
- Farming in 'Three Storeys' 95
- Growing Trees with Little Rain 102

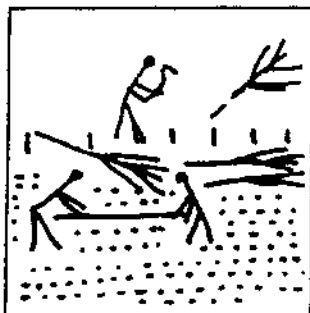
What is Agro-Forestry?

*Forests could be profitably used as farmland
without destroying the existing trees.*

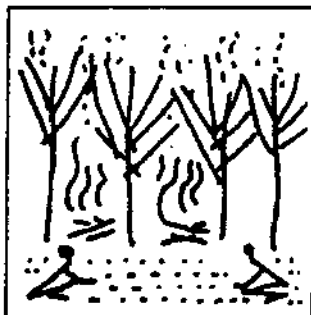
*A combination of trees and undergrowth
may yield multiple cropping to the farmer.*



People
who want new farmland

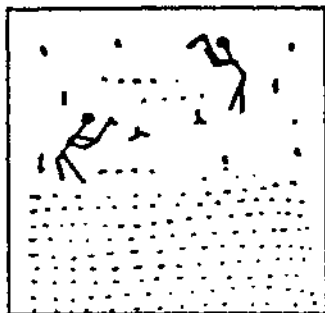


often destroy
the existing forests



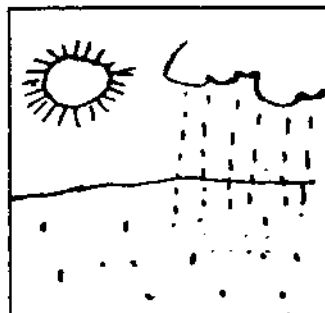
by cutting down
all the trees

or by burning them down.



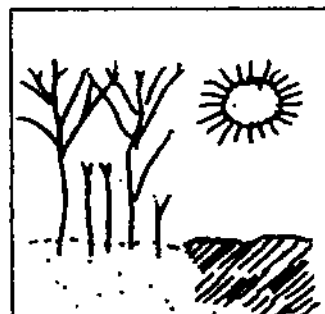
The deforested area

they convert into fields.



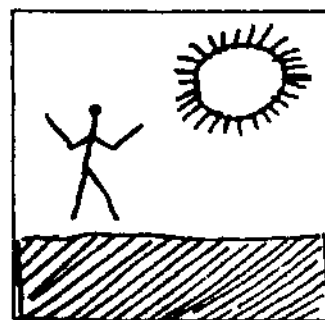
This trend
is very dangerous

practically in all regions.



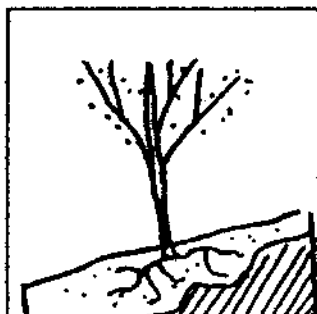
Under certain climates

certain types of soil
turn into solid rock



when not protected
from sunrays
due to absence of trees.

Such hardened soil becomes
sterile for growing crops.



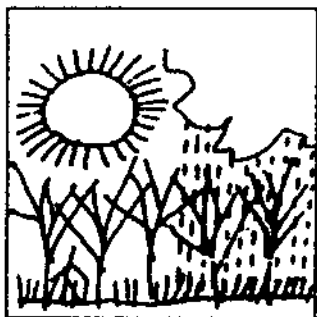
Normally, trees retain
with their roots the fertile soil

particularly on a slope.



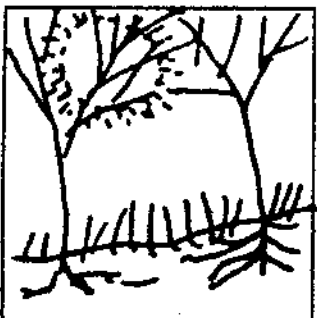
Once those trees
are cut down

the rain washes away
the fertile layer
and the slope becomes barren.



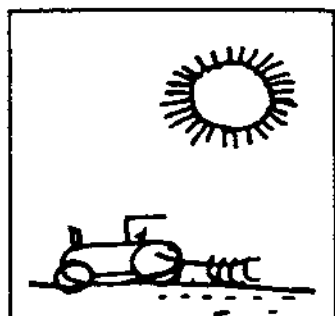
In most regions
having too dry a climate
or too violent a rainfall

existing forests could be made
to give better farming results
than deforested areas.



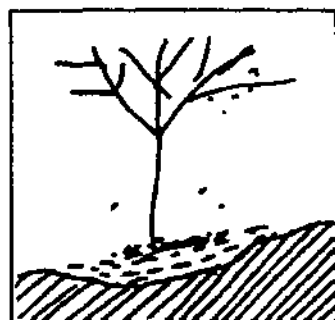
Trees of a forest

keep the soil intact
and improve its fertility



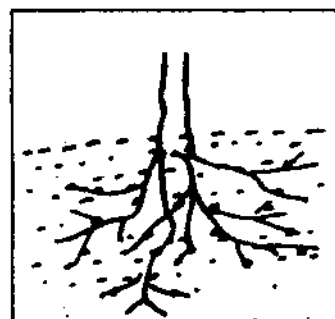
often more successfully
than does the farmer

even with his modern tools.

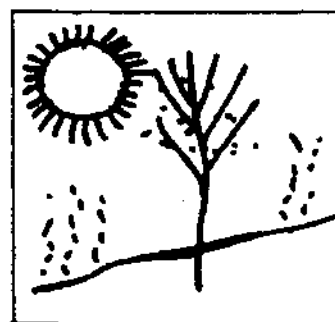


Trees improve the soil
around them in many ways :

they make it fertile
with rotten leaves and moss
(which act as natural compost).

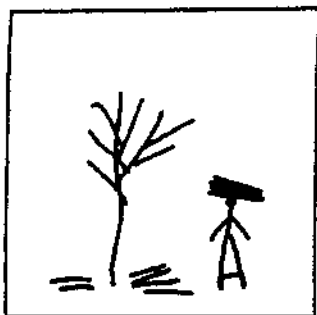


Their roots often contain
soil enriching microorganisms.



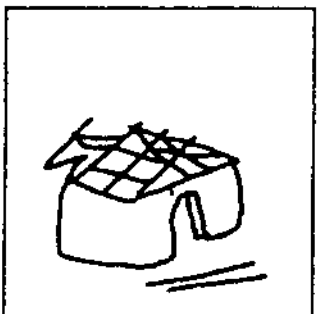
Trees also lessen evaporation

and make the soil
keep its humidity.



Besides keeping the soil
in good condition

trees furnish firewood,

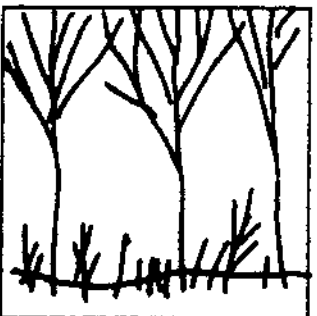


raw materials
for craftsmen,



food for people

and fodder for domestic animals.

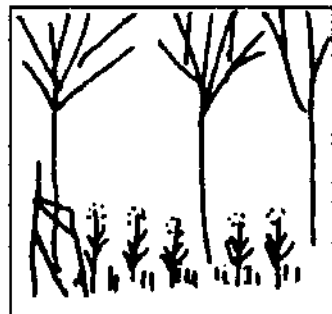


But a forest
does not consist of trees alone :

there is the undergrowth

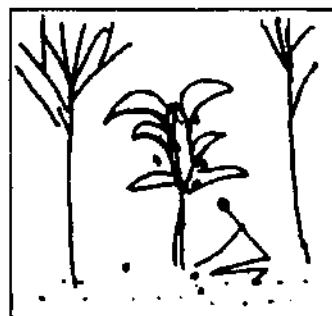


wherever there is enough daylight for the plants to grow.



The right approach is not to cut down forests but to use them as a special type of farmland

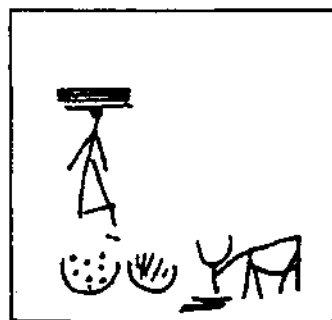
replacing the undergrowth with plants you want to grow.



Similarly, new trees can replace some of the original trees to make the forest more fruitful.

Indeed, undergrowth and trees complement each other

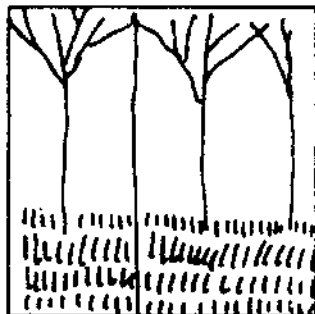
and can give multiple crops to the farmer :



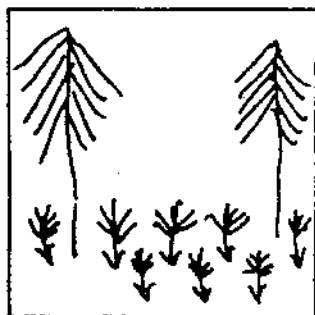
fruits, legumes, vegetables, fodder and firewood.

Agro-Forestry: Which Forests?

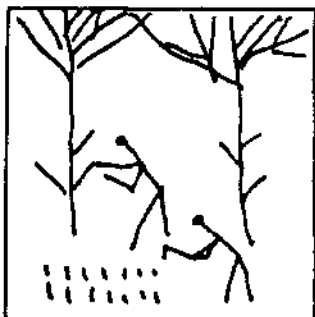
*Well-managed woodlands can give higher yields
through agro-forestry
than what can be achieved
through farming on deforested land.*



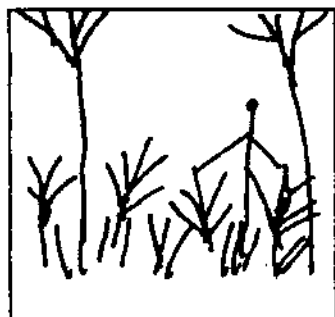
To use forests
as farmland



one has to know what types
of forests are good for
what kinds of undergrowth.



To make the forest
suitable for farming



the simplest way is
to stabilize the undergrowth :

it can be often used
in its natural state



as pasture (sparingly)
for domestic animals

like sheep

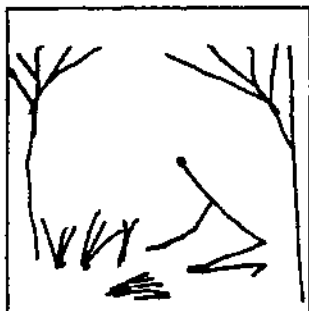


or goats or cattle.

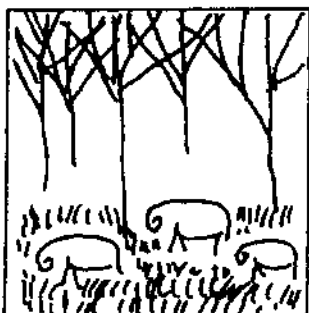


The undergrowth varies
with each forest.

But most undergrowth
can be used for pasture;

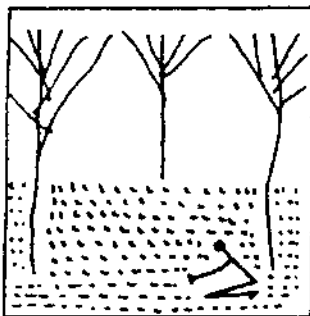


some undergrowth
can be used as fodder.



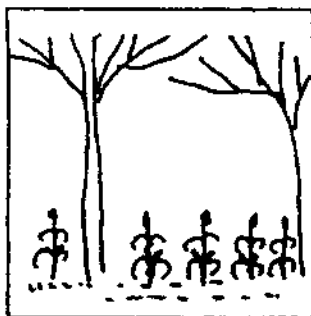
Using it as pasture
might often be more easy

involving less work.



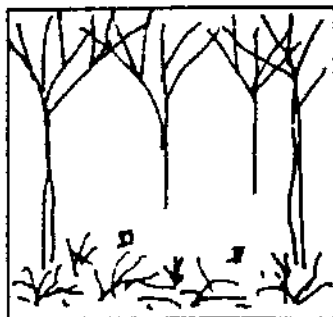
But it can be more interesting
to use the forest area

for growing food crop



as undergrowth

using suitable food plants or
new trees which can co-exist
with existing trees.

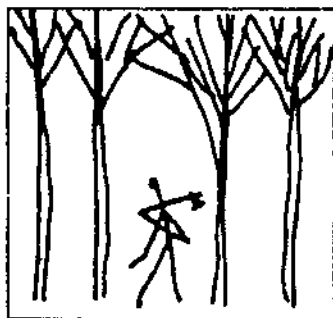


Cutting of existing trees
should be avoided
as far as possible.



To plant food crop
among the trees

does not involve much labour.

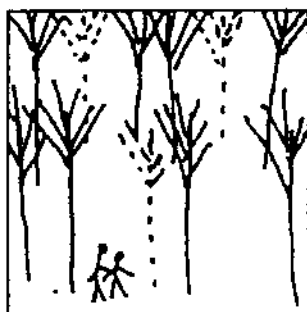


However, to grow
undergrowth crop
in the forest,

the forest
should not be too dense.

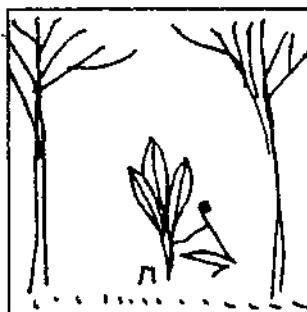


You can make small openings
between the trees

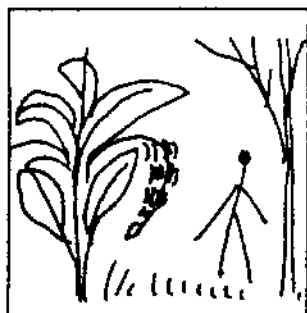


by cutting down
(for example) one tree in 3 or 4.

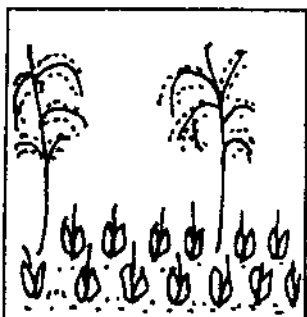
The best way is to
create corridors,
about 10 meters wide.



You can as well replace
a part of the forest trees

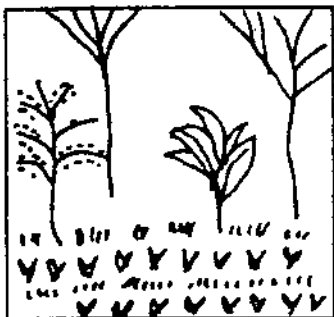


with such trees
which give you valuable crops



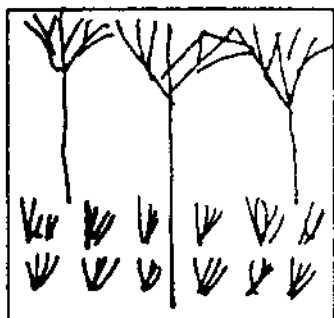
and whose vicinity
can be beneficial

to the undergrowth
you have planted.



But it is best if you don't plant

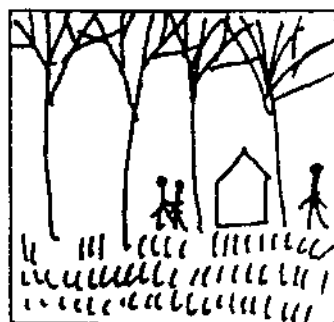
only one kind of undergrowth
or only one kind of trees.



If you learn how to manage
your woodland the right way

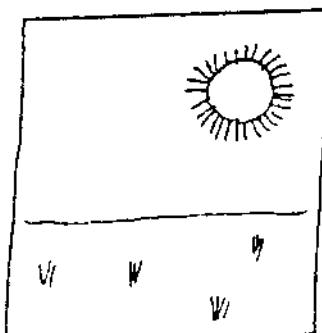


it may yield even more than
common fields do.

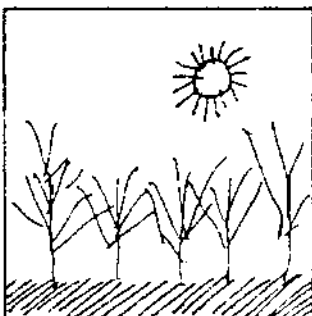


But if you consider the value
of your land in the long term

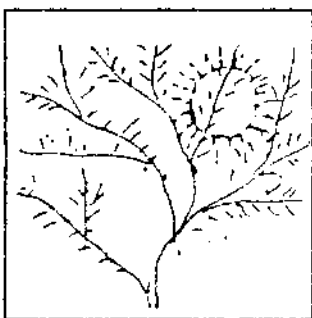
woodlands will yield more



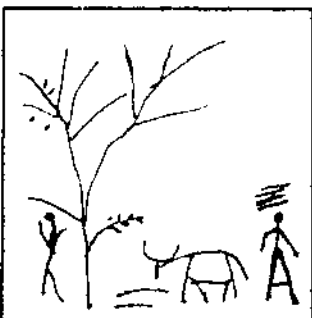
than what you can derive
from deforested fields.



Trees as well improve
the climate at the spot



by filtering the light.

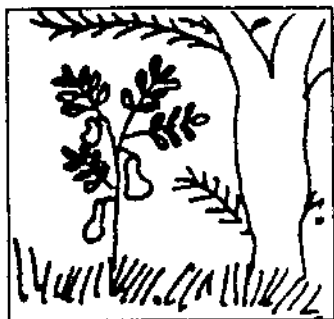


Finally, trees can give fruits,
forage, fuel wood, timber
and even vegetal materials

and thus make a woodland
farmer prosperous.

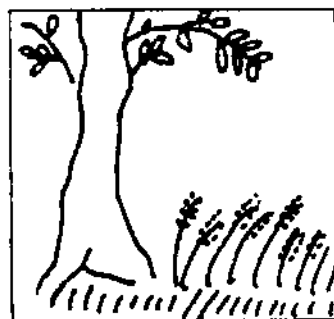
Agro-Forestry : Which Crops?

Any forest could be adapted for agro-forestry keeping in view the climate, type of soil, kind of trees, the needs of the people, and by selecting the suitable undergrowth, which can co-exist with the trees.



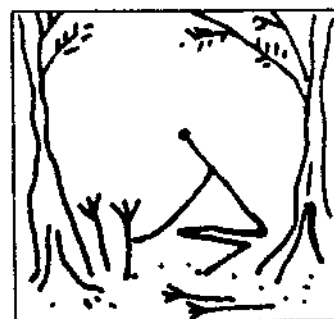
It is important to select the right plants (matching them to the right trees)

for farming within the forest

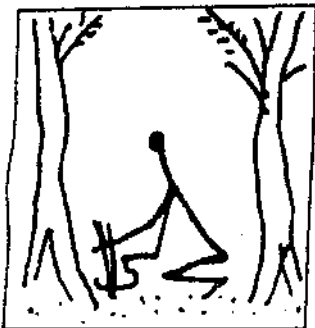


because every food crop may not grow well

as undergrowth among the forest trees.



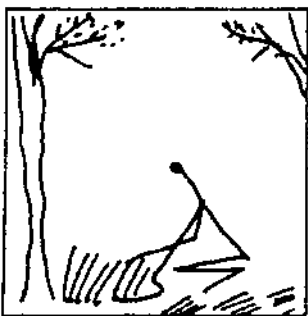
Planting of crops among trees



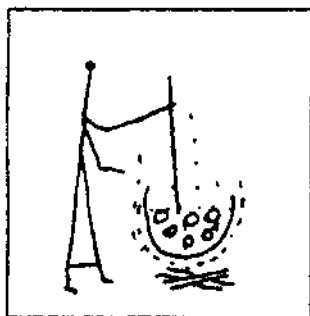
and harvesting them
from there is not easy.



In this respect vegetables
and legumes could be preferred



over cereals (rice, wheat, etc.)
and grass-like plants

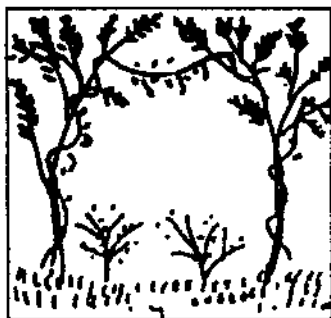


Vegetables and legumes
are some times
more nutritious than cereals.

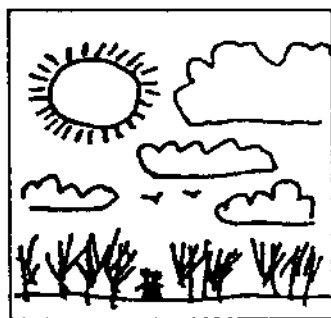
They are also easy to cook
compared to the cereals.



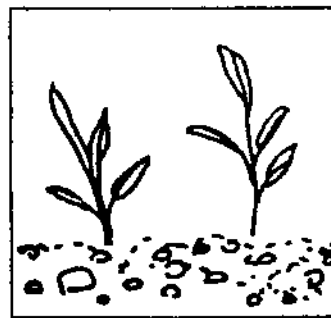
Creepers like beans could be ideal for agro-forestry, which easily creep on the trees.



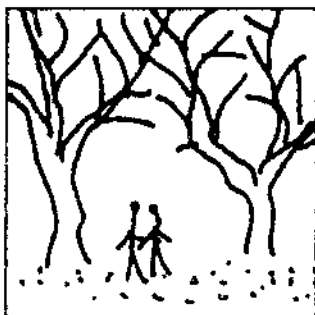
They can also co-exist with the undergrowth.



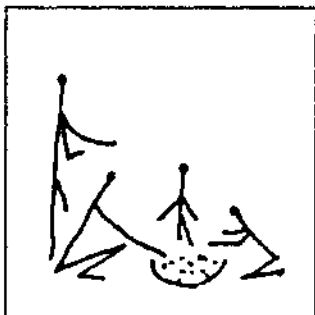
However, it ultimately depends on the climate,



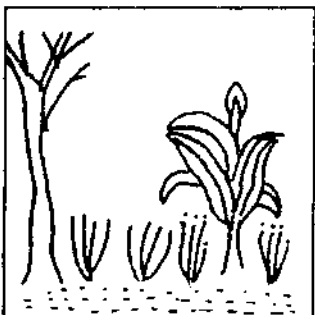
on the type of soil,



on the kind of trees



and on your needs,



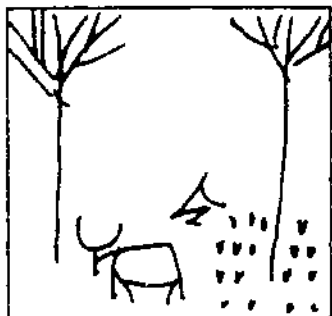
as to which plants are right
for your woodland farm.

There is no forest on earth,
which could not be adapted
to woodland farming

with suitable undergrowth,
and some of its trees substituted
by trees of your own choice.

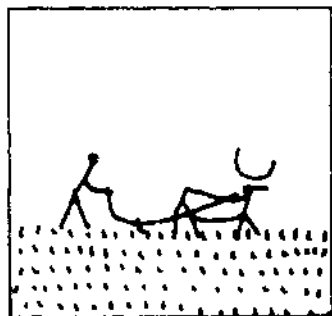
What Care Does a Woodland Farm Need?

*A well-managed woodland farm
demands more of your time
to observe the various plants growing there
but less of your time
to perform actual physical labour.*

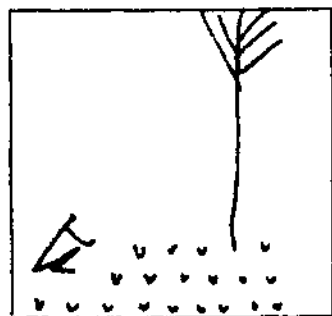


If you do farming
in the woodlands

it necessitates a care

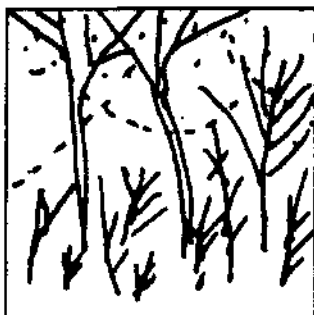


different from that
involved in farming on the fields



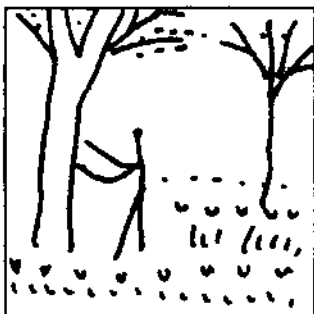
more attention, less tools

and less work.



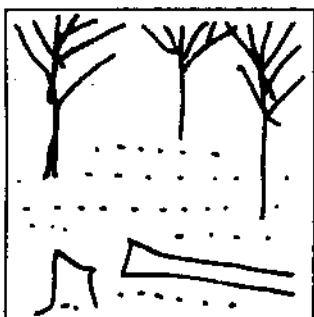
First,
give attention to those trees,

which were there before
you started to farm.



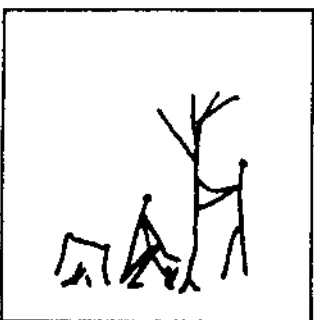
Select those trees,
which give useful products
and have 60-80 trees a hectare.

See that they are in good shape

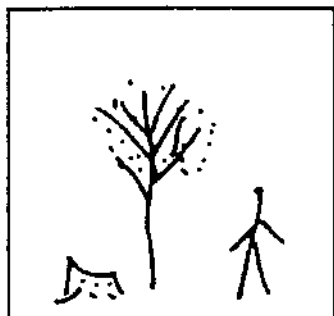


and cut down those,
which seem weak,

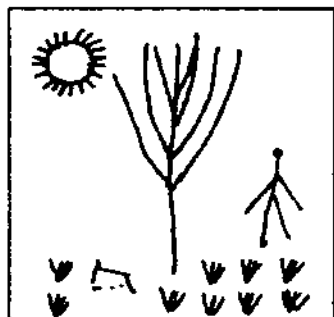
diseased or dead.



If you cut down a tree
you should replant a new
one with marked utility

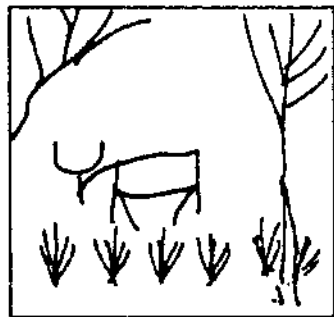


near the same place
where you cut the old one.



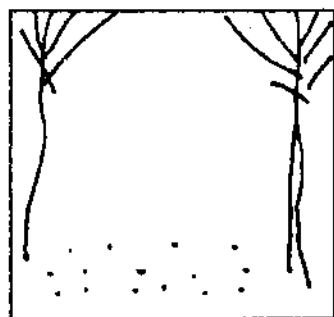
Think it over well
which kind of crop you will plant

in the "corridor" or patch
where there is sunlight
in the vicinity of the new tree.

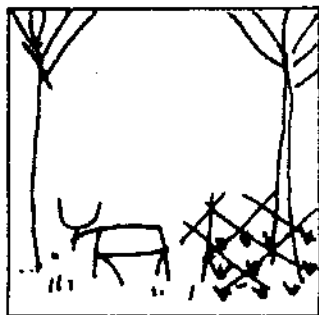


You have to take care
of the undergrowth as well.

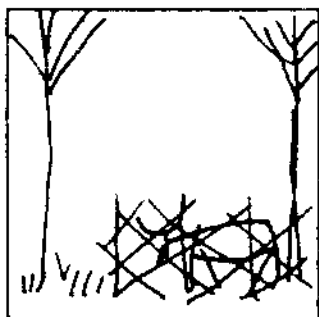
If you use it for pasture
for domestic animals



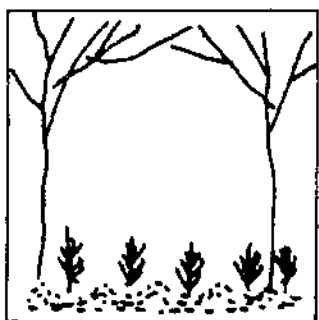
beware of overgrazing :
the plants need time for rest.



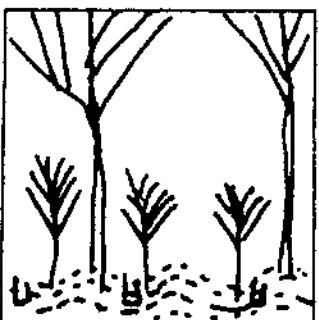
Don't thus let the animals roam all over your forest land



but let them graze in fenced compartments, one compartment for a certain period.



Such enclosures serve as a source of dung.

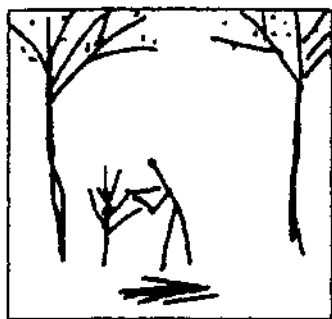


You should tend the undergrowth that you have yourself planted for its crop

as you would your own garden or plantation

keeping it well watered, enriching its soil

and checking it for pests and plant diseases.



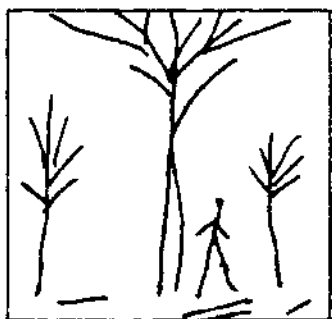
The trees and bushes from which you take your firewood

you should harvest carefully.



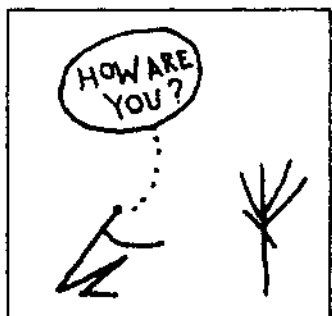
If you strip them of too much branches or twigs, taking all from the same plant, or cutting branches too frequently,

the plants will die.



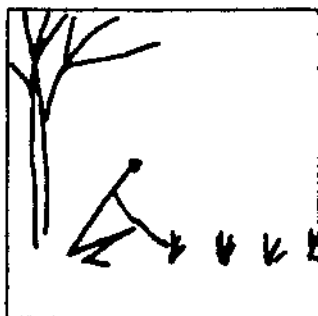
It is better to take a few branches from this plant and another few from another one

keeping all of them alive.

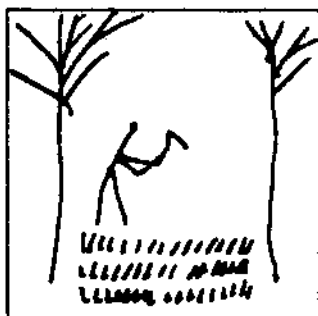


A well-kept woodland farm asks for much time

to observe all plants

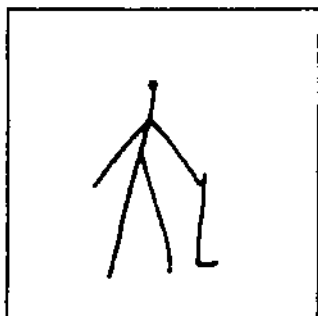


and far less time
of actual physical work.



Mechanical tools
are practically excluded
(except those with draft animals)

as plant beds
are practically too small.

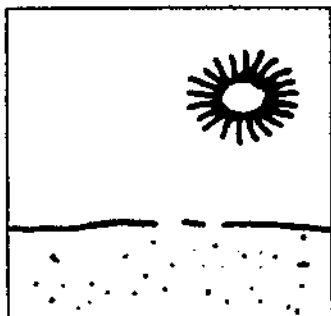


Hand tools, oxen, handwork,
observing eyes and a good
head on your shoulder

are what
a woodland farm needs.

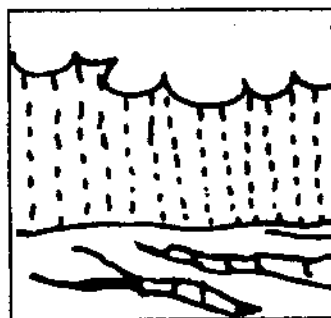
Farming in "Three Storeys"

*By growing mutually co-existing plants
of three different heights – trees, shrubs and grasses –
you can protect your land from deterioration
and at the same time
increase the total yield from it.*



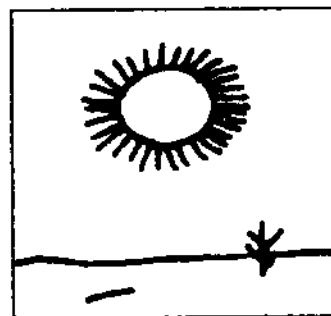
The soil, if unprotected,
gets bone dry during drought

and deteriorates in quality.



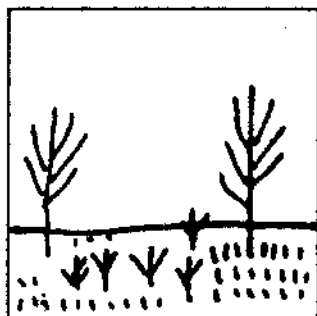
Even if
there is adequate rainfall,

fertile soil is subject to
deterioration due to erosion.



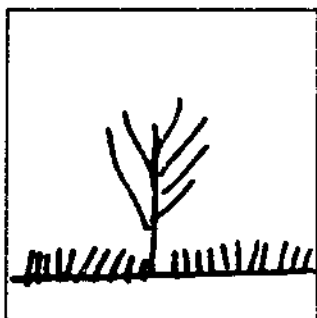
Constant sunshine makes
certain soils barren

if there is no
protective plant cover.

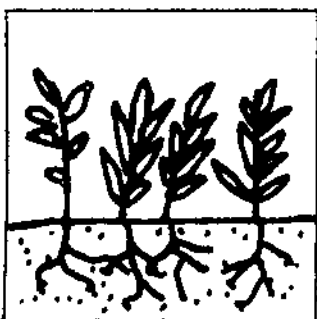


Plants protect your land

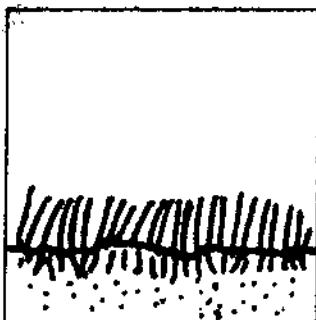
by resisting erosion.



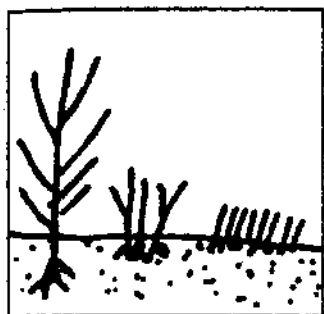
Plants also
keep your soil in shade



and their roots reinforce it

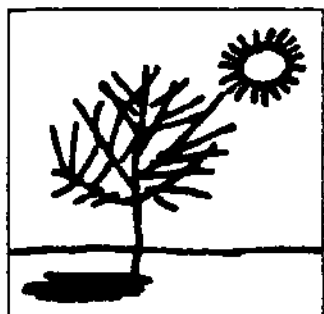


and help it keep its moisture.

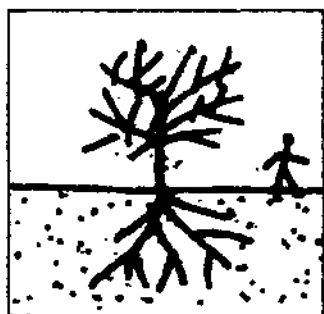


If you combine
various plants together

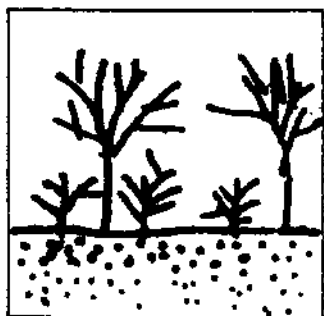
such protection is more effective.



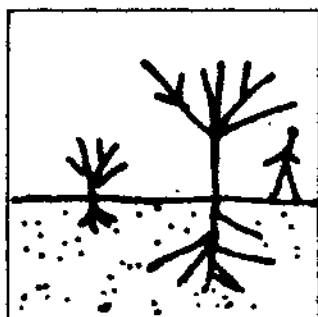
Trees give enough shade



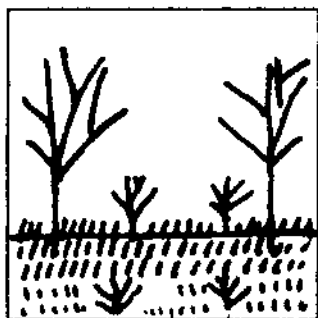
and their roots go deep.



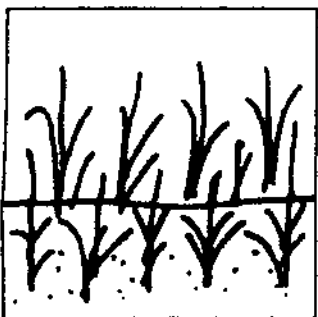
Shrubs
are able to live among trees



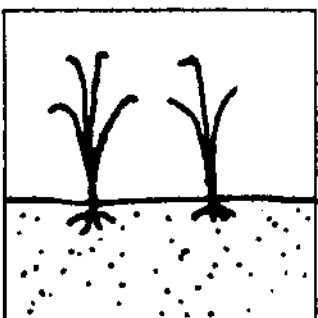
because
their roots go less deep.



Between trees and shrubs

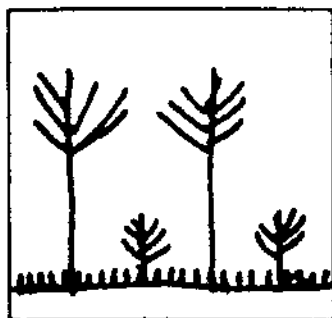


grass-like plants can also have
enough room to grow :



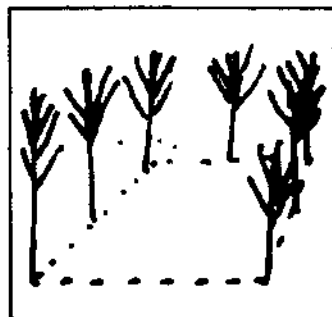
their roots reach
the upper layers of the soil

which are unexploited
by trees or shrubs.



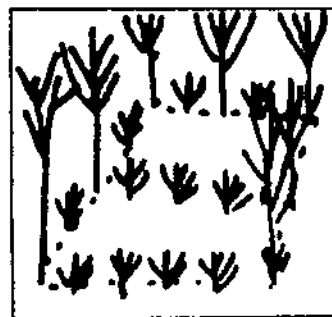
You can thus
farm your field

in three “stories”:



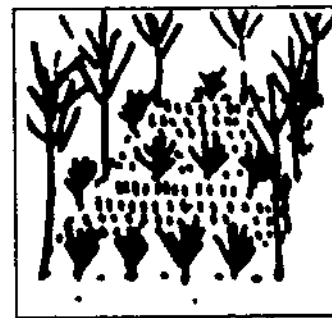
you border it with trees

(which give you fruits,
or firewood)



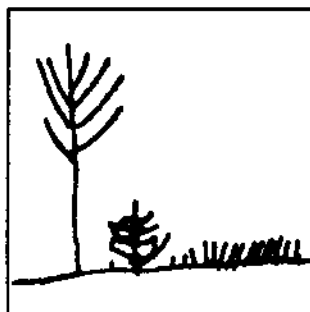
you plant hedges of shrubs

(which produce useful leaves,
fruits or seeds);



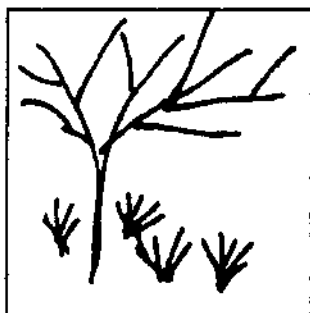
and you seed
grass-like cereals

among them.

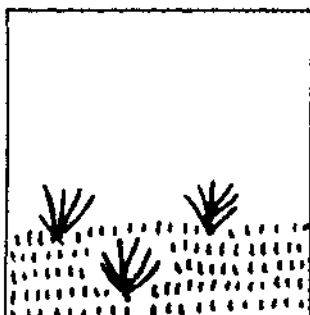


These three categories
of plants

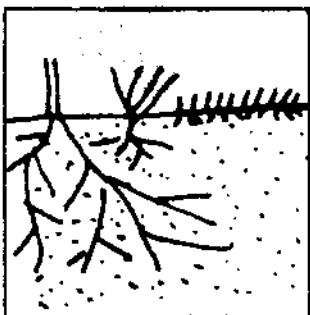
can mutually improve
their growing conditions.



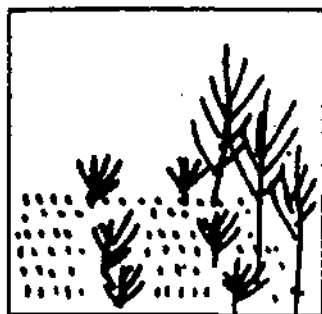
So do certain
trees and shrubs



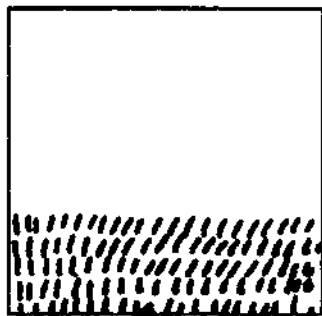
and certain shrubs
and grass-like plants
(cereals, legumes, etc.)



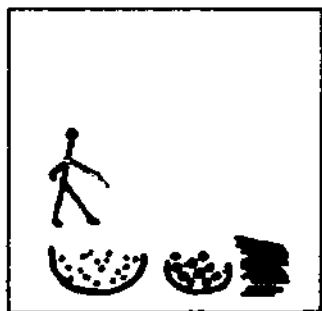
enriching the soil for each c



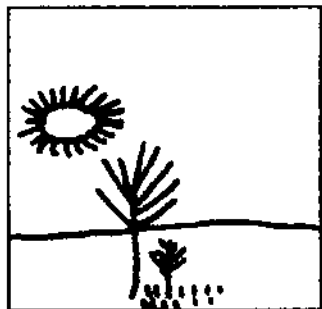
Land cultivated
in three “stories”



yields more than
it does the ordinary way



if you look at the
TOTAL production.



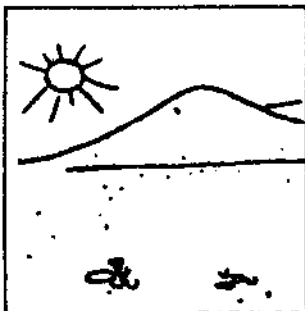
Farming in three “stories”
helps your land produce even i:

the climatic conditions
are particularly bad.

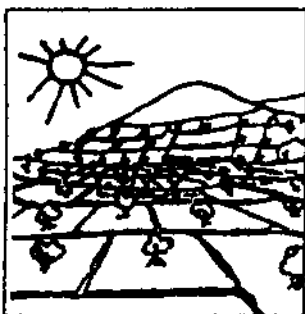
The “three storey” culture
thus protects your land
and gives you better yield.

Growing Trees With Little Rain

*In areas where it rains too little to grow any vegetation,
one can make some income by growing trees
and other plants in micro-catchments
that could be easily made.*

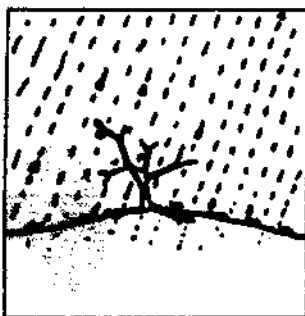


In areas with too little rainfall
for plant survival



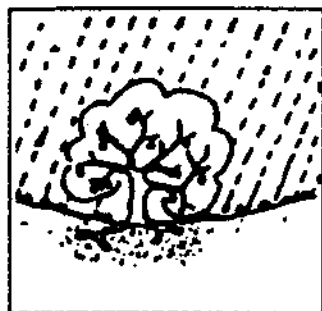
farming can be made possible
with some effort :

fruit trees, forage plants,
firewood or crops can be
productively grown.



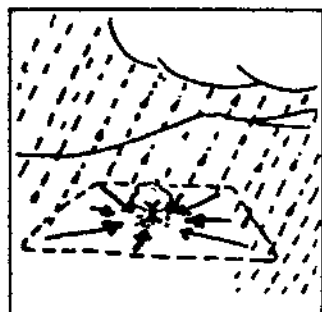
In dry regions,
a plant cannot survive
with the rainwater alone

which falls
in its immediate proximity.



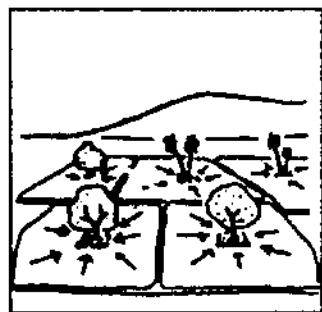
But plants
do grow in depressions

because of the extra
run-off rainwater that gets
concentrated around them.



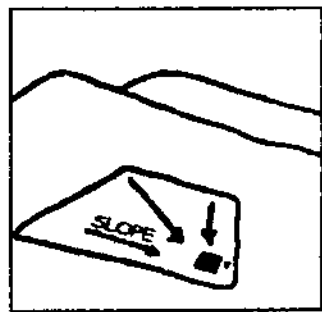
A large piece of land,
sloped to one point,
collects enough run-off water
to ensure survival of one fruit tree
or a few other plants.

We call such a plot a
“micro-catchment”.

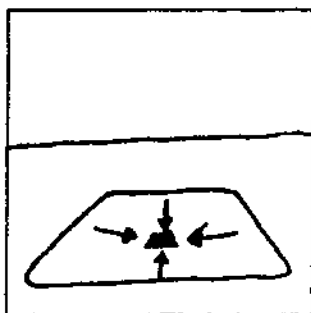


A micro-catchment consists
of a large rainwater collecting
area and a small plot
of fertile soil.

Its size depends
on the local climate
and the kind of plant grown.

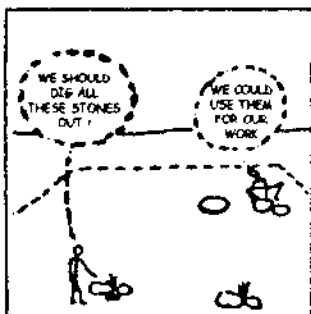


Micro-catchments
can also be made taking
advantage of natural slopes.

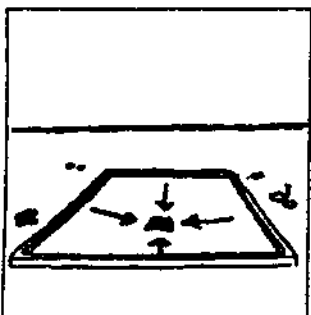


In case of a level terrain,
an artificial slope can be made
to design a catchment.

Here, even a very slight
slope is sufficient!

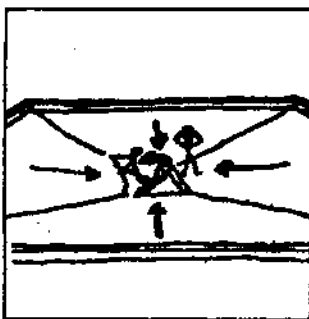


The surface of the catchment
can be left in its natural state or
cleared of stones and rocks.



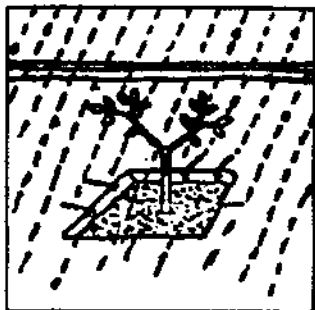
Each catchment is surrounded
by a low wall,
to protect it against erosion.

(You can make this wall using
stones or dry mud).



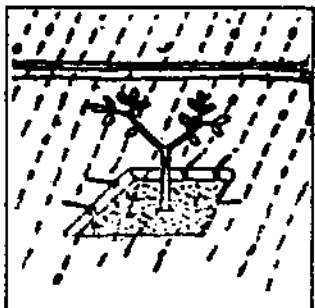
At the lowest point
within the catchment
a basin should be dug

which can be
one or two feet deep and



large enough to store
the run off water
collected by the catchment.

The soil in the basin
becomes so fertile,
that plants can grow there easily



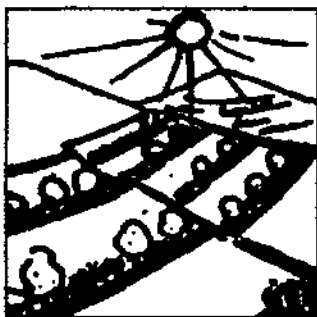
However,
to facilitate plant growth,
the basin can be
fertilized with manure.



To enable easy water
penetration the soil in the
basin should be kept loose.

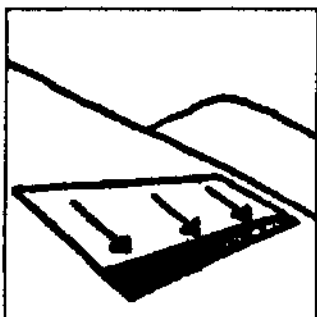


A mulch of straw
or some other kind of cover
can reduce
water evaporation from the soil.

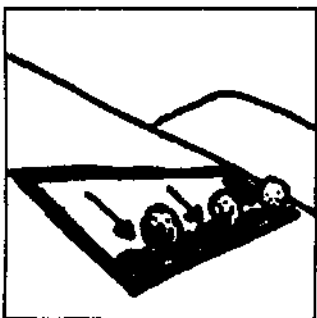


In hills, where the slopes are more steep, micro-catchments can have a different form :

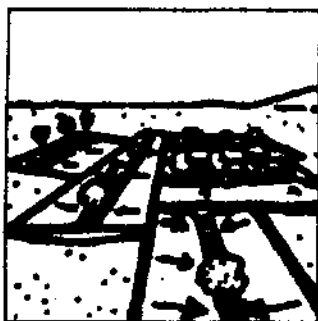
Here the fertile soil is disposed in long, narrow basins.



A basin is placed along the lowest strip within the catchment.

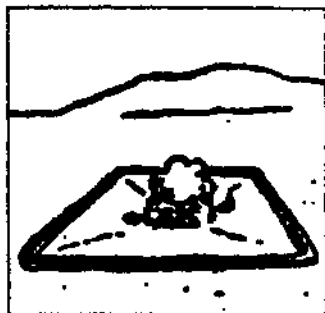


Here you can grow trees and other plants.



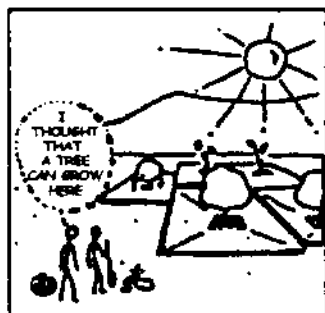
A similar arrangement can be adopted also in the plains.

Here the rainwater collecting area can be placed on both side of the basin having fertile soil.



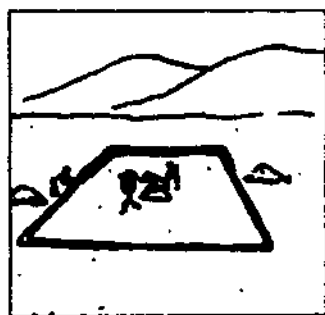
The micro-catchment technique has one limitation :

it makes use of much land for each plant.

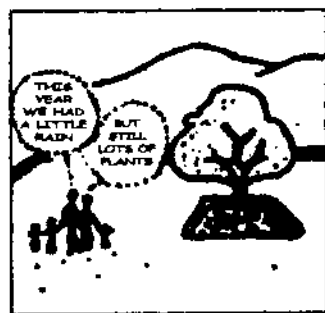


But its advantages are greater :

It makes barren land productive;

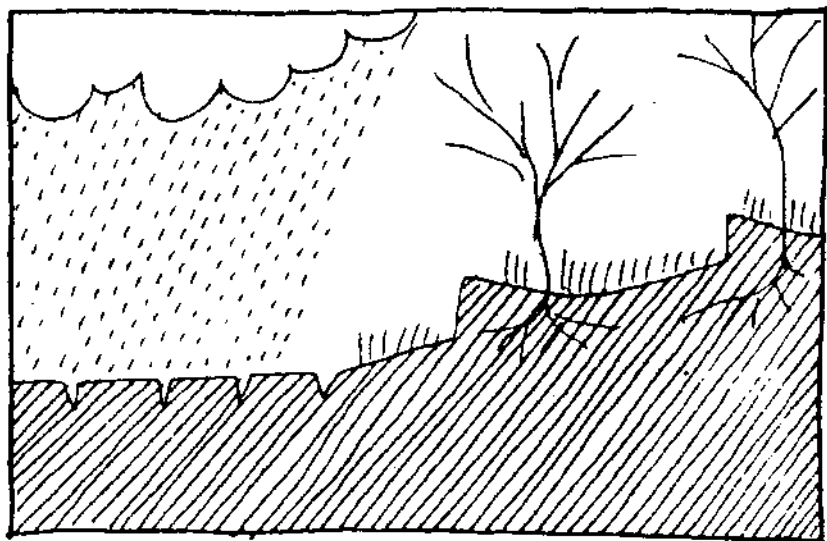


it is less expensive than most other techniques;



and it can help you make some income by spending almost nothing!

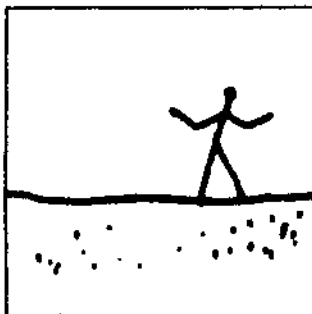
IV. WASTELAND INTO FARMLAND



- Wasteland Into Good Land 110
- Washing the Salty Land 120
- Self-Forming Terraces on Slopes 126
- Catching the Run-Off Water 132
- Crops that Need Little Water 144

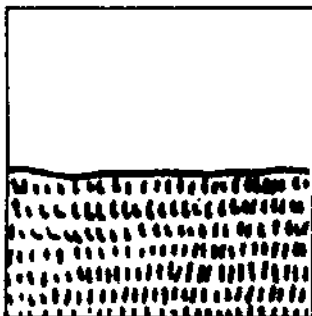
Wasteland into Good Land

*You can make your salty barren land fertile
by washing its extra salt content by means of rainwater.
But when the infertility is due to erosion of the top layer
it could be enriched by compost prepared on the spot
and by growing suitable crops and plants.*



There is much land
in our country,

which cannot be used
for farming in its present state.



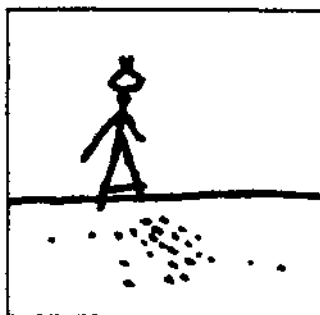
But much of such land
could be converted

into farmland



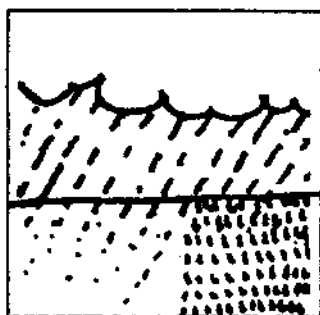
if, for a few years,
people invest in them

some labour
and the necessary care.



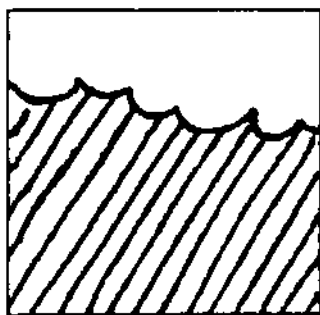
The first thing to do for
converting bad land
into good land

is to provide water.

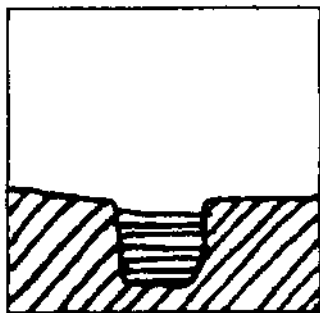


Everywhere there is some rain,
even if sparse

on good land
as well as on bad land.

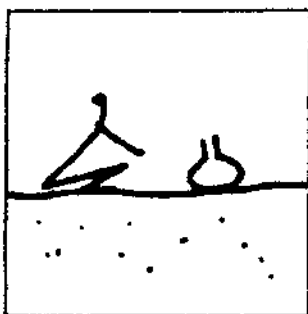


Rainwater can often suffice
for converting
bad land into fertile one

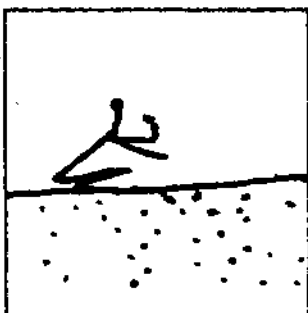


if you know
how to collect and store water

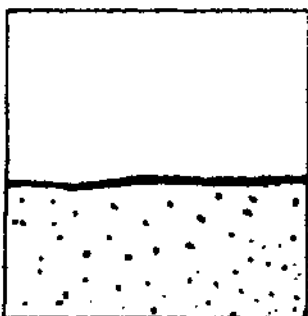
as near to your land as
possible.



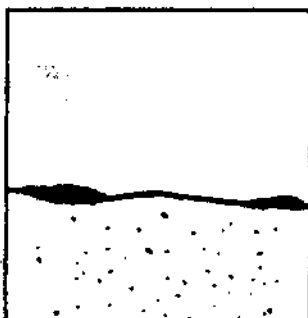
But having water
is not enough
to make wasteland fertile.



You have to find out
why your land is barren :

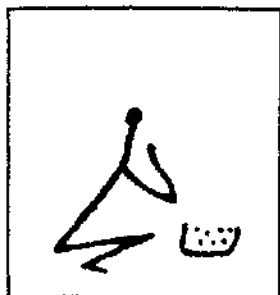


it might be due to
salty soil,

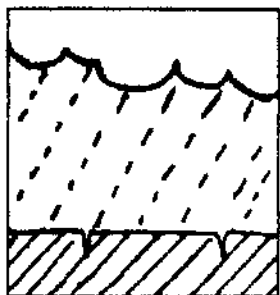


or it might have been
destroyed by erosion

(wind and water carrying away
good top-soil).

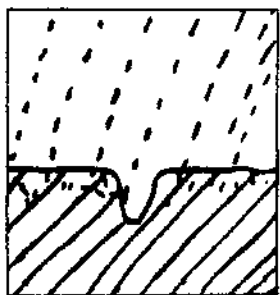


If the soil contains salt



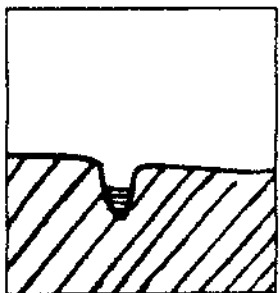
you can make
the rain wash it :

deep furrows every few feet
can work as drainage.

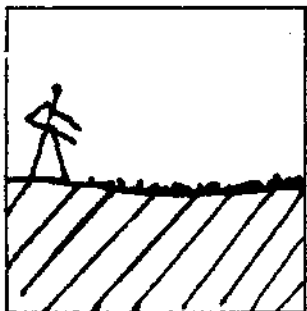


During rains water trickles
through the top layer
of the soil

washing the salt away
into the furrows.

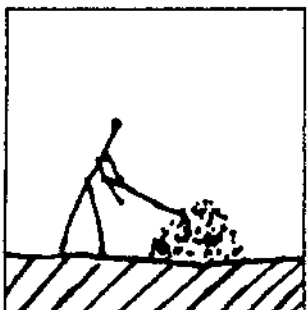


The strips between
the furrows
thus become free of salt.

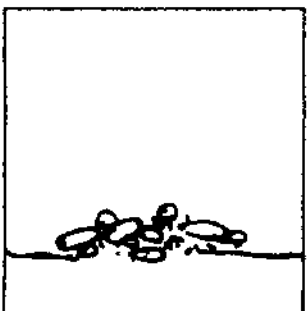


If the land has lost its good soil,
what you need is not to wash it,
but to feed it :

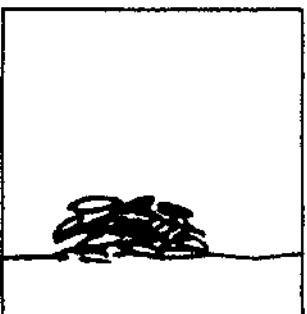
you should create
a fertile cover over it.



For this purpose
you can use compost

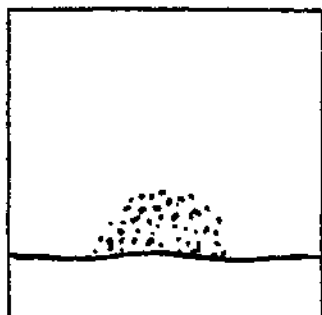


made of animal waste,
vegetal waste, kitchen refuse, etc.

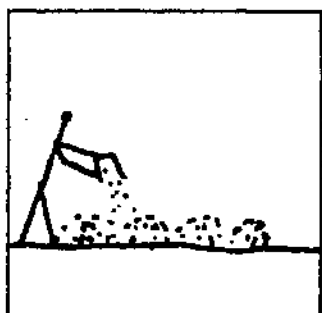


You can even use
as a base for the compost

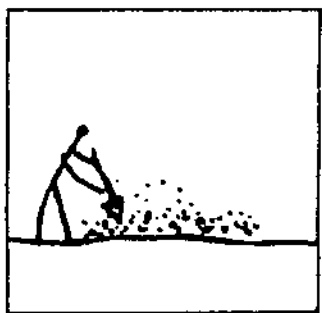
water weeds from ponds.



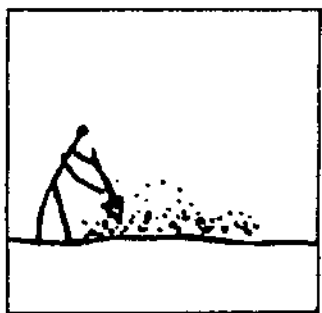
It is not difficult to make
compost out of organic waste :



you just pile the waste into
a heap and let it rot



by watering it from time to time.



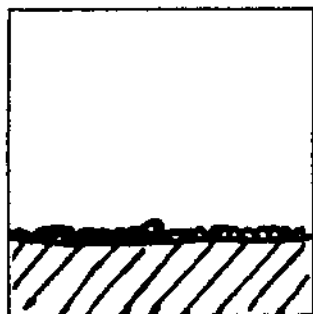
You have to turn over
the heap periodically



in order to expose
the whole mass to air.

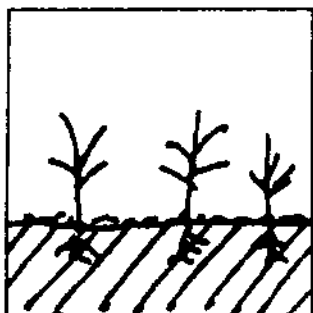
When the compost is ripe

mix it with
the top layer of your land.



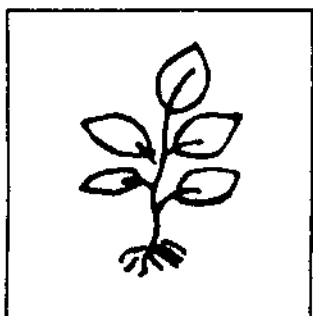
You should grow
(for the first few years)

on the washed
and composted land

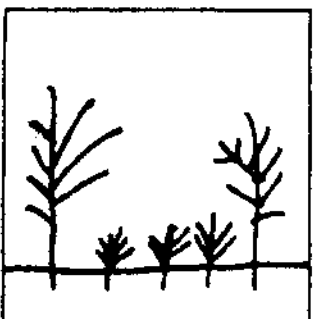


crops,
which can tolerate poor soil

and even enrich it.

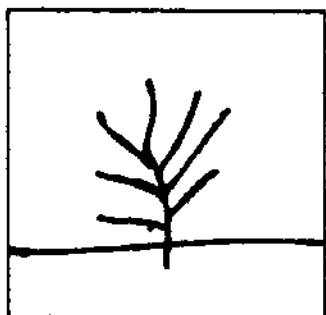


Such crops differ
from region to region.

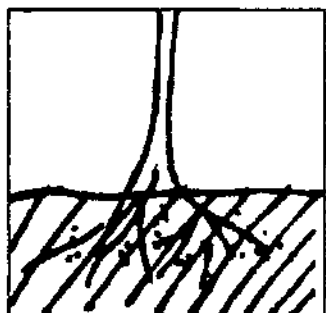


But, generally,
it is better to start

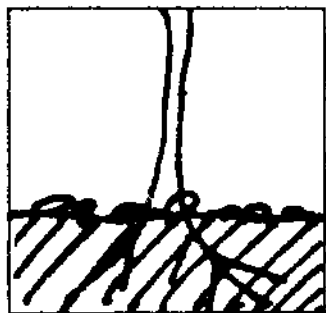
with certain trees
or shrubs.



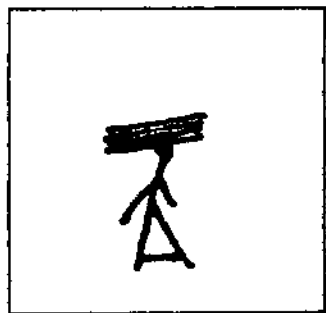
There are trees,
which grow in poor soil



and some trees
even improve the soil quality.

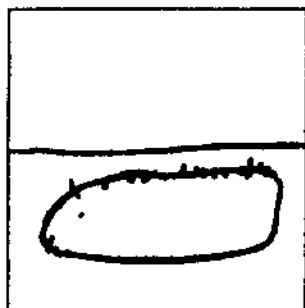


Their foliage can serve
as the next compost.



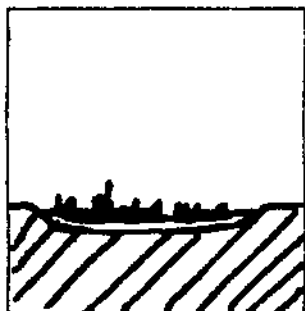
And these trees
might give you fruits

as well as
branches for firewood.



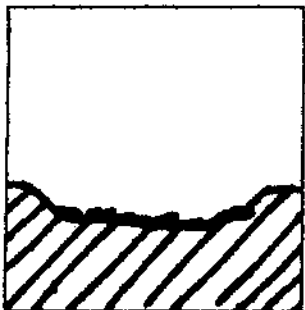
You can also convert your wasteland into farmland (if you have enough rain)

by converting it into a pond for a year

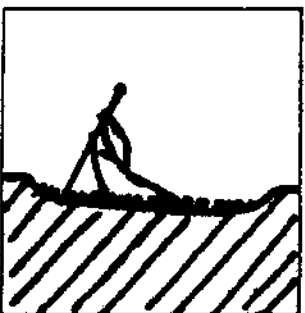


and growing water weeds (or even fish) in this pond.

(Water hyacinth might serve the purpose).

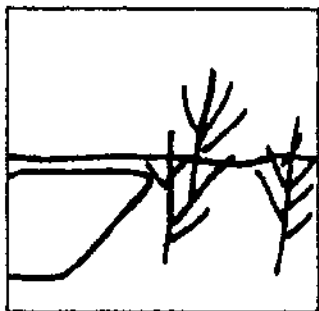


When, in the dry season, the water becomes shallow (or even disappears)



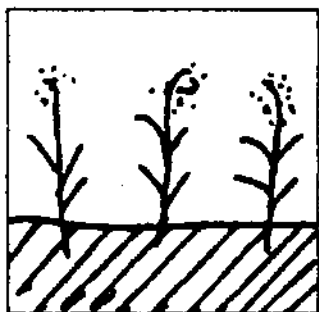
you can convert the weed into compost on the spot

and thus enrich the soil.

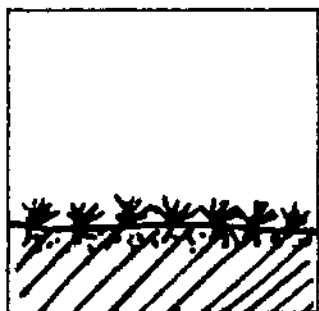


There are many ways
to convert barren land

into farm land

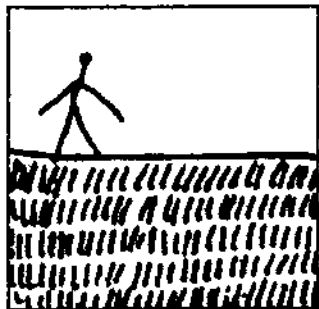


and there are many plants,
which grow on poor land.



If you grow every year
plants that enrich the soil

(even if the crop
does not enrich you)

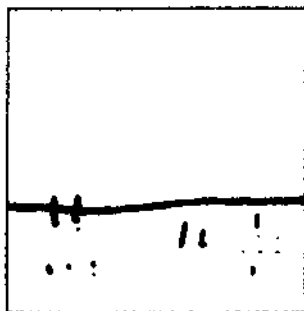


you can procure
for yourself in a few years

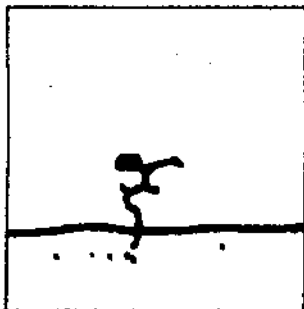
a fertile farmland.

Washing the Salty Land

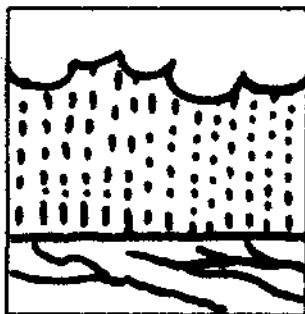
*The barren salty land could be made fertile
by washing off its salt content
with the help of rainwater
by making suitable furrows to drain out the water
thus rinsing the soil.*



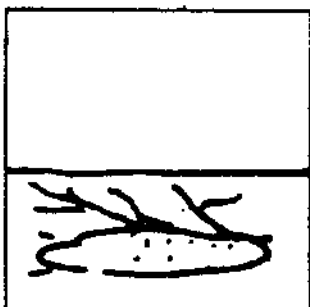
Barren land
often contains mineral salts,



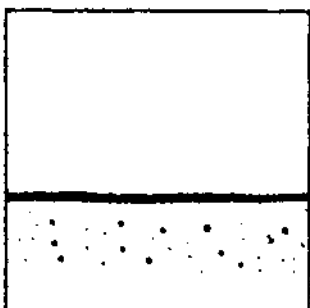
which make it difficult
for the plants to grow.



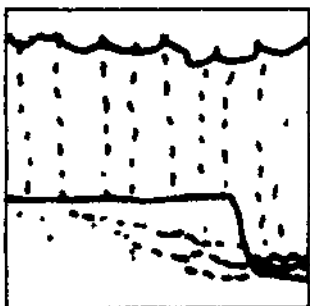
Some of these mineral salts
could be washed away
with rainwater



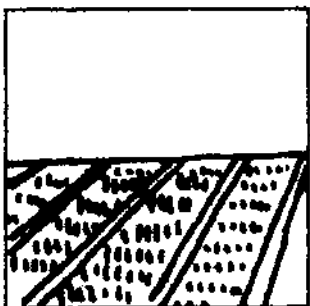
if the rain-washing the soil
could be evacuated.



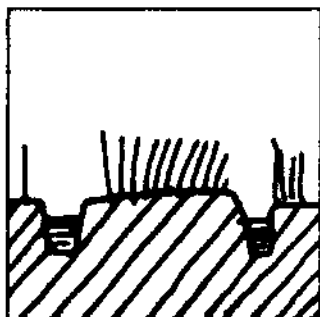
In order to wash the salt away



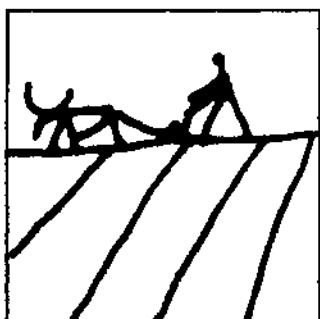
the land has to be drained.



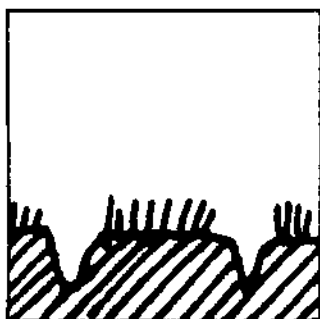
Such a drainage system
consists of shallow canals



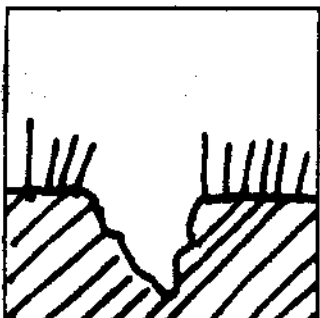
for collecting
the water rinsing the soil.



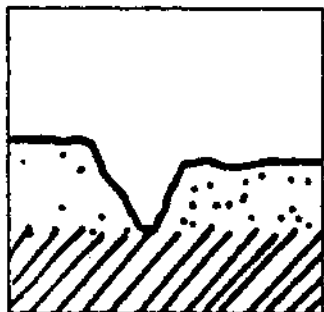
A simple drainage system
consists of deep furrows



separating plant beds
of about 2-3 feet width.

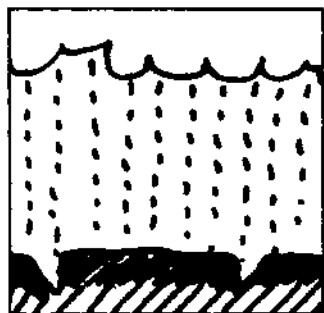


The furrows
should be about one foot deep

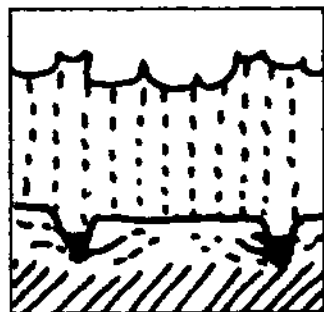


The actual depth depending
the thickness of the soil layer

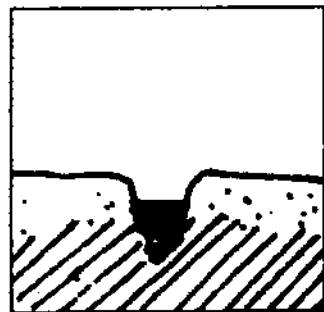
you want to wash.



Each rainfall
thus gets soaked in the upper
layer of the soil

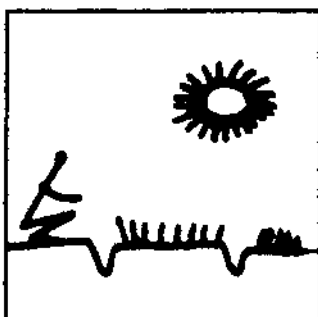


and rinses it

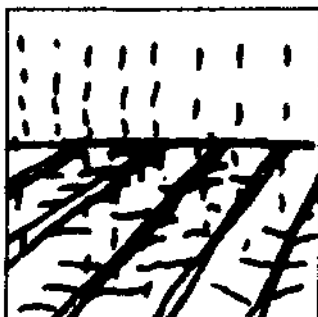


and the water rinsing
it is collected

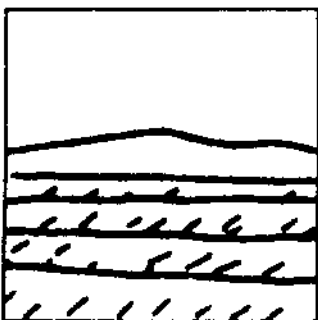
in the furrow.



Washing of land
is not a quick process :

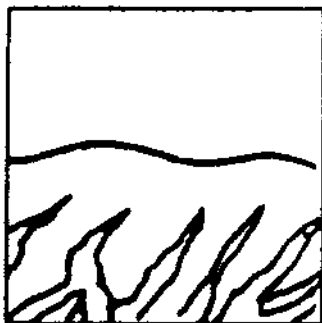


indeed, the water
rinsing the land should not run off
too fast on the field;



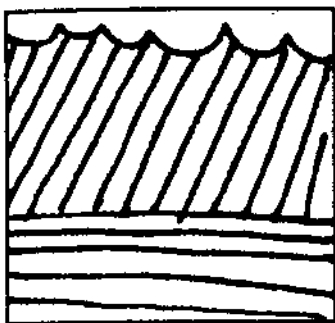
and even the water in the
furrow should flow very slowly

(make your furrows
parallel to the slope)



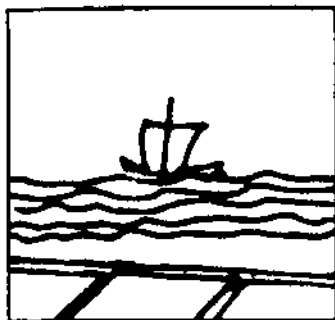
else your land
could get eroded

and thus loose
the good top soil.



Washing salty soil in a region
with sufficient rainfall

can take a couple of years.

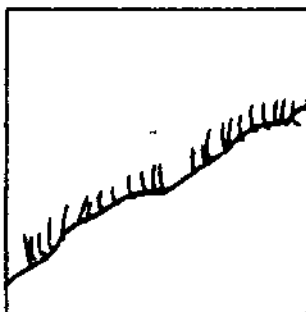


You can even wash
land reclaimed from the sea

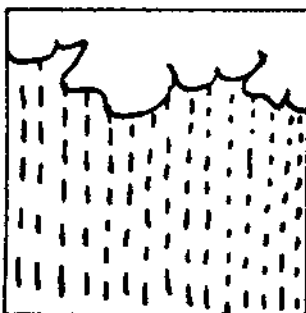
in about 5-6 years.

Self-forming Terraces on Slopes

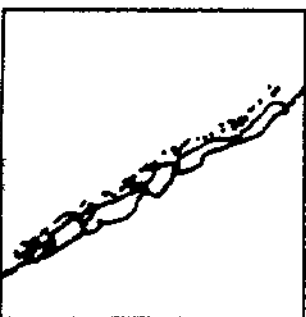
*Rows of trees planted on terraces
can serve as "soil traps"
to protect your land
against the ravages of the rain.*



On hillside land

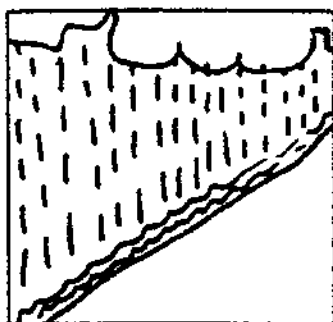


in the region
where rain is very violent

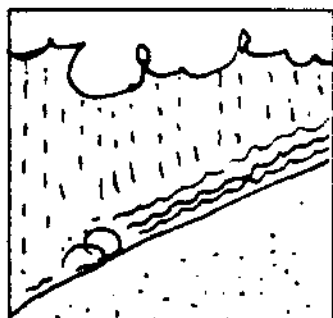


or very frequent

all the fertile
top-soil gets lost

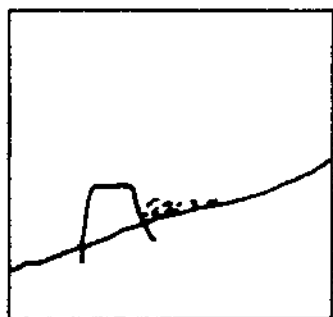


washed away
by the run-off water.



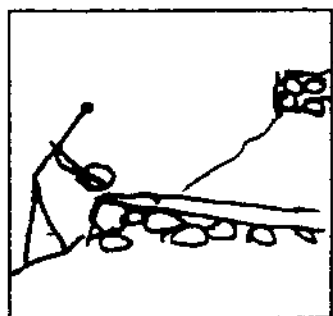
You can slow down
that run-off

so the water will pick up
smaller quantities of
the top-soil.

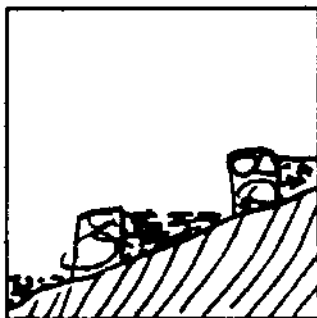


For slowing down the water
and making it loose the fertile
mud it carries

you can make "soil traps" :

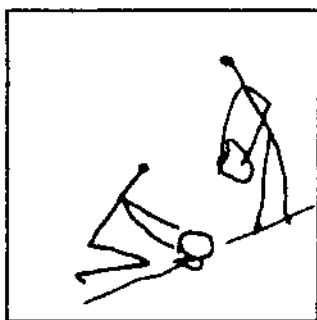


for example, by building low
walls horizontally at the slope.

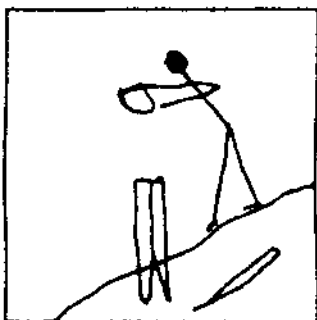


The run-off water will then deposit all the washed-away soil at the uphill side of the wall.

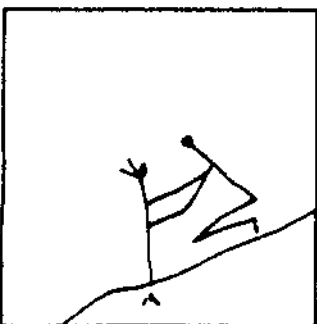
The deposited mud will form a horizontal flat area : a terrace.



Such soil-traps are built most often with stones

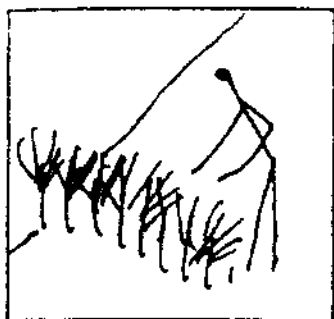


or formed by barriers made with wood.



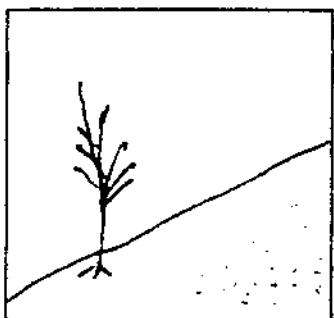
There are other ways, too, to create such a soil-trap :

for example, by planting trees (a hedge)



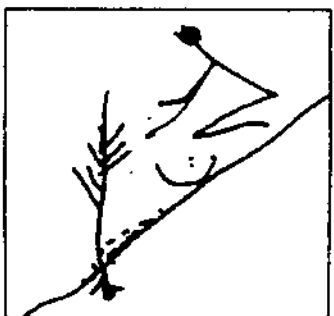
instead of building a barrier.

These trees should be short, stubby fast-growing kind.

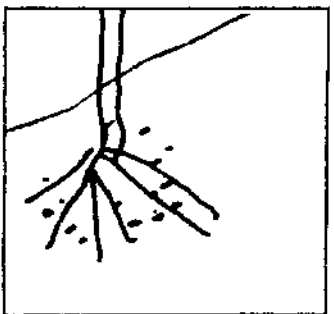


There are many advantages of a planted soil-trap :

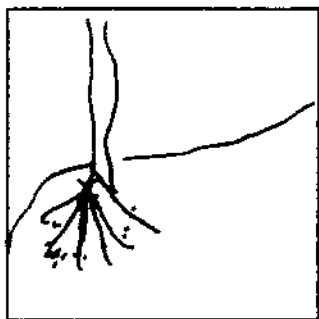
first of all, these trees will produce



fruits, leaves, and firewood.

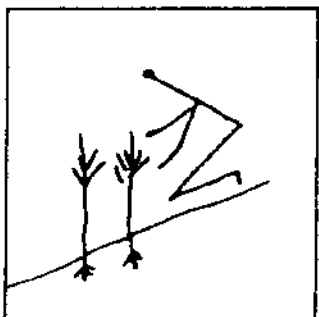


At the same time, if they are leguminous plants, their roots enrich the soil with nitrogen (a natural fertilizer).



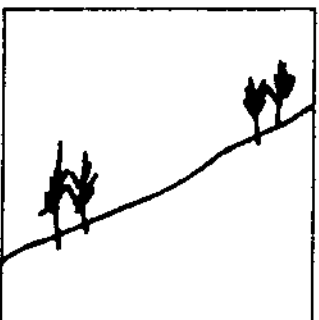
Thirdly, their roots hold the soil in place and make it resistant to erosion (destruction by water or wind).

Besides, it is less expensive to plant trees than to build terraces otherwise.



If you decided to plant such a soil-trap (with leucaena, for example)

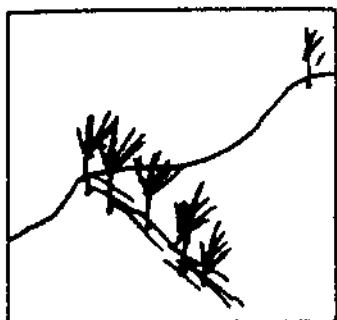
you should plant trees in double rows (30-60 cm between rows).



These double rows can be planted every 6 meters (or less if the slope is steep).

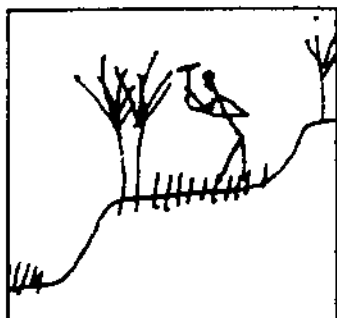


The trees should be planted closely to each other (8-10

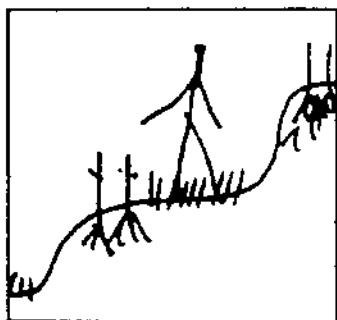


When the trees
are sufficiently grown

you can lay
along the hedge twigs,
branches, corn stalk, etc.



You can even cut down
the crown of these trees,
once the terraces are formed



leaving only the stems and the
roots, essential for the soil-trap.

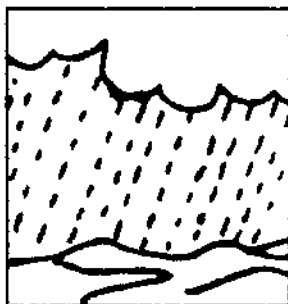


You thus save your land
with simple means

and even get additional profit
by using
what the trees produce.

Catching the Run-Off Water

The extra water of the rainy season, which flows over the earth, could be preserved for the dry days by trapping it in small dams made of earth filled sacks or in deep holes made in the way of the flowing water.



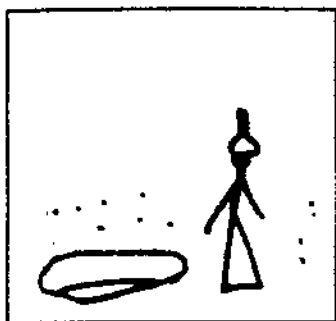
In many regions
all the yearly rainfall



is concentrated
in one short period.

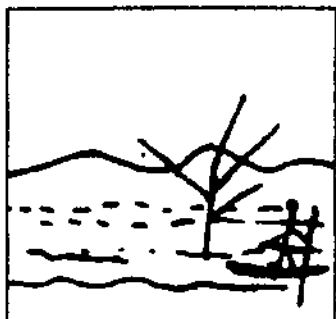


During this period
there is plenty of water



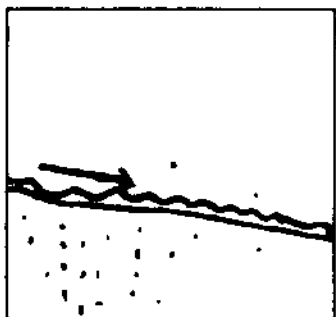
but during the rest of the year
people have to depend
on water reserves,
natural or artificial,

made during the rainy season.



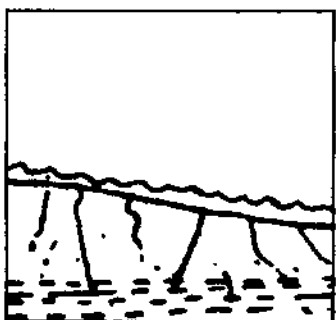
The large part of rainfall
during the rainy season

floods the country



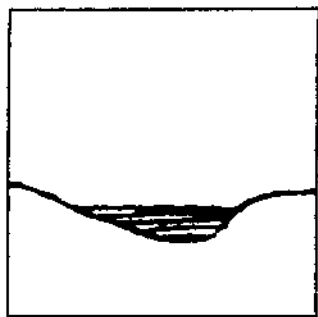
and these floods run off
within a few hours or a few days

towards the rivers
and into the sea.



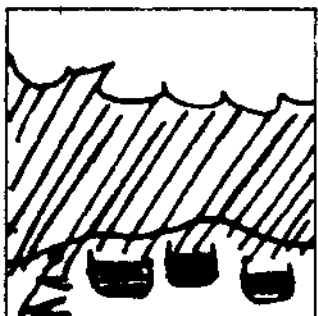
There is another
smaller part of the water,

which seeps into the soil
and becomes ground water
(accessible through wells
and water holes).

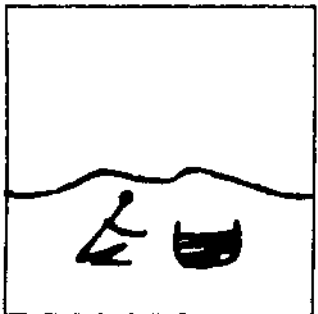


There is some
left over water as well

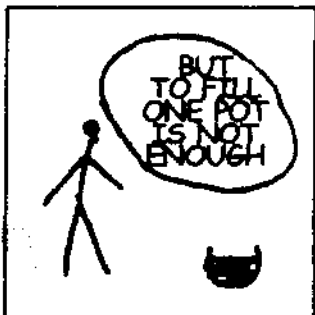
which is collected
into ponds and tanks.



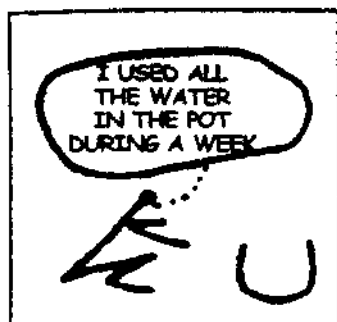
If people can collect
part of the run-off water
during the rainy season



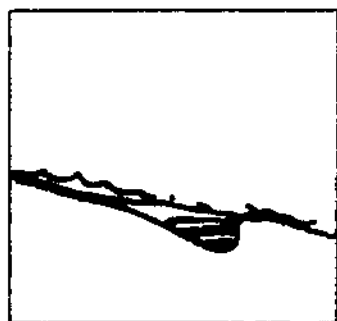
and if they can keep it



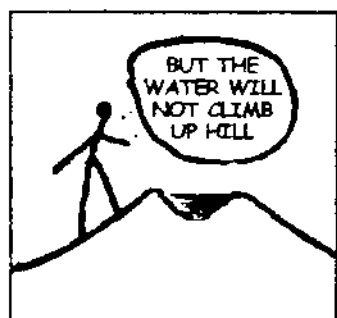
this can be a good way
of making
an important water reserve



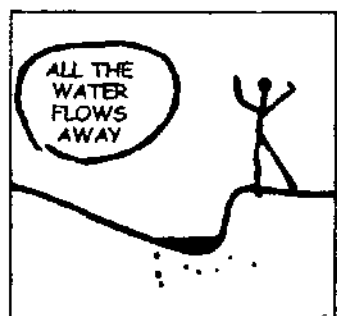
for the whole year.



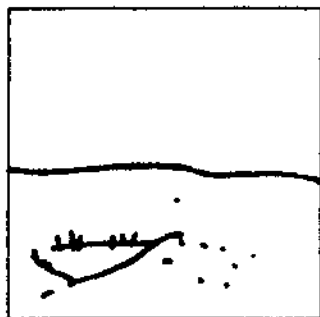
Run-off water
can be caught by traps



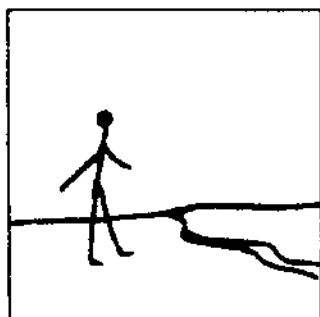
if you know
where to make such a trap



and how to do it

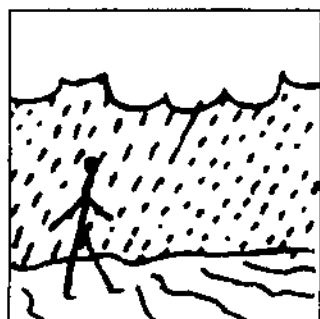


with small dams,
terraces or water holes.

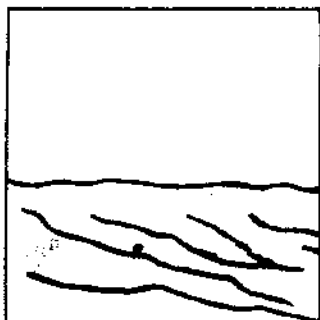


In order to catch
the run-off water

you have to first observe
the path the water follows



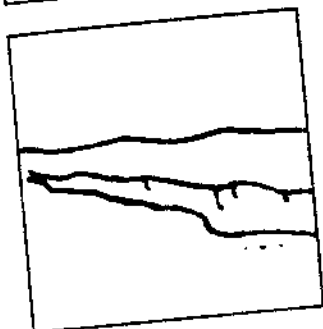
immediately after rainfall.



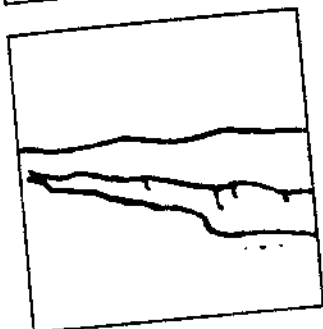
Run-off water generally
flows in many small gutters
along gentle slopes



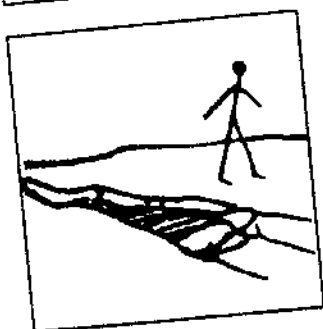
making these gutters
deeper after a few days



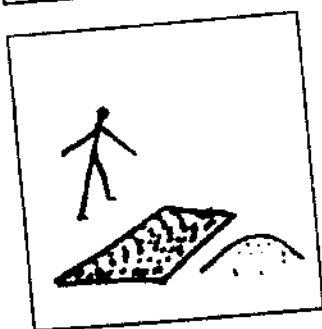
and forming
shallow basins here and there.



If these gutters
become somewhat deeper



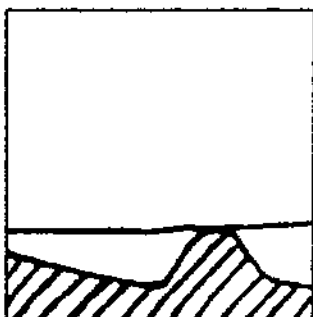
you can stop the water
with small dams



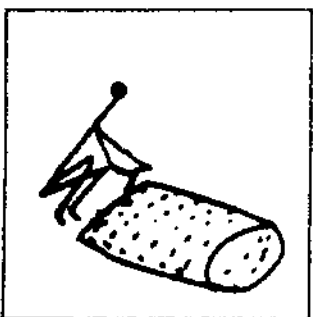
made out of
earth and straw mats.



Such dams, with the gutter,
will form small ponds.



The best way
to build a small dam

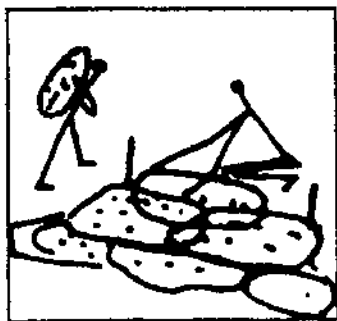


is by making sacks or big
pockets out of straw mats



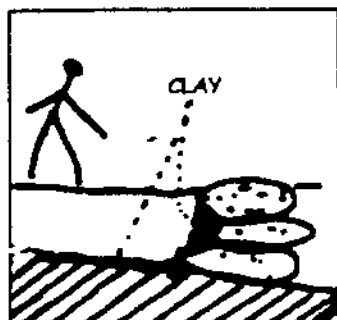
and filling them with earth

(the mat will keep the earth
from being washed away).



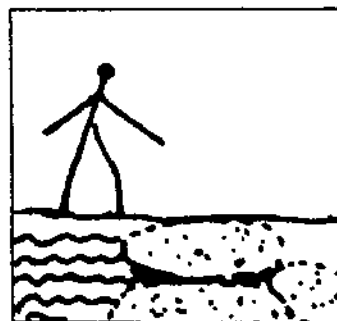
You can build your dam with these sacks of earth, as if they were large bricks.

You can occasionally fix them with bamboo poles.



If you can have clay you should use it

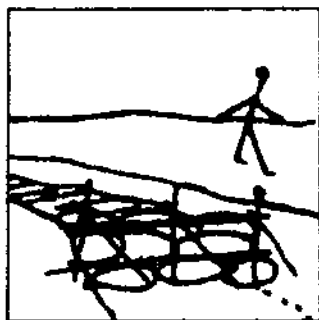
as clay resists seepage.



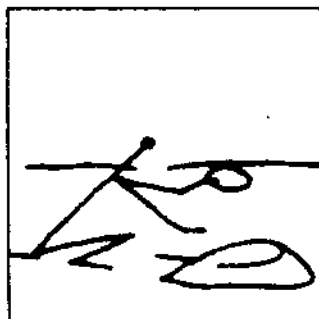
The sacks protect the clay from being washed away by the running water



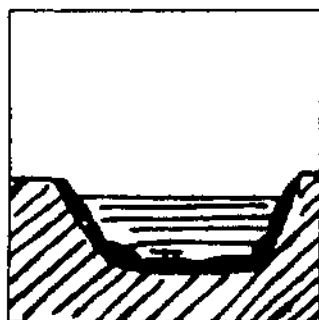
and the bamboo poles anchor the whole dam (if it is high)



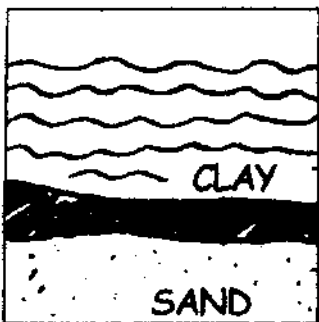
to the ground.



It would be advantageous
if you can line with clay

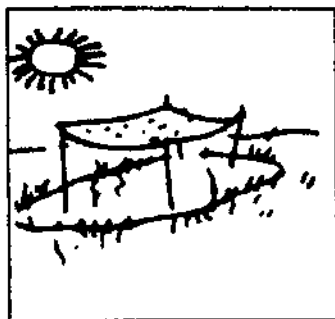


the bottom and the sides



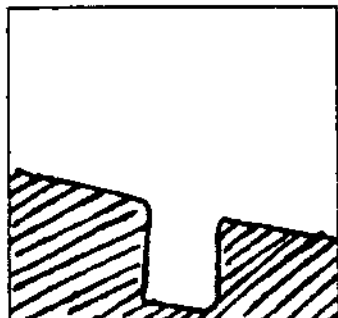
of your pond

to prevent seepage.



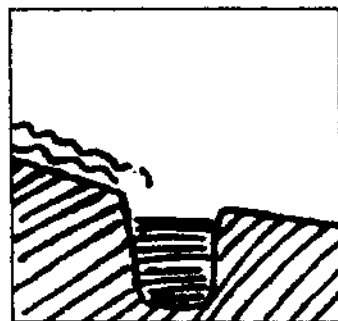
You can lessen evaporation,
too,

by keeping
the water surface in the shade.

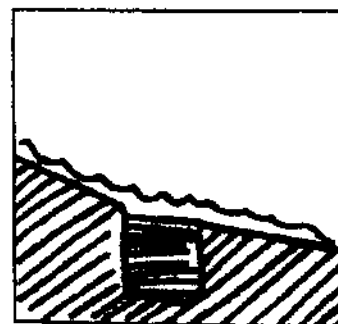


There are simpler ways, too,
for collecting the run-off water :
by digging deep holes
in its way, for example

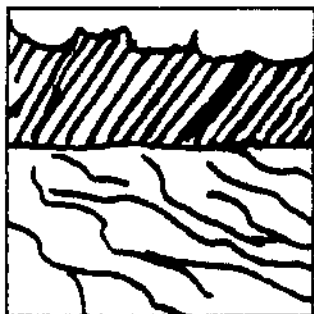
(but don't forget to take the dug
out earth away from the rim).



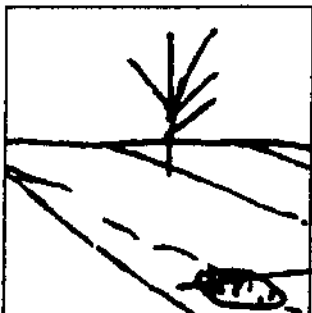
The running water
thus gets trapped,
filling the hole up to the brim



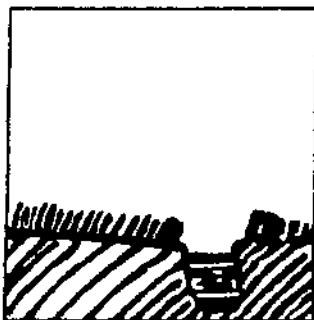
before continuing its course.



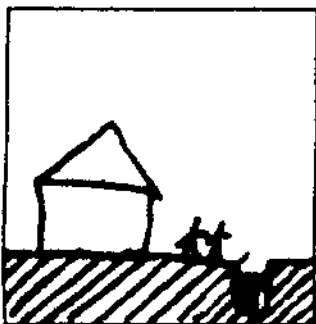
Run-off waterways happen to be everywhere when it rains.



You can thus make your water trap



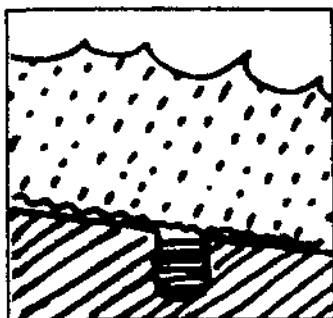
as near as possible



to your field

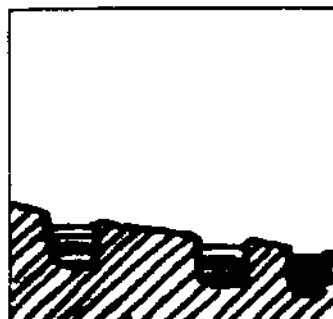
or to your house

where you need the water most.

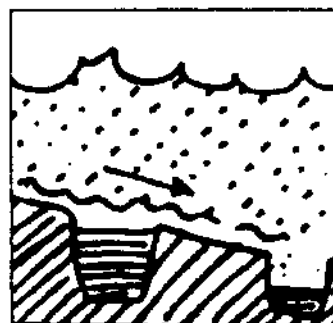


By making
your own water trap

you take only
a little of all the rain water :

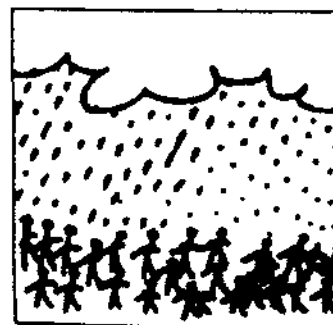


there remains
enough for all your neighbours.



The run-off water
once it has filled your trap

continues on its way



and can fill up
the water traps of all others.

Thus, only one rainfall can give
more water than all of you
can catch.

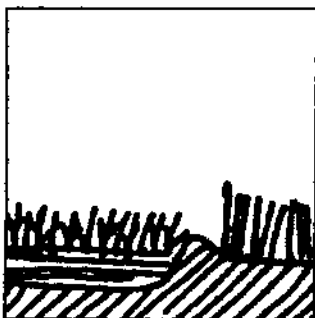
Crops that Need Little Water

*Farmers can virtually evade drought
by growing crops and trees that need little water.
Millet and coconut, for example,
can be successfully grown in drought conditions.*



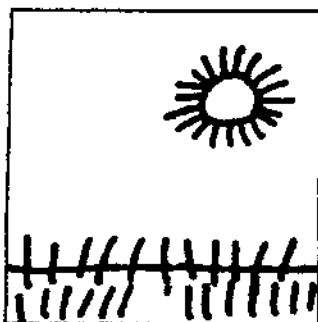
Water for household use

is generally shared
equally by each household.



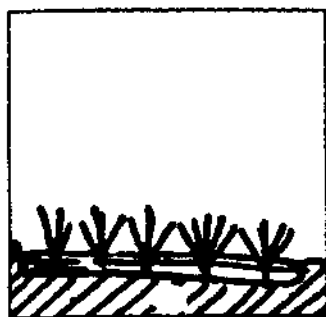
But water for irrigating crops
or for watering plants
is required in varying quantities

depending on the kind of plants
you grow
and the type of land you have.



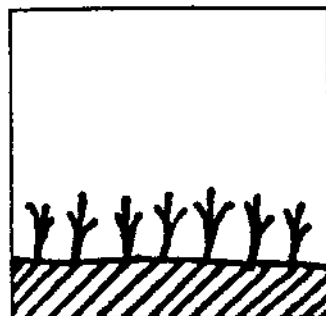
In regions
where drought is frequent

one can grow plants,
which need little water.

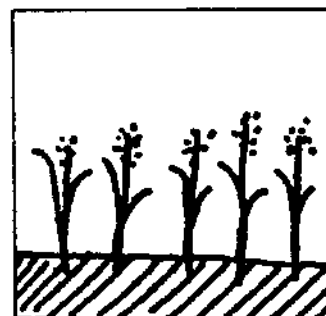


For example :

rice needs a lot of water,
much more than other crops;

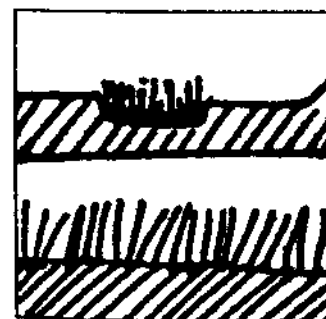


wheat
needs less water than rice;



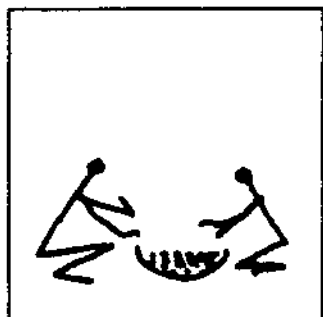
and millet
needs even less water than wheat

Indeed, millet is an ideal
staple food for dry land.



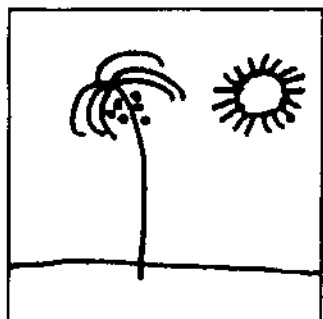
Using the same amount
of water that you need
for one acre of rice,

you can grow
several acres of millet.



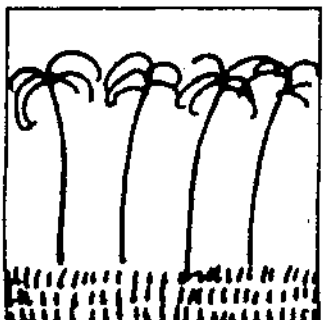
Millet is rich food,
and easy to harvest.

By growing millet you will have
less fear of drought.



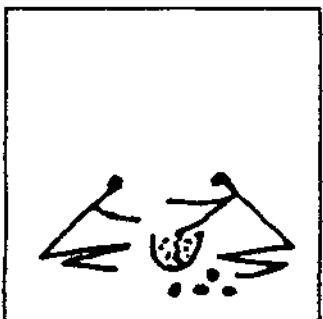
Many trees, too,
can survive drought
and give you nourishing fruits.

The body of such a tree keeps
a reserve of water and its roots
reach deep to find moisture.

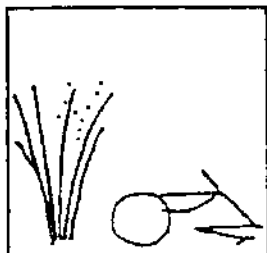


So,
even when you grow
rice or wheat

don't forget to grow
some millet
and some coconut trees



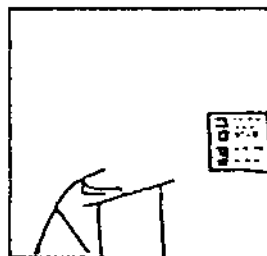
as a safeguard
against possible drought
in the days ahead.



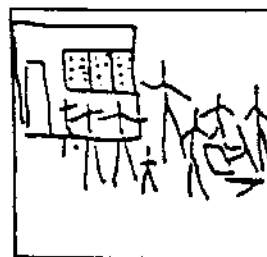
THAT IS
WHAT WE DO.
WE SELECT METHODS,
WHICH ENABLE PEOPLE TO
ASSURE THEIR LIVELIHOOD
WITHOUT SPENDING CASH,



MAKING USE
BOTH OF TRADITIONAL
KNOW - HOW
AND OF ADVANCED SCIENCE.

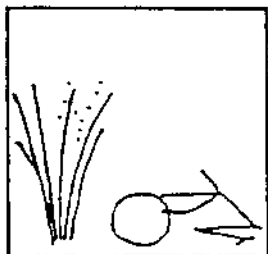


THAT INFORMATION
WE MAKE ACCESSIBLE
FOR UNSCHOOLED PEOPLE.
BY EXPLAINING IT IN
DRAWINGS WITH LITTLE TEXT.

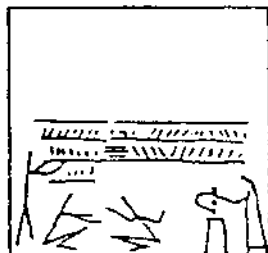


THAT EXPLANATION
WE DIFFUSE
AS WALL JOURNALS,
POSTERS, INSERTS IN THE
LOCAL PRESS OR
OTHER SIMILAR WAYS.

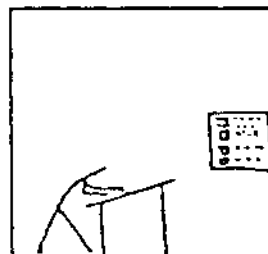
AND WE ARE LOOKING AHEAD



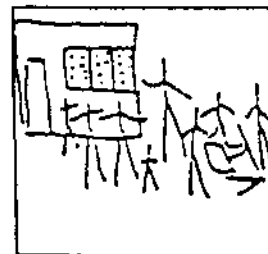
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