

The background image shows a dense field of cover crops, possibly a legume like vetch or clover. The plants are in various stages of growth, with some leaves showing signs of aging and turning yellow. The overall scene is a lush, green field with some brown, dried plant matter visible, suggesting a natural or agricultural setting. The text is overlaid on the top half of the image.

Green Manure/Cover Crops: Soil Recuperation at Zero Cost



The following photos were all taken in the fields or homes of practicing farmers in Mexico, Guatemala, Honduras, Costa Rica, Haiti, Ecuador, Peru, Paraguay, Benin, Cameroon, Japan, Thailand and Indonesia

**The impact of organic
matter (om):**

**Typical field
before preparation**



Same field, being prepared





Same field, six months later

1973



**Another field,
in Guatemala**

1978





1982

**And near
Guinope,
Honduras**



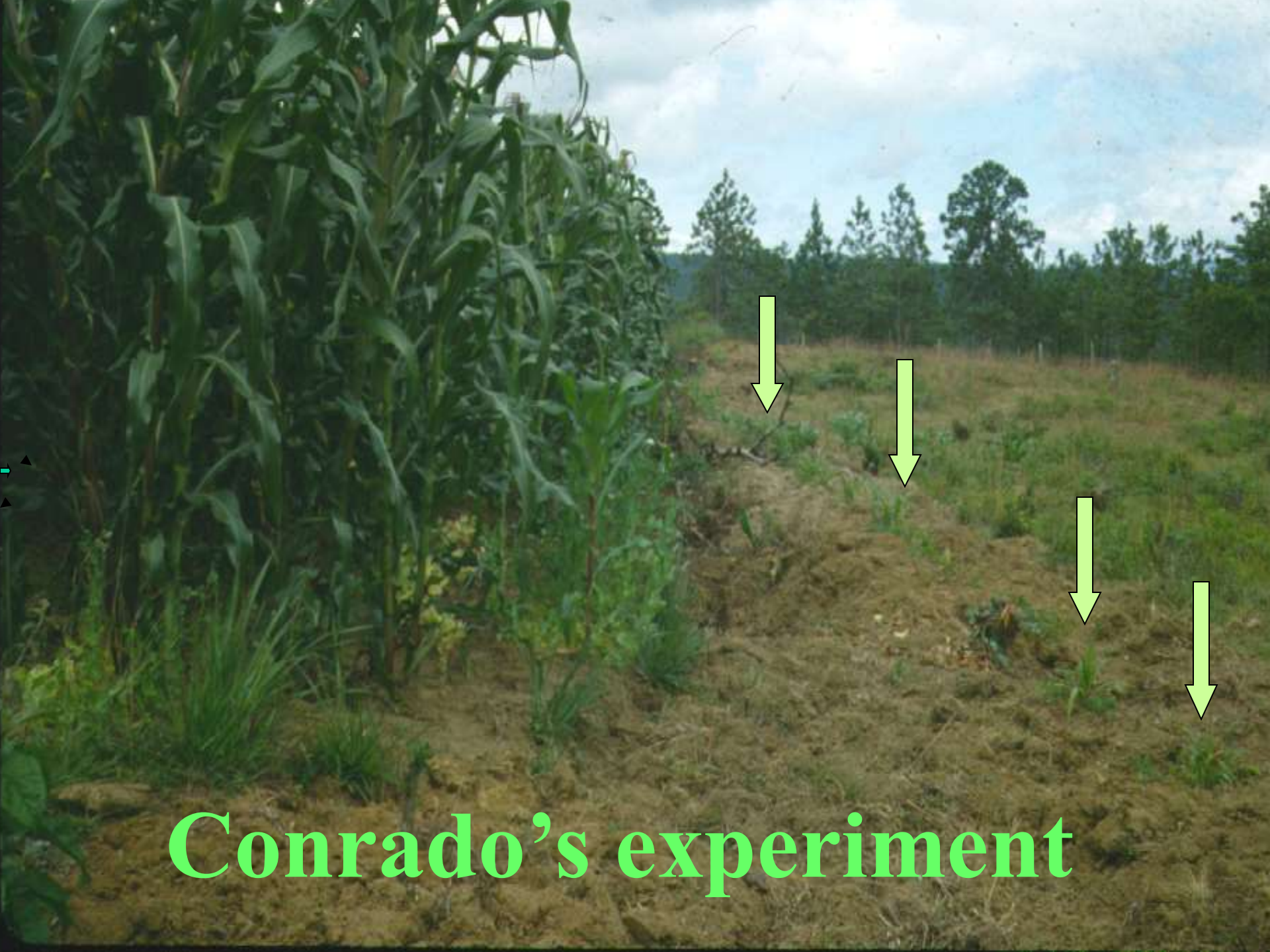
1983

The top half with mucuna



**Same field,
a closer
look**





Conrado's experiment

The First Alternative: Purchased inputs





A Second Alternative: Compost



A Third Alternative: Animal Manure

Other Alternatives: Coffee Pulp,





Sugarcane Bagasse

For most small farmers, green manure (gm) and cover crops (cc's) will be the least expensive way to increase significantly the om content of their soil.



Definition of a green manure/cover crop:

A plant, often leguminous but not always, whether a tree, bush, climber or creeper, that is used by a farmer to, among other things, maintain or improve soil fertility or control weeds.

NOTE:

We are not talking here about traditional green manures. Gm/cc's are not usually grown as monocrops, are almost never cut down at the flowering stage, and are seldom incorporated into the soil.

What are the characteristics we are looking for in a gm/cc?

1. Vigorous growth. Usually a good gm/cc will produce 50 t/ha or more of biomass per season.





Hundreds of thousands of farmers in South America use gm/cc's primarily to be able to use zero tillage.

2. Good weed control





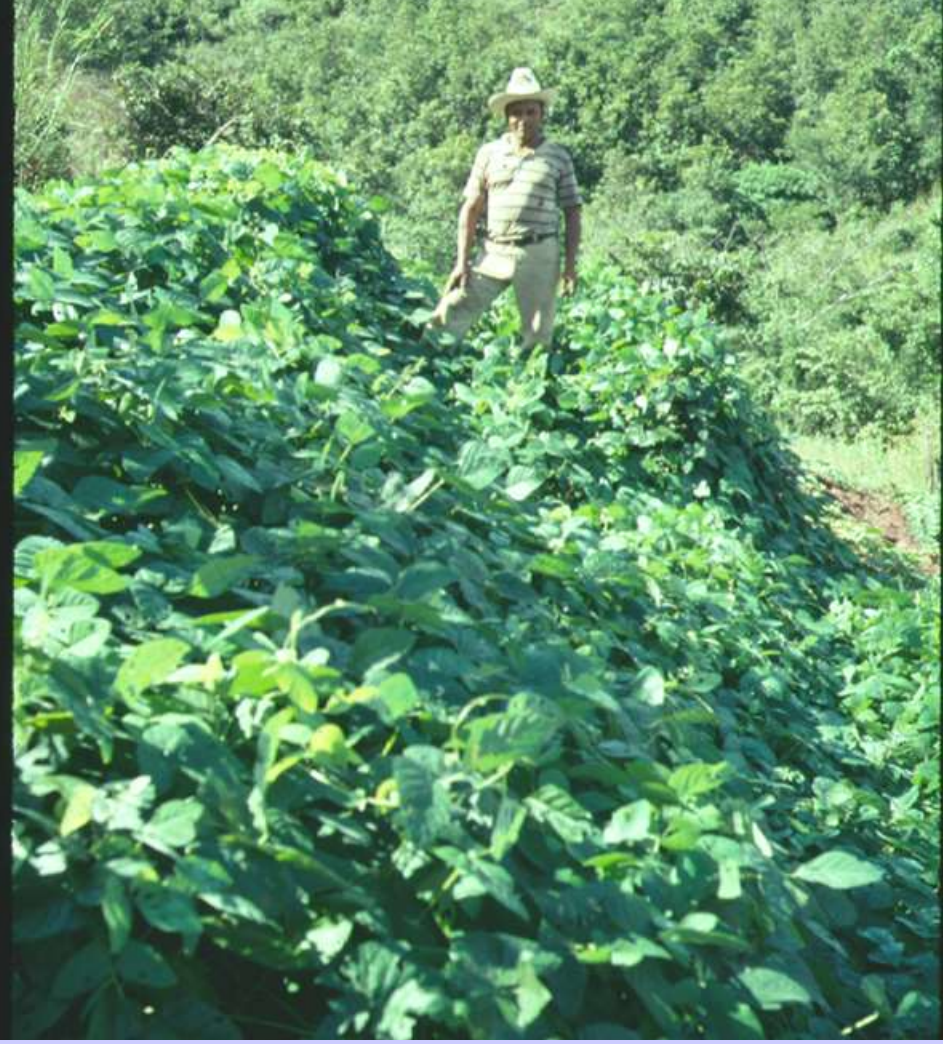
Weed control is also achieved by the mulch formed by the gm/cc.

**Weed control among
perennials can also be
important.**



Some gm/cc's can even control
weeds as noxious as Imperata grass





3. Often we want gm/cc's to grow well in the poorest of soils.

**4. Usually,
we also
want
healthy
nitrogen
fixation.**





**Most important, farmers want
their gm/cc's to produce food.**

When gm/cc's
produce food or
fodder, the om
they produce is
usually a free
by-product





The characteristics we look for in a gm/cc species:

1. Vigorous growth
2. Good weed control
3. Resistance to poor soils, drought, or shade
4. Plentiful N fixation
5. Production of food, fodder, fuel, or some other useful products

Characteristics of sustainable gm/cc systems:

- 1. The land occupied by a non-food-producing gm/cc must have no opportunity cost.**
- 2. The gm/cc must bring no cash costs.**
- 3. The gm/cc must not increase labor costs appreciably.**

A photograph of a cornfield with tall green stalks and leaves. In the bottom left corner, there is a mound of brown soil. Overlaid on the image is yellow text with a black outline.

**4. The gm/cc must provide
some major benefit in addition
to improving the soil**

**5. The gm/cc must cause no
other changes in the existing
farming systems**



**But how can we grow gm/cc's
on land that has no
opportunity cost?**

Five major ways:

**1. By intercropping it with
already existing crops**

**2. By growing
them between
and under tree
crops**






3. By growing them in the dry season

A photograph of a hillside covered in a dense field of purple lupines. The plants are tall with green leaves and long stems topped with clusters of small purple flowers. In the background, there is a stone wall and a line of trees on a higher ridge. The sky is overcast.


**4. By growing them on
wastelands**



5. By growing them as an improved fallow



**The velvetbean (Mucuna
spp.) is probably the most
popular gm/cc species
around the world.**



**Difficult to use as a food,
the velvetbean owes its
popularity to its
remarkable ability to
control weeds.**



**Soil from a
humid
tropical
hillside after
growing
maize and
velvetbeans
every year
for 40 years**

**The jackbean
(Canavalia
ensiformis)
will grow on
the worst
soils, making
it ideal for
wasteland
recuperation.**



The jackbean is also highly resistant to drought.



**It can also be intercropped with
maize, sorghum and cassava.**



Lablab beans (Dolichos lablab) are eaten like peas or as a dry bean.






**Very drought-resistant, lablab
beans can produce fodder
throughout a six-month dry season**



**Tefrosia
(Tephrosia
candida or T.
vogelii) is
popular as a
hedgerow
species and as
an improved
fallow.**

**Cowpeas
(Vigna
unguiculata)
are a food
crop, but they
also improve
the soil.**

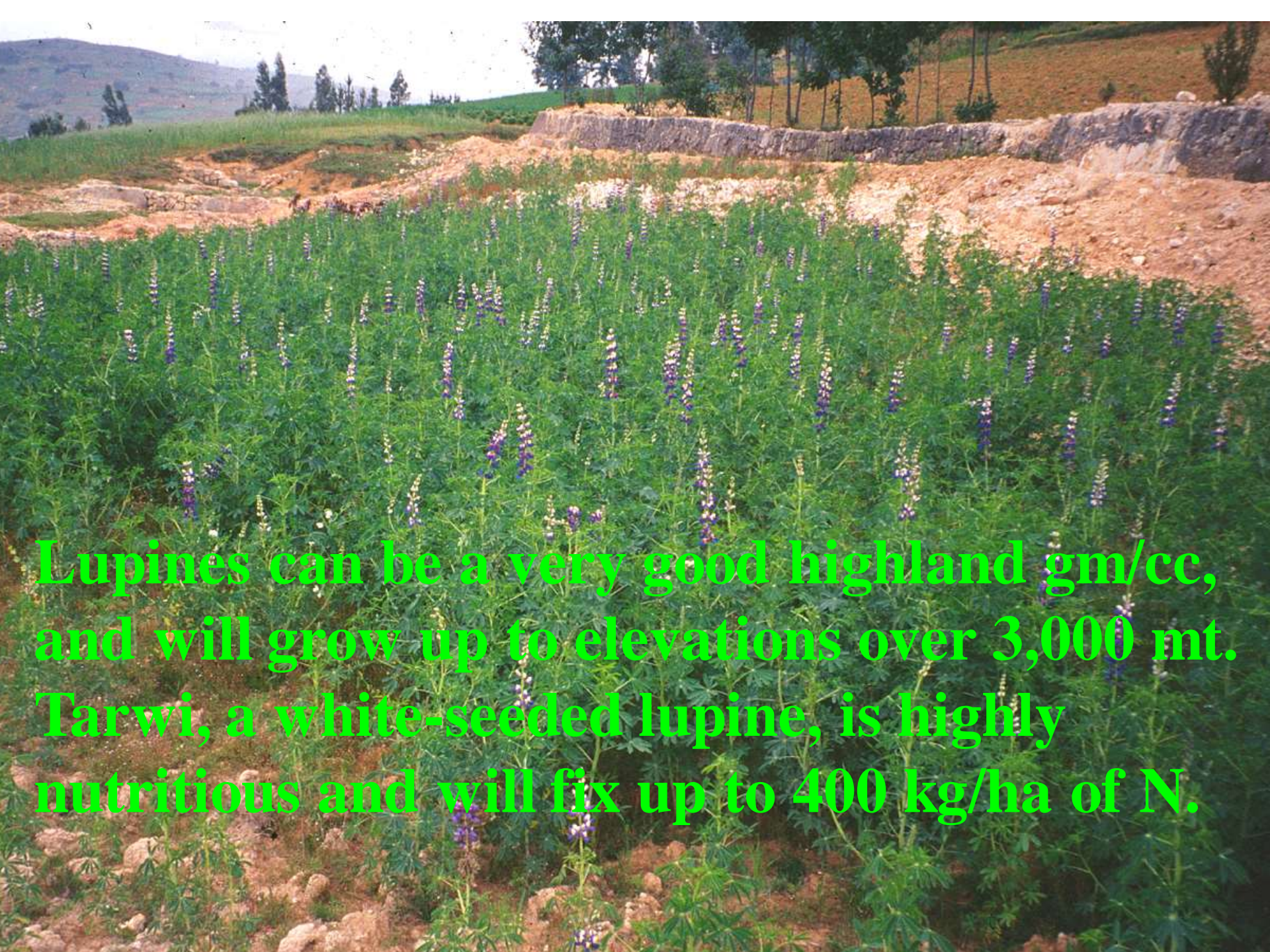




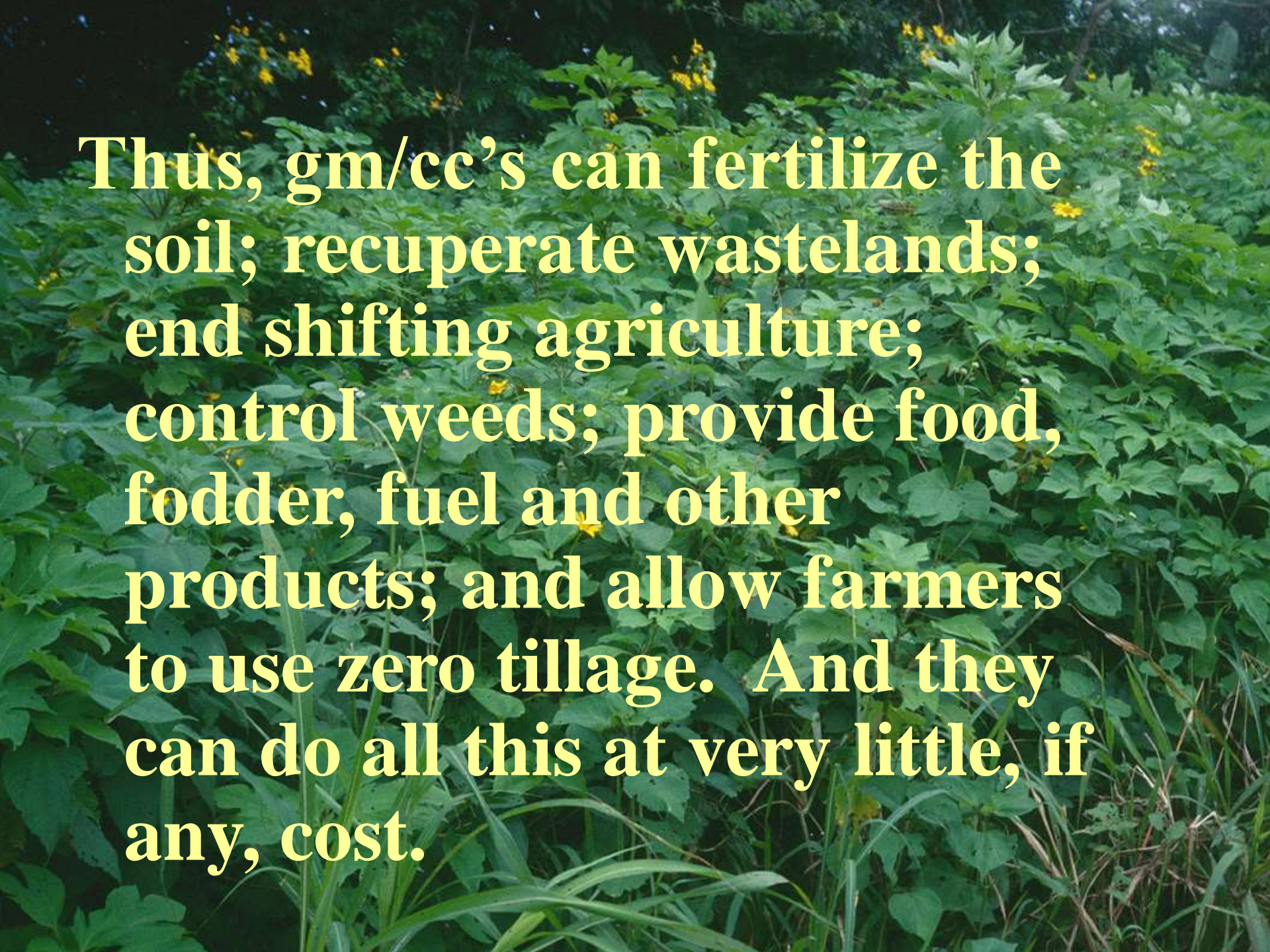
The runner
bean
(Phaseolus
coccineus)
is the most
popular
upland
species.

Sweet clover (Melilotus albus) can be intercropped with maize, and then grazed all through the dry season.

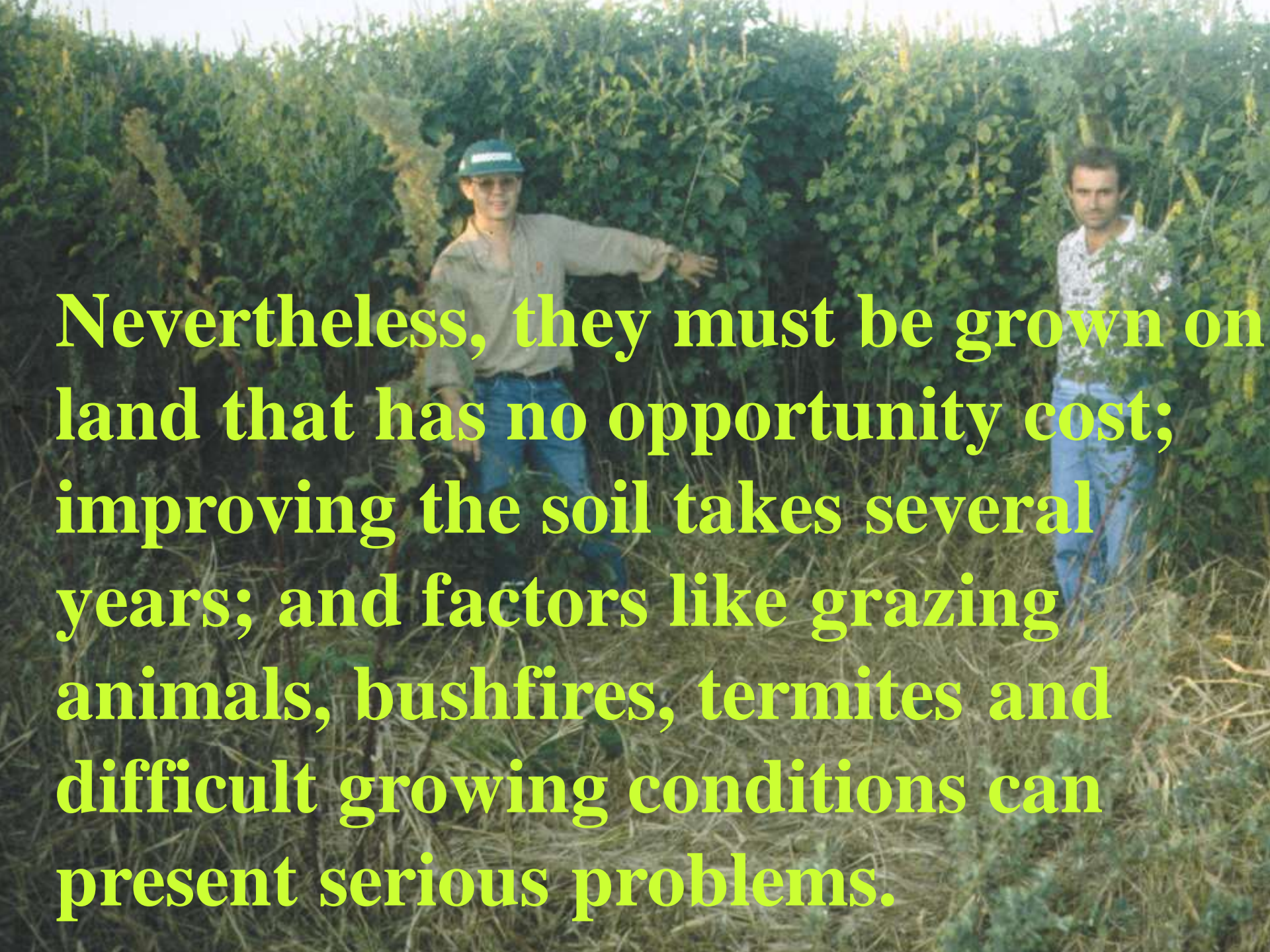





Lupines can be a very good highland gm/cc, and will grow up to elevations over 3,000 mt. Tarwi, a white-seeded lupine, is highly nutritious and will fix up to 400 kg/ha of N.



Thus, gm/cc's can fertilize the soil; recuperate wastelands; end shifting agriculture; control weeds; provide food, fodder, fuel and other products; and allow farmers to use zero tillage. And they can do all this at very little, if any, cost.

A photograph of two men standing in a field of dense, tall green vegetation. The man on the left is wearing a green hard hat, safety glasses, a light-colored long-sleeved shirt, and blue jeans. He is pointing towards the vegetation with his right hand. The man on the right is wearing a light-colored patterned shirt and blue jeans. The background is a thick wall of green plants, possibly a hedge or a field of tall grasses. The ground is covered with dry, brownish vegetation.

Nevertheless, they must be grown on land that has no opportunity cost; improving the soil takes several years; and factors like grazing animals, bushfires, termites and difficult growing conditions can present serious problems.

A photograph of a person with dark hair, wearing a light blue and white striped shirt, working in a field of dense green plants. The person is leaning over, possibly tending to the plants. The background is filled with similar green foliage.

Thus, gm/cc's require of us a good deal of knowledge and creativity to find the systems that will provide the most benefits for any given group of farmers.