

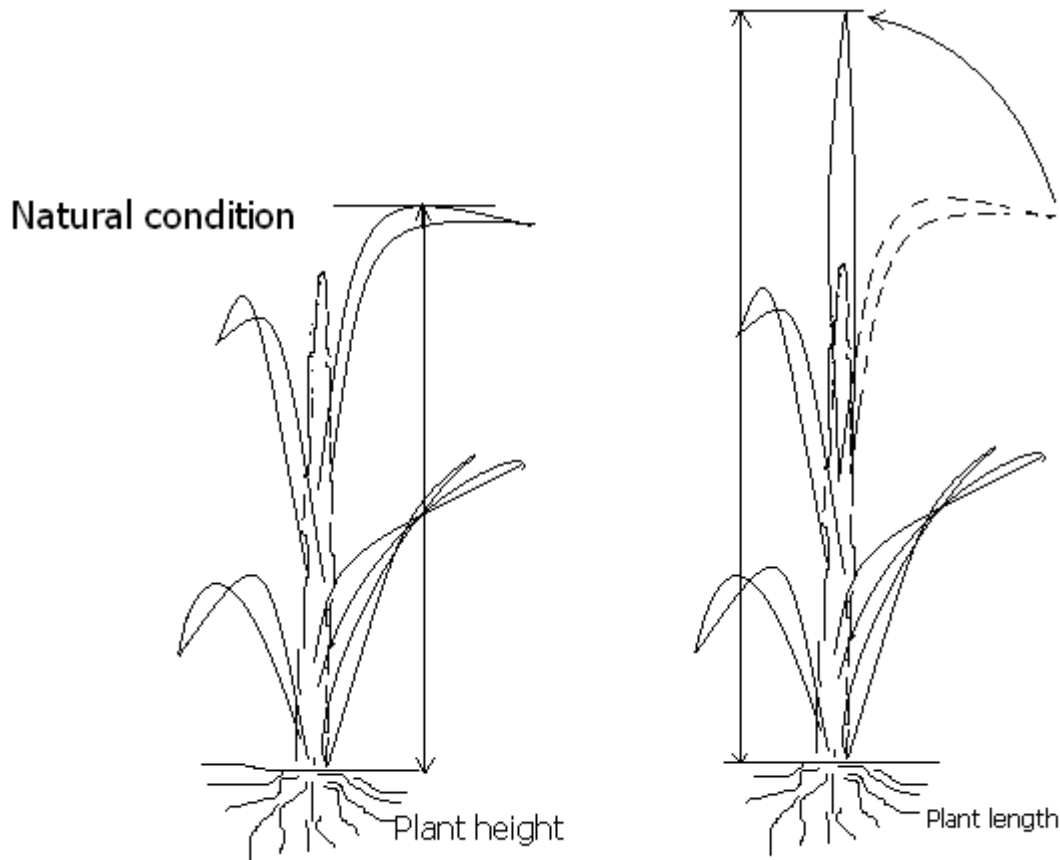
PASTURE SCIENCE MANUAL

Sejun Kikuchi

VIETNAM - 2006

Measuring height and length of pasture plant

Force to erect the stem or leaf by hand



Expectation:

I hope that (1) You will correct;

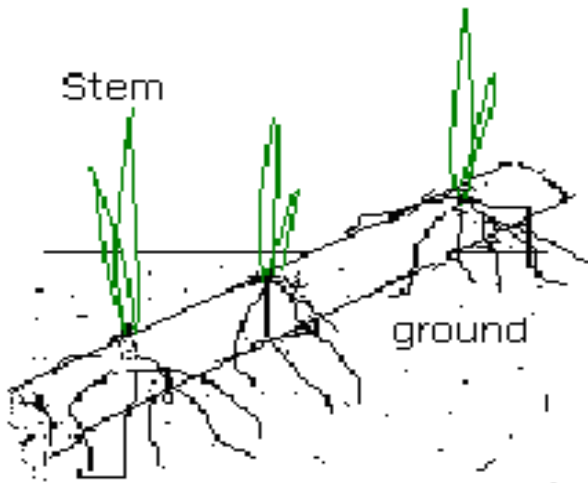
(2) Develop further the content of this manual;

(3) In order to develop the agriculture industry of your country.

Sejun Kikuchi

(1) How to plant

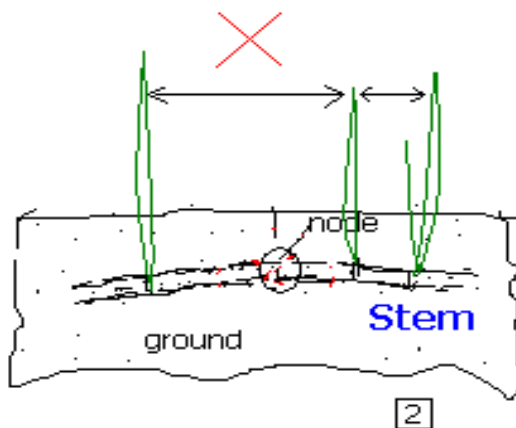
good



Planting method for Napier grass:

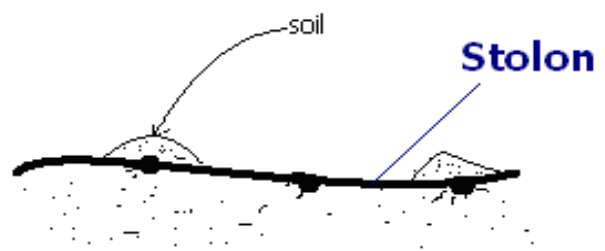
- 2 nodes under ground, 1 node upper ground
- **Planting angle: 45° to develop more root system by ethylene hormone**
- **Plant spacing is regular**

bad



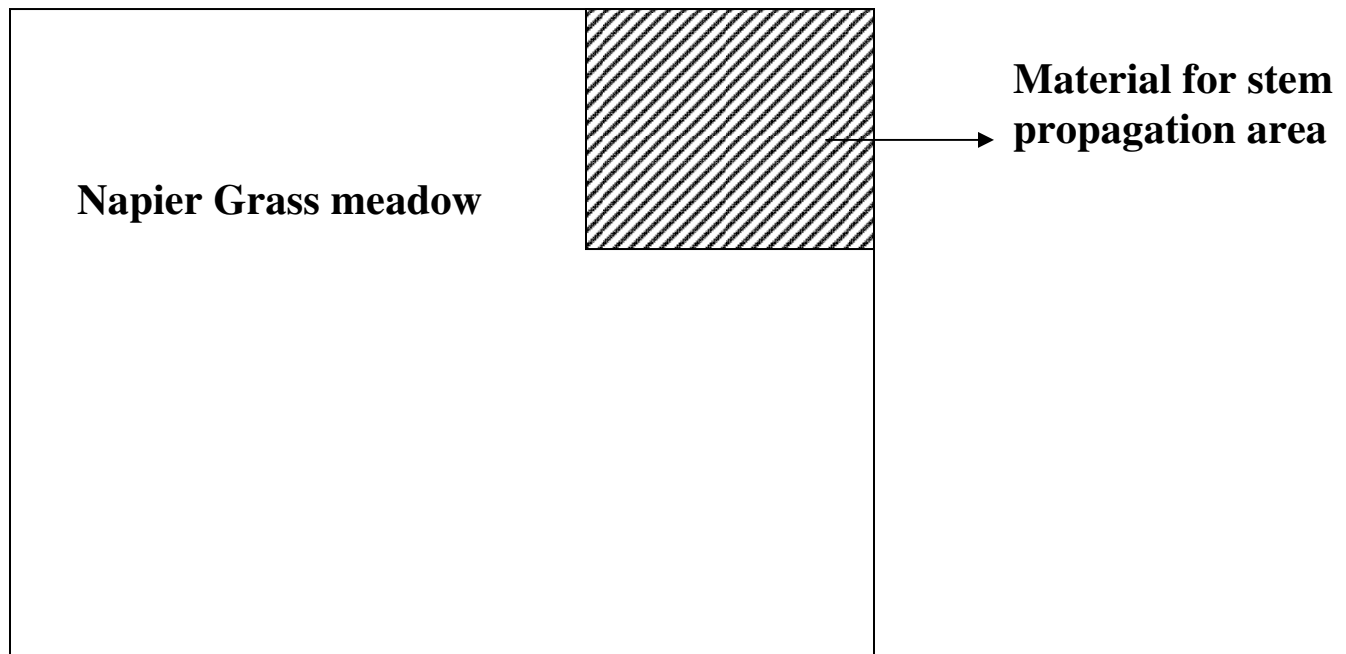
Sugar cane planting method is unsuitable for Napier grass because some stems might not emerge then, plant spacing is irregular


good



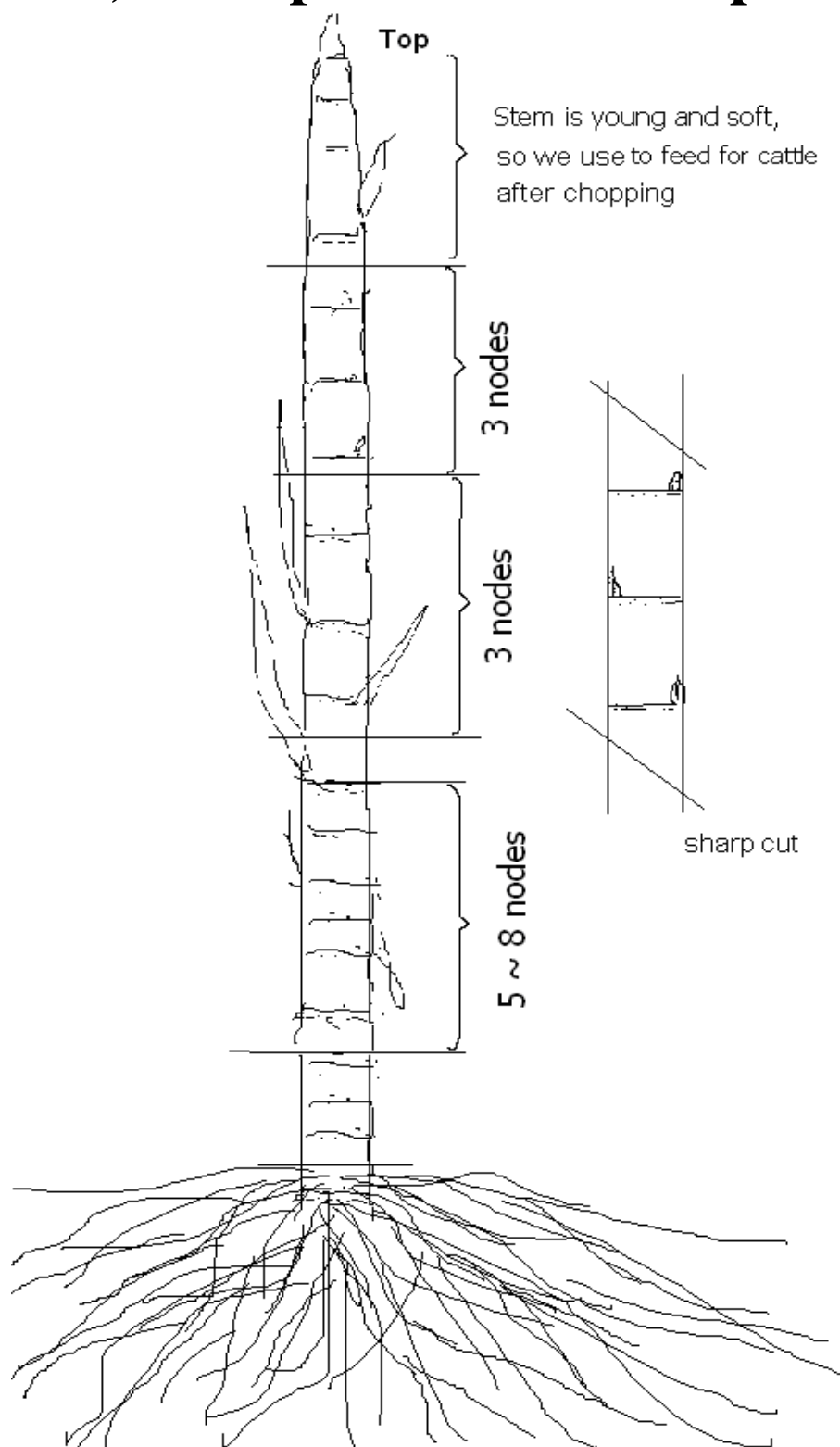
Cover solidly some nodes of stolon with soil: For example, Giant Star grass, Creeping Signal grass, Bermuda grass and Para grass, etc.

(2) How to prepare the vegetative propagation stem of Napier Grass

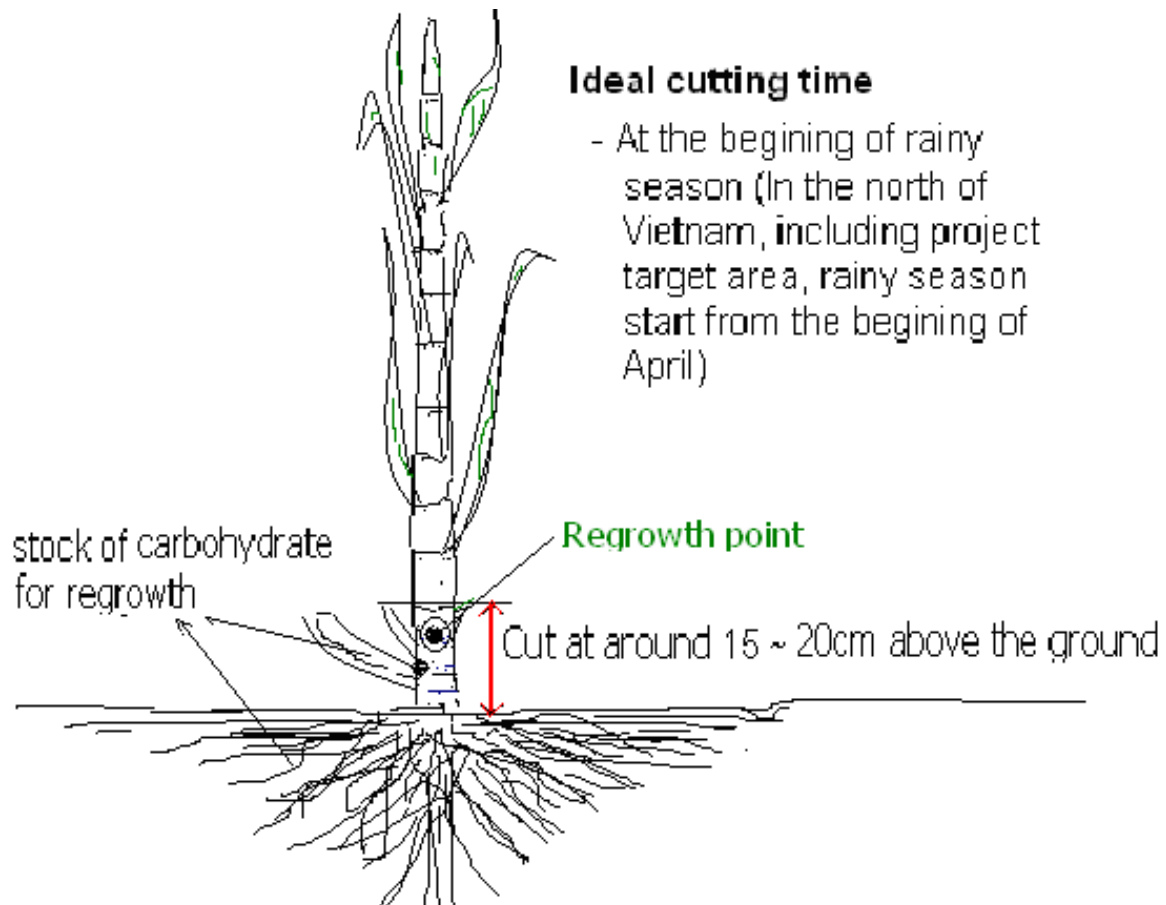


- When the later part of raining season come, in  area, stop cutting (For example, in Ba Vi, September)
- Fertilize N.P.K.S: (For example, 15% : 15% : 15% : 10%).
- It's recommended to use Superphosphate (P.S, for acid soil) , Urea (N) and/or compound fertilizer (N.P.K). Quantity is from 500 - 1000 kg/ha. Please contact the regional extension officer for adequate quantity.

(3) How to cut the old (mature) stem (6 months or more) of Napier Grass for replanting



(4) Ideal cutting time and height of Napier grass?

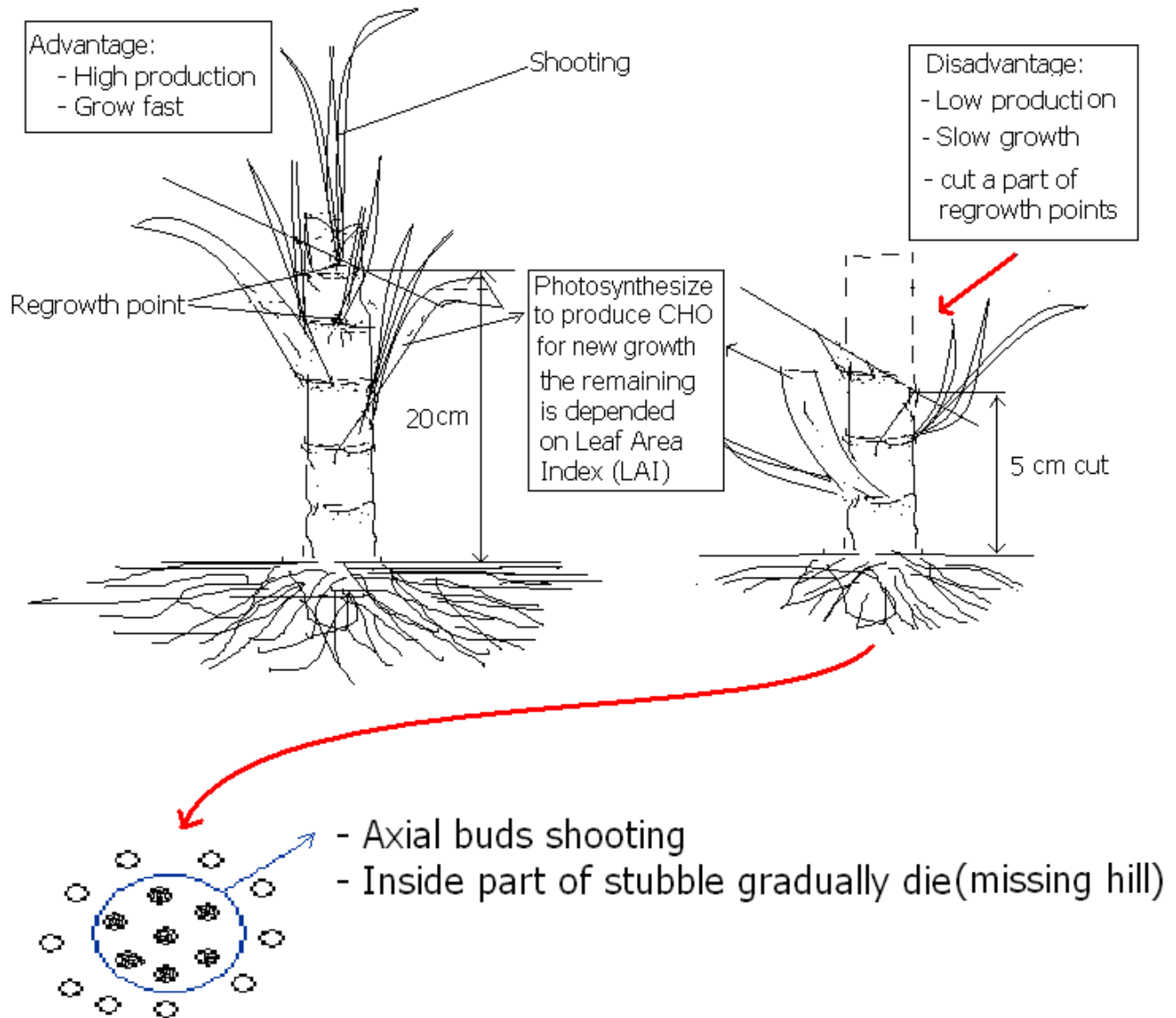


Further research needed for the cutting height by the Vietnamese researcher.

Cut the whole plant 15~20 cm from the ground level (basal stem part) for propagation, the ideal time for cutting is when the stem is hard and in brown color.

Usually at the beginning of rainy season, we cut and divide stem for planting.

(5) How to regrow after cutting



(6) Where to fertilize the grass?

If we do not use fertilizer and manure for pasture grass and legume, the soil will gradually degrade because the pasture grass use the natural soil fertility.

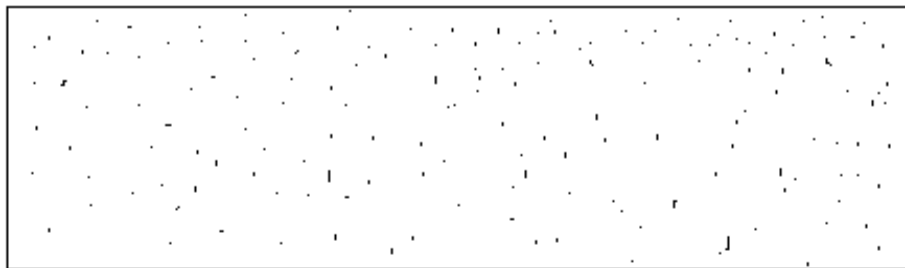
Main requirement for fertility:

Grass: N.

+ P, K, S, Zn, Ca, etc.

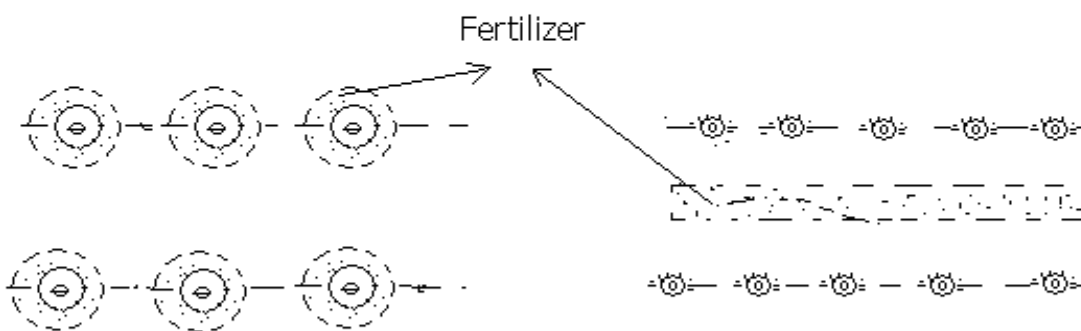
Legume: P₂O₅

+ K, S, Mo, etc.



Basal fertilizer:

Broadcasting fertilizer the land (N.P.K) and incorporate into soil by plow or harrow



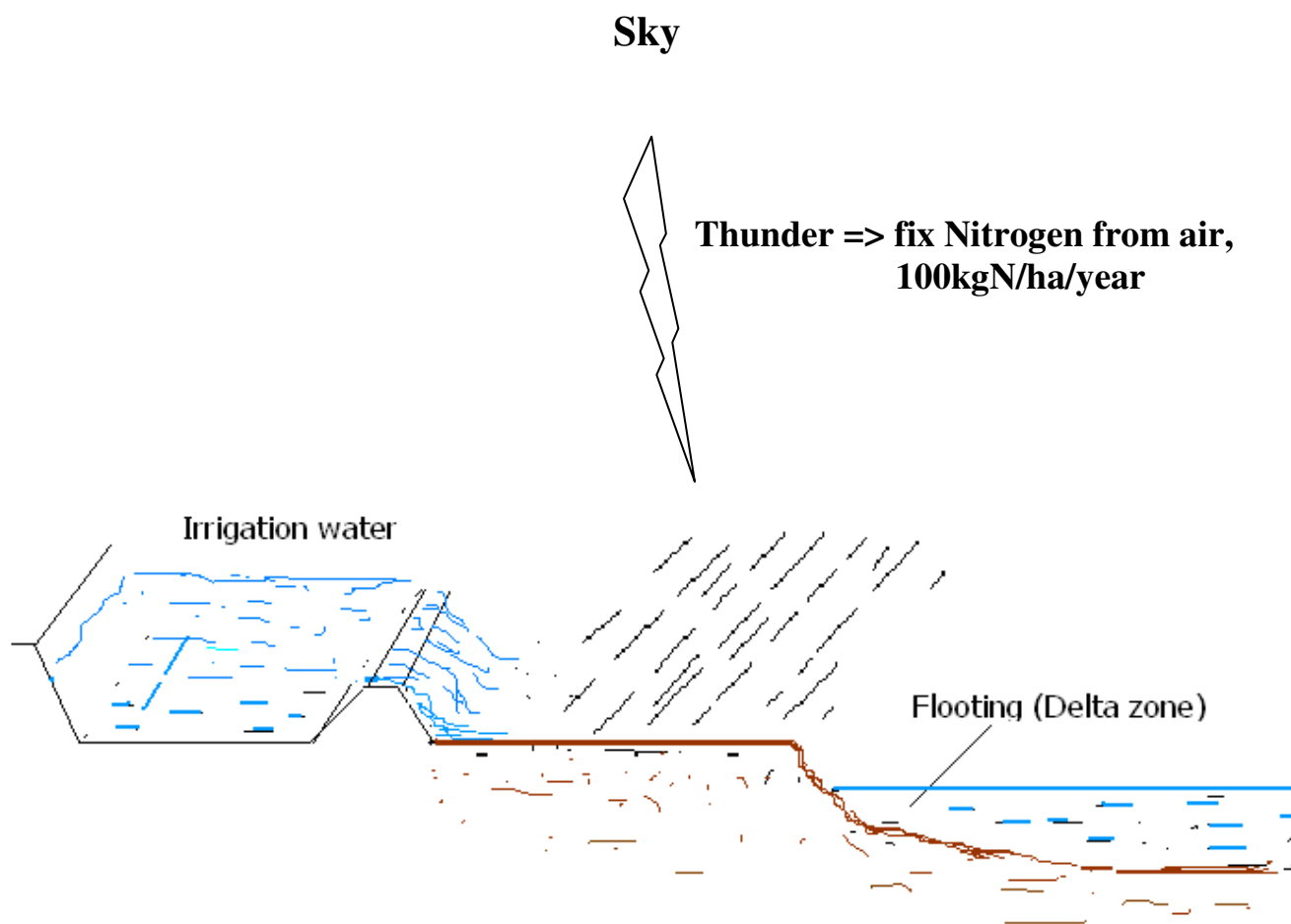
After pasture grass grow about 20 cm height, fertilize around the young plant

Additional fertilization:

- After each time harvesting, we have to do additional fertilizer for the new growth.
- After every 3 - 5 years, we have to renovate the pasture.

(7) Natural Nitrogen resource for fertilizer of pasture Grass and Legume

Natural N fertilizer resource

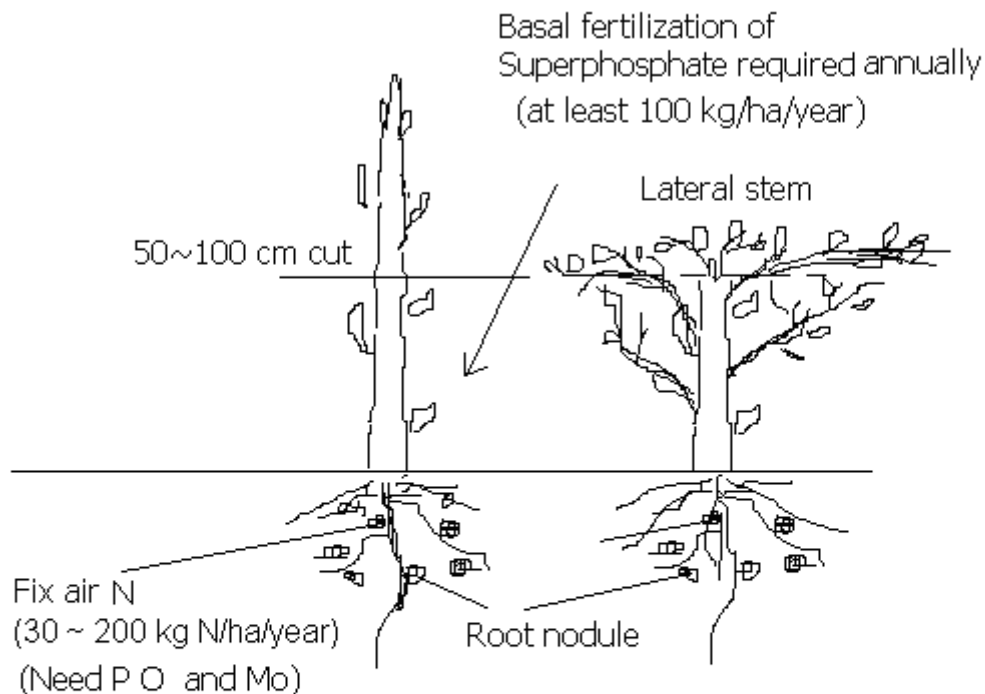


Irrigation and flooding supply N and minerals

(8) Protein bank

Tropical forage legume tree (*Leucaena* spp., *Gliricidia* spp., etc.) fix nitrogen from the air. Dry matter of the leaf and soft (edible) stem contain 20~25% of crude protein. This source is better than commercial concentrate.

- Compound fertilizer formula for basal fertilization (before planting): **N : P : K : S: 15 – 15 – 15 – 15 and Mo** (Co-enzyme of root nodule bacteria)
- Fertilize at least 100kg super-phosphates/ha annually



Forage legume tree:

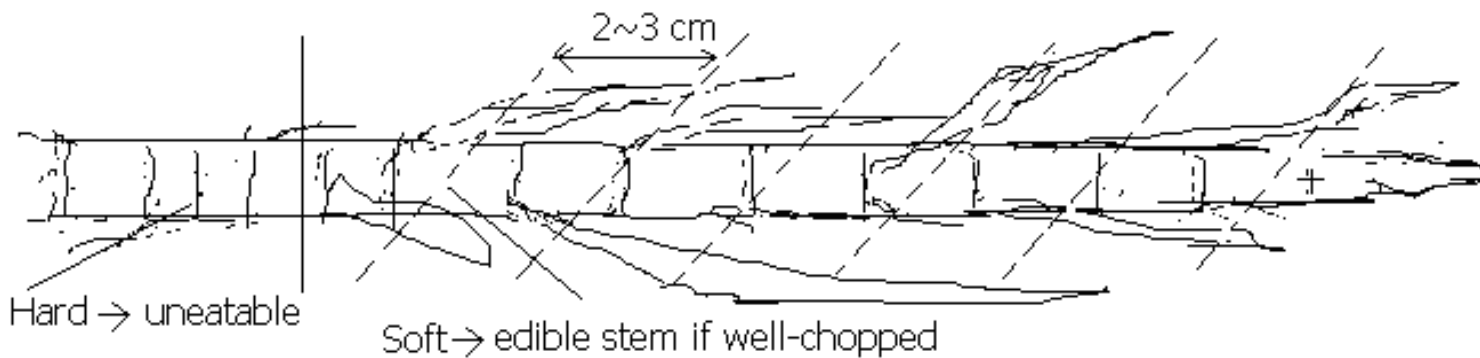
- *Leucaena* spp. (Grow bad under acid soil and low temperature)
- *Gliricidia* spp. (Grow well in acid soil but no resistance against draught and low temperature)

(It is more palatable If we feed the cattle with dried leaf)

N Fixation by legume and forage legume tree

(9) How to utilize the Napier Grass stem and leaf?

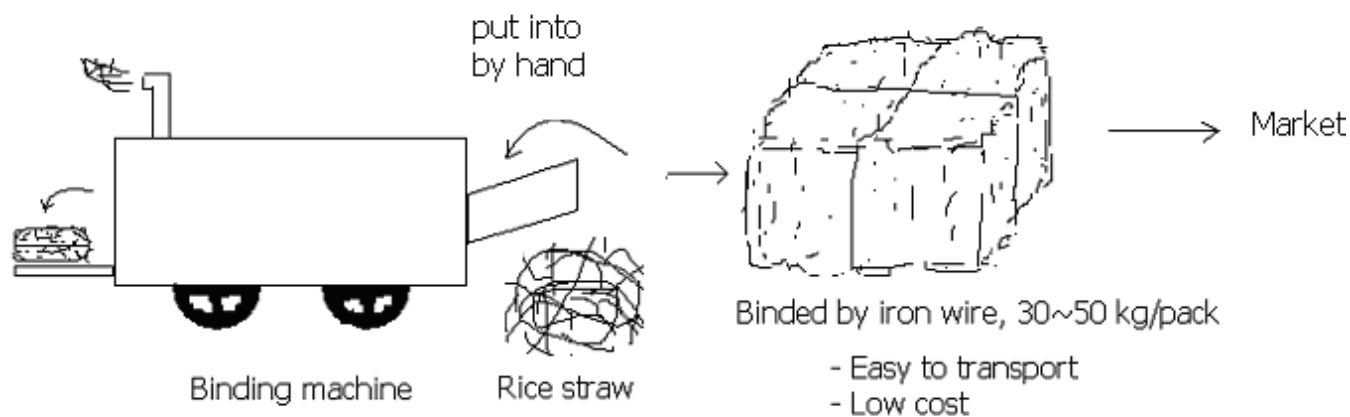
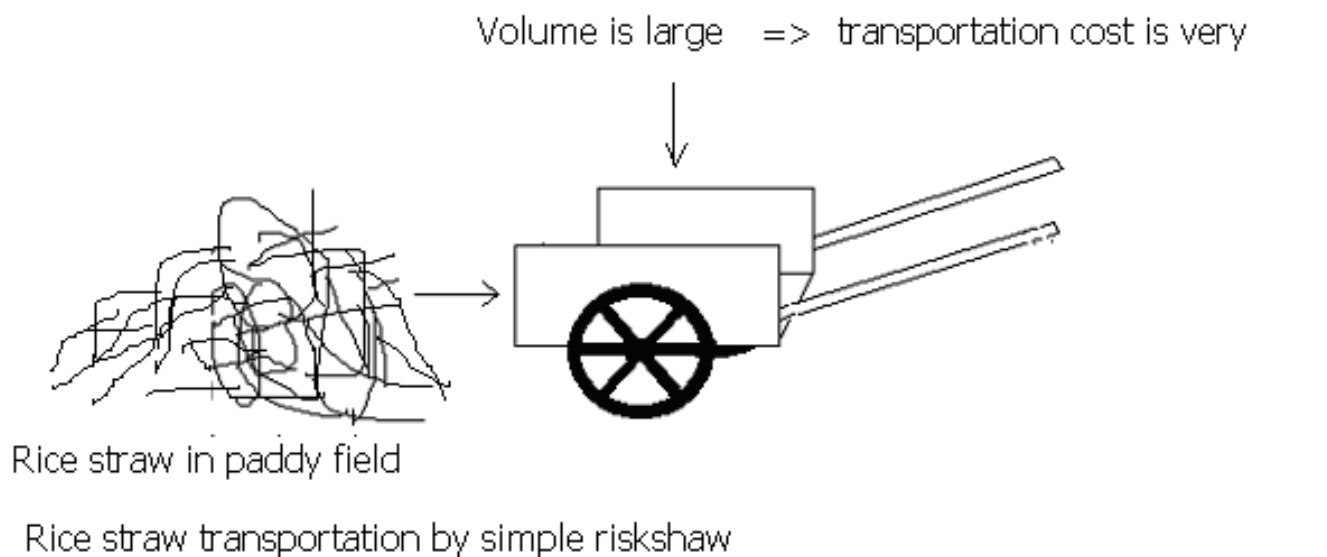
- It is not recommended if we feed the whole plant to cattle without chopping because cattle can only eat the leaf. Cutting frequency should be short to decrease the hard stem part. However, it is needed to fertilize the grass after each cutting time.
- We have to cut or chop the part of soft (edible) stem part (by machine or manually) to 2 ~ 3 cm length ideally.



To increase the edible part (utilization ratio of plant's stem)

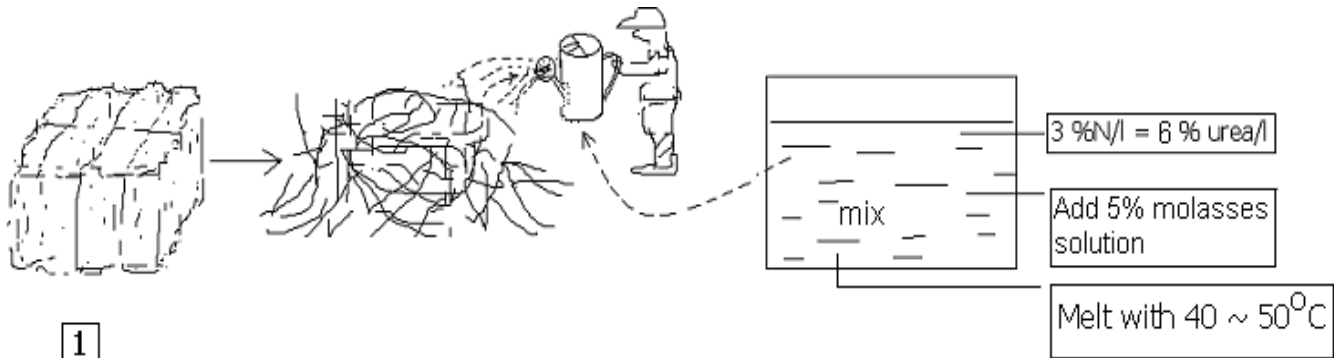
The farmer should chop it to small pieces, 2~3 cm length

(10) Rice straw utilization for feeding in the dry season

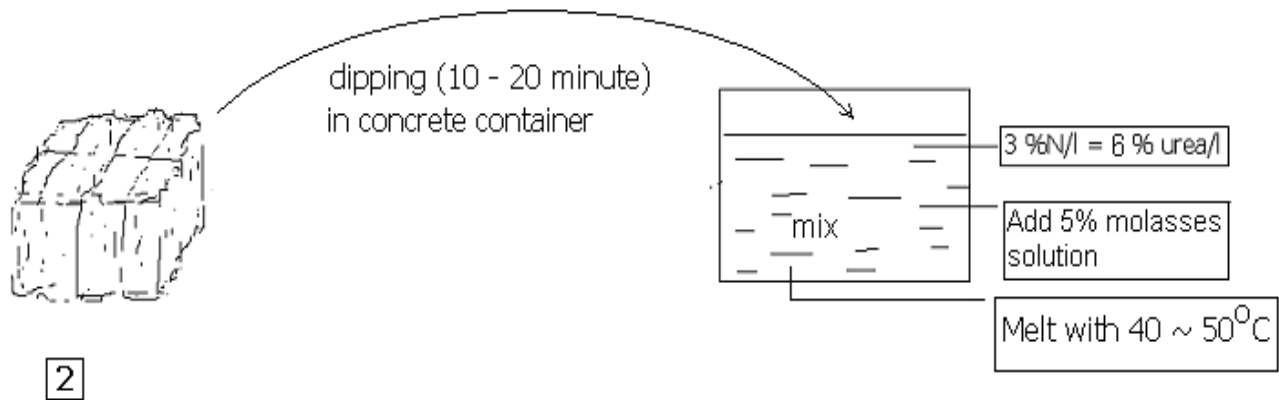


Binding rice straw using simple binding machine
Made in Thailand and Ho Chi Minh city, etc.

(11) Rice straw treatment by urea (NH_4^+) and molasses (CHO) for feeding in dry season



Total concentration of N maximum 3%
and molasses is 5 - 10% of weight



Ideally give 1% urea - molasses treated rice straw + 1% concentrate + 1 % dried grass, in total 3% of body weight of the cattle during dry season.

(12) Urea – molasses – mineral block for dry season

(Already experimented in NIAH)

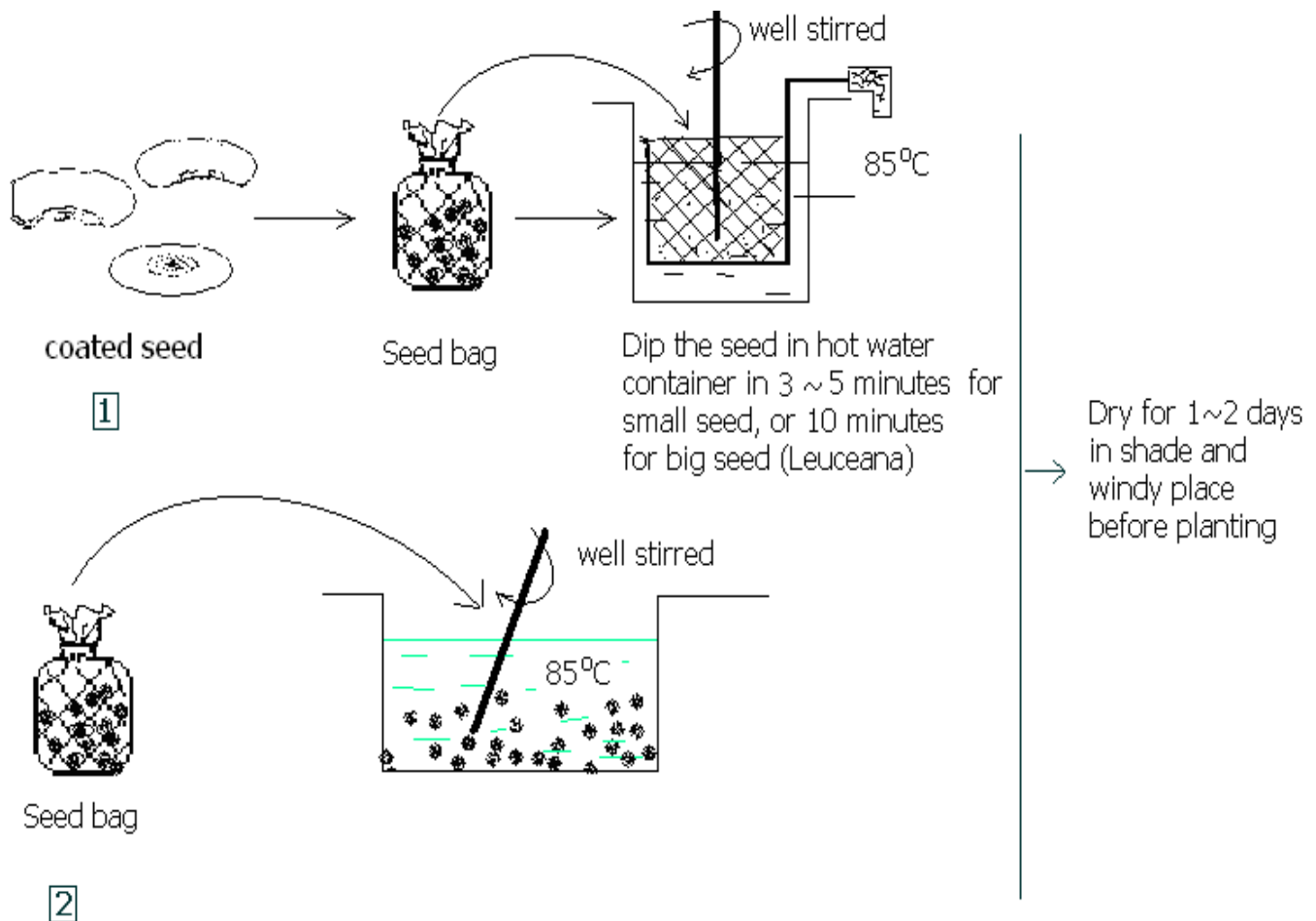
It was introduced by Australian method but the Vietnamese farmers do not take advantage of this.

Why:

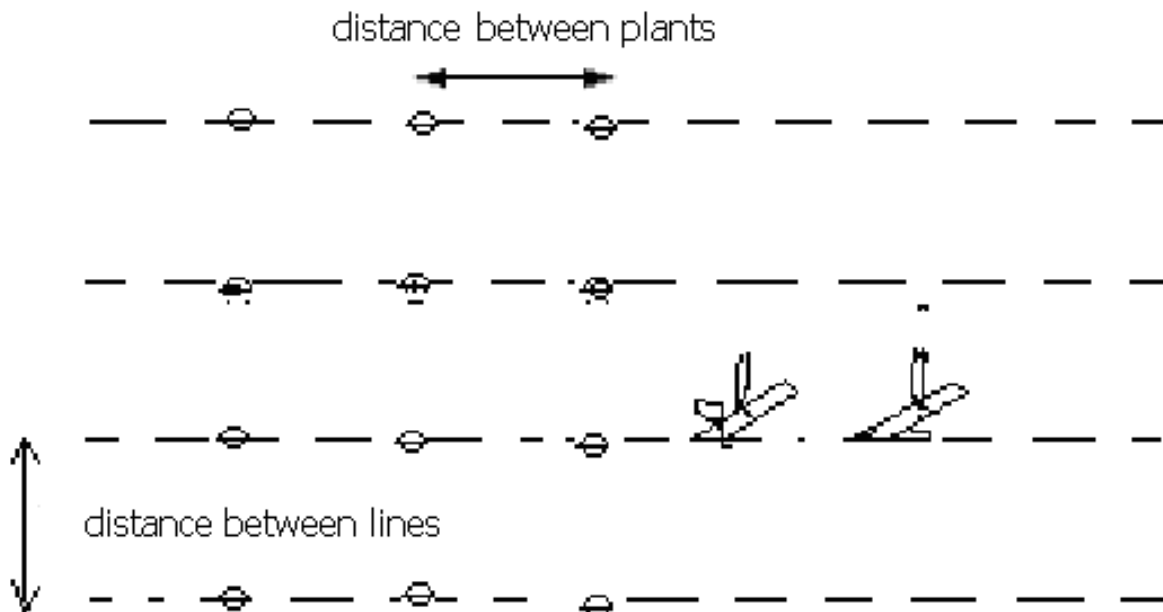
- + A lack of simple machine to produce block? (Mixer and block maker)
- + Labor cost? (Especially if added sulfur, it causes irritation to skin of worker)
- + Price?
- + Extension activities to introduce the feed?
- + Distribution and transportation cost?

(13) Breaking dormancy of tropical legume seed

- Before planting last year harvested seed, we have to treat to break the hard coat (dormancy) with using hot water treatment.
- If the seed was harvested 3~4 years before, the seed don't need this treatment.

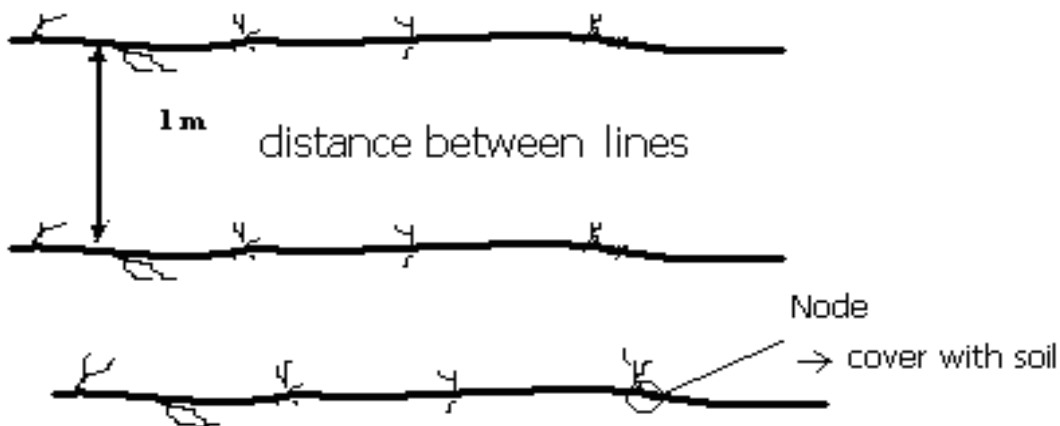


(14) Planting density of Napier Grass



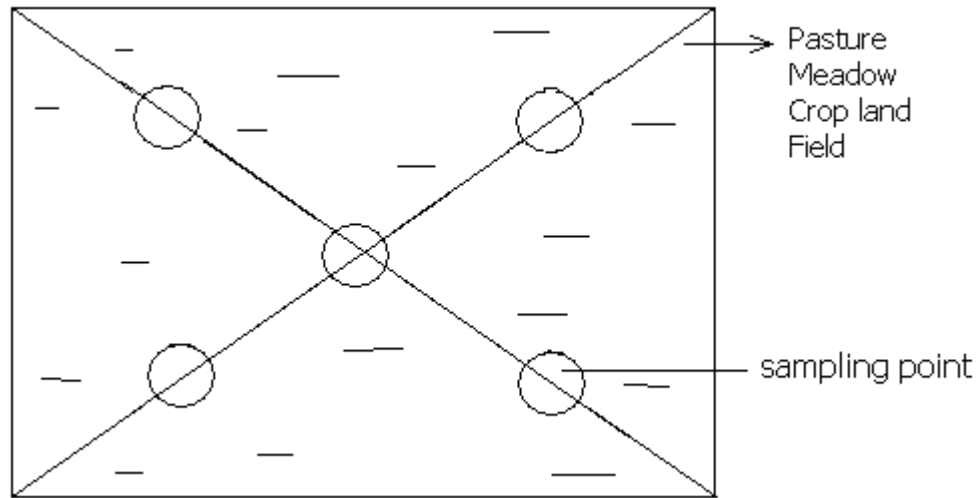
Density: 50cmx50cm in fertile soil, good drainage, high temperature
75cmx75cm in normal soil
100cmx100cm infertile soil

(14) Stolon (Runner): African (Giant) Star grass
Creeping signal grass (*Brachiaria humidicola*, etc.)



Do not cover the whole stolon but every 30 ~ 60 cm over the nodes and then tap by foot

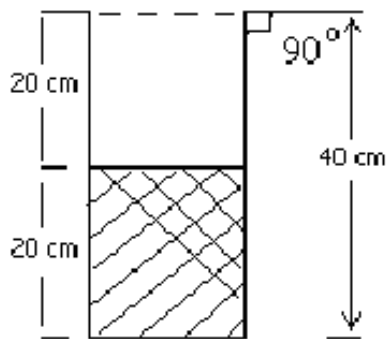
(15) Sampling method of soil for chemical and physical analysis



+ Soil sampling depth

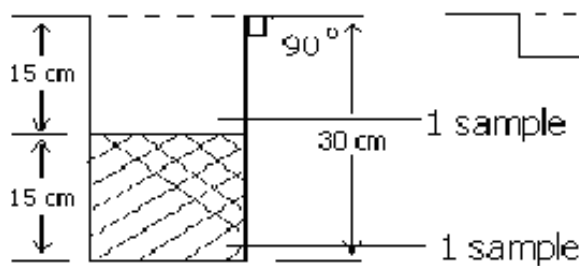
Vietnam

(based on Russian method)

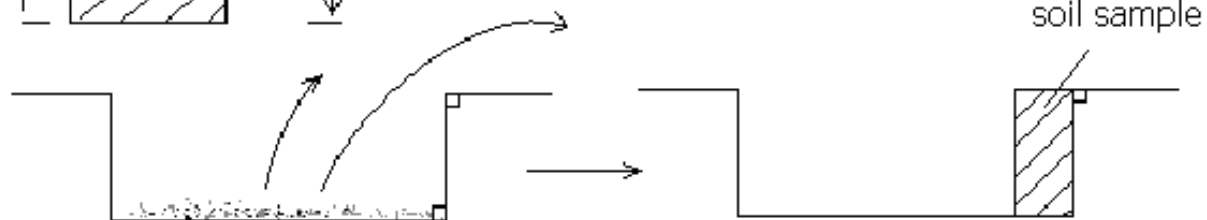
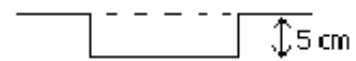


South America

(CIAT method)



Japan



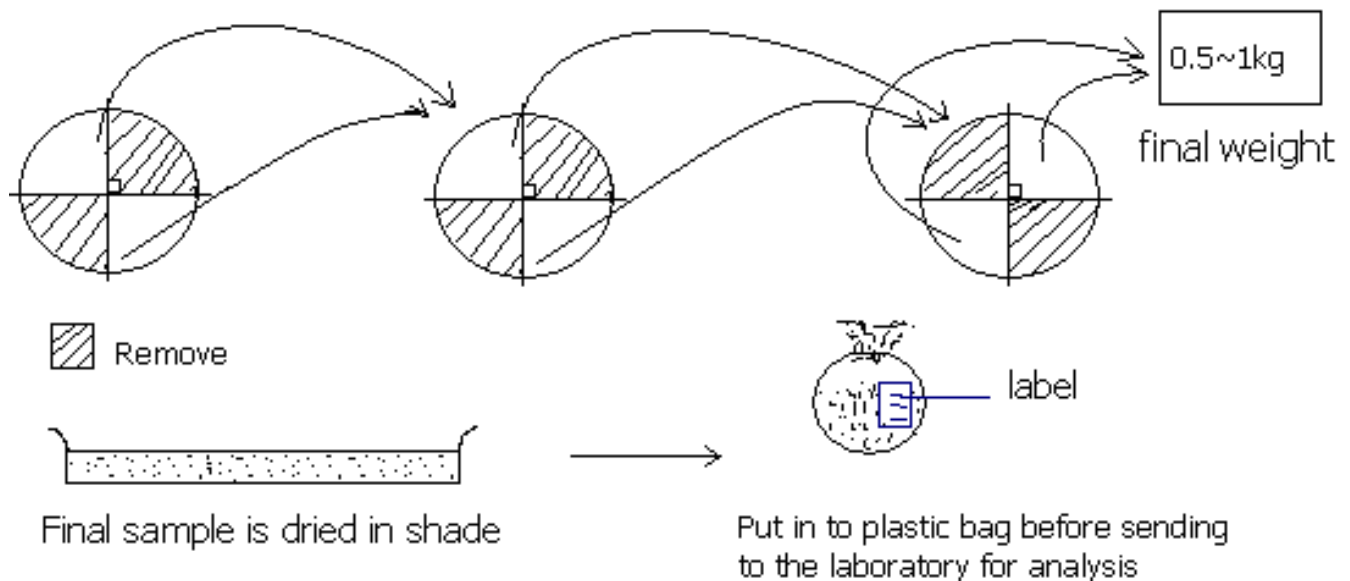
Take out completely the remaining soil in the hole

Take sample beside the hole

(16) Quarter method for soil sampling

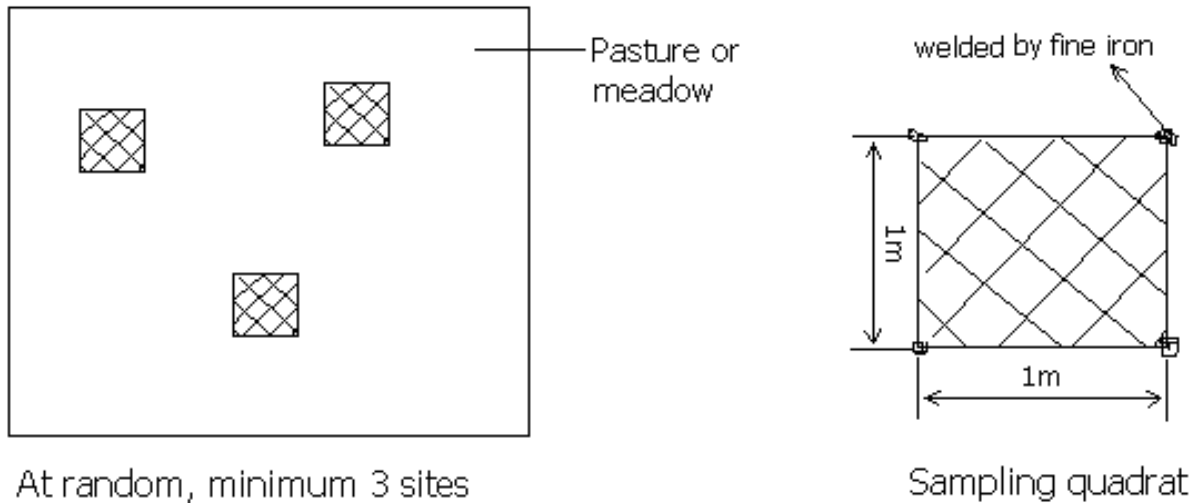


- Eliminate root and stone by $\Phi 2$ mm metal mesh
- Well mixed
- 1st soil sample (2 ~5 kg)



- Labeling to sample bag:
 - Location and farmer name
 - Date
 - Sample number
 - Name of collector
 - Organization name
 - Name of planted grass

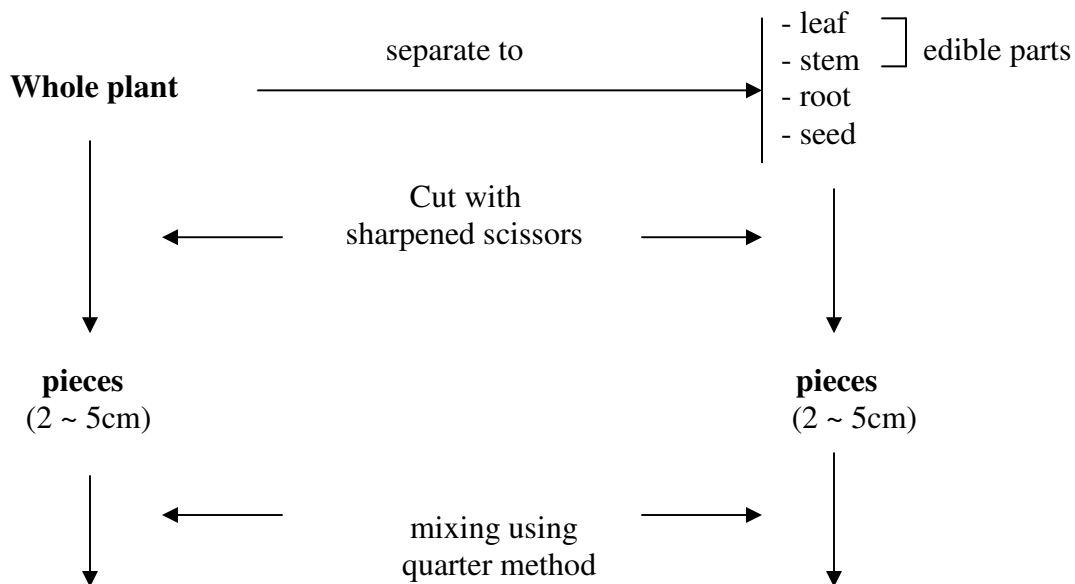
(17) Sampling forage crop for approximate analysis

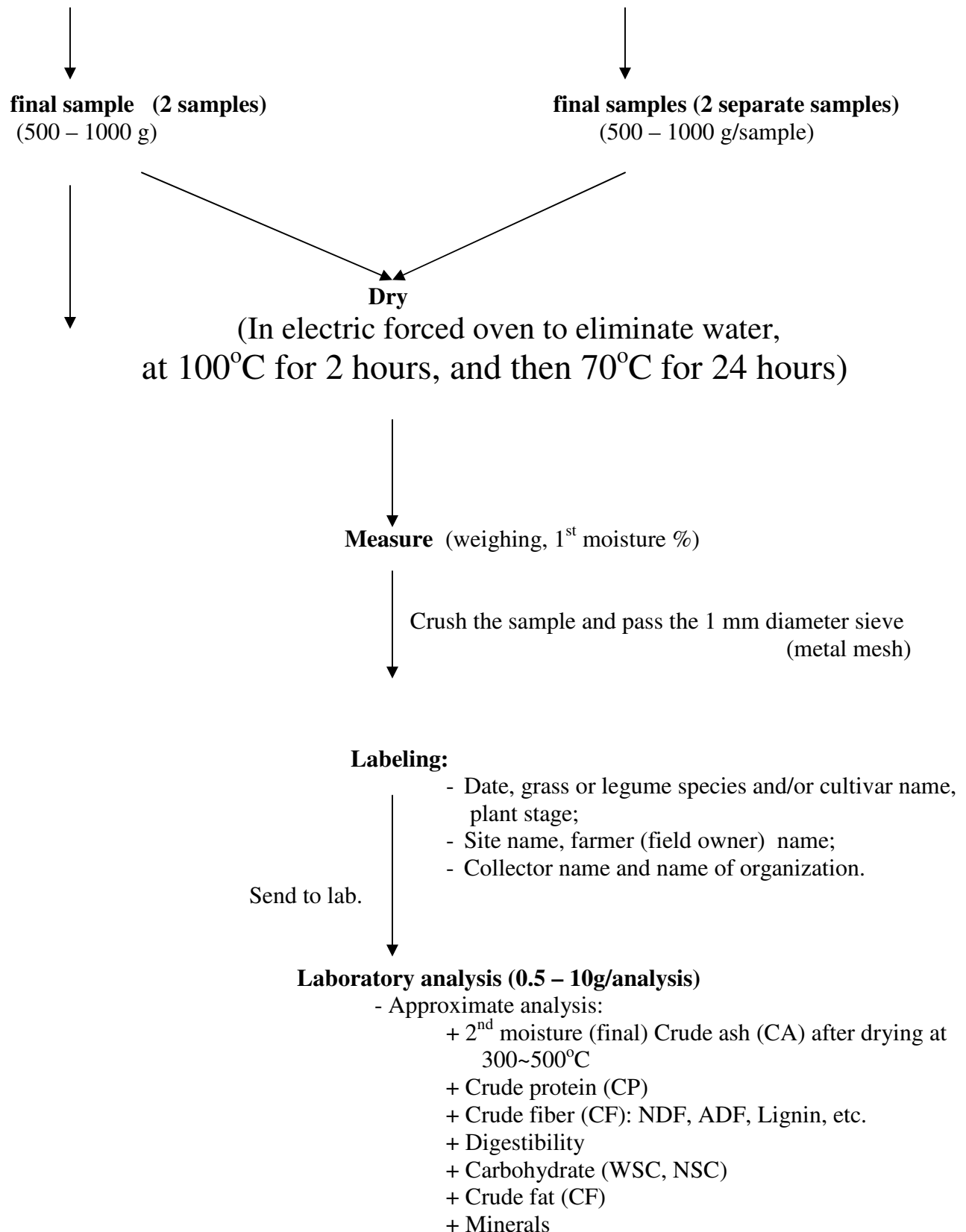


- Cutting height: 5 ~ 10 cm above the ground (fix the same cutting height for all species except tall type and creeping type)
- Chopping: The whole plant is cut by sharpened scissors into 2 ~ 5cm length pieces

Popular method

Research method in detail



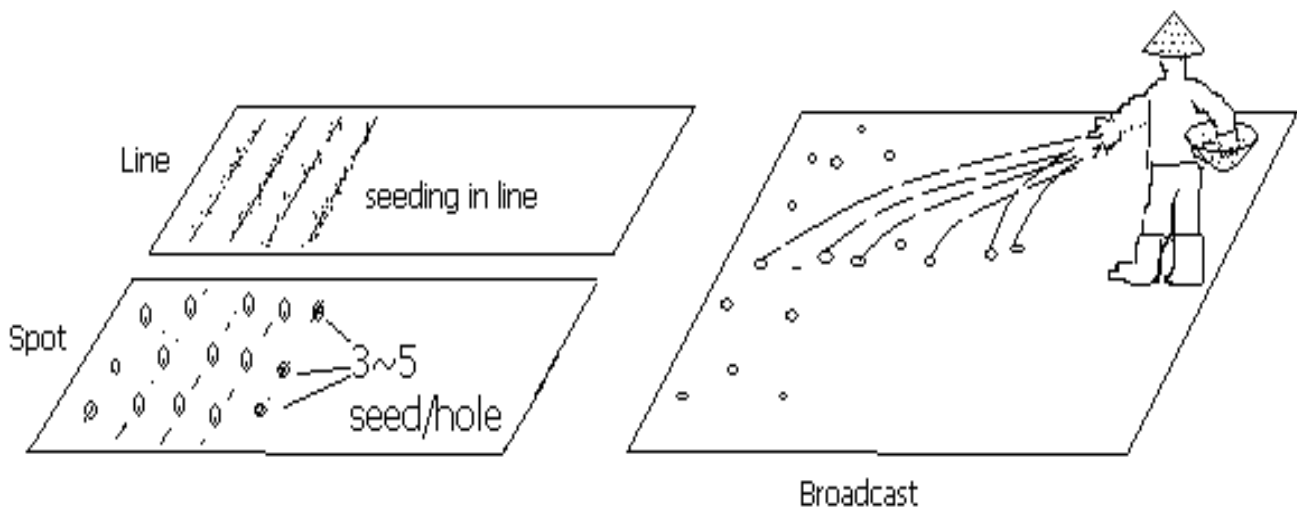


(18) Planting method

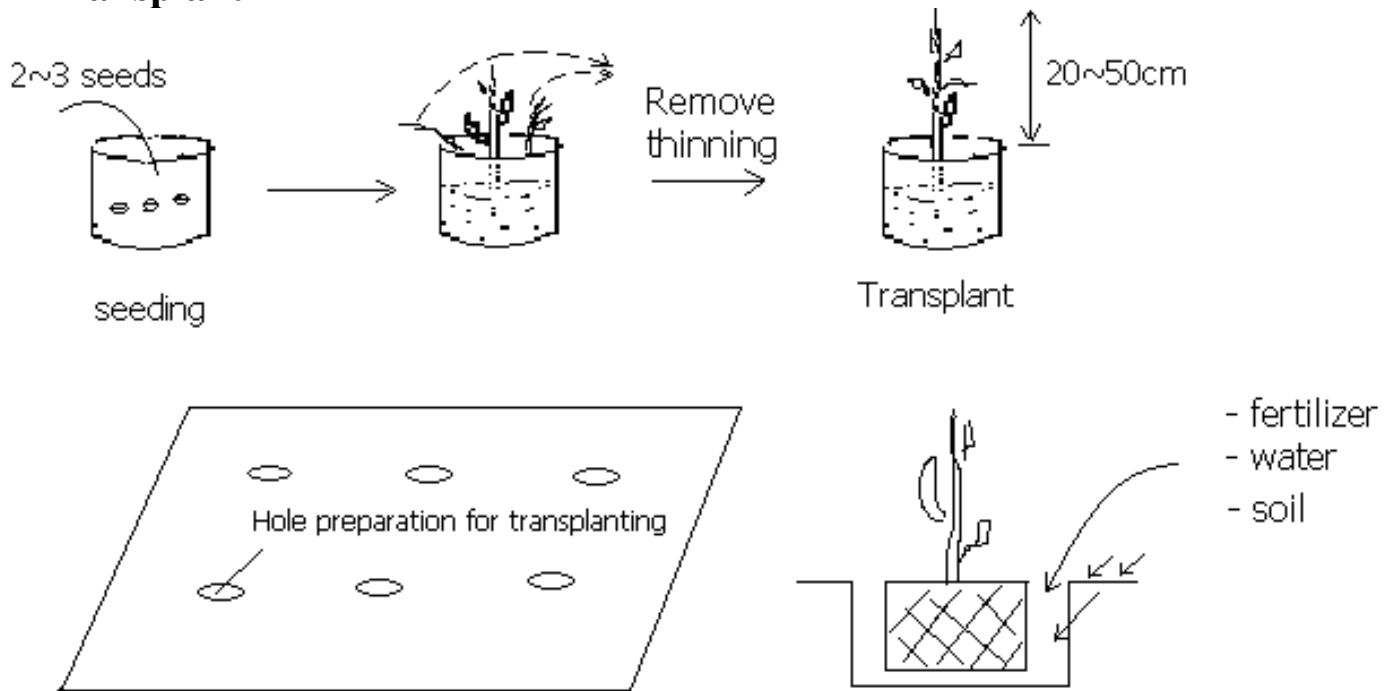
+ Seed:

- 1- Line (streak)
- 2-Spot (hill seeding, spaced planting)
- 3-Broadcast
- 4-Transplant (from nursery)

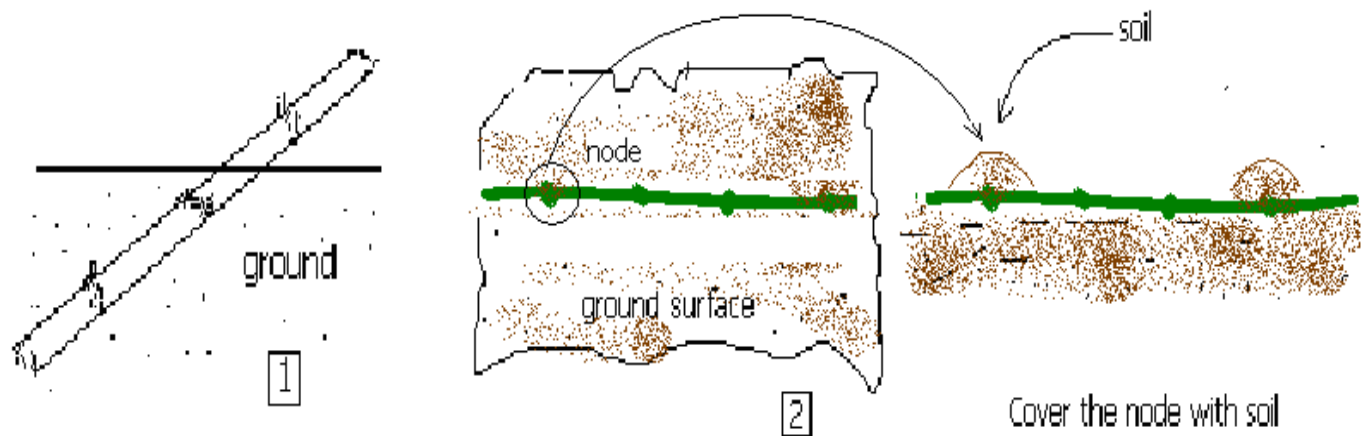
+ Vegetative parts (stem, root, nursery plant)



+ Transplant



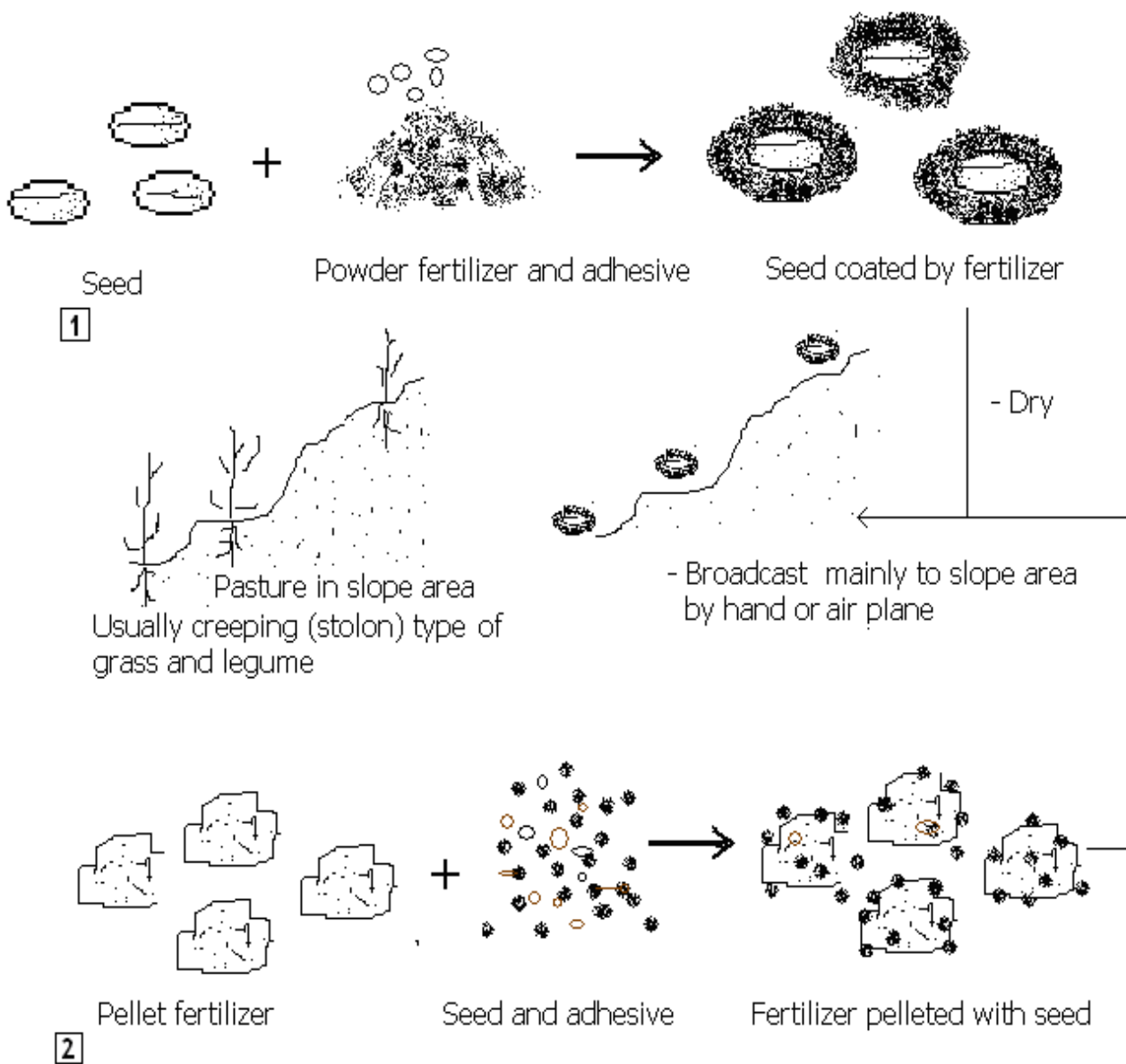
+ Stem



Planting method of stem type

Planting method of stolon

(19) Pelleted seed



(20) Shot gun mixture

When we need decide immediately local adapted species, we do as follow:

First, if we can not get information of the soil in detail, we observe the soil color and indicator plant (Cassava – acid soil, Sugar cane – fertile soil, etc.).

We ask for information from the local farmer and technician about the natural condition, planted species and custom.

Based on limited information with expert experience, we can select what kind of species can be successfully grown in that area.

1- Mix - broadcasting

We mix 5 – 20 species together and broadcast to the seed bed. After germination, we observe the vigor of growth, diseases, palatability, etc. We can decide the most adaptable species.

2- Line (streak) planting

We examine 5 – 20 species in the field. Each species is planted in one or some line and put on the label with species name.

We observe the plant vigor, productivity, diseases, etc. to decide adapted species.

(21) Seed germination test

Germination test by ISTA (International Seed Testing Association (France) is common, but it is difficult for us to do in local area.

We use simple method by Petri dish with paper filter (single or double method) or toilet paper.

Firstly, we wet the paper by boiled water (or mineral water) or KCl solution.

Put 20 ~ 100 seeds into the dish (for legume seeds, we have to treated with hot water to break seed dormancy before putting into the petri dish), then keep the dish in dark place. Start counting germinated seed when they start germinating.

Remove germinated seed and record until no more seed can germinate.

Fungi may occur but it does not affect so much the germination test. Add water if necessary to keep the moisture inside the dish.

Germination % = Number of germinated seed \div Total number of the seed

