

LOW EXTERNAL INPUT AND SUSTAINABLE AGRICULTURE

The idea of Low External Input and Sustainable Agriculture (LEISA) is not new for the communities in the Central Highlands Irian Jaya. Since the early days, they have carried out a similar activity like LEISA.

As changes in time and environment, the carrying capacity of the land is not enough again. Deforestation and loss of topsoil become the major threat for a sustainable agriculture in the highlands. Besides that, the “modernization” pressures makes the people seek money.

In the old days, re-planting the garden with some nitrogen fixing trees is essential. On initiation days when celebrating the boys entering the manhood, they should plant trees (especially Casuarina sp.). Casuarina is the best firewood in the world and is the most important tree in the Central Highlands culture. They have a belief if the trees died, they will die too.

They have known how to prevent soil erosion by putting some fences and rocks. They also use contour trees for marking the land-ownership.

When accepted the modern religions, people have forgotten their old wisdom. In this matter, refreshing the community about their old-good culture is very important.

LEISA IN JAYAWIJAYA

1. Agroforestry

In every hill of Jayawijaya will apply the terracing method. As it is very difficult and a hard labour for making step-terrace (a terrace with ditches), we will only plant trees following the contour. To mark the contour we use A-frame.

Along the contour, we will begin to plant nitrogen -fixing trees. Casuarina cunninghamia, C. oligodon, Albizzia falcataria, Accacia angustissima, Caliandra calothyrsus will be planted. The distance between the trees is 1.5 m – 2 m. Between these trees, we will plant fruit trees such as Macademia, Jack-fruit, Avocado etc. We use a lot of nitrogen -fixing trees to prevent disaster when a species of the tree attacked by pests.

We will begin to plant trees on the lowest end of the slope (the fertile one) and the highest peak of the hill. We begin from the bottom as we will succeed to grow the trees.

Under the trees contour, we will pile all stones found. We will also grow grass for fodder (especially for rabbit, goat and sheep). These grasses and stones will help to prevent the soil erosion. Vetiver grass has been very effective in grass strips. It does not spread onto cultivated soil, it produces sterile seeds, has few pest problems and can survive in a wide range of climates.

At both end of the rows we will dig a blind-end ditch for checking the water flow. This 1 x 1 x ½ m³ ditch is very useful for preventing the erosion. It also is very useful as a source of water in the dry season. When the ditch is full with soil (topsoil), we put the soil in the seedbeds again.

The distance between rows of contour is around the height of the people. The steepest the area, the nearest the distance is the rows. After 5 years, this contour method produces natural terraces. The reforestation tree and the grass produce a microclimate suitable for production of food crops.

Between the rows, especially middle-lowest part of the hill we will plant food crops (sweet potato, peanut, soybean, etc.). we will always plant a mixed cropping as a strategy for insect attack prevention. As these crops need sunshine, we will prune the reforestation trees as high as 1.5 m. This system is called alley-cropping. The prune sticks could be used as firewood.

In the upper-middle part of the hill, we will not plant food crops, but we will plant coffee trees. So, we will receive double benefits, reforestation and coffee. After the forest begins to shape, a bee-keeping activity will begin. Bees will help the pollination of the food crops.

2. Low External Input

The system of alley-cropping is like this :

All seedbeds will be horizontal. To improve the quality of soil, we will embed grass, leaves of pruned trees, fecal materials. Research in time by BPPT found that this method increased the productivity up to 400 %.

With this method, we will discourage the slash and burn activity. Although the ash of the burn trees material is very fertile, it could not last longer. In three months, the soil will lose its fertility. Besides that, burning destroys the quality of soil (kill the worms and young trees).

Bare soil between growing plants is covered with a layer of organic matter such as straw, grasses, leaves (mulching). Mulching keeps the soil moist, reduces weeding, keeps the soil cool and adds organic matter.

In places that can grow *Mucuna pruriens* (velvet bean), a cover crop, we will encourage the people to plant this bean in their fallow garden. When they need to open this fallow garden, they just embed the cover crops (as green manures) and begin to grow foods. This method enriches the soil and decreases the time need to open a garden.

Local people have used *Crotalaria* sp. as a method for improving the fertility of the soil. This tree enriches the soil too. They have known that they have to embed this tree for getting a high agricultural output. They plant the tree after finishing planting the food crops.

Cover crops are a kind of living mulch. They also reduce weed. *Mucuna pruriens* also produce bean that could be eaten after soak the bean for 3 days.

These systems will help the community to abandon shifting agriculture and slash-burn farming. If they leave this method, they do not have to open new forest, and women do not have to walk further away from their gardens.

We could see that with a low external input, the community could receive a higher harvest. This system helps the community to preserve the forest.

3. Sustainable agriculture

Forest, gardens and animal husbandry-fish pond will make a mixed farming. Rabbit, chicken, goat and sheep could get benefits from the forest and garden (grass and pulses). The fecal materials of the animals could be used as fertilizer (compost). This interaction will benefit each other and produce a sustainable agriculture.

CONCLUSION

Soil erosion happens because of two enemies (rain drop impact and run-off). Two solutions are soil cover and barriers. The control methods are:

× **Cover methods**

1. Mulching
2. Cover crops and green manures
3. Inter-cropping and mixed cropping
4. Crop residues

× **Barrier methods**

1. Contour grass strips
2. Contour hedges and trees
3. Terracing

REFERENCES

1. Carter M., *"How Soil Erosion Happens"*. Footsteps 1993; 15 : 5 -7
2. National Research Council. *Vetiver Grass : "A Think Line Against Erosion"*. National Academy Press, Washington, D.C. 1993.