

## SALT BACKGROUND

Shifting cultivation (slash and burn *jhum*) is widely practiced by farmers in the hill regions of the North-Eastern states of India. Though implemented in a sustainable way for generations, this system of subsistence agriculture is now facing many challenges and there is an urgent need to identify suitable alternatives.

Challenges to shifting cultivation include unseasonal and erratic rainfall, reduction in duration of fallow period due to pressure on land, reduction in yields due to decline in soil fertility, lack of interest among the younger generation in practicing it among others. Fallow land treatment to ensure conservation of biodiversity is also becoming challenge.

The government and scientific establishment has long considered *jhum* to be destructive to the environment due to the removal and subsequent burning of vegetative cover from the selected *jhum* area. Increased air pollution, soil erosion and landslides have been attributed to *jhum*. The main alternatives put forth by the establishment have been conversion of *jhum* area to settled agriculture through terrace construction or establishing plantations and orchards. The success of these alternatives has been limited since they are cost intensive and dependent on external inputs and technology beyond the reach of the hill farmers.

The Sloping Agriculture Land Technology (SALT) approach when suitably adapted to the local conditions has the potential to offer the hill tribes with an alternative method of agriculture, which while being climate smart, will also provide the farmers with a means of sustainable livelihoods.

A pilot SALT project has been initiated in village Aben of Manipur state by Mr. David Gandhi during the 2017 monsoon season and is proven successful. Goatery, fishery, piggery, duckery and apiculture has been incorporated into the model for added benefit. Primary processing facilities to facilitate marketing also being add for developing an ecosystem of production, forward and backward linkages. Over the longer term, there is great potential to adapt the model wherever shifting cultivation is being practiced in the north-east hill zone.

Community forest will be encouraged with agro-ecological approaches and by additional plantation of locally important wild species in the community the conserved area for sustainable income generation in the catchment areas of the SALT model. This will enrich forests produces while conserving biodiversity and spring shed areas ensuring sustainable environment.

The following guidelines are considered essential. The system must:

- Adequately control erosion
- Help restore soil structure and fertility
- Be efficient in food crop production
- Be applicable to at least 50% of hillside farms
- Be easily duplicated by upland farmers
- Be culturally acceptable
- Have the small farmer as the focus and food production top priority
- Be workable in a relatively short amount of time
- Require minimum labour
- Be economically feasible

#### **ADVANTAGES OF SALT FARMING:**

- Sloping Agriculture Land Technology is a simple technology. There is no need for expertise. Any farmer can easily learn to make a contour line by using A frame.
- Low cost method of upland farming.
- Its technology helps to maintain the soil structure.
- This technology is best suited for resource poor farmers. Farmers with few tools, little capital and with little formal education in agriculture can easily adopt this technology.
- By preventing soil erosion and retaining moisture, contour farming boosts productivity.
- Planting of Nitrogen fixing trees helps to replenish soil nutrients and ultimately boost up productivity.
- Since we cultivate permanent crops, short and medium term crops in the strips, so crop produce can be obtained year round.
- This technology enables farmers to cultivate varieties of crop at a time.
- The trees and shrubs can be harvested to obtain firewood and use as raw materials for other purposes.
- It can easily revert back to forest land if left unfarmed.
- This technology is applicable to at least 50 percent of hillside farms.
- As the farming technologies adopted by this method are in harmony with the Asian beliefs, it is a culturally accepted method of farming.
- This technology gives priority to food production.
- It is economically feasible.
- It is ecologically sound.
- This technology is efficient for food crop production.

If farmers leave the SALT farm, like some tribal groups do, the nitrogen-fixing trees and shrubs (NFTS/ NFP) will continue to grow and overshadow the crop area. By the time the land is reverted to cultivation, the soil has been enriched already by the large amount of NFTS/NFP leaves and there is no erosion to contend with. In addition, the trees may be harvested for firewood or charcoal.

### **The ten steps of SALT**

#### **Step 1: Make an A-frame**

The first step is to make an instrument to locate the contour lines of your field. The ARLDF recommends using an A-frame. This is a simple yet effective tool that looks like the letter A, hence its name.

The A-frame is so simple that you can make your own using materials generally found on farms. To make it, you will need three sturdy wooden or bamboo poles, a saw or bolo, an ordinary carpenter's level, and string or rope. Cut two wooden poles at least 1 m to serve as the legs of the A-frame. Cut the third piece at least 0.5 m long to be used as the cross bar of the frame.

Tie together the upper ends of the longer poles. Let the lower ends of the legs stand on the level ground. Spread the legs about 1 m apart to form a perfect angle. Brace horizontally the shorter pole to become a crossbar between the two legs. Tie carpenter's level on the top of the crossbar.

Use the A-frame to find the contour lines of the land. Plowing and planting following the contour lines can prevent soil erosion. The contour line is a level line from one end of the field to the other and is found around the hill or mountain

*Other instruments for finding contour lines:* Many other instruments can be used to find the contour lines of your field. One is the variation of the A-frame mentioned earlier which uses a string and rock as a plumb bob instead of the carpenter's level. When done right, this possibly the most simple, economic and accurate method of locating contour lines.

Other farmers have chosen to use "O-rings", water levels, homemade transits and even professional transits to locate the contour lines. Your method of locating contour lines should be one that is acceptable to your local area.

## **Step 2: Locate and mark the contour lines**

The next step is to use your instrument of choice to locate contour lines in the field. Cut tall grasses or remove any obstruction so that you can move easily and mark lines. When using the A-frame, the task is much easier and faster with two people working together. One operates the A-frame while the other marks the located contour lines with stakes.

Make a study of the area for which contour lines are to be determined. Begin marking contour lines near the highest point. Let the A-frame stand on the ground. Without moving the rear leg, then put the front leg down on the ground that is on the same level with the rear leg.

The two legs of the A-frame are on the same level when the air space in the carpenter's level stops in the middle. When this happens, it means that you have found the contour line which is a level line between the two legs of the A-frame. Mark with a stick the spot where the rear leg stands.

Move the A-frame forward by placing the rear leg on the spot where the front leg stood before. Adjust the front leg again until it levels with the rear leg. For every 2-3 m of contour line you find, mark it with a stake. Follow this procedure until you reach the entire length of the contour line, which is the other side of the mountain or hill.

Try to locate as many contour lines as possible. Remember, the farther the contour lines are from each other, the more potential erosion occurs. Also, closer contour lines mean more nutrient-rich biomass produced and made available to the crops growing in the alley.

There are two criteria for determining the distance between contour lines: vertical drop and surface distance. Generally, no more than a 1 m vertical drop is desirable for effective erosion control. Therefore, the steeper the slope, the closer the contour hedgerows should be; conversely, the flatter the slope, the wider the spacing of hedges. However, on the flatter slopes, it is recommended that contour hedgerows be spaced no farther apart than 5 m in order to maximize the benefits of the NFTS on soil fertility management.

In determining a 1 m vertical drop, the "eye-hand" method is a simple procedure to use. If using a transit or home-made transit, the 1 m vertical drop can be obtained very quickly.

### **Step 3: Prepare the contour lines**

After you have found and marked the contour lines, prepare them by plowing and harrowing until ready for planting. The width of each area to be prepared should be 1 m. The stakes will serve as your guide during plowing.

### **Step 4: Plant seeds of nitrogen-fixing trees and shrubs/ plants (NFTS/NFP)**

On each prepared contour line make two furrows at a distance of 0.5 m apart. Sow the seeds in each furrow to allow for a good, thick stand of seed lings. Cover seeds lightly and firmly with soil.

The ability of NFTS to grow on poor soils and in areas with long dry seasons makes them good plants for restoring forest cover to watersheds, slopes and other lands that have been denuded of trees. Through natural leaf drop they enrich and fertilize the soil. In addition, they compete vigorously with coarse grasses, a common feature of many degraded areas that have been deforested or depleted by excessive agriculture.

### **Step 5: Cultivate alternate strips**

The spaces between the thick rows of NFTS/ NFP where the crops are planted is called a strip. Other names for the strips are alleyways or avenues.

If you wish to prepare the soil for planting before the NFTS/ NFP are fully grown, do it alternately on strips 2, 4, 6, 8, (those plowed) and so on. Alternate cultivation will prevent erosion because the unplowed strips will hold the soil in place. When the NFTS/ NFP are fully grown, you can proceed with cultivation on every strip.

### **Step 6: Plant permanent crops, short and medium-term crops**

Plant permanent crops in every third strip. They may be planted at the same time the seeds of NFTS/ NFP are sown. Only the planting holes are cleared and dug; later, ring weeding is employed until the NFTS are large enough to hold the soil.

Examples of permanent crops include jackfruit, coffee, banana, citrus, tree bean, and others of the same height. Tall crops are planted at the bottom of the hill while the short ones are planted at the top. Shade-tolerant permanent crops can be intercropped with the tall crops.

You can plant short and medium-term crops between and among strips of permanent crops. They are your source of food and regular income while waiting for the permanent crops to bear fruit. Suggested short and medium-term crops are pineapple, ginger, gabi, castor bean, camote, peanut, mung bean, melon, sorghum, corn, upland rice, etc. To avoid shading, plant shorter plants away from tall ones.

### **Step 7: Integrate livestock**

Small livestock such as goats, piggery and local birds are incorporated into the system. Leguminous fodder species cultivated as fodder banks are periodically harvested to feed the animals. Animal dung is also composted and applied to the soil to maintain soil fertility. This system is less labour intensive,

requires low external inputs, provides food for the family, marketable produce for income generation and is a sustainable and climate friendly form of settled agriculture.

### **Step 8: Regularly trim the NFTS/NFP**

About once a month, the continuously growing NFTS are cut back to a height of 0.5-1 m from the ground. Pruned leaves and twigs should always be piled at the base of the crops. They serve as soil cover to minimize the impact of raindrops on the bare soil. They also act as excellent organic fertilizer for both the permanent and short-term crops. In this way, only a minimal amount of commercial fertilizer (about one-fourth of the total requirement) is necessary.

### **Step 9: Practice crop rotation**

A good way of rotating non-permanent crops is to plant grains (corn, upland rice, sorghum, etc.), tubers (camote, cassava, gabi, etc) and other crops (pineapple, castor bean, etc) on strips where legumes (mung bean, bush sitao, peanut, etc) were planted previously, and vice versa. This practice will help maintain the fertility and good condition of your soil. Other management practices in crop growing, like weeding and pest control, should be done regularly.

### **Step 10: Build and maintain green terraces**

Apart from providing you with adequate food and sufficient income, another important benefit of using SALT is the control of soil erosion. This is done by the double-thick rows of nitrogen-fixing trees and the natural terraces being formed along the contour lines of the hill. As you go on farming the sloping land, keep gathering and piling up straw, stalks, twigs, branches, leaves, rocks, and stones at the base of the rows of nitrogen fixing trees. By doing this regularly, and as the years go by, you can build strong, sustainable, and beautiful green terraces which will reliably anchor precious soil in place .

**Rationale for inclusion of livestock:** After carefully analysing Goat rearing is found to be the most suitable and profitable activity for SALT farmers.

- Goat rearing under the SALT approach can offer a sustainable alternative to shifting cultivation
- Each mother goat can produce upto 4 kids each year, which can generate upto Rs. 12,000/ annual income. Each unit of 6 mother goats and 1 buck can generate upto Rs. 72,000/ annual income for the household.
- Goat rearing provides a low-tech and low-cost avenue for income generation.
- Goat rearing can be easily taken up by women farmers as a drudgery free livelihood option to shifting cultivation.
- Goats can be easily marketed in neighboring villages and towns even under conditions of poor infrastructure and roads.
- Impacts will be visible within short time frame of 12 months of establishment of goat unit.
- The results of the preliminary trials in Aben village are very promising.

### **Field based experience:**

- Concept seeding took more time than anticipated; reason being communities working with us are fixed on traditional farming practices. However, we can see slight changes in their attitude. Entering second year of taking up SALT farming as a sustainable strategic activity is starting to show result. We are able to identify sincere serious farmers from our target villages.
- One of the main concerns is the distance of the SALT farms from their settlement area. Almost all new SALT farms in our target areas are very far from their settlement area. This is because almost all target villages during General Body Meeting resolved to cut new farms far from the settlement area.
- Another challenge comes from low capacity to provide livestock support during the beginning of intervention stage.

### **Case study: Change Maker**

Lumhiugai Panmei, 32 from Azuram village, Tamenglong district one of the field executives of RNBA stride to change the farming culture. He plans to have his farm settled and sustainable. He belongs to Rongmei tribe who is dedicated, hard working and loving son who also looks after his ailing mother. His farm is located in the vicinity of NH 137 (Tamenglong, Manipur to Haflong, Assam).

Lumhiugai was also one of the staff of RNBA who was given the opportunity to visit Aben village to learn about SALT farming in the year 2021. During his visit in Aben village, he collected some seeds (Tephrosia and indigo fera); these seeds are nitrogen fixing plants that should be planted in the contour lines, which is one of the basic principles of SALT farming. The creation of hedgerows of NFPs along the contour lines is to control soil loss and surface run-off rain water while improving soil fertility through nitrogen-fixation. Hedgerows are pruned regularly and the clippings are applied to the inter-row strips as mulch.

Lumhiugai with his father in one of his existing farm which is about a size of 1 1/2 acre of land he and his father created 9 contour lines and planted the NFP (tephrosia and indigo fera). In the farm he grows varieties of crops (short, mid and long term); seasonal crops, turmeric, ginger, papaya, banana, passion fruit, mulberry, lemon, heiribob, orange, jackfruit, mango, pomegranate, parkia (tree bean), and wild tree fruits.

Today he and his father have collected their first harvest of NFPs, they collected about 2 kgs seeds after their first pruning, his farm is now a demo farm in his village.

He plans to create a new SALT farm for his new family with his wife. As we look across the new road cutting for NH137 from the top he pointed and quoted, "I'm planning to construct a small cafe in

the near future around the NH which will overlook my SALT farm and travellers can also come and learn my style of farming. I can also sell my produces from the SALT farm in my cafe. It sounds like a good dream to me". His dream is admirable, serene, humble but above all rewarding.