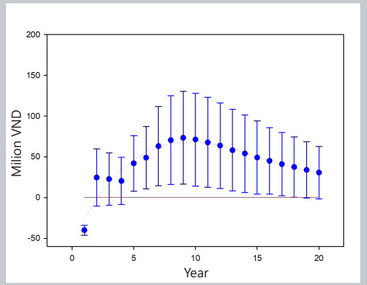
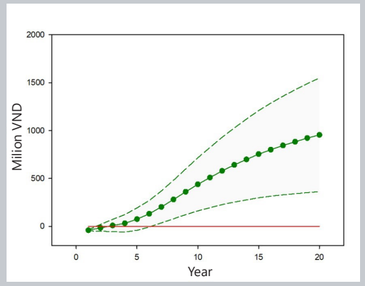
ECONOMIC EFFICIENCY

Total investment cost of the agroforestry option is 37.4 million VND per ha (containing materials and labor cost) and the agroforestry option could pay back the loan/credit to farmers in the second to third year. The first 5-years of data have been used for simulations up to 20 years based on different scenarios. The results have showed that the agroforestry option could yield profit more than 50 million VND/ha/year in the 7th to 14th year and deliver more than 30 million VND/ha/year from the 5th - 6th year and over 15 to 20 years.



A profit simulation of the agroforestry option over 20 years



A cumulative profit simulation of the agroforestry option over 20 years

REFERENCE

- MARD, 2013. Curriculum: H'mong apple planting. Page 68-69.
- Pham, H.T., Do, V.H., Hoang, T.L., La, N., 2016. AFLI technical report no. 25: Pruning and Pest control techniques for Son tra production in Northwest Vietnam.
- Vu, T.H., Hoang, T.L., Pham, H.T., Tran, H.M., 2014. Pruning and canopy forming techniques for Son tra (in Vietnamese).

FOR INFORMATION CONTACT

Dr. La Nguyen
Project Leader
Email: l.nguyen@cgiar.org

World Agroforestry (ICRAF) Viet Nam
13th Floor, HCMCC Tower, 249A Thuy Khue Street,
Thuy Khue Ward, Tay Ho District, Ha Noi, Viet Nam
Tel & Fax: +84 24 37834644/45
http://worldagroforestry.org/country/vietnam

Australian Government
Australian Centre for International Agricultural Research

CGIAR
RESEARCH PROGRAM ON
Forests, Trees and Agroforestry

PESTS AND DISEASES PREVENTION

Some main pests harmful to Son Tra trees, such as longhorn beetle and fruit borers, can be managed using biological methods.

- Stem borer: Adult of longhorn beetle (*Cerambycidae* family) lays their eggs to the surface of exposed wood. The hatched larvae will firstly attack bark and softwood parts, then bores deeper. Control methods include pruning properly to open the canopy and weeding. The pruning is carried out in March and October and combined with lime-water treatment (in the ratio of 0.5-1 kg lime + 5 liters of water) on the main stem to prevent the beetles laying eggs. If any holes of borer beetles are observed, the treatment can be done by injecting lime-water into the hole, and backfilling the hole with clay.
- Fruit borer (unknown scientific name): According to the survey of the AFLi project, in Tuan Giao (Dien Bien) and Thuan Chau (Son La) about 50% of Son Tra fruits was affected by fruit borers. The current method used is to do weeding and pruning to create open canopy in order to minimize pest habitat.

HARVESTING

1. FORAGE GRASS

- The forage grass (mulato or guinea) can be harvested from three months after planting. When grass reaches 60-70 cm in height, the harvest is implemented by cutting the upper part of the grass leaving only about 10 cm length of the grass stems from the ground. Grass yield in this agroforestry option reaches the highest in the second and third year, up to 60 tons/ha/year. In Northwest, grass can be harvested once every 30 days in the rainy season and 45 days in the dry season. Harvesting frequency depends on the number of cattle of each household, however, it is recommended to avoid late harvesting to minimize loss of nutrients in stem and leaves after the grass has flowered.
- Grass yield will gradually become less in the fourth and fifth years. Grass will grow fast and compete with Son Tra for nutrition. Therefore, it is recommended to remove grass that near Son Tra rows, maintaining four grass rows from the fourth year. After the fifth year, grass can be replanted to preserve performance of the agroforestry option, however, it is not necessary to replant after ten years because Son Tra's canopy has closed.

2. SON TRA

- Son Tra often bears fruits in the second and the third year with increasing yield and in the fifth year, average fruit yield is about 100 kg per tree, according to trials establishing in 2013 in Toa Tinh (Dien Bien). In Northwest, annual harvesting season is from August to October.

AGROFORESTRY TECHNICAL MANUAL

OPTION: SON TRA - FORAGE GRASS

La Nguyen, Pham Huu Thuong, Do Van Hung, Do Thi Hoa, Tran Ha My, Vu Thi Hanh, Nguyen Van Thach

World Agroforestry

INTRODUCTION

Son Tra (*Docynia indica*, also known as 'H'Mong apple') is an indigenous forest tree growing at high elevations in South and Southeast Asia, including high mountains in northern Vietnam. Son Tra fruit are edible and used to make tea, syrup, vinegar or wine. Many nutrients are found in Son Tra fruit such as polyphenols, tannins, saponins, organic acid, amino acids that are good for health. Son Tra is classified as semi-evergreen or deciduous. It can be grown from seeds or grafted seedlings. Grafted trees can bear fruit after three years, whereas trees grown from seed requires five years.

Son Tra fruits in Son Tra - Forage grass option at Dien Bien province

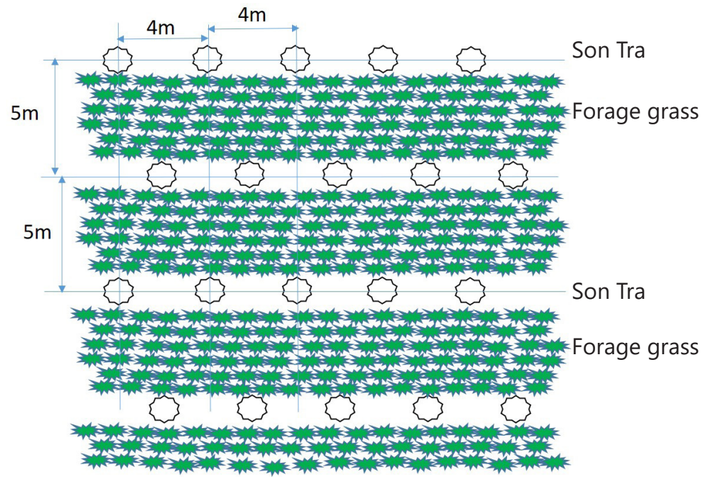
Son Tra is a native tree that only bears fruit at high elevation of more than 800 m above sea level. Thence, an agroforestry option combination consisting of high quality or grafted Son Tra seedlings will bring a variety of products, deliver an early profit, and both diversify and increase income for smallholders in mountainous areas.

DESIGN

The agroforestry option of Son Tra and forage grass is designed to provide early income for farmers from grass that can be used to feed livestock or sell while Son Tra has not yet produced fruit. Furthermore, grass in the agroforestry option can quickly provide a physical barrier to prevent erosion on sloping land.

Trees and grass are planted on the contour line to be more efficient in soil erosion prevention. The grafted Son Tra seedlings are used to plant at 5 m between rows and 4 m within row spacing (500 trees/ha) (figure below).

Between the rows of Son Tra are six rows of forage grass mulato (*Brachiaria* sp.) or guinea (*Panicum maximum*). The distance within six rows of forage grass is 0.5 m and 1 m apart from Son Tra rows. In a grass row, forage grass is planted with distances of 0.4 m (about 5-10 tons of grass/ha). The depth of grass rows should be about 20-25 cm. Grass could be grown by seed, however to reach high performance, it should be sown as rice is and then transplanted onto fields.



Distance and layout of trees and crops in Son Tra - Forage grass option

PLANTING TECHNIQUES AND FERTILIZING

1. SON TRA

Planting hole: The size of a hole is 50 cm x 50 cm x 50 cm or 60 cm x 60 cm x 60 cm.

Basal fertilizer application: Applying 10-15 kg of manure and 0.5 kg of NPK in a ratio of 5:10:3 (or equivalent) per hole. This should be composted one month planting.

Top dressing fertilizer application:

- In the 1st to the 3rd years: Apply 0.2 kg of NPK in the ratio of 5:10:3 per tree.
- From the 4th year onwards: Depending the yield of Son Tra trees, applying 0.5 kg NPK in the ratio of 5:10:3 per tree divided twice, the first time is in March-April, the second around October after harvesting. If the tree bears more fruit than average (compared to those planted at the same time), the amount of fertilizer should be increased to ensure fruit yield in the following year. The quantity is from 0.75-1 kg NPK 5:10:3/tree/year.
- Application fertilizer for each tree: Do weeding and dig a trench 15-20 cm deep below canopy, spread fertilizer evenly then cover with soil.

2. FORAGE GRASS

- Dig a grassy trench 20-25 cm deep on the contour lines, which is below Son Tra rows. The forage grass grow very fast, therefore preventing runoff of nutrients.
- The forage grass can utilize the nutrients and fertilizers from runoff; it is unnecessary to apply fertilizer for grass.

Son Tra - Forage grass option in Điện Biên

PRUNING AND CANOPY FORMATION

1. PRUNING AND CANOPY FORMATION IN ESTABLISHMENT PERIOD

Pruning and canopy forming when tree is young is to build a strong frame and produce a desirable shape and height.

- Prune off the top of the tree at 60-70 cm from the graft union to promote branching. When those branches develop well, keep 3-4 strong branches growing in all directions; these are primary branches.
- Cut the top of those primary branches when they reach about 60 cm to boost secondary branches.
- Keep two to three those branches facing in different directions, to maintain balanced crown. Similarly, repeat with secondary branches to create the third level branches. Thin away the dense interior branches.
- Remove any suckers at ground level and any shoots on the trunk below the graft union.

2. PRUNING IN HARVESTING YEARS

Prune annually after harvesting (around October) and before flowering (from February to March). Remove dead, damaged, broken and diseased/weak twigs, crossing branches, whorled twigs, stubs, water sprouts and suckers, or thinning if necessary.