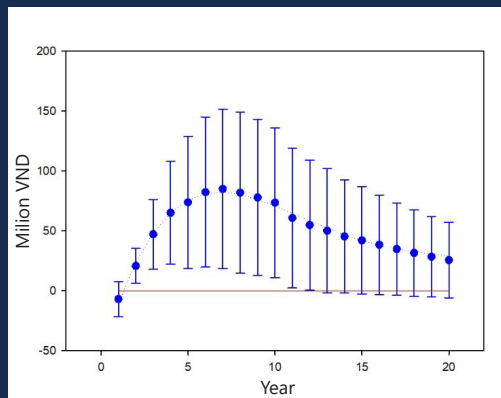
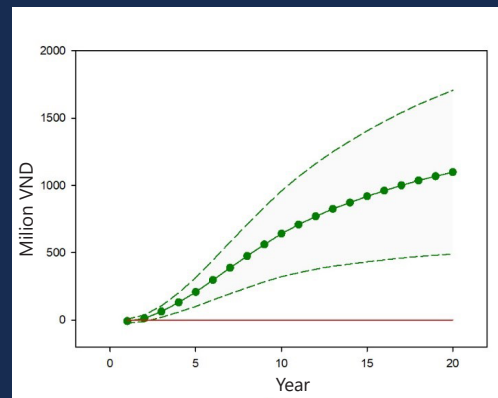


ECONOMIC EFFICIENCY

Total investment cost of this agroforestry option is 44 million VND per ha (including materials and labor cost) which can begin to be paid back from the second year. Data from five years of trials were used to create simulations over 20 years based on different scenarios. The results showed that profits of this agroforestry option increase progressively and peak in the 7th year. From the 4th to 13th year, the agroforestry option could get profits of more than 50 million per ha per year that is 20 million VND more than in 14th to 18th year, then there is a decline to 25 million in the 20th year. Thus, average profit from the 4th to 20th year is about 55 million per ha per year.



A profit simulation of the agroforestry option over 20 years



A cumulative profit simulation of the agroforestry option over 20 years

REFERENCE

- Longan propagation by grafting technique (Kỹ thuật nhân giống nhãn bằng phương pháp ghép cành). AFLi project. 2016.
- Dominant late-longan tree management process (Quy trình chăm sóc và quản lý cây đầu dòng nhãn chín muộn). Ha Noi DARD, 2012.
- Research on varieties and intensive technical methods to improve productivity, quality and production efficiency of longan in Song Ma district, Son La province (Nghiên cứu xác định giống và biện pháp kỹ thuật thâm canh nâng cao năng suất, chất lượng và hiệu quả sản xuất nhãn hàng hóa tại huyện Sông Mã, tỉnh Sơn La). FAVRI. 2011.
- Maize sowing and planting technical manual (Hướng dẫn gieo trồng giống ngô Lai VN10). VINASEED. 2014. <http://www.vinaseed.com.vn/vi/huong-dan-gieo-trong-giong-ngo-lai-lvn10-c107n59.htm>.

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RESEARCH
PROGRAM ON
Forests, Trees and
Agroforestry

PESTS AND DISEASES PREVENTION

1. LONGAN

Some common pests and diseases harmful to longan:

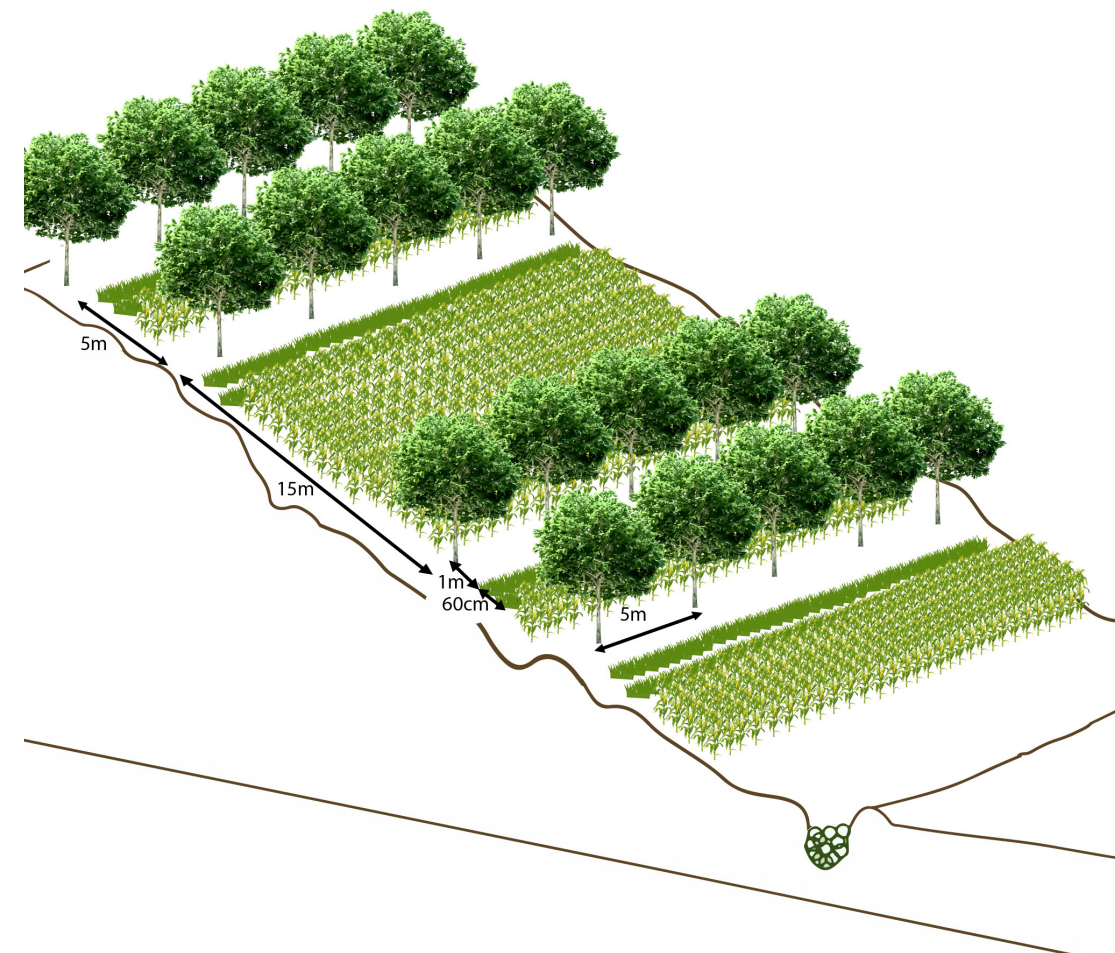
- Longan stink bugs (*Tessaratoma papillosa* Drury.): Attack young shoots, flowers and fruits. Prevention by removal of leaves that have bug eggs, shaking tree and collecting stinking bugs and burn. Using pesticide with *Cypermethrin* active ingredients according to using instructions (for example, Sherpa 25EC, 10-20 ml mixed in a 16-liter bottle, spraying 10-12 bottles for 1 ha. This dosage is used for the agroforestry option. For mono-longan system with plant spacing 5 x 5 m, it requires about 20 bottles).
- Stem borer/limb borer (*Cerambycidae*): Prevention by weeding and pruning, apply dense lime-water mixture on the stem/ base.
- Longan bugs (*Toxoptera citricida*): that harming to flowers and green fruits. Management method is similar to stink bugs.
- Witches' broom phenomenon on longan (*Eriophyes dimocarpi*) (shoots and leaves are curly, leaves cannot grow): This disease is caused by a filamentous virus which is transmitted by vectors *Eriophyes dimocarpi* Kuang mites on longan trees in Vietnam. Remove and burn infected branches, pruning to keep airy canopy.

2. MAIZE

- Black cutworm (*Agrotis ipsilon*) in the soil: Using pesticide with *Diazinon* active ingredients according to using instructions (for example, Vibasu 10GR containing *Diazinon* 10% w / w. Package of 1 kg for an area of 1000-1200 m², spread on soil before sowing).
- Corn borers, corn earworm (*Ostrinia nubilalis*): Using pesticide with *Dimethoate* or *Fenobucard* active ingredients according to using instructions (for example, Vibam 5 gr contains *Dimethoate* 3% + *Fenobucarb* 2%. Using 1.5-2 kg for 1000 m², sprinkle 4 to 5 seeds into cornfield when see butterfly of the stem borers).
- Sheath blight (*Rhizoctonia solani*): remove leaves when disease occurs.

HARVESTING

- Forage grass provides income early in the implementation of this agroforestry option, usually three months after planting. Grass yield reaches a peak in the second year, up to 17 tons/ha/year and reduce slowly from the fifth year. In the Northwest, it could be collected once in 30 days in the rainy season and 45 days in the dry season. Harvesting frequency depends on the number of cattle of each house-hold, however, avoid late harvest to minimize loss of nutrition after the grass has flowered. Replanting grass after the fifth year harvest is recommended to maintain efficiency, however there is a need to adjust planting distance given that the longan canopy has expanded.
- Grafted longan usually bears fruit from the second or third year, yet in accordance with tree growth, it is possible to cut flowers off and just keep fruits from the 4th year onwards. Longan harvesting season in Northwest is from 15th August to 5th September. Collecting longan fruit should follow requirements of the market, avoid crushing fruits and breaking branches.
- In Yen Bai province, maize is cultivated in two seasons, from February to March and July to August (rainy season). There is only one maize crop in Son La and Dien Bien province, planted from April to May after rain has begun.



AGROFORESTRY TECHNICAL MANUAL



OPTION: LONGAN - MAIZE - FORAGE GRASS

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Tran Ha My, Vu Thi Hanh, Nguyen Van Thach

INTRODUCTION

Longan (*Dimocarpus longan*) is a sub-tropical fruit species, it requires a period of cold climate, but not temperatures below zero, before flowering and fruiting. Longan has a wide adaptability and is suitable at altitudes that are lower than 800 m. Its root system is quite strong and can adapt to a variety of soils with pHs ranges from 5.5-6.5. Longan is sensitive to water logging, prefers porous soil, and grows well in hilly land.

As traditional farming in Northwest, some short-term crops, such as maize, are cultivated on sloping land. Hence, the introduction of late fruiting longan, forage grasses (mulato or guinea) and others trees planted on contour lines can generate diverse products, raise income and lessen soil erosion.



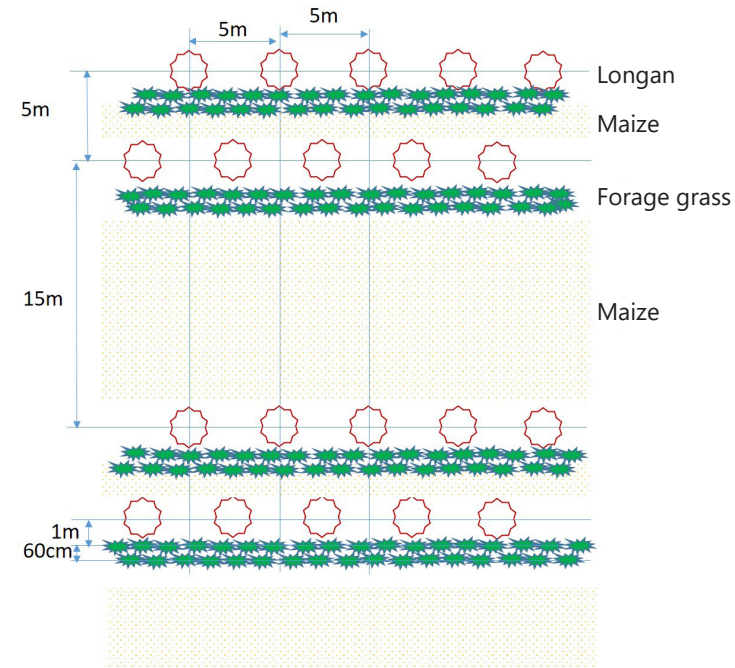
Longan for fruits in Longan - Maize - Forage grass option at Yen Bai province

DESIGN

Contour planting is designed in the agroforestry option to minimize soil erosion. Late fruiting longan cultivar is used and planted in a double row with row spacing of 5 m and tree spacing of 5 m. A double row are 15 m apart. Planting density of longan in the agroforestry option is 240 tree per ha.

Two rows of forage grass (mulato or guinea) are planted closely and 1 m apart to each longan row. Spacing between a double grass row is 60 cm. In a row, grass cuttings are planted 40 cm apart (about 1.5-2 tons of grass per ha). Grass could be grown by seed, however, to reach a high performance, it should be sown as rice then planted on field as designed above.

Maize is sown on the remaining areas. The required amount of maize seed equals to 65-70 percent of mono-maize cultivation (12 kg seed per ha per season). Maize rows need to be kept at least 1 m away from longan rows to avoid affecting longan trees when they are newly established.



Distance and layout of trees and crops in Longan - Maize - Forage grass option

PLANTING TECHNIQUES AND FERTILIZING

1. LONGAN

- Planting hole: The size of a hole is 60 cm x 60 cm x 60 cm or 80 cm x 80 cm x 80.
- Basal fertilizer application: Apply 15-20 kg manure, 1 kg NPK in the ration of 5:10:3 (or equivalent) and 0.5-1 kg lime for each hole before planting 30 days and cover the hole by soil.

Top dressing fertilizer application:

- In the first to third year: Apply 1-1.5 kg NPK in the ratio of 13:5:10 (or equivalent) per tree.
- From the fourth year onwards: Considering each tree condition and its yield, it is possible to apply about 30-50 kg manure, 1-1.2 kg Urea, 1.5-1.7 kg Superphosphate, 1-1.2 kg Potassium chloride per tree.

2. FORAGE GRASS

- Dig a grassy trench 20-25 cm deep on the contour lines, which is below longan rows. The forage grass grow very fast, it therefore will be prevented the nutrients and fertilizers run following along the slope.
- The forage grass can utilize nutrients and fertilizers from runoff; it is unnecessary to apply fertilizer for grass.

3. MAIZE

- Basal fertilizer application: Maize is sown in the remaining areas: 6-10 tons manure and 300 kg Superphosphate per ha.
- Top dressing fertilizer application: total of 180-240 kg Urea, 300 kg Superphosphate and 75-100 kg Potassium chloride (per ha) are divided into two to three times:



Longan - Maize - Forage grass option in Yen Bai province

- The 1st time: When maize has 3-4 leaves, apply one third of Urea amount and half of Potassium;
- The 2nd time: When maize has 9-10 leaves, apply one third of Urea amount and half of Potassium;
- The 3rd time: Before flowering 5-7 days, apply the remaining amount of Urea fertilizer.

Fertilizing is done after weeding, grubbing soil; then hill up plant. Usually, there are two times of weeding.

PRUNING AND CANOPY FORMATION

In establishment period: Pruning and canopy forming when tree is young 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 grow equally in all directions, called primary branches. Again, cut the top of those primary branches when they reach about 60 cm to boost secondary branches. Keep two to three those branches turning to distinct directions. Similarly, repeat with secondary branches to create the third level branches. Yet, those are not limited in number and length, only thin away the dense interior branches.
- Remove any suckers at ground level and any shoots on the trunk below the graft union.

Pruning time: Pruning three to four times per year

- The 1st time: End of February - beginning of March, remove weak, disease and disordered growing branches and twigs.
- The 2nd time: End of May - beginning of June, cut off weak branches that do not bear fruit and do fruit's pruning/thinning.
- The 3rd time: After harvesting (in August-September), remove suckers, diseased and broken branches.
- The 4th time: When buds grow up to 5-7 cm, remove weak branches, keep two to three strong and healthy/ main branches.