

# PRODUCTION OF PIGEON PEA INTEGRATED WITH OIL PALM

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**P**igeon pea (*Cajanus cajan* L.) is a leguminous shrub to a small tree and one of the main pulse crops. It ranks sixth in area and production among the grain legumes. Indigenous to India, it is now widely grown all over the subcontinent which produces almost 90% of the world's crop. The plant requires a temperature of 18°C to 30°C and does well in a range of soils, from sandy to clayey loams. However, it grows best on fertile and well drained loams. The crop is drought tolerant but prefers an annual rainfall of >650 mm for better growth and yield.

Pigeon pea is a popular food in developing tropical countries, particularly in the semi-arid tropics. It is an important vegetable protein - the dried grain is 20%-22% protein, depending on the cultivar and location grown. It is mainly consumed split, known as dhal, normally to make soup and stew. It can also be made into flour, the green seeds eaten boiled or sprouted as a vegetable.

In 2003, pigeon pea was first integrated in oil palm at MAAH Plantation in KLIA Sepang (Figure 1). The crop grew satisfactorily and produced a good grain yield. It adapted well to the soil, climate and integration with oil palm. With good management, the grain yield can exceed 2 t ha<sup>-1</sup>. The results from five years trials indicate that pigeon pea has a great potential integrated with oil palm planted in a double avenue system. Three years of yield have shown no negative effects of pigeon pea on the oil palm.

## PLANTING

For integrating pigeon pea, the oil palm should be planted in double avenues. In the two rows of palms forming an avenue, the planting distance is 6.1 m x 9.1 m x 9.1 m (136 palms ha<sup>-1</sup>). The distance between palms in a row is 6.1 m, and between two double avenues 15.2 m. The area between the



Figure 1. Short duration pigeon pea (110 days after planting) with potential integration with oil palm.

palm avenues is used for planting the pigeon pea (Figure 2). The area is cleared and ploughed to 20 – 30 cm depth. Two disc ploughings and one rotovation is suffice to work the soil to a suitable tilth. Ground magnesium limestone (GML) at 1-2 t ha<sup>-1</sup> is applied at least two weeks before planting.

The planting should be timed with the onset of the rains and the harvest with drier conditions. In Peninsular Malaysia, the most suitable month for planting is September with harvesting targeted for January/February, the driest period of the year. The suggested planting spacing is 50 cm between rows and 10 cm within row, giving a density of 200 000 plants ha<sup>-1</sup> when planted. The seeding depth is 4 - 5 cm. The seeds must be treated with Thiram at 3 g kg<sup>-1</sup> before use. The seeding rate is 15 - 20 kg ha<sup>-1</sup>, the seeds manually dibbled in or drilled (Figure 3).

Fertilizer is applied as basal dressing before the final cultivation round (rotovation). The rotovation then works the fertilizer in. The general fertilizer recommendation for pigeon pea is 50 kg N, 100 kg P<sub>2</sub>O<sub>5</sub> and 100 kg K<sub>2</sub>O per hectare. The rates can be

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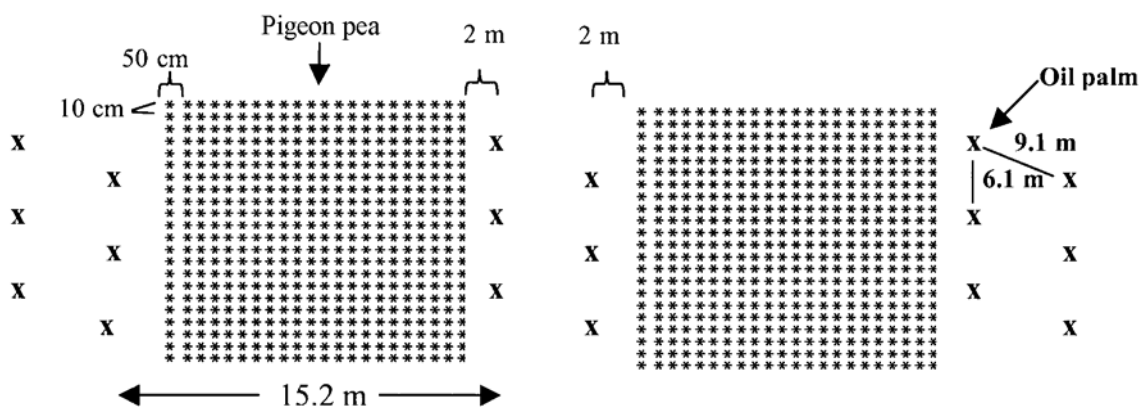


Figure 2. Schematic diagram of integrating pigeon pea with oil palm planted in double avenues.



Figure 3. Planting pigeon pea with a Kunh seed drill (left) and pigeon pea crop 2.5-month-old.

achieved by applying 333 kg NPK 15:15:15, 83 kg Muriate of Potash and 109 kg Triple Super Phosphate.

Effective weed control in the young crop is necessary as pigeon pea is slow growing, thus very susceptible to competition. Pre-emergence spraying is effective for early weed control. A pre-emergence herbicide like Alachlor at 4.0 litre ha<sup>-1</sup> can be used, giving about one month's control. This is followed by two to three rounds manual weeding, depending on the intensity of weed growth. Alternatively, a post-emergence herbicide, such as Fluazifop-Butyl, can be used for early weed control.

The common pests of pigeon pea are pod borers and pod sucking bugs. The larvae of *Helicoverpa armigera* destroy the flower buds, flowers and pods. Then, *Maruca vitrata* larvae bind together the leaves, buds and pods to form webs in which they remain in to feed (Figure 4). The pod-suck-

ers, *Clavigralla* spp., sucks the developing seeds through the pod wall. The affected seeds shrivel in dark patches. Systematic control using suitable pesticides must be carried out to reduce the yield loss (Table 1).

Dry conditions at crop maturity are important for uniform crop ripening and minimum yield loss during harvesting, which is recommended for January to late February. The crop is harvested when >80% of the pods are mature, when they have brown and dry testa (Figure 5). The short duration pigeon pea only takes 120 - 140 days to mature. Delayed harvesting by wet weather will risk damage to the seeds. The mature plants are cut 30 - 45 cm above the ground using a hedge trimmer. The harvested plants are sun dried for two to three days and then threshed for their grain, which is cleaned and dried in a batch drier or in the sun before packing and storing.





Figure 4. Borer larvae attacking pigeon pea flowers (left) and borer larvae encased in web of leaf and flowers.

**TABLE 1. RECOMMENDED PESTICIDES AGAINST PIGEON PEA PESTS**

Pest	Days after planting	Recommended insecticides
Flower bud borer	40-50	Dimethoate, trichlorphon and cyfluthrin
Flower borer	50-60	Dimethoate, trichlorphon and cyfluthrin
Pod borer & sucker	70-80	Cyfluthrin, trichlorphon and cypermethrin
Pod borer & sucker	90-100	Deltamethrin, cypermethrin and lambda cyhalothrin
Pod borer & sucker	110-120	Deltamethrin, cypermethrin and lambda cyhalothrin



Figure 5. Mature pigeon pea with dry pods ready for harvest (140 days after planting).

## ECONOMIC EVALUATION

The average yield for pigeon pea integrated with oil palm is about 2 t ha<sup>-1</sup>. The price is about RM 1.80 kg<sup>-1</sup>. The average harvest should therefore give a gross return of RM 3600 ha<sup>-1</sup>. The cost of planting is RM 2562 ha<sup>-1</sup> (Table 2), giving a net return of RM 1038 ha<sup>-1</sup> - a return to investment of 1.4.

## CONCLUSION

Based on the trial results, pigeon pea has a great potential for integration with oil palm. The integration will maximize the land use, increase land productivity and generate additional income for the oil palm grower. There has been no evidence that pigeon pea is detrimental to the oil palm yield.

**TABLE 2. COSTS AND RETURNS FOR INTEGRATING PIGEON PEA WITH OIL PALM (RM ha<sup>-1</sup>)**

Item	Quantity/price (RM)	Value (RM)
<b>a). Return</b>		
Sale of crop	2 000 kg @ 1.80	3 600
Total gross return		3 600
<b>b). Cost</b>		
<b>Input Cost:</b>		
Seed	18 kg @ 2.50	45
Lime	1 t @ 160	160
Fertilizer	525 kg @ 1.20	630
Herbicide	4 litre @ 38	152
Insecticide	5 litre @ 50	250
<b>Labour Cost:</b>		
Ploughing	contract	600
Planting	by machine	250
Fertilizer application	2 m.d. @ 25	50
Weed control	5 m.d. @ 25	125
Pest control	4 m.d. @ 25	100
Harvesting	8 m.d. @ 25	200
<b>Total Production Cost</b>		<b>2 562</b>
<b>c). Net Return</b>		<b>1 038</b>
<b>d). Return on Investment</b>		<b>1.40</b>

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