

THE PERFORMANCE OF MUNGBEAN INTEGRATED WITH OIL PALM

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Mungbean, *Vigna radiata* is a green seeded legume with pods borne at the top of the plant (Figure 1). The crop originated from India. It was distributed to other tropical Asian countries in the early 17th century. It belongs to the family *Leguminosae*, the same as soyabean, groundnut and chickpeas (John Milton Poehlman, 1991). Mungbean grows well on a clay loam soil with a soil pH that ranges from 5.8 to 6.5; temperatures of 25 C - 27 C; relative humidity of 50% - 80%; day light of 10 hr per day and rainfall of within 50 to 200 mm per month. Mungbean has several uses; the main being the production of bean sprouts, high in protein, vitamins A, B1, E and C.



Figure 1. Mungbean at 55 days after planting.

In 2011, Malaysia imported 11 782 t of mungbeans valued at RM 42.09 million (Ng *et al.*, 1977). It is expected that the import of mungbean will increase due to shortage of local supply and an increase in population. Thus, effort should be made to increase the local production of mungbean. This can be achieved by cultivating of mungbean as integration crop with oil palm.

METHODOLOGY

The trial on mungbean integration with oil palm was conducted in 2006 to 2007 on mineral soil in Sepang, Keratong and Lahad Datu.

In this study the oil palm was laid in double-avenue planting system (6.1 m x 9.1 m x 15.2 m) with a planting density of 136 palms ha⁻¹ (Figure 2). The palms were managed according to standard estate practices. An avenue of 15.2 m between the two palm rows was cleared from shrubs, weeds and ploughed twice using the disc and rotor to a depth of 20 to 30 cm. The lag time between ploughs was 7 to 10 days.

Mungbean seeds (Figure 3) were obtained from Indonesia and Taiwan, which originated from the Asian Vegetable Research and Development Centre (ILETRI) in Indonesia and the Asian Vegetable Research and Development (AVRDC) in Taiwan.

For better growth and survival rates the mungbeans were planted at the onset of the rainy season. The seeds were planted at a distance of 40 cm x 10 cm at the rate of 10 kg ha⁻¹, *i.e.* 250 000 plants per hectare. To control pre-emergence weeds an alachlor herbicide was sprayed at 2 kg ha⁻¹ after sowing.

A basal fertiliser was broadcasted in the plots before final rotor tilling. Table 1 shows the fertiliser programme of the mungbean. Weeding was carried out at 25 to 30 days interval, which was equivalent to two to three rounds per season.

Generally, the mungbean can be harvested 60 to 66 days after planting (Figure 4). Harvesting was carried out by manual picking of the pods.

The harvested pods were sun dried until the moisture content reduced to 11% to 13% and were then threshed using a thresher machine. There were three harvesting cycles for one planting season.



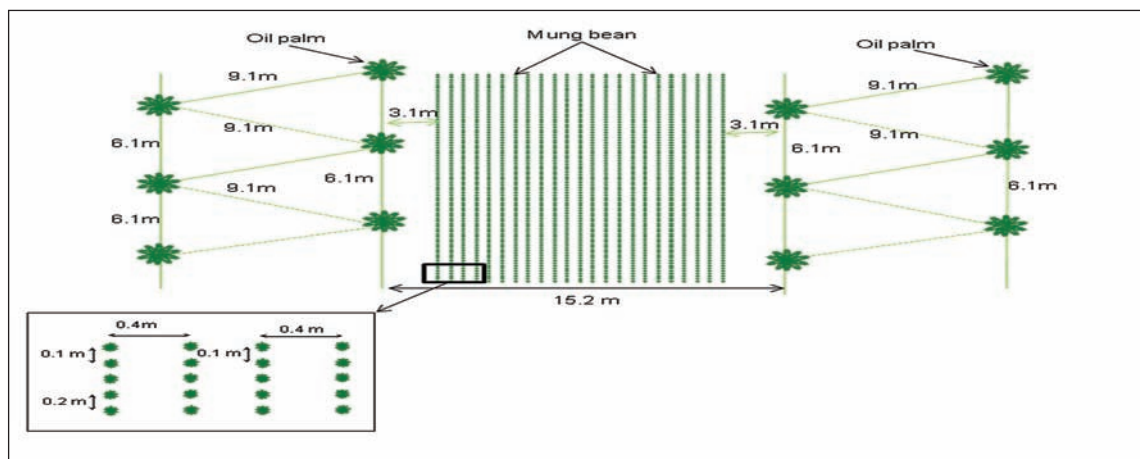


Figure 2. The layout of oil palm-mungbean integration plot.

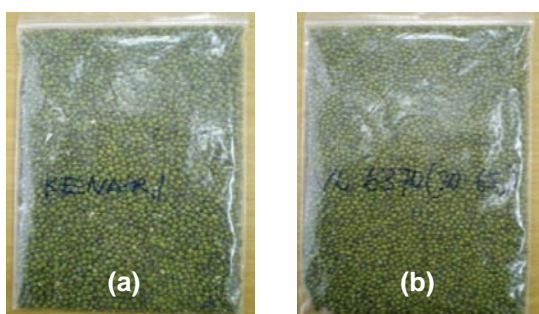


Figure 3. Mungbean seeds from (a) the Asian Vegetable Research and Development (ILETRI) in Indonesia and (b) the Asian Vegetable Research and Development (AVRDC) in Taiwan.

TABLE 1. MUNGBEAN FERTILISER PROGRAMME

Type of fertiliser	Basal dressing* (kg ha ⁻¹ per season)
Compound 15:15:15	200
Triple superphosphate	65
Muriate of potash	25

Note: Applied before final rotor filling.



Figure 4. Mungbean pods change from green to black when ripe.

RESULTS

The integration of mungbean with oil palm using the double-avenue planting system was found technically and economically viable. This integration model optimises land use and maximises income per unit of oil palm land area. The results indicated that the mungbean varieties of Kenari, Perkutut and VC 6153-B were suitable for integration with oil palm. The recommended planting distance was 40 cm x 10 cm, which was capable of producing an average dry bean yield of 1.21 t ha⁻¹ per season. Table 2 shows the performance of the mungbean varieties.

Pod borers, *Helicoverpa armigera* and *Etiella* sp. (Figure 5) were the common pests found during the study. These pests were controlled with an application of the insecticides such as cypermethrin, carbaryl, trichlorphon and fenvalerate at 0.1% a.i.



Figure 5. Pod borer, (a) *Helicoverpa armigera* and (b) *Etiella* sp.

No reduction of oil palm yield was observed during the three-year study period. The fresh fruit bunch (FFB) yields for the three years were 3.21 t ha⁻¹ yr⁻¹, 10.71 t ha⁻¹ yr⁻¹ and 23.25 t ha⁻¹ yr⁻¹.

TABLE 2. PERFORMANCE OF MUNGBEAN VARIETIES

Variety	Plant height (cm)	Leaf (No. /plant)	Pod (No. /plant)	100 seeds mass (g)
Kenari	57.23	14.67	21.69	6.63
Perkutut	60.84	23.42	24.05	5.89
Murai	44.54	9.79	12.97	6.69
VC 6153 (B)	40.14	16.86	12.64	6.86
SML 134	45.85	11.72	17.85	3.35
Average	49.72	15.30	17.84	5.88

PRODUCTION COST AND REVENUE

The total production cost of integrating mungbean for one planting season using the double avenue oil palm planting system was RM 3731 ha⁻¹ (Table 3). The average dry seed yield was 1.2 t ha⁻¹. The market price of 1 t dry seed was RM 5000 (RM 5 kg⁻¹). The gross and net revenues per hectare per year were RM 24 000 and RM 9076

respectively. The additional income per month was RM 756 (Table 4).

The oil palm revenue was calculated based on the average FFB price per tonne in 2012 which was RM 604. At this price and FFB production of 23.25 t ha⁻¹ yr⁻¹, the gross and net revenues per hectare were RM 14 043 and RM 9393 respectively. The monthly income from oil palm revenue was RM 783. The total monthly income from integrating mungbean and oil palm was RM 1539 (Table 4).

CONCLUSION

Mungbean has a great potential to be integrated with oil palm as a protein source. The integration maximises land use, increases land productivity and generates additional income for oil palm grower. Besides increasing the oil palm growers income, it will also contribute and support the sustainability of food production industries and the national economy.

TABLE 3. ESTIMATED PRODUCTION COST OF MUNGBEAN INTEGRATED WITH OIL PALM*

Input/activities	Input cost/contract (RM)	Labour		Total (RM)
		Man-day	Cost (RM)	
Seed (10 kg ha ⁻¹)	120	-	-	120
Land preparation	650	-	-	650
Planting	-	12	300	300
Liming and fertiliser	911	4	100	1 011
Weeding	90	6	150	240
Pest and disease control	360	6	150	510
Harvesting	-	36	900	900
Total cost	2 131	64	1 600	3 731

Note: Three months per season (four seasons per year)

TABLE 4. ESTIMATED REVENUE FROM INTEGRATION OF MUNGBEAN WITH OIL PALM

Item	Mungbean *Price: RM 5000 t ⁻¹	Oil palm **Price: RM 604 t ⁻¹	Total (RM)
Production (t ha ⁻¹ yr ⁻¹)	4.8	23.25	-
Gross return (RM ha ⁻¹)	24 000	14 043	38 043
Total cost (RM ha ⁻¹ yr ⁻¹)	14 924	4 650	19 574
Net return (RM ha ⁻¹ yr ⁻¹)	9 076	9 393	18 469
Monthly income (RM)	756	783	1 539

Note: * Department of Statistics (2012).

** Actual fresh fruit bunches price in 2012.

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