

# SWEET POTATO PRODUCTION IN OIL PALM PLANTATIONS

RAJA ZULKIFLI RAJA OMAR; WAHID OMAR and NORKASPI KHASIM



MPOB INFORMATION SERIES • ISSN 1511-7871 • JUNE 2010

MPOB TT No. 465

**C**rop integration in oil palm (e.g. by intercropping) maximizes land usage and generates additional income for the growers. It can be carried out during the immature stage of oil palm at the normal triangular planting configuration, and also during the mature stage of oil palm adopting the double-row avenue planting. The latter system allows for a longer time for intercropping that can sustain the additional income during the mature palm phase.

Many short-term crops have been found to be suitable for intercropping in double-row avenue oil palm including sweet potato (*Ipomea batatas*) (Figure 1). Sweet potato is an important food crop belonging to the Family Convolvulaceae. It has high nutritive value because the storage roots are a good source of carbohydrates, sugars, calcium, iron and other minerals, and vitamins, particularly A and C. A yellow or orange root flesh colour is directly related to the presence of beta-carotene, a precursor of vitamin A.

The growth and root yield of the sweet potato intercrop is comparable to those from a monocrop. Two to three crops can be planted in a year, depending on the climate and conditions of the oil palm area. Local demand for sweet potato roots as food is relatively good. Roots from selected cultivars can fetch a good price. Sale of roots from this integrated production can give satisfactory additional income to the oil palm grower. Therefore, production of sweet potato in oil palm is a feasible venture and is recommended for adoption by oil palm growers.

## PRODUCTION PRACTICES

Select a good soil for sweet potato intercropping in the double-row avenue oil palm system. Sweet potato can be planted on a wide range of soils except in water-logged areas. The most suitable soil type is sandy-loam. The area in



Figure 1. Two months after planting (upper) and three months after planting (lower) sweet potato as an intercrop in oil palm in double-row avenue planting.

the palm avenues is cleared first of bushes and undergrowth. Then, the soil is ploughed to a depth of 30 cm by two rounds of disc ploughing and one round of rotor tilling. At least two weeks before planting, limestone at 1-2 t ha<sup>-1</sup> is applied and incorporated into the soil through the second ploughing. After rotor tilling, raised beds should be constructed manually or by using a bed-former attached to the tractor. Well-formed raised beds are very important in ensuring that the sweet potato crop will produce a good root yield (Figure 2). The raised bed size should be sufficiently high and wide for good root formation. The recommended bed size is 60-90 cm wide and 30-40 cm high. The width depends on the cultivar to be planted, i.e.

ISSN 1511-7871



9 771511 787001

Malaysian Palm Oil Board, Ministry of Plantation Industries and Commodities, Malaysia

P. O. Box 10620, 50720 Kuala Lumpur, Malaysia. Tel: 03-87694400

Website: [www.mpob.gov.my](http://www.mpob.gov.my)

Telefax: 03-89259446





Figure 2. Good land preparation (upper), and newly planted sweet potato cuttings on the raised beds (lower).

90 cm bed width should be used for a cultivar with large roots *i.e.* Gendut, and 60 cm width for a cultivar with smaller roots *i.e.* Biru Jepun.

It is highly recommended that the planting of sweet potato is by the use of shoot cuttings collected from a mature crop. The cutting length should be 30 cm, and the cuttings are kept for one to three days under a humid shaded area prior to planting in the field. This technique will induce the sprouting of adventitious roots that can contribute to the success in establishment at field planting. Plant the bottom ends of the cuttings on the raised beds to a depth of 15-20 cm. The suggested planting distance is 25-30 cm within a row and 90-120 cm between the rows. Cultivars with large roots are planted at 30 cm x 120 cm, that is requiring 27 777 cuttings ha<sup>-1</sup>, while cultivars with smaller roots are planted at 25 cm x 90 cm, requiring 44 444 cuttings ha<sup>-1</sup>.

At seven days after planting, a compound fertilizer of NPK 12:12:17:2 is applied at 200 kg ha<sup>-1</sup>. The fertilizer is placed in a furrow beside the crop row or put in holes made between the plant points on the bed. Then, the furrow or hole is covered over with soil to prevent fertilizer loss through run-off. A second fertilizer application is carried out at 32 days after planting using the same fertilizer and rate as in the first application; however, the

fertilizer is broadcast on the raised beds along the crop rows.

For good crop growth and high root yield, systematic weed control should be practiced. A day prior to planting, the raised beds should be sprayed with a pre-emergence herbicide such as *alachlor* or *metolachlor*. Thereafter, weed control is carried out manually using a hand hoe at 31 and 56 days after planting. To facilitate weeding, it is suggested that this is carried out after vine lifting and turning.

Vine lifting and turning should be carried out to uproot the adventitious roots growing from the internodes to prevent them from forming small unmarketable storage roots. This will allow the main stem to form storage roots of marketable size and shape (Figure 3). This activity should be carried out twice in a crop season, at 30 and 55 days after planting, prior to weeding and fertilizer application.

The common pests in sweet potato intercropped with oil palm are the sweet potato weevil, stem borer and rats. The weevil *Cylas formicarius* can pose great losses in the market value of the roots. The weevil feeds and breeds in the roots, making



Figure 3. Vines lifted and turned out at 30 days after planting (upper), and marketable sized roots formed at the base of the main stem (lower).



them valueless. Meanwhile, larvae of *Omphisa anastomosalis* bore into the main stem and grow inside it (Figure 4). These attacks distort root formation near the base of the main stem. Rats are a common pest in oil palm that can cause damage to the sweet potato intercrop as well. Normally, the rats attack during the root bulking stage. Rats eat the developing roots that form near the soil surface. These pests can be controlled using suitable pesticides as given in Table 1. In addition to chemical control, crop rotation and field sanitation are good cultural practices to be carried out in the field to protect the sweet potato crop from pests and diseases.

Normally, a sweet potato crop matures at three to four months after planting. The mature crop is

harvested by cutting the vines, and then digging out the roots using a hoe. Root yield varies with cultivar, climatic conditions and production practices. The average yield for sweet potato intercropped with oil palm on mineral soil is 11 t ha<sup>-1</sup>. The yield is considered satisfactory as compared to the yield from monocropped sweet potato. The yield is higher if all the above production factors are optimum.

## ECONOMIC EVALUATION

The production cost for sweet potato is estimated at RM 4950 ha<sup>-1</sup> per crop season (Table 2). Total production cost can be reduced in the subsequent planting seasons by using shoot cuttings taken from the previous crops. The fresh roots are sold at



Figure 4. Frass (excreta) from stem borer on the soil surface at the main stem (left), and borer larvae inside the main stem (right).

TABLE 1. RECOMMENDED PESTICIDES AGAINST SWEETPOTATO PESTS

| Type of pest        | Month(s) after planting | Recommended pesticides                                |
|---------------------|-------------------------|---|
| Sweet potato weevil | 1 – 2                   | <i>Carbofuran, fipronil or endosulfan</i>             |
| Stem borer          | 1                       | <i>Lambda cyhalothrin, dethamethrin or phenthoate</i> |
| Rat                 | 2                       | <i>Brodifacoum or floucomafen</i>                     |

TABLE 2. ESTIMATED PRODUCTION COST FOR SWEET POTATO INTERCROPPED WITH OIL PALM (RM HA<sup>-1</sup>)

| Input/field operation              | Input cost / contract (RM) | Labour    |              | Total (RM)   |
|------------------------------------|----------------------------|-----------|--------------|--------------|
|                                    |                            | Man-days  | Cost (RM)    |              |
| Planting material                  | 730                        |           |              | 730          |
| Land preparation                   | 850                        |           |              | 850          |
| Planting                           | -                          | 10        | 250          | 250          |
| Liming and fertilizer applications | 1 120                      | 15        | 375          | 1 495        |
| Weeding                            | -                          | 24        | 600          | 600          |
| Pest and disease control           | 400                        | 10        | 250          | 650          |
| Harvesting                         | -                          | 15        | 375          | 375          |
| <b>Total cost</b>                  | <b>3 100</b>               | <b>74</b> | <b>1 850</b> | <b>4 950</b> |

an average farm price of RM 1.00 kg<sup>-1</sup>. Therefore, sale of roots brings in a gross return of RM 11 000 ha<sup>-1</sup>. After deducting the production cost, the total net return is RM 6050 ha<sup>-1</sup> per season. The net return will increase accordingly if the price and yield level go up and *vice versa* (with cost remaining unchanged). The sensitivity analysis shows that returns are still positive even at a low root yield and farm price (Table 3).

## CONCLUSION

Sweet potato has great potential for intercropping with oil palm. The sweet potato intercrop is able to produce satisfactory root yield. Sale of the roots can provide good additional income to the oil palm grower, particularly the smallholder. This venture of sweet potato production as an intercrop in oil palm was found to be viable from both the technical and economic points of view. Therefore, this technology is suitable for adoption by oil palm growers.

**TABLE 3. ESTIMATED RETURNS FROM SWEET POTATO INTERCROPPED WITH OIL PALM AT DIFFERENT LEVELS OF YIELD AND PRICE (RM ha<sup>-1</sup>)**

| Level of yield                        | Farm price of roots      |                          |                          |
|---------------------------------------|--------------------------|--------------------------|--------------------------|
|                                       | RM 0.80 kg <sup>-1</sup> | RM 1.00 kg <sup>-1</sup> | RM 1.50 kg <sup>-1</sup> |
| <b>Yield – 7.0 t ha<sup>-1</sup></b>  |                          |                          |                          |
| Gross return (RM ha <sup>-1</sup> )   | 5 600                    | 7 000                    | 10 500                   |
| Net return (RM ha <sup>-1</sup> )     | 650                      | 2 100                    | 5 550                    |
| <b>Yield – 11.0 t ha<sup>-1</sup></b> |                          |                          |                          |
| Gross return (RM ha <sup>-1</sup> )   | 8 800                    | 11 000                   | 16 500                   |
| Net return (RM ha <sup>-1</sup> )     | 3 850                    | 6 050                    | 11 500                   |
| <b>Yield – 15.0 t ha<sup>-1</sup></b> |                          |                          |                          |
| Gross return (RM ha <sup>-1</sup> )   | 12 000                   | 15 000                   | 22 500                   |
| Net return (RM ha <sup>-1</sup> )     | 7 050                    | 10 050                   | 17 550                   |

For more information, kindly contact:

Director-General  
MPOB  
P. O. Box 10620  
50720 Kuala Lumpur, Malaysia.  
Tel: 03-8769 4400  
Fax: 03-8925 9446  
[www.mpob.gov.my](http://www.mpob.gov.my)