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Intercropping Land Kale on Hypopodium Leftover Oil Palm Fronds Pruning

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ABSTRACT

The horticultural consumption of land kale in Indonesia is still quite high due to its complete nutritional content. However, limited cultivation land is an obstacle to the production of land kale. On the other hand, Indonesia has a very large area of oil palm plantations because it is a superior commodity as a foreign exchange earner. But it is unfortunate that the output obtained is only oil palm fresh fruit bunches (FFB). Therefore, it is necessary to create an integrated agricultural model such as intercropping so that the output obtained is more and profitable economically and environmentally sustainable. Intercropping is a method of agricultural cultivation by planting two or more commodities in the same area to maximise land use and maximise productivity. Intercropping in oil palm is not carried out in producing crops due to constraints on cultivation land area. However, by using a new agricultural cultivation method, namely cultivation on the hypopodium of the remaining leaf pruning, oil palm producing plants can still be intercropped. Hypopodium is the tip or base of the leaf that connects to the plant stem. The hypopodium area that is already wide enough in producing plants can be used as a place for kale plant growth. In addition, the content of organic matter in the hypopodium can be used as a source of nutrients and as an organic substrate. This type of primary research with qualitative methods shows the results that the intercropping method of kale with oil palm on the hypopodium of the remaining pruning of oil palm leaves can be done, so that the output out of the farm is more.

Keywords: Integrated agriculture, new agricultural cultivation, organic substrate, palm oil frond hypopodium, sustainability.

INTRODUCTION

Land kale (*Ipomoea reptans* Poir.) is a leaf vegetable horticultural commodity that is often processed by the Indonesian people as a source of fibre (Syarifudin *et al.* 2022). Green plants from the *convolvulaceae* family have hollow stems, intermittent leaves, and white flowers that produce bags and contain four seeds (Prasetia and Pupitasari 2023). This plant, which can grow in low and highlands, has high nutritional content and value (Devinta *et al.* 2022). In one serving of boiled land kale weighing 100 g, there are about 23 calories, 2.2 g of fibre, 2.9 g of protein, 3.6 g of carbohydrates, and only 0.4 g of fat. Land kale is also a source of vitamin A, vitamin C, vitamin K1, folic acid, iron, and calcium. Not only that, land kale also contains important compounds such as lutein and kaempferol, which can support

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eye health and reduce the risk of chronic diseases. The demand for kale for food in Indonesia is quite high with an average of 9.43 per capita per day (BPS 2019). Therefore, land kale must be cultivated sustainably so that the demand can be fulfilled domestically and even exported. Oil palm crop (*Elaeis guineensis Jacq*.) is one of the plantation crops that has an important role in the national economy, especially in providing labour and foreign exchange earnings for the country (Anggraeni and Hukom 2021). Based on data from the Central Bureau of Statistics (BPS), Indonesia, which is the first-ranked oil palm exporting country in the world, has a land area of 15.34 million hectares with a total production of 46.82 million tonnes in 2022, and earns foreign exchange of up to 600 trillion in 2023 (BPS 2023). However, the integration and sustainability of almost all oil palm plantations is still very minimal, this is seen from the output obtained, which is only in the form of oil palm fresh fruit bunches (FFB). The very wide spacing of oil palm plantations, which ranges above 7 metres per plant, and the minimal utilisation of other parts of the oil palm plant, must be made integrated and sustainable innovations so that they can overcome other agricultural problems such as limited land for vegetable horticulture cultivation and other problems.

The oil palm plant has some distinctive morphology, although it is a staple but its roots are fibrous spread, its trunk is upright can reach 24 m and generally unbranched. Its leaves are compound with a tapered elongated shape, and its flowers are monoecious, male flowers are elongated oval, while female flowers are rounded and are fruit ovules. Oil palm plant maintenance includes fertilisation, weed control, and pruning. Pruning is an activity to regulate the number of leaves (supporting fronds) on oil palm plants by cutting the ends of unproductive (old) leaves using dodos (Wasil and Chairudin 2023). However, pruning generally leaves the tip of the frond still attached to the stem, namely the hypopodium. The remaining fronds of the pruning (hypopodium) are not utilised and are only overgrown with weeds or ferns, even though there are organic materials from the crumbs of oil palm plants that collect in the cracks of the hypopodium and can be used as a substrate for plant growth media. Intercropping is a system of planting two or more different commodities in the same cultivation area (Warman and Kristiana 2018).

Intercropping is an integrated and sustainable agricultural technique because cultivation inputs can be taken from within the system and the output will be more and more profitable both economically and its impact on the environment than mono-culture cultivation systems. In Indonesia, the intercropping agricultural cultivation method in oil palm plantations is only applied to immature plants (TBM). Meanwhile, in producing plants (TM) it has not been applied because the land area that is not planted already has other functions, namely as a frond stack and as a harvesting road for fresh fruit bunches (FFB). However, this can be resolved with a new innovative agricultural cultivation technique, namely cultivation on the hypopodium of remnant fronds of mature oil palms. This was reinforced by a limited trial of planting land kale on the hypopodium of mature oil palm frond residues.

MATERIALS AND METHODS

The research “Intercropping Land Kale on Hypopodium Leftover Oil Palm Fronds Pruning” was conducted at Cikabayan Oil Palm Plantation in month of September for 5 weeks. The oil palm plants used were two producing plants (TM). The hypopodium height used was 60 cm above ground level to 170 cm to facilitate planting and maintenance with a total of 20 hypopodium planting holes per plant. The land kale seeds used were local seeds with a total of 2 seeds per hypopodium. Maintenance includes weed control in the hypopodium area and watering. The addition of organic materials or planting media is done on some hypopodiums to

ensure the nutritional content of kale plants can be fulfilled during their growth period. The type of research used is simple primary research. The primary research method is a direct trial on the media or the thing to be studied in this experiment is the intercropping of land kale on the hypopodium of the remaining pruning of oil palm fronds (Gulo 2000). The results of the data obtained from this experiment were analysed and concluded. The type of research used in this study is exploratory qualitative and direct analysis. Data from primary research conclusions in the form of qualitative data will be analysed descriptively. Then, the descriptive data is explained based on the author's point of view plus reinforcement in the form of research documentation so that the conclusions obtained can be used as a reference for further research.

RESULTS AND DISCUSSION

Oil palm plants that can be used for intercropping the hypopodium system are plants that have produced with an age of more than equal to 8 years or TM-5 or hypopodium with a width of more than 15 cm. This is intended so that the width of the hypopodium is wide enough to cultivate vegetable horticultural crops, and there is enough organic matter in it. If the media on the hypopodium is insufficient, then other media inputs must be added from outside so that the intercropping cultivation process can still take place. The results of the limited trial of land kale cultivation on the hypopodium of the remaining pruning of oil palm leaves were obtained as in Table 1. The cultivation on the oil palm hypopodium was successful although the results were not as good as cultivation with conventional methods. This success is due to the fact that the planting media substrate on the hypopodium is nutritionally sufficient, because it contains the remaining crumbs of oil palm plant parts and soil (dust) which is in the top soil when it is blown away by the wind or splashes of rainwater.

Based on observation data, land kale experienced rapid height growth, but narrower and shorter leaves. This occurred because the level of shade was high enough to cause etiolation which stimulated more auxin hormones, thus spurring plant growth quickly. But the small amount of light in the shaded area is a problem because photosynthesis is not maximised, making the land kale plants have smaller leaves and roots that are not strong. Therefore, the selection of shade-tolerant land kale varieties is a requirement for intercropping oil palm and land kale using the hypopodium method.

To get the best results, it is necessary to regularly control weeds and insects around the hypopodium. The high intensity of insects in their activities disrupts the growth of land kale plants because insects such as ants tend to dredge little by little the planting media that already exist around the palm fronds, so that it does not rule out the supply of nutrients and the ability of plant roots to be less than optimal which results in consistency of growth. In addition to insects, the growth of weeds found in the land kale planting area is more dominant in

Table 1 Yield of land kale of each organ part.

	Yield (Observed at Harvesting)
Roots	Shorter roots, not many branches, and very low binding capacity to the media compared to conventionally grown plants.
Stems	The stems of landraces grown using the hypopodium method were longer, but the diameter was smaller and the stems were more flexible than those grown conventionally.
Leaves	The average ratio of the number of leaves of field kale grown using the hypopodium method to conventional is 7:9 (2 leaves less). The colour of the leaves was lighter and the length and width were three times smaller than those of conventionally grown kale.

growth. The ability of weeds grows faster than land kale plants. This indicates that weeds compete with the main crop for water and nutrient supply.

The intercropping cultivation system between land kale and oil palm between the fronds is economically valuable. This cultivation system does not require expensive costs because the planting media used is the cross-sectional area of the fronds that have been filled with organic material from the weathering of the fronds and additional planting media composition such as dolomite, manure and so on to increase the essential nutrients needed by plants. Oil palm entrepreneurs can obtain land kale as daily consumption and can even be a side income from their oil palm if the expected production is achieved. From the large number of fronds in oil palm plants, it is very potential in increasing the production of land kale plants, but it needs to be considered in the management of the land kale plant canopy above it. The development of this system can be a solution to utilise the growing space of plants that have economic potential so that this system should continue to be carried out to get more benefits than monoculture cultivation systems in oil palm plants.

Figure 1 Planting land kale plants on the oil palm hypopodium.

Figure 2 Land kale 3 weeks after planting.

Figure 3 Land kale 5 weeks after planting, ready for harvest.

CONCLUSION

Intercropping between oil palm and horticulture such as land kale on the hypopodium can be done although the results are not good due to the influence of etiolation. To get maximum results in hypopodium cultivation, seeds that are resistant to oil palm shade and good maintenance are needed, especially in nutrient and water management. The hypopodium intercropping method has the advantage that the results obtained from the garden are more economical and environmentally friendly even without land cultivation and minimal capital. The oil palm hypopodium intercropping method is very suitable for cultivating plants that are not too large and resistant to shade. Further research needs to be done to find out which plants are more suitable for cultivation with the intercropping method on the remaining hypopodium of oil palm leaf pruning.

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