

PRODUCTION OF HIGH QUALITY KENAF FODDER FOR INTENSIVE LIVESTOCK INTEGRATION WITH OIL PALM

RAJA ZULKIFLI, R O; WAHID, O; NOOR KHAIRANI, M B;
KAMIL AZMI, T; NORKASPI, K and MD ZAINAL RASYIDI, M RODI



MPOB INFORMATION SERIES • ISSN 1511-7871 • JUNE 2014

MPOB TT No. 547

Feed is one of the major success factors in livestock enterprise for intensive production system. Intensive production system relies ultimately on a good feed supply in term of quantity and quality. Feed quality has direct impact on livestock performance especially on body conformation, breeding efficiency and milk production. With intensive livestock integration in place, therefore it is important to have a good fodder supply package to sustain the project.

Kenaf offers a good complementary forage crop for inclusion in the multi species production system of oil palm plantation and livestock integration. It is an excellent forage crop with its good quality for feeding ruminants. It can fit easily for planting in immature or mature palm planted using double avenue planting system (*Figure 1*). It can be harvested multiple times without significantly affecting its fodder quantity, quality and nutritional value.



Figure 1. Kenaf at eight weeks after planting integrated with oil palm.

OBJECTIVE

The objective of this technology is to provide good agriculture practices for integrating kenaf in double avenue oil palm planting for producing high quality kenaf fodder as a feed source for intensive livestock integration with oil palm.

GOOD AGRICULTURE PRACTICE

It is highly advisable to establish kenaf in double avenue oil palm planting at least two to three months in advance before introducing the livestock in the system. This is to ensure that kenaf is ready to be harvested when the livestock is introduced in the system. However, the most important thing is to ensure that the green fodder produced is sufficient and in good quality. To achieve these requirements, the kenaf must be raised using good agriculture practices (GAP). The following practices are recommended for kenaf integration with oil palm:

Land Preparation

For land preparation, all vegetations between the oil palm rows must be cleared mechanically or by herbicide spraying. Then, the land is ploughed to produce a good soil texture suitable for seeds planting. Three ploughings are sufficient, *i.e.*, two disc ploughings and one rotor tilling. Lime is applied on the soil after the first ploughing and subsequently incorporated into the soil by the second ploughing. Ground magnesium limestone at 1-2 t ha⁻¹ can be used for the liming.

Planting

Kenaf variety V36 is recommended for the integration to produce fodder. Use kenaf with high germination rate and plant the seeds at the onset of rainfall season. Seeds must be treated with fungicide (Benlate, 3 g kg⁻¹ seed) before sowing. The seeds can be planted using a seeding machine or manual dibbling. For manual planting, put two seeds per hole and cover slightly with a friable soil. The recommended plant spacing is 50 x 10 cm (200 000 plants ha⁻¹). The plots are sprayed immediately with pre-emergence herbicide (Alacholor) after seeds are planted. At two weeks after planting, thinning is conducted by leaving only one vigorous seedling per hill to grow further.

Fertilisation

Basal fertilizer is applied prior to seeds planting using 45 kg N, 45 kg P₂O₅ and 45 kg K₂O per



hectare. Row dressing fertilisers are applied after every fodder harvesting or cutting. The fertiliser rate is similar to the basal fertiliser.

Weed Control

Kenaf planted area should be free from excessive weeds. This can be achieved by carrying out good weed control. Post emergence weeds are controlled according to their growth. Generally, manual weeding is recommended to be carried out at 25 to 30 days interval. But, it is paramount to quickly control the weeds after each harvesting or cutting. If not, the weed will suppress the re-growth process of the standing stems.

Pest Control

It was observed that pest and disease infestations are not serious in kenaf integrated with oil palm. From several trials that have been conducted, only leaf eaters are quite important. But, they can be easily controlled by spraying pesticides. For disease, fungi infestation normally prevails during high rainfall at early kenaf growth. Suitable fungicide spraying can deter the infestation.

Harvesting

Plant's age has direct effect on fodder quality for livestock feed. The forage is recommended to be harvested at eight weeks after planting. The cutting height during the harvesting will determine the re-growth process and ultimately the fodder yield. The stems will have a short live if the cut is made below than optimum height. The recommended cutting height is 50 cm above the ground level and it must be maintained for each harvest (Figure 2). Fodders from the re-growth crops can be harvested again at every six weeks interval. Four harvestings are recommended for each planting season of six months. First harvesting is from the main crop and three subsequent harvestings are from the re-growth crops.



Figure 2. Standing stems with cutting height of 50 cm after second harvesting.

TECHNICAL VIABILITY

Kenaf was found suitable to be integrated with oil palm using double avenue planting system. Based on several trials carried out in MPOB Research Stations, the crop was found easy to establish and manage. The kenaf favours moist soil and sufficient rainfall increases fodder production. No major pest and disease infestation was observed during the trials. The results of the trial indicated that kenaf integration did not affect the oil palm yield.

With sufficient soil moisture, the kenaf seeds start to grow within two to three days after sowing. A full plant canopy can be achieved at five weeks after planting. At eight weeks after planting, the plant height averaged at 144.6 cm. The plant height averaged at 146.31 cm, 135.7 cm and 129.35 cm for second, third and fourth harvest, respectively. On average, there were six main branches per plant at every succeeding harvest (Figure 3). Plant survival rate in the field was averaged at 94.55% from the first harvest up to the fourth harvest. However, due to dry condition, the survival rate was significantly reduced to 46.67% in the sixth harvest.



Figure 3. Kenaf forage ready for second harvest (top) and re-growth shoots at two weeks after second harvest (bottom).

Six planting distance treatments with four replicates were tested using randomised complete block design (RCBD). There were six kenaf fodder harvestings carried out during the trial. The first harvesting was from the main crop, carried

out at eight weeks after planting. The harvested kenaf stems cut at 50 cm above the ground successfully re-grew after the harvesting. Side shoots around the stems grew vigorously to form multiple branches with full stems and leaves. The same plants then can be harvested again after six weeks interval. There was no significant different in kenaf fresh fodder yield between the treatments tested except for the fodder yield of the first harvest (Table 1). Only planting distance 50 x 10 cm and

compared to forage sorghum and Napier grass. The crude protein was higher in kenaf fodder harvested at six to eight weeks interval. The content ranged from 19.84% - 22.70% with an average of 21.4% from the four harvests. Means of the crude protein was not significantly different at $p < 0.05$ for kenaf fodder of the four harvests. The metabolism energy of the four harvested fodders was good with an average of 9.78 MJ kg⁻¹. These results

TABLE 1. MEANS OF FRESH FODDER YIELD OF KENAF INTEGRATED WITH OIL PALM IN MPOB RESEARCH STATION, KERATONG

Planting distance	Fodder yield per harvest (t ha ⁻¹)						Total
	1 st	2 nd	3 rd	4 th	5 th	6 th	
50 x 10 cm	11.50 ^a	13.50 ^a	13.48 ^a	11.40 ^a	1.60 ^a	4.62 ^a	56.10
50 x 20 cm	8.32 ^{ab}	12.00 ^a	11.43 ^a	12.22 ^a	1.75 ^a	4.19 ^a	49.91
60 x 10 cm	9.62 ^{ab}	12.32 ^a	12.09 ^a	11.12 ^a	1.30 ^a	3.96 ^a	50.41
60 x 20 cm	7.10 ^{ab}	12.20 ^a	12.42 ^a	10.35 ^a	1.25 ^a	4.00 ^a	47.32
70 x 10 cm	8.80 ^{ab}	11.87 ^a	12.17 ^a	10.45 ^a	1.42 ^a	3.85 ^a	48.56
70 x 20 cm	5.91 ^b	10.77 ^a	11.90 ^a	9.62 ^a	1.30 ^a	3.92 ^a	43.42

Note: Means with similar alphabet in the same column are not significantly different at $p < 0.05$.

70 x 20 cm treatments were significantly different at $p < 0.05$ in terms of fodder yield at the first harvest. However, both treatments were not significantly different with the other treatments. Fodder yield in the fifth and the sixth harvest were reduced significantly due to dry condition. Cumulative fodder yield was higher for planting distance 50 x 10 cm. It is recommended to replant the kenaf when the fodder yield dropped.

The most critical nutrition for livestock feed which contribute to livestock performance is crude protein and metabolism energy. A good feed should contain sufficient amount of protein and energy. Analysis of fodder samples indicated that kenaf has good nutritional values (Table 2). It is superior

indicated that kenaf fodder is suitable for feeding ruminants livestock such as goat, sheep cattle, etc.

Cut and carry system is suggested for feeding kenaf fodder to intensively managed ruminants. Harvested kenaf fodder from the field is transferred to the ruminant's house or stall using a tractor-trailer. The fodder can be fed to the livestock as whole or in chopped form. However, chopped fodder was easy to handle when feeding the livestock. It was more palatable and suitable for livestock reared under intensive production system. Low crude fibre content in the kenaf fodder increased intake by livestock and unconsumed feed was minimal. Surplus fodder can be preserved as silage for future feeding.

TABLE 2. MEANS OF NUTRITIONAL CONTENT OF KENAF FODDER FROM DIFFERENT HARVESTS

Content	Kenaf harvesting cycle				Average
	1 st	2 nd	3 rd	4 th	
Crude protein, %	19.84 ^a	22.40 ^a	20.70 ^a	22.70 ^a	21.41
Crude fat, %	2.58 ^a	2.37 ^a	2.23 ^a	2.52 ^a	2.42
Crude fibre, %	27.27 ^a	27.43 ^a	27.32 ^a	32.90 ^a	28.73
Phosphorous, %	0.21 ^a	0.23 ^a	0.29 ^b	0.25 ^a	0.24
Nitrogen free extract, %	39.87 ^a	38.47 ^a	40.50 ^a	31.97 ^b	37.70
Total digestible nutrient, %	68.29 ^a	65.82 ^{ac}	63.62 ^{bc}	61.70 ^b	64.85
Metabolism energy, MJ kg ⁻¹	10.35 ^a	9.94 ^{ac}	9.58 ^{bc}	9.27 ^b	9.78

Note: Means with similar alphabet in the same row are not significantly different at $p < 0.05$.



Figure 4. Katjang goat (left) and Yellow cattle (right) feeding on chopped kenaf fodder under intensive integration system.

ECONOMIC VIABILITY

Table 3 shows detail costs for integrating kenaf with oil palm using double avenue planting system. Total cost of integrating the kenaf with four kenaf fodder harvestings was estimated at RM 7993 ha⁻¹. The cumulative fodder yield of the

fodder has better nutritional value compared to normal pasture fodder and suitable to be fed to the ruminant livestock either as whole or as chopped fodder. The fodder can be sold to give additional income to the oil palm growers. It is technically and economically feasible to integrate kenaf with oil palm for fodder production.

TABLE 3. ESTIMATED PRODUCTION COST FOR INTEGRATING KENAF WITH OIL PALM USING DOUBLE AVENUE PLANTING SYSTEM (RM ha⁻¹)

Activity	Input/contract cost (RM)	Labour		Total (RM)
		Man-day	Cost (RM)	
Land preparation	850	-	-	850
Seeds	200	-	-	200
Planting	450	-	-	450
Liming	300	1	35	335
Fertilisations	2 640	4	140	2 780
Weed controls	228	18	630	858
Pest and disease controls	70	2	70	140
Harvestings	-	68	2 380	2 380
Total	4 738	93	3 255	7 993

four harvestings was 50 t ha⁻¹. The production cost of fresh kenaf fodder was RM 0.16 kg⁻¹. The kenaf fodder can be sold at higher price because of its superior quality compared to normal fodder such as Napier grass. Normal farm gate price of Napier grass fodder (whole form) is RM 300 – RM 500 t⁻¹. If the kenaf fodder is priced at RM 300 t⁻¹, then the total sale is RM 15 000 ha⁻¹. The net income will be RM 7007 ha⁻¹ or RM 1001 ha⁻¹ per month.

CONCLUSION

Kenaf is suitable to be integrated with oil palm for fodder production. It can be integrated with oil palm using double avenue planting system. With good agricultural practices, kenaf produces high fodder yield with high quality green fodder. The

For more information, kindly contact:

Director-General
MPOB
6 Persiaran Institusi,
Bandar Baru Bangi,
43000 Kajang, Selangor,
Malaysia
Tel: 03-8769 4400
Fax: 03-8925 9446
www.mpob.gov.my