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RESEARCH PAPER

Biomass Production and Potential Nutrient Contribution from Oil Palm Plantation Annually and at Feelling

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ABSTRACT

Attempts were made to quantify the availability of biomass from a mature plantation annually and also at the stage of felling. The representative samples of the palm components were analysed separately for nutrient content viz., N, P, K, Ca and Mg. The biowastes available to the tune of 15 tonnes every year from a mature plantation under rain fed conditions, 132 kg N, 11.5 kg P, 155kg K, 92 kg Ca and 38 kg Mg could be expected. If recycled properly, this can meet almost 77% nitrogen, 13% phosphorus and 90% potassium requirement of palms as per the present recommendation of 1200-600-1200g NPK under rain fed conditions. At felling stage, with an estimated biomass yield of 163 tonnes per hectare, 1503 kg N, 129 kg P, 2345 kg K, 513 kg Ca and 438kg Mg could be expected. Thus it is clear that though oil palm is a heavy feeder, major share of the nutrients absorbed by palms is recycled back to the soil during its lifespan of 30-35 years. The nutrients available at the end of the crop could be utilized by the subsequent crop if properly managed and a major share of the requirement during initial years could be met through these nutrients.

Key words: oil palm, biomass, nutrients, recycling.

INTRODUCTION

Among the major plantation crops, Oil palm is reported to be the highest yielder of biomass as evident from its luxurious growth. On an average the palm generates 20 to 25 tonnes/ha of vegetative dry matter annually in the form of fronds, fresh fruit bunches, male flowers and leaf bases of which only 30-35 percent is fully utilized (Chan *et al*, 1981). The rest of the products as empty fruit bunches, mesocarp wastes, effluent, fronds and male flowers amounting to 65-70% are mostly discarded. All these biowastes are nutrient rich and if properly recycled can meet a major share of nutrient requirement of palms.

At the time of felling of a plantation, the available above ground biomass include trunks, fronds, leaf bases, inflorescences, spear leaves, cabbage and the below ground root mass. The total nutrient stocks of above ground biomass at felling of old stands were reported to be 577Kg N, 50Kg P, 1255Kg K, 141Kg Mg and 285Kg Ca (Khalid *et al* 1999) after 23 years of planting. Thus there is vast potential of nutrient recycling at the end of the crop also. Attempts were made to quantify the annual availability of biomass from a mature plantation and also at the stage of felling raised under rain fed conditions of Kerala. Also quantified the nutrient contribution expected every year as well as at felling.

MATERIALS AND METHODS

The data on annual availability of biomass were collected from a 16 year old plantation at NRCOP, Regional station, Palode. Annual dry matter production of different components viz. pruned leaves, (Pinnae, rachis and petiole) male inflorescence, empty fruit bunches, mesocarp wastes and shell from representative areas were assessed and the mean value taken. Similarly the total biomass production of 27 year old plantation was assessed by way of destructive sampling of representative palms and weighing different components separately. The representative samples of all the components available annually as well as at felling were analyzed for major and secondary nutrients and based on dry matter

production, nutrient potential was worked out both annually and also at felling stage.

RESULTS AND DISCUSSION

The biomass contribution from a hectare of mature plantation annually and the estimated nutrient contribution are presented in Table 1.

Fronds contributed about 70% of the total dry matter through regular harvests and annual pruning and remaining 30% constituted by empty fruit bunches, mesocarp wastes and shell. Leaves are rich sources of Nitrogen and potassium. Bunch wastes are rich in potassium. Of the biowastes available to the tune of 15 tonnes every year from a mature plantation under rain fed conditions, 132 kg N, 11.5 kg P, 155kg K, 92 kg Ca and 38 kg Mg could be expected. That means, almost 77%nitrogen, 13% phosphorous and 90%potassium requirement of palms could be met, if the nutrient reserve is properly recycled, as per the present recommendation of 1200-600-1200 g NPK under rain fed conditions.

The biomass production and nutrient contribution from a plantation near to felling are presented in Table 2.

The trunk contributed more than 50% of the total dry matter and found to be the most potential nutrient reserve at the time of felling. It contributed significantly higher proportion of nitrogen and potassium. Fronds available to the tune of about 15%, also contributes significantly towards the nitrogen pool. Considering a planting density of 143 palms in a hectare, 163 tonnes of dry matter can be expected at the end of the crop. From these, nutrients to the extent of 1503 Kg N, 129

Table 1: Annual availability of biomass and nutrient contribution

Palm Parts	Biomass production	Nutrient Contribution (Kg/ha)				
	(t/ha)	N	P	K	Ca	Mg
Pinnae	3318	82.8	4.9	27.5	20.6	10.1
Petiole & Rachis	7222	19.2	2.1	79.7	66.2	17.8
Male Inflorescence	272	7.6	1.6	4.9	1.8	3.2
Empty Fruit Bunches	1301	12.5	1.7	33.5	2.7	4.0
Mesocarp wastes	2506	6.5	0.9	6.5	0.6	1.7
Shell	800.8	3.3	0.3	3.4	0.5	1.2
TOTAL	**15473**	**131.9**	**11.5**	**155.5**	**92.4**	**38.0**

Table 2. Availability of Biomass and Nutrient contribution at felling

Palm Parts	Biomass production	Nutrient Contribution (Kg/ha)				
	(t/ha)	N	P	K	Ca	Mg
Trunk	85.80	729.30	60.06	1021.02	223.08	199.92
Leaflets	8.72	183.04	11.44	85.80	52.91	30.03
Rachis & Petiole	14.16	84.37	12.87	204.49	68.64	25.74
Spears	3.80	55.77	6.01	85.51	11.58	9.30
Inflorescence	0.12	2.86	0.43	2.86	1.00	0.43
Leaf bases	8.72	87.23	5.72	140.14	52.91	47.19
Bole mass	35.75	321.75	28.60	750.75	85.80	104.39
Roots	5.58	38.61	3.86	54.34	17.16	21.45
TOTAL	**162.65**	**1502.93**	**128.99**	**2344.91**	**513.08**	**438.45**

Kg P, 2345 Kg K, 513 Kg Ca and 438 Kg Mg could be expected.

Chan *et al.* (1980) reported that about 90t/ha of dry matter could be obtained at felling a mature plantation which contained about 518 kg N, 49 kg P, 721 kg K, 112 kg Mg and 182 kg Ca. Mohd. Hashim *et a*l (1993) quoted slightly lower values as 339 kg N, 32 kg P, 424 kg K, 76 kg Mg based on the measurements of palm residues of trunks and fronds only. In the present study, all the values are high compared to the earlier reports, since in none of the earlier studies; the significant contribution from below ground biomass in terms of dry matter production or nutrient value is accounted. The luxurious growth put forth by this crop under humid tropical conditions contributes better returns throughout as well as at the end of the crop.

So it can be concluded that, though Oil palm is a heavy feeder of nutrients, a major share of nutrients absorbed by palms is recycled back to the soil during its life span of 30-35 years. These could supplement the requirement of either the standing crop or the subsequent crop after felling, if properly managed.

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