

Original Research Article

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## Effect of Horticulture Crop Based Border Row System on the Yield of Cumbu Napier Hybrid Grass Fodder in Tamil Nadu, India

M. Suganthi\* and S. Usha

Institute of Animal Nutrition, Madras Veterinary College, Tamil Nadu Veterinary and Animal science University, India

\*Corresponding author

### ABSTRACT

#### Keywords

Cumbu Napier hybrid grass, coconut tree, Border plantation, jack fruit tree, Agri horti system

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Profitable agriculture could be achieved through diversified farming system. High economic return could be obtained only with the inclusion of animal husbandry. Border row horticulture system is recommended in the intensive fodder production system. The study was conducted during 2017-2018 in field no.23. Cumbu Napier hybrid grass was cultivated as per cultivation techniques. Coconut and Jack fruit trees were maintained as borders rows of Cumbu Napier hybrid grass. As per the study, it could be concluded that the yield of Cumbu Napier Hybrid grass was significantly increased in open system to the tune of 5.96 percent compared to the treatment (with boarder rows of coconut). This might be due to shading effect of nine years old coconut palm. Whereas, in Jackfruit boarder row system there is no significant reduction in the yield of Cumbu Napier Hybrid grass. Hence, boarder row system of Jackfruit with regular pruning interval of three months could be recommended in the agroforestry system.

### Introduction

Conservation of biodiversity and ecosystem could be achieved through diversification of agriculture rather than intensification. Profitable agriculture could be achieved through diversified farming system involving crops, fruit trees, agroforestry, animal husbandry and farm mechanization. Growing agricultural crops includes fodder crops are highly economical and liable to minimize the risk occurring with sole cropping and without animal husbandry. Agriculture and animal husbandry are a twin eyes of Indian Economy. There is a huge demand for green fodder. Country faces nearly 60% deficit in green fodder. Maintenance of exclusive

agroforestry system is a tough task in the current scenario of unavailability of labour. Border row agroforestry system is recommended in the intensive fodder production system.

Tree fodder is an important component of green fodder & obtained through agroforestry system. Trees help in nutrient pumping from lower strata to the crop root zone (Kenneth *et al.*, 1999). The potentially higher productivity could be due to capture of more growth resources like light, water or due to improved soil fertility (Pamo *et al.*, 2001). Trees help in nutrient pumping from lower strata to the crop root zone (Kenneth *et al.*, 1999).

Border row horticulture system is recommended in the intensive fodder production system. Coconut (*Cocos nucifera*) and Jackfruit (*Artocarpus heterophyllus* L.) trees are widely distributed in tropical countries. Straight growth of coconut trees would not interfere with the yield of fodder crops. Coconut and Jackfruit trees are effective border trees which helps to increase moisture use efficiency especially during hot summer.

Jack fruit leaves are good source of feed for small ruminants and the leaves have been used traditionally by farmers as animal feed which is the conventional protein-rich (8.43 %) concentrates (Keir *et al.*, 1997). This foliage characterized by great contents of dry matter (33.2%), crude protein (16.6%) and neutral detergent fiber (52.6%) (Mui *et al.*, 2002) compared to more common forage crops for ruminant feed such as Para grass (*Brachiaria mutica*) (Mui *et al.*, 2002), Napier grass (Maleko *et al.*, 2019) and Guinea grass (Oliveira *et al.*, 2020). Jackfruit leaves also has high content of insoluble protein (Kouch *et al.*, 2003) and phenolic compounds, e.g. tannins (Pal *et al.*, 2015). Jackfruit trees are effective border trees which helps to increase the availability of tree fodder to the small ruminants especially during summer months. Distel *et al.*, (2020) suggested that replacement of simple traditional forage by complementary forage species that enable ruminants to select a diet in benefit of their nutrition, health, whilst reducing the negative environmental impacts caused by agricultural systems.

In order to enhance the milk production and to meet the demand of green fodder, cows should be fed with nutritious green fodder like Cumbu Napier Hybrid grass throughout the year (Vijayakumar *et al.*, 2009). In intensive cultivation system of Cumbu Napier hybrid grass Jack fruit trees can be effectively maintained as border rows. Hence the present study is focusing on the effect of border row as coconut and Jackfruit on the yield of Cumbu Napier hybrid grass.

## Materials and Methods

Coconut and Jack fruit trees were maintained as borders rows of Cumbu Napier hybrid grass in the field of PGRIAS. The study was conducted during 2017-2018 in field no.23. Cumbu Napier hybrid grass was cultivated as per cultivation techniques of Crop Production Guide. Nine years old coconut trees were maintained in the border of Cumbu Napier Hybrid grass of one acre land. Likewise twenty Jackfruit trees were maintained as

border crop of another one acre of Cumbu Napier hybrid grass. The ten years old Jackfruit trees were pruned at regular interval of three months. The yield of CN hybrid grass in Coconut and Jackfruit border row system and without border row system was compared. The yield of Jack fruit tree leaves as fodder was also taken in to account for comparison. The statistical data was analysed by using SPSS module.

## Results and Discussion

The plant height varied from 158.0 cm to 179.0 cm. The average plant height was 169.0 cm in treatment (with boarder row) and it was 180.9 cm in control (without boarder row) (Table.1). While comparing the yield in different cuttings, the average yield was about 59.57 tonnes / ha /cutting in treatment compared to the average yield of 63.28 tonnes / ha /cutting in control from table 1.

The plant height and yield of the treatment and control was varying significantly. The shading effect creates significant different among the treatment and control. The coconut trees are nine years old and the crown coverage is higher enough to shade the crop in the field and able to reduce the yield of the Cumbu Napier Hybrid grass to the tune of 5.96 percent.

The results are coincided with the result of previous observations by Mohan Kumar and Kunhamu (2022). They observed that young adult palms between 8 to 25 years of age, the maximum ground coverage and low trunk height characterize this phase, limiting light penetration to the lower storey, and hence it affects the performance of the main understorey crops. The results indicated that shading effect of the border rows of nine years old coconut tree would affect the yield of Cumbu Napier Hybrid grass significantly. This could be due to, in nine years old coconut tree the crown covers about five to six feet and created shading effect. Hence the yield of the crop was affected significantly. ([www.elsevier.com/locate/nbsj](http://www.elsevier.com/locate/nbsj))

As per the earlier discussion, it could be concluded that the yield of Cumbu Napier Hybrid grass was significantly increased in open system to the tune of 5.96 percent compared to the treatment (with boarder rows of coconut).

In Jackfruit based agroforestry system, the plant height of Cumbu Napier Hybrid grass varied from 161.2 cm to 180.1 cm. The biomass yield varied from 59.97 and

63.37 tonnes/ ha/cutting in treatment (with boarder row of Jack fruit) and varied from 60.67 and 63.39 tonnes/ ha/cutting in control (without boarder row of Jack fruit) respectively.

From Table. 2, the average plant height was 170.9 cm in treatment and it was increased to 174.4 cm in control (without boarder row). Further the average biomass yield of Cumbu Napier Hybrid grass obtained in treatment was 62.08 tonnes/ha/cutting and it was increased in control to 62.52 tonnes/ ha/cutting respectively. The plant height and yield of treatment and control was not varying significantly. Even though the plant height and yield was

increased in control, it was not statistically significant. This might be due to, there is no much shade effect of Jackfruit on the main crop of Cumbu Napier hybrid grass. Apart from this, Jackfruit leaves are very good fodder for small ruminants. In goat farming, Jackfruit (*Artocarpus heterophyllus*) tree leaves can be effectively used as an alternative forage source. The tree fodder obtained from the border rows of Jack fruit tree leaves was 16.5 tonnes/ha/year. From the boarder row of Jackfruit trees we could obtained the fruit yield of two tonnes. The results indicated that the border rows of Jack fruit would not affect the yield of main crop of Cumbu Napier hybrid grass.

**Table.1** Comparison of growth and yield parameters of Cumbu Napier Hybrid grass with boarder rows of Coconut (treatment) and in open system (without boarder rows of coconut (control)).

Cutting	With boarder row (Treatment)		With out boarder row (Control)	
	Plant height (cm)	Biomass yield (t/ha/cutting)	Plant height (cm)	Biomass yield (t/ha/cutting)
First cutting	179.4 ± 1.29	61.75 ± 2.37	189.7 ± 2.14	64.08 ± 1.81
Second cutting	174.3 ± 3.67	61.97 ± 2.20	190.4 ± 4.52	64.05 ± 1.59
Third cutting	168.5 ± 1.87	61.12 ± 2.64	181.2 ± 1.22	65.18 ± 4.52
Fourth cutting	164.6 ± 2.19	58.42 ± 4.50	177.4 ± 0.97	64.02 ± 4.96
Fifth cutting	158.3 ± 1.05	54.63 ± 4.96	167.8 ± 1.66	59.05 ± 4.54
Average	169.0	59.57	180.9	63.28
	HS	HS	HS	HS

**Table.2** Comparison of growth and yield parameters of Cumbu Napier Hybrid grass with boarder rows of Jack fruit (treatment) and in open system (without boarder rows of Jackfruit (control)).

Cutting	With boarder row		With out boarder row	
	Plant height (cm)	Biomass yield (t/ha/year)	Plant height (cm)	Biomass yield (t/ha/year)
First cutting	180.1 ± 0.856	63.37 ± 4.80	178.2 ± 0.78	63.39 ± 3.72
Second cutting	178.8 ± 0.873	61.72 ± 2.31	181.4 ± 0.84	62.10 ± 2.06
Third cutting	171.0 ± 1.5	62.25 ± 6.4	171.4 ± 1.25	62.50 ± 1.93
Fourth cutting	161.2 ± 2.44	63.08 ± 1.83	175.0 ± 0.478	63.38 ± 2.54
Fifth cutting	163.7 ± 1.13	59.97 ± 1.98	166.2 ± 1.69	60.67 ± 3.02
Average	170.9	62.08	174.4	62.52

This might be due to the regular pruning of Jackfruit trees once in three months. If pruning is done at regular intervals, there is no shade effect and we could able to get good yield of Cumbu Napier Hybrid grass along with the tree leaf fodder. [Van et al., \(2005\)](#) reported that, goat

diet containing many kinds of foliage potential resulted in higher intake compared to feeding the foliage alone. Similarly, the yield of Cumbu Napier Hybrid grass in open system was on par with the treatment. Since pruning is done at regular intervals there is no shade

effect even though the tree is ten years old. Hence it could be concluded that in intensive fodder production system, we could recommend Coconut trees up to seven years. Further if the trees are above seven years, we could not recommend coconut tree as boarder rows. Where as in jackfruit tree boarder row system, we could recommend the Jackfruit with regular pruning intervals of three months. Regular pruning help to reduce the shade effect. It is evident from increased yield of Cumbu Napier Grass in Jackfruit based boarder row system.

### Author Contribution

M. Suganthi: Investigation, formal analysis, writing—original draft. S. Usha: Validation, methodology, writing—reviewing.

### Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

### Declarations

**Ethical Approval:** Not applicable.

**Consent to Participate:** Not applicable.

**Consent to Publish:** Not applicable.

**Conflict of Interest:** The authors declare no competing interests.

### References

Distel R A, Arroquy J I, Lagrange S and Villalba J J 2020 Designing diverse agricultural pastures for improving ruminant production systems. *Frontiers in Sustainable Food Systems*, 4, 215 <https://doi.org/10.3389/fsufs.2020.596869>

Keir B, Dinh Van Bien, Preston, T. R. and Orskov, E. R. 1997. Nutritive value of leaves from tropical trees and shrubs Intake; growth and digestibility studies with goat, Livestock Research for Rural Development.

Kenneth R. Allison, John J.M. Dwyer, Susan Makin. 1999. Perceived Barriers to Physical Activity among High School Students, *Preventive Medicine*, 28(6): 608-

615. <https://doi.org/10.1006/pmed.1999.0489>

Kouch T, Preston T R and Ly J 2003 Studies on utilization of trees and shrubs as the sole feedstuff by growing goats; foliage preferences and nutrient utilization. *Livestock Research for Rural Development*. 15, #50. <http://www.lrrd.org/lrrd15/7/kouc157.htm>

Maleko D, Mwilawa A, Msalya G, Pasape L and Mtei K 2019 Forage growth, yield and nutritional characteristics of four varieties of napier grass (*Pennisetum purpureum* Schumach) in the west Usambara highlands, Tanzania. *Scientific African*. 6, e00214 <https://doi.org/10.1016/j.sciaf.2019.e00214>

Mohan Kumar, B. and T. K. Kunhamu, 2022. Nature-based solutions in agriculture: A review of the coconut (*Cocos nucifera* L.)-based farming systems in Kerala, “the Land of Coconut Trees” Nature-Based Solutions 2. Published by Elsevier Inc.pp1-15. <https://doi.org/10.1016/j.nbsj.2022.100012>.

Mui N T, Ledin I, Udén P and Binh D V 2002. The foliage of flemingia (*Flemingia macrophylla*) or jackfruit (*Artocarpus heterophyllus*) as a substitute for a rice bran - soya bean concentrate in the diet of lactating goats. *Asian-Australasian Journal of Animal Sciences*, 15(1), 45-54 <https://doi.org/10.5713/AJAS.2002.45>

Oliveira J K S D, Corrêa D C D C, Cunha A M Q, Rêgo A C D, Faturi C, Silva W L D and Domingues F N 2020 Effect of nitrogen fertilization on production, chemical composition and morphogenesis of Guinea grass in the humid tropics. *Agronomy*, 10(11), 1840. <https://doi.org/10.3390/agronomy10111840>

Pal K, Patra A K, Sahoo A and Kumawat P K 2015 Evaluation of several tropical tree leaves for methane production potential, degradability and rumen fermentation *in vitro*. *Livestock Science*, 180, 98-105. <https://doi.org/10.1016/j.livsci.2015.07.011>

Pamo T.E., Kennang T.B.A., Kangmo M.V.2001. Etude comparée des performances pondérales des chèvres Naines de Guinée supplémentées au Leucaena leucocephala, au Gliricidia sepium ou au tourteau de coton dans l’Ouest Cameroun. *Tropicicultura*, 19: 10-14.22.

Van DTT, Mui NT, Ledin I. 2005. Tropical foliages: effect of presentation method and species on intake by goats. *Anim Feed Sci Technol*. 118:1–17.

Vijayakumar, G., G C. Babu, K. Velayudham and T. S. Raveendran. 2009. A High Yielding Cumbu Napier Hybrid Grass CO (CN) 4. *Madras Agric. J.*, 96 (7-12): 291-292.

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