

## Varietal performance of cane in association with different multipurpose tree species

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**Abstract:** A field experiment was conducted at the Agroforestry Farm, Hajee Mohammad Danesh Science and Technology University, Dinajpur, during 20 April 2007 to 20 July 2007 to evaluate the performance of four Cane species under different multipurpose tree species. The treatments were three tree species viz. Mehogany, Deshi neem and Eucalyptus, which were used as the upper storey. There was also a control (Open field) treatment. Four cane species namely Bhudum beth, Udum beth, Jali beth and Golla beth were used as the middle storey non-woody perennial. This experiment was laid using two factor Randomized Complete Block Design (RCBD) with three replications. The aim of the experiments was to study the growth performance and selection of potential cane species under different multipurpose tree based agroforestry system. Considering cane species, jali beth was the best performer compared to other cane species. Udum beth + Deshi Neem were found as the best combination followed by Udum beth + Mehogany combination and Udum beth + Eucalyptus combination. Significantly the lowest performance was found in open field irrespective of cane species. While the tree effects, Mehogany was the best one followed by Deshi neem and significantly the poorest performance was found in the open field.

**Key words:** Cane variety, Multipurpose tree species, Agroforestry system.

### Introduction

Cane is one of the important natural resources of Bangladesh forests and homesteads. Cane is mostly trailing or climbing spiny-palm with characteristic scaly fruits and classified under the Lepidocaryoid major group (Moore, 1973) of the palm family Aracaceae (Palmae). It is an integral part of the tropical forest ecosystem. There are 14 genera of canes in the world comprising about 600 species (Dransfield, 1981). The species is a very important source of livelihood for the economically and socially weaker sections of the community. The plant is used as raw material for variety of products of handicraft and small cottage industries, having increasing demand in national and international markets. The climber is mainly used for making ropes, furniture frames, walking sticks, polo sticks, umbrella handles, baskets, sports goods, mat making, wicker work, for stuffing and packing etc. Apart from conventional uses, cane has beneficial medicinal uses as well (Bhatt, 1992). Cane is partially shade-loving non-timber species. In any agroforestry system, partial shade loving species are always preferable and various researches have been done for different cane species but a little in any agroforestry system. Though most of the cane species are suitable for hilly areas, it is a matter of research works to study the suitability of some species in plain land or northern side of Bangladesh in multistoried agroforestry systems. Multipurpose trees (MPTs) can be used for more than one purpose. It provides food, fodder, fuel wood, timber, minor tree products and shelter material to subsistence farmer. All plants can be use for more than one purpose. But all plants may not be referred as multipurpose tree species. If the tree is grown in the farm land to get intended products (food, fodder, fuel wood, shelter material) would be placed in multipurpose category. In the view of proper utilization of plain land or shaded places and to increase the production, cane and MPTs based agroforestry system would be a promising option.

### Materials and Methods

The experiments were conducted in cane based multistoried model at the western side of the Agroforestry Research Farm, Hajee Mohammad Danesh Science and Technology University, Dinajpur during 20 April 2007 to 20 July 2007. The site was between 25° 13' latitude and 88° 23' longitude, and about 37.5 m above the sea level.

The experimental plot was situated in a medium high land belonging to the old Himalayan Piedmont Plain area (AEZ 01). Land was well-drained and drainage system was well developed. The soil texture was sandy loam in nature. The soil pH was 5.1. The experiment was laid out following the two factorial RCBD under three different tree species i.e. Mehogoney, Deshi neem, and Eucalyptus. Four cane species planted randomly in between tree species with a control plot (open field). There were three replications of each treatment. The spacing for the cane species was 3 M x 3 M while for trees 3 M x 3 M. The land was opened in the middle of March 2007 and prepared thoroughly by spading to obtain a good tilth. All weeds and stubbles were removed from the filed and bigger clods were broken into smaller pieces. The four cane species were planted on 28 August 2005. The cane species were randomly arranged in each MPTs. It was planted tree rows just in the middle of two trees i.e. one tree species and one cane species alternatively arranged in the same line by 1.5 m apart. Different intercultural operations were performed as per requirement. Data were statistically analyzed using the (ANOVA) "Analysis of Variance" technique with the help of the computer package MSTAT. The mean differences were adjusted by the Duncan's Multiple Range Test (DMRT) (Gomez and Gomez, 1984).

### Results and Discussion

Interaction effect of Cane species and trees on the growth performance of cane species in agroforestry system are presented in Table 1 & 2 describe as:

**Plant height:** From the interaction effect, significantly the highest plant heights at 21 and 24 MAP were observed 285.6 and 345.6 cm respectively in C<sub>2</sub>T<sub>2</sub> (Deshi Neem + Udum beth) which were followed by 238.2 and 315.3 cm respectively in C<sub>2</sub>T<sub>0</sub> and C<sub>3</sub>T<sub>2</sub>. Significantly, the lowest plant heights at 21 and 24 MAP were 105.5 and 127.6 cm respectively in C<sub>1</sub>T<sub>3</sub> (Eucalyptus + Bhudum beth). This result was similar to the previous experiment carried out by Rahman (2006) on cane based multistoried agroforestry system.

**Number of stem:** From the interaction effect, significantly the highest stem plant<sup>-1</sup> (Number) at 21 and 24 MAP were found 14.03 and 22.50 (Number) in C<sub>3</sub>T<sub>2</sub> (Deshi Neem + Jali beth) and C<sub>2</sub>T<sub>2</sub> (Deshi Neem + Udum beth). Significantly, the lowest stem plant<sup>-1</sup>

<sup>1</sup>(Number) at 21 MAP was observed 1.010 respectively in C<sub>1</sub>T<sub>3</sub> (Eucalyptus+Bhudum beth).

**Number of leaf:** From the interaction effect, significantly the highest leaves plant<sup>-1</sup> (Number) at 21 and 24 MAP were observed 184.5 and 275.0 (Number) respectively in (Number) C<sub>3</sub>T<sub>3</sub> (Desi Neem + Jali beth) which were

followed by 92.33 and 196.0 (Number) respectively in C<sub>2</sub>T<sub>2</sub> (Desi Neem + Udum beth). Significantly, the lowest leaves plant<sup>-1</sup> (Number) at 21 MAP was respectively 6.150(no.) in C<sub>1</sub>T<sub>3</sub> (Eucalyptus + Bhudum beth) which was statistically identical with 8.50 and 7.330, respectively in C<sub>2</sub>T<sub>3</sub> and C<sub>4</sub>T<sub>3</sub>.

**Table 1.** Interaction effect of cane species and trees on plant height and base girth cane in multistoried agroforestry system

Interaction	Plant height (cm) at		Base girth (cm) at	
	21 MAP	24 MAP	21 MAP	24 MAP
C <sub>1</sub> T <sub>0</sub> (control x Bhudum beth)	175.2i	200.5k	12.01ef	13.12d
C <sub>2</sub> T <sub>0</sub> (control x Udum beth)	238.2b	291.9d	14.80b	17.66b
C <sub>3</sub> T <sub>0</sub> (control x Jali beth)	191.3f	269.8f	15.80a	18.66a
C <sub>4</sub> T <sub>0</sub> (control x Golla beth)	189.4g	251.3g	13.50cd	14.71c
C <sub>1</sub> T <sub>1</sub> (Mehogany x Bhudum beth)	130.5i	155.7l	9.50g	10.03f
C <sub>2</sub> T <sub>1</sub> (Mehogany x Udum beth)	205.1e	273.4e	11.10f	13.69d
C <sub>3</sub> T <sub>1</sub> (Mehogany x Jali beth)	179.7h	249.6g	13.86bc	14.86c
C <sub>4</sub> T <sub>1</sub> (Mehogany x Golla beth)	165.6k	217.2i	10.09g	11.08e
C <sub>1</sub> T <sub>2</sub> (Desi neem x Bhudum beth)	203.7e	222.4h	4.120l	4.603i
C <sub>2</sub> T <sub>2</sub> (Desi neem x Udum beth)	285.6a	345.6a	5.400k	6.100h
C <sub>3</sub> T <sub>2</sub> (Desi neem x Jali beth)	220.4d	315.3b	6.150jk	6.901h
C <sub>4</sub> T <sub>2</sub> (Desi neem x Golla beth)	236.4c	303.3c	4.180l	4.800i
C <sub>1</sub> T <sub>3</sub> (Eucalyptus x Bhudum beth)	105.5o	127.6o	7.050ij	7.851g
C <sub>2</sub> T <sub>3</sub> (Eucalyptus x Udum beth)	170.8j	207.9j	8.200h	11.50e
C <sub>3</sub> T <sub>3</sub> (Eucalyptus x Jali beth)	121.4m	150.4m	12.73de	13.66d
C <sub>4</sub> T <sub>3</sub> (Eucalyptus x Golla beth)	115.6n	135.6n	8.000hi	9.500f
Level of significance	**	**	**	**

\*\* 1% level of significance \* 5% level of significance MAP= Month after Planting

**Table 2.** Interaction effect of cane species and trees in multistoried agroforestry system

Interaction	Stem plant <sup>-1</sup> at		Leaves plant <sup>-1</sup> at		Leaf length (cm) at		Leaf breadth (cm) at	
	21 MAP	24 MAP	21 MAP	24 MAP	21 MAP	24 MAP	21 MAP	24 MAP
C <sub>1</sub> T <sub>0</sub> (control x Bhudum beth)	2.050efg	2.150fg	11.00g	14.75ef	69.50l	76.60def	56.08e	60.03d
C <sub>2</sub> T <sub>0</sub> (control x Udum beth)	6.330cd	6.700cd	18.33e	32.00def	120.0b	120.7b	68.90c	86.05b
C <sub>3</sub> T <sub>0</sub> (control x Jali beth)	4.150def	5.150de	20.33e	25.33def	115.3c	168.7a	72.66bc	89.20ab
C <sub>4</sub> T <sub>0</sub> (control x Golla beth)	3.370efg	4.620de	15.33f	23.16def	105.0e	154.2a	51.25ef	65.27d
C <sub>1</sub> T <sub>1</sub> (Mehogany x Bhudum beth)	1.520fg	1.650fg	8.800gh	11.50f	79.10k	83.25cdef	32.13h	34.50f
C <sub>2</sub> T <sub>1</sub> (Mehogany x Udum beth)	3.660efg	3.990ef	14.00f	27.00def	125.0a	156.0a	41.99g	64.33d
C <sub>3</sub> T <sub>1</sub> (Mehogany x Jali beth)	3.330efg	3.583ef	18.00e	22.66def	120.9b	174.1a	47.33f	77.05c
C <sub>4</sub> T <sub>1</sub> (Mehogany x Golla beth)	2.760efg	2.960efg	9.33gh	11.66f	113.4d	161.0a	33.33h	43.06e
C <sub>1</sub> T <sub>2</sub> (Desi neem x Bhudum beth)	4.560de	4.700de	32.40d	41.06de	59.40n	65.30f	39.08g	43.17e
C <sub>2</sub> T <sub>2</sub> (Desi neem x Udum beth)	10.32b	22.50a	92.33b	196.0b	101.0f	105.7bcd	54.33e	61.07d
C <sub>3</sub> T <sub>2</sub> (Desi neem x Jali beth)	14.03a	17.66b	184.5a	275.0a	85.03i	99.05bcd	63.33d	63.50d
C <sub>4</sub> T <sub>2</sub> (Desi neem x Golla beth)	7.890c	8.167c	47.50c	110.2c	83.09j	94.03bcde	47.90f	60.10d
C <sub>1</sub> T <sub>3</sub> (Eucalyptus x Bhudum beth)	1.010g	1.120g	6.150i	9.650f	62.20m	71.90ef	75.11b	72.00c
C <sub>2</sub> T <sub>3</sub> (Eucalyptus x Udum beth)	2.750efg	2.900efg	8.500ghi	13.21f	105.0e	115.1b	75.33b	89.01ab
C <sub>3</sub> T <sub>3</sub> (Eucalyptus x Jali beth)	2.050efg	2.080fg	11.12g	15.25ef	95.01g	107.2bc	81.33a	92.06a
C <sub>4</sub> T <sub>3</sub> (Eucalyptus x Golla beth)	1.590fg	1.050g	7.330hi	43.83d	89.05h	101.1bcde	72.33bc	73.37c
Level of significance	**	**	**	**	**	**	**	**

\*\* 1% level of significance \* 5% level of significance MAP= Month after Planting

**Leaf length:** The largest leaf length (cm) at 21 MAP was observed 125.0 cm respectively in C<sub>2</sub>T<sub>1</sub> (Mehogany+ Udum beth). At 21 MAP, significantly the shortest leaf length was 59.40 cm respectively in C<sub>1</sub>T<sub>2</sub> (Desi Neem + Bhudum beth). At 24 MAP, significantly the longest leaf length was 156.0 cm respectively in C<sub>2</sub>T<sub>1</sub> (Mehogany + Udum beth). Considerably, the shortest leaf length(cm) at 24 MAP was observed 63.50 cm in C<sub>1</sub>T<sub>2</sub>(Desi Neem + Bhudum beth).

**Leaf breadth:** The highest leaf breadth at 21 MAP was observed 81.33 cm in C<sub>3</sub>T<sub>3</sub> (Eucalyptus + Jali beth ). Significantly, the shortest leaf breadth at 21 MAP was observed 32.13 cm in C<sub>1</sub>T<sub>1</sub> (Mehogany + Bhudum beth) which was statistically identical with 33.33 cm respectively in C<sub>4</sub>T<sub>1</sub> (Mehogany + Golla beth). At 24 MAP, significantly the highest leaf breadth was 92.06 cm in C<sub>3</sub>T<sub>3</sub> (Eucalyptus + Jali beth). Significantly, the shortest leaf breadth at 24 MAP was observed 34.50 cm respectively in C<sub>1</sub>T<sub>1</sub> (Mehogany + Bhudum beth).

**Base girth:** The highest base girth(cm) at 21 and 22 MAP were found 15.80 and 18.66 cm respectively in C<sub>3</sub>T<sub>0</sub> (Control + Jali beth ).At 20 MAP, significantly the lowest base girth was 4.120 cm respectively in C<sub>1</sub>T<sub>2</sub> (Desi Neem + Bhudum beth) which was statistically identical to 4.180 cm respectively in C<sub>4</sub>T<sub>2</sub>(Desi Neem + Golla beth). At 24 MAP, significantly the lowest base girth was found 4.603 cm respectively in C<sub>1</sub>T<sub>2</sub> (Deshi neem + Bhudum beth), this value was statistically similar to 4.80 cm, respectively in C<sub>4</sub>T<sub>2</sub>.

**Effect of lower storey crop production (Cane) on the growth performance of MPTs:**

**Plant height:** Plant height (m) at different month after planting was significantly influenced by different storey combinations (okra and cane; Table 3). Significantly, the tallest plant at 33 and 36 MAP were recorded 6.30 m and 6.69 m in T<sub>3</sub> (Eucalyptus in multistorey), respectively which were statistically identical with T<sub>0</sub> (Eucalyptus in open field). At 33 and 36 MAP, the significant shortest plants were 3.54 and 3.88 m in T<sub>5</sub> (Deshi neem in open field).

**Table 3.** Effect of different cane species on the plant height and base girth of different tree species

Tree species	Plant height (cm ) at		Base girth (cm) at	
	33 MAP	36 MAP	33 MAP	36 MAP
T <sub>1</sub> (Mehogany in multistorey)	4.930b	5.320b	25.17a	25.60a
T <sub>2</sub> (Deshi neem in multistorey)	4.552b	4.938b	18.00b	18.15b
T <sub>3</sub> (Eucalyptus in multistorey)	6.300a	6.690a	21.05b	21.69ab
T <sub>4</sub> (Mehogany in open field)	3.92b	4.29b	23.56a	24.44a
T <sub>5</sub> (Deshi neem in open field)	3.54b	3.88b	16.39b	17.15b
T <sub>6</sub> (Eucalyptus in open field)	5.27a	5.61a	19.44b	20.33b
Level of sig.	*	*	**	*

\*\* 1% level of significance \* 5% level of significance MAP= Month After Planting

**Table 4.** Effect of lower storey crop production on the bole girth and GBH (girth at breast height) of different cane species

Treatment	Bole girth (cm)		GBH (m)	
	33 MAP	36 MAP	33 MAP	36 MAP
T <sub>1</sub> (Mehogany in multistorey)	14.75b	17.16b	2.563b	3.043b
T <sub>2</sub> (Deshi neem in multistorey)	11.98c	13.05c	2.273b	2.555c
T <sub>3</sub> (Eucalyptus in multistorey)	18.00a	20.71a	3.075a	3.820a
T <sub>4</sub> (Mehogany in open field)	11.75c	15.1c	2.1d	2.68c
T <sub>5</sub> (Deshi neem in open field)	8.9d	11.5d	1.91e	2.1e
T <sub>4</sub> (Eucalyptus in open field)	15.0b	18.17b	2.5b	3.4b
Level of sig.	**	**	**	**

\*\* 1% level of significance \* 5% level of significance MAP= Month After Planting

**Base girth:** Significantly, the biggest base girth (cm) at 33 MAP was recorded 25.17 cm in T<sub>1</sub> (Mehogany in multistorey; Table 3). The significant smallest base girth at 33 MAP was found 16.39 cm in T<sub>5</sub> (Deshi neem in open field), which was statistically similar to that of T<sub>2</sub> and T<sub>3</sub> (Deshi neem and Eucalyptus in multistorey). Significantly, the biggest base girth at 36 MAP was recorded 25.60 cm in T<sub>1</sub> (Mehogany in multistorey), which was statistically identical to T<sub>3</sub> (Eucalyptus in multistorey). At 36 MAP, the smallest base girth was 17.15 cm in T<sub>5</sub> (Deshi neem in open field) which was statistically similar with T<sub>2</sub> (Deshi neem in multistorey) and T<sub>6</sub> (Eucalyptus in open field).

**Bole girth:** Significantly, the biggest bole girth (cm) at 33 and 36 MAPS were recorded at 18.00 and 20.71 cm respectively in T<sub>3</sub> (Eucalyptus). The significant smallest bole girth at 33 and 36 MAP were recorded 8.9 and 11.5 cm, respectively in T<sub>5</sub> (Deshi neem in open field) (Table 4).

**Girth at breast height:** Significantly, the highest girth at breast height (m) at 33 and 36 MAPs were recorded at 3.075 and 3.82 m, respectively in T<sub>3</sub> (Eucalyptus in

multistorey). The significant lowest girth at breast height at 33 and 36 MAPs were found 1.91 and 2.1 m, respectively in T<sub>5</sub> (Deshi neem in open field) (Table 4).

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