INCREASING THE INCOME OF FARMERS BY CHANGING THE ROTATION OF FARM GROWN *BOMBAX CEIBA* (SIMAL) IN CENTRAL PUNJAB, PAKISTAN

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Abstract

This study was carried out with the objective to determine whether income of farmers may be enhanced by changing the rotation of *Bombax ceiba* (simal) trees. This study was conducted in Tehsil Samundri (District Faisalabad), Punjab, Pakistan in the year 2022-23. 10 villages were randomly selected from Tehsil Samundri. 270 trees of *Bombax ceiba* were selected from these 10 villages. The minimum age of trees was 1 year and maximum age was 9 years. The price of standing trees was inquired from the farmer and noted. It was found that average price of 2, 4, 5 and 9 years old trees was Rs. 3506.67, 4496.67, 5743.33 and 11660 respectively. Discounting was carried out at discount rate of 22% set by the state bank of Pakistan for the year 2022-23. Different rotations were tested viz. 9 years, (5+4=9 years), (4+ 5 = 9 years) and (3+3+3=9 years). Net present worth was Rs. 1939.23, 2864.83, 2977.13 and 4215.16 at above mentioned rotations respectively. The NPW for cultivation of *B. ceiba* trees was highly positive in call rotation options. But it was maximum at fourth rotation (3+3+3=9 years). Sensitivity analysis was carried out. The NPW was Rs.4213.64 and Rs. 4199.97 by increasing costs by 10 and 100% respectively, at (3+3+3=9 years) rotation. The NPW was Rs. 3790.605 and Rs. 2098.47 by decreasing benefits by 10% and 50% respectively at above mentioned rotation. Which indicates that cultivation of

B. ceiba is highly profitable even if costs are increased by 100% or profit is decreased by 50%. Fourth rotation (3+3+3=9 years) was found to be the most profitable rotation with NPW of Rs. 4215.16. So, farmers are recommended to cultivate this tree on their farmlands, at 3 years continuous rotations, to get maximum profit.

Keywords: Farmer's income, Costs, Benefits, Net Present Worth, Rotation, *Bombax ceiba*.

1. INTRODUCTION

Cultivation of trees on farmlands is a very old profession/business all over the world especially in developing countries. In Pakistan too, farmers grow trees on their farmlands to get additional income. Various trees are grown on the farmlands in Pakistan including *Populus deltoides, Dalbergia sissoo, Vachellia nilotica, Eucalyptus camaldulensis, Bombax ceiba* and many other commercially important trees. Farmers usually prefer to gow fast growing tree species on their farmlands. Farmers of Faisalabad District grow *Bombax ceiba* (simal) on large scale. A large number of *B. ceiba* trees can be seen on the farmlands of Faisalabad including Samundri Tehsil.

Scientists in various countries have calculated economic rotations of various tree species growing in forests and farmlands as well. In Pakistan, information/data on economic rotation of farm trees (even the commonly growing commercial trees) is very limitedly available. There is a need to calculate and compare economic returns obtained at various rotations of different tree species especially farm trees as farm forestry is the most productive forestry type of Pakistan.

A lot of search was carried out to find data/information about economics of farm grown *Bombax ceiba* in Pakistan but no scientific data/research was available on electronic media (internet). So available literature on various other tree species was reviewed for providing a strong base to carry out the present research work. The review of available data/research work is discussed below briefly.

(Younas *et al*., 2014) stated that growing of *Dalbergia sissoo* at a rotation of 8 years for fuel wood production and at 12 to 13 years for timber production was economically best

in various areas of Bangladesh. Maximum net present worth (NPW), benefit cost ration (BCR) and internal rate of return (IRR) was obtained at these rotations.

(Hossain *et. al*. 2015) calculated the economic rotation of *Dalbergia sissoo*. He described that rotation of 5 years for fuelwood production and 14-15 years for timber production was economically best. BCR was 6.57 of *Dalbergia* plantations while NPW was 6395599 Bangladeshi Tikkas per hectare. While Return on investment (ROI) was 85%. On the other hand, biological rotation (on the basis of average annual increment) of *Dalbergia* was found to be 6 years for fuelwood production and 10-13 years for timber production.

Jalota and Sanga (2000) calculated the economic rotation of *Dalbergia sissoo* plantations in northern India. Various products of the tree such as timber, fuelwood and forage etc were economically analyzed . It was noted that *Dalbergia* plantations older than 20 years were eoncomically more suitable for timber production. However, total net present worth per hectare for 25 years rotation was 13.40 million Rs. It was noted that economic returns from 13 years old plantation were far less and unacceptable as compared to 25 years old plantation.

(Roja and Zeller, 2005) calculated economic rotation of a broad leaved forest. At a rotation of 20 years, NPW was 860 dollars per hectare. While at rotation of 10 years it was 2086 dollars per hectare. NPW increased significantly when rotation was reduced by one half period period (10 years instead of 20 years).

(Ayyaz *et. al.,* 2014) carried out economic evaluation of an angiospermic tree plantation. NPW was Rs. 52,11,669 per hectare at 21 years rotation. It increased to Rs. 74,49,253 when 21 years rotation was divided into three rotations, each of 7 years.

(Anjum *et al.,* 2017) compared various rotations of D. sissoo to know the best and most rewarding rotation in Khushab, Pakistan. Three rotations were tested with same total life span of 15 years. It included a single rotation of 15 years. Second rotation consisted of two consecutive rotations, first of 10 years and second of 5 years (total period 10+5= 15 years). Third rotation consisted of three consecutive rotations of each 5 years, with total span of 15 years (5+5+5=15). BCR, NPW and ROI was used as economic indicators. The second rotation (10+5=15 years) was most profitable with NPW of Rs. 2519.82. second best rotation was 15 years single rotation having NPW of Rs. 2039.05. And last best rotation was third rotation (5+5+5 = 15 years) with a NPW of Rs. 1578.92.

(Upadhychy, 2020) carried out financial evaluation of a tree plantation of Teak (*Tectona grandis*). NPW was Rs. 2357,981 per hectare at a rotation of 35 years.

(Anjum *et al*,.2011) economically evaluated Kamalia plantation in Pakistan. NPW of whole plantation was 0.014 million per hectare and ROI was -89.15%.

(Khafagi, 2021) economically evaluated a plantation of *Cordia Myxa*, a hardwood tree species. NPW was 102.47 mexican pesos and BCR was 2.11 per hectare when the rotation was 40 years. On the other hand, when rotation was increased to 60 years, NPW became 265 mexican pesos and BCR to 5.61.

(Korena, 2022) described that economic rotation is calculated by taking into account the monetary value of timber, fuelwood, forage and other forest products produced by the forest/tree. Cost of establishment and management of forest are also taken into account. Moreover, interest/discount rate has a very key role in determining the economic rotation of a tree species.

(Holusova, 2021) described that determining the economic/financial rotation of trees has become very important in all European countries especially Czech republic and Slovak republic and also in other developed non-European countries. Economic as well as biological rotation of a number of tree species has already been calculated/ determined in both republics but still there are many plantations/ forest stands for which economic rotation has yet to be calculated.

(Stokland, 2021) reported that while calculating biological rotation of trees, production of biomass in a certain period of time is taken into account. But this type of rotation does not describe that how much financial returns will be received from a forest in a specific period of time. To calculate financial returns, the only way is to calculate/ determine the economic rotation of trees/ forest stands.

It may be assumed that the income from a particular tree species can be increased by changing (increasing or decreasing) the rotation of that tree. So present research was carried out to know the potential of *Bombax ceiba* (simal) to enhance the income of farmers by changing its rotation. As described above, *Bombax ceiba* is a fast growing tree cultivated on large scale in Punjab especially central Punjab, by the farmers, on their farmlands. Its wood is a general purpose timber using for making a number of products/items including plywood,

packing crates for fruits, match sticks and as poles for shuttering etc. keeping in view these facts, *B. ceiba* was selected for present study.

2. MATERIALS AND METHODS

2.1. Selection of Trees and data collection

This study was carried out in 2022-23. 10 villages of tehsil Samundri (District Faisalabad), Punjab were randomly selected. Preliminary, visit to the farmlands of three villages was made. The age of *B. ceiba* trees growing in the agricultural fields was inquired from the farmers. It was observed that trees of 1 to 9 years were growing on the farmlands. Above 9 years age, no tree was found. Then from all (10 villages), 30 trees belonging to each age year, from 1 to 9 years were selected. The price of each tree was inquired from the farmer and noted. In this way, a total of (30 x 9 = 270) trees were assessed. It was seen that trees of 1 year age were too small and not suitable for selling. So, data of 1 year old trees was excluded from the study (Dong *et al*., 2013).

2.2. Discounting

The data was tabulated, organized and discounting was carried out at 22% discount/interest rate (Anonymous, 2023). The discount factor was calculated by sing the following formula:

Discount factor = $(1/1+i)^{n}$

Where: i = discount rate/interest rate

And n = number of year (1 for first year, 2 for second year and so on.)

2.3. Net present worth (NPW)

NPW was used as criteria for economic evaluation of the project. The values of cost and benefit streams was multiplied with their respective discount rates to calculate net present

worth (NPW). If NPW is positive, the business/project is acceptable and vice versa (Barkley, 2018).

3. RESULTS

3.1. Price of Trees

The average price of 2 years old trees was found to be Rs.3506.67 and that of 3 years old was Rs. 4143.33 (Table-1). The price of 4 and 5 years old tree was Rs. 4496.67 and Rs.5743.33 respectively. The average Price of 9 years old trees was Rs. 11660.

3.2. (9 years) rotation

The present worth of costs (pw costs) at 9 years rotation was Rs.8.19 while present worth of benefits (pw benefits) was Rs. 1947.42. Net present worth was Rs. 1939.23.

3.3 (5 + 4 = 9 years) rotation

The pw costs at (5 + 4 = 9 years) rotation was found to be Rs. 11.88 and that of benefits was Rs. 2876.04. NPW was found to be Rs. 2864.82

3.4 (4 + 5 = 9 years) rotation

The pw costs at (4 + 5 = 9 years) rotation was found to be Rs. 11.88 and that of benefits was Rs. 2989.03. NPW was found to be Rs. 2977.13

3.5. (3 + 3 + 3 = 9 years) rotation

The present worth of costs at a rotation of (3 + 3 + 3 = 9 years) rotation was found to be Rs.15.18 and that of benefits was Rs. 4230.34. NPW was found to be Rs. 4215.15

3.6. Economic comparison of various rotations of *Bombax ceiba*

At 9 years rotation, net present worth was 1939.23. It increased to 2864.83 at rotation of 5+4= 9 years. It again increased to Rs. 2977.13 at rotation of 4+5= 9 years. It further increased to Rs. 4215.16 at rotation of 3+3+3 = 9 years.

Table: 1: Price of trees of *Bombax ceiba* (Simal) of Various Ages

	Age	Price	Age	Price	Age	Price	Age	Price	Age	Price	Age	Price	Age	Price	Age	Price
	Years	Rs.	Years	Rs.	Years	Rs.	Years	Rs.	Years	Rs.	Years	Rs.	Years	Rs.	Years	Rs.
1.	2	4500	3	3000	4	4400	5	5700	6	6900	7	7800	8	8800	9	
2.	2	2500	3	5200	4	4200	5	5400	6	7100	7	8200	8	9500	9	11000
3.	2	3500	3	4900	4	4800	5	5000	6	7300	7	7500	8	9300	9	11400
4.	2	3900	3	3900	4	5500	5	5800	6	6500	7	7900	8	10000	9	12600
5.	2	4200	3	4400	4	5000	5	5700	6	7000	7	8000	8	10500	9	11500
6.	2	3300	3	5000	4	4000	5	6000	6	7100	7	8300	8	9600	9	11900
7.	2	2800	3	3800	4	3900	5	5100	6	6500	7	7800	8	9400	9	12000
8.	2	4100	3	4200	4	4200	5	6300	6	7400	7	8300	8	9800	9	12600
9.	2	2900	3	4900	4	4800	5	6200	6	6800	7	7500	8	8700	9	13200
10.	2	3400	3	4200	4	4600	5	6300	6	7000	7	8000	8	9900	9	12500
11.	2	3500	3	4500	4	5000	5	6100	6	6800	7	8500	8	8600	9	11000
12.	2	2700	3	4300	4	4800	5	5500	6	6700	7	7800	8	9700	9	12500
13.	2	3300	3	3800	4	4400	5	5700	6	7200	7	8500	8	8800	9	11900
14.	2	3600	3	4700	4	5000	5	5400	6	6800	7	8200	8	9200	9	12700
15.	2	3100	3	3500	4	4100	5	5100	6	6900	7	9000	8	8900	9	13000
16.	2	3000	3	3800	4	4200	5	6400	6	6400	7	8400	8	9400	9	11600
17.	2	3600	3	3900	4	4200	5	5700	6	6500	7	7700	8	9900	9	11800
18.	2	3200	3	4500	4	4800	5	6300	6	7000	7	7900	8	8500	9	12400
19.	2	3300	3	4200	4	4600	5	6100	6	7200	7	8100	8	9000	9	11900
20.	2	3500	3	4300	4	5000	5	5800	6	6100	7	8200	8	8700	9	10800
21.	2	3000	3	3900	4	4400	5	6200	6	7500	7	7800	8	10200	9	12600
22.	2	4200	3	4000	4	4000	5	5900	6	6500	7	8700	8	9700	9	11900
23.	2	3400	3	4100	4	4200	5	5900	6	6700	7	8500	8	9600	9	12300
24.	2	4200	3	3800	4	4500	5	6200	6	6200	7	7800	8	10000	9	11000
25.	2	3800	3	3600	4	4900	5	4900	6	6400	7	8600	8	9800	9	11000
26.	2	4400	3	4100	4	4800	5	5700	6	7100	7	8100	8	9200	9	12500
27.	2	4500	3	3900	4	3900	5	5200	6	6800	7	7900	8	8800	9	13200
28.	2	3500	3	3600	4	4100	5	5800	6	6300	7	8500	8	10200	9	11600
29.	2	3200	3	4200	4	4400	5	5500	6	6200	7	8600	8	10000	9	13000
30.	2	3100	3	4100	4	4200	5	5400	6	6900	7	8700	8	9800	9	12400
31.	**Average**	**3506.67**		**4143.33**		**4496.67**		**5743.33**		**6793.33**		**8160**		**9450**		**11660**

Table:2 **Age, Cost, Benefits, Present worth of costs and benefits of *Bombax ceiba* (Simal) at a rotation of 9 years**

Age (Years)	Cost(Rs.)	Benefits (Rs.)	D.F.	PW costs (Rs.)	PW benefits (Rs.)
1	**10**	0	0.819	8.19	0
2	0	0	0.671	0	0
3	0	0	0.551	0	0
4	0	0	0.451	0	0
5	0	0	0.369	0	0
6	0	0	0.303	0	0
7	0	0	0.248	0	0
8	0	0	0.203	0	0
9	0	**11660**	0.167	**8.19**	**1947.42**
NPW (Rs.) = 1939.23					

Table:3 **Age, Cost, Benefits, Present worth of costs and benefits of *Bombax ceiba* (Simal) at a rotation of 5+4 = 9 years**

Age (Years)	Cost(Rs.)	Benefits (Rs.)	D.F.	PW costs (Rs.)	PW benefits (Rs.)
1	**10**	0	0.819	8.19	0
2	0	0	0.671	0	0
3	0	0	0.550	0	0
4	0	0	0.451	0	0
5	0	5743.33	0.369	0	2125.02
6	10	0	0.303	3.03	0
7	0	0	0.248	0	0
8	0	0	0.203	0	0
9	0	4496.67	0.167	0	751.02
Total =				**11.22**	**2876.04**
NPW (Rs.) = 2864.83					

Table:4 **Age, Cost, Benefits, Present worth of costs and benefits of *Bombax ceiba* (Simal) at a rotation of 4+5 = 9 years**

Age (Years)	Cost(Rs.)	Benefits (Rs.)	D.F.	PW costs (Rs.)	PW benefits (Rs.)
1	10	0	0.819	8.19	
2	0	0	0.671	0	
3	0	0	0.550	0	
4	0	4496.67	0.451	0	2029.79
5	10	0	0.369	3.69	
6	0	10	0.303	0	
7	0	0	0.248	0	
8	0	0	0.203	0	
9	0	5743.33	0.167	0	959.23
Total =				**11.88**	**2989.028**
NPW= 2977.13					

Table:5: Age, Cost, Benefits, Present worth of costs and benefits of *Bombax ceiba* (Simal) at a rotation of 3+3+3 = 9 years

Age (Years)	Cost(Rs.)	Benefits (Rs.)	D.F.	PW costs (Rs.)	PW benefits (Rs.)
1	**10**	**0**	0.819	8.19	0
2	0	0	0.671	0	0
3	0	4143.33	0.551	0	2281.76
4	10	0	0.451	4.51	0
5	0	0	0.369	0	0
6	0	4143.33	0.303	0	1256.58
7	10	0	0.248	2.48	0
8	0	0	0.203	0	0
9	0	4143.33	0.167	0	692
Total=				**15.18**	**4230.34**
NPW (Rs.)=				**4215.15**	

Table: 6: Economic comparison of various rotations of *Bambax ceiba* (Simal)

Rotation (Years)	Present worth of costs (Rs.)	Present worth of benefits (Rs.)	Net Present Worth (Rs.)
9 years	8.19	1947.42	1939.23
5+4 = 9 years	11.22	2876.05	2864.83
4+5 = 9 years	11.89	2989.02	2977.13
3+3+3=9 years	15.19	4230.35	4215.16

3.7. Sensitivity analysis of various rotations of *Bombax ceiba*

The sensitivity analysis of *Bomax ceiba* at various rotations by increasing costs by 10, 20, 30, 40, 50 and 100% is shown in talbe-7.

3.8. By increasing costs by 10%

By increasing costs by 10%, at 9 years rotation, the pw cost became Rs.9.1 and NPW became Rs. 1938.32.

3.9. By increasing costs by 20%

By increasing costs by 20% at the same rotation, pw cost became 9.828 and the NPW became Rs. 1937.59.

3.10. By increasing costs by 30%

By increasing costs by 30 %, at 9 years rotation, pw cost became Rs. 10.647 and NPW reduced to Rs. 1936.77.

3.11. By increasing costs by 40%

By increasing costs by 40 %, at 9 years rotation, pw cost increased to Rs. 11.466 and NPW reduced to Rs. 1935.954.

. 3.12. By increasing costs by 50%

By increasing costs by 50 %, at 9 years rotation, pw cost increased to Rs. 12.285 and NPW reduced to Rs. 1935.135.

3.13. By increasing costs by 100%

By increasing costs by 100 % at 9 years rotation, pw cost increased to Rs. 16.38 and NPW reduced to Rs. 1931.04.

The sensitivity analysis of *Bomax ceiba*, at various rotations, by decreasing benefits by 10, 20, 30, 40 and 50 % is shown in talbe-8.

3.14. By decreasing benefits by 10%

By decreasing benefits by 10%, at 9 years rotation, the present worth of benefits became Rs. 1752.678 and NPW became Rs. 1743.578.

3.15. By decreasing benefits by 20%

By decreasing benefits by 20%, at 9 years rotation, the present worth of benefits became Rs. 1557.94 and NPW became Rs. 1549.

3.16. By decreasing benefits by 30%

By decreasing benefits by 30%, at 9 years rotation, the present worth of benefits became Rs. 1363.194 and NPW became Rs. 1354.094..

3.17. By decreasing benefits by 40%

By decreasing benefits by 40%, at 9 years rotation, the present worth of benefits became Rs. 1168.45 and NPW became Rs. 1159.35

3.18. By decreasing benefits by 50%

By decreasing benefits by 50%, at 9 years rotation, the present worth of benefits became Rs. 973.71 and NPW became Rs. 964.61

Table: 7: Sensitivity analysis of different rotations of *Bombax ceiba* by increasing costs by 10, 20, 30 , 40, 50 and 100%

By increasing costs by 10%			
Rotation	**PW Costs (Rs.)**	**PW Benefits (Rs.)**	**NPW (Rs.)**
9 years	9.1	1947.42	1938.32
5+4 = 9 years	12.34	2876.05	2863.71
4+5 = 9 years	13.1	2989.02	2975.92
3+3+3=9 years	16.71	4230.35	4213.64
By increasing costs by 20%			
9 years	9.828	1947.42	1937.592
5+4 = 9 years	13.464	2876.05	2862.586
4+5 = 9 years	14.268	2989.02	2974.752
3+3+3=9 years	18.228	4230.35	4212.122
By increasing costs by 30%			
9 years	10.647	1947.42	1936.773
5+4 = 9 years	14.586	2876.05	2861.464
4+5 = 9 years	15.457	2989.02	2973.563
3+3+3=9 years	19.747	4230.35	4210.603
By increasing costs by 40%			
9 years	11.466	1947.42	1935.954
5+4 = 9 years	15.708	2876.05	2860.342
4+5 = 9 years	16.646	2989.02	2972.374
3+3+3=9 years	21.266	4230.35	4209.084
By increasing costs by 50%			
9 years	12.285	1947.42	1935.135
5+4 = 9 years	16.83	2876.05	2859.22
4+5 = 9 years	17.835	2989.02	2971.185
3+3+3=9 years	22.785	4230.35	4207.565
By increasing costs by 100%			
9 years	16.38	1947.42	1931.04
5+4 = 9 years	22.44	2876.05	2853.61
4+5 = 9 years	23.78	2989.02	2965.24
3+3+3=9 years	30.38	4230.35	4199.97

Table: 8: Sensitivity analysis of different rotations of *Bombax ceiba* by decreasing benefits by 10, 20, 30, 40, and 50%

By decreasing benefits by 10%			
Rotation	**PW Costs (Rs.)**	**PW Benefits (Rs.)**	**NPW (Rs.)**
9 years	9.1	1752.678	1743.578
5+4 = 9 years	12.34	2588.445	2576.105
4+5 = 9 years	13.1	2690.118	2677.018
3+3+3=9 years	16.71	3807.315	3790.605
By decreasing benefits by 20%			
9 years	9.1	1557.94	1549
5+4 = 9 years	12.34	2300.84	2289
4+5 = 9 years	13.1	2391.22	2378
3+3+3=9 years	16.71	3384.28	3368
By decreasing benefits by 30%			
9 years	9.1	1363.194	1354.094
5+4 = 9 years	12.34	2013.235	2000.895
4+5 = 9 years	13.1	2092.314	2079.214
3+3+3=9 years	16.71	2961.245	2944.535
By decreasing benefits by 40%			
9 years	9.1	1168.45	1159.35
5+4 = 9 years	12.34	1725.63	1713.29
4+5 = 9 years	13.1	1793.41	1780.31
3+3+3=9 years	16.71	2538.21	2521.5
By decreasing benefits by 50%			
9 years	9.1	973.71	964.61
5+4 = 9 years	12.34	1438.025	1425.69
4+5 = 9 years	13.1	1494.51	1481.41
3+3+3=9 years	16.71	2115.175	2098.47

4. DISCUSSION

In this study, NPW was Rs. 1939.23 at rotation of 9 years. It was Rs.2864.83 at rotation of 5+4=9 years. On rotation of 4+5=9 years, NPW was Rs.2977.13 and at rotation of

3+3+3=9 years, it was Rs.4215.16. It is evident that NPW was lowest at rotation of 9 years and it gradually increased as rotation decreased. It was highest at rotation of 3+3+3=9 years. Sometimes, NPW increases as rotation of tree/tree crop increases and sometimes, it decreases as rotation increases (Nakajima, *et al.*, 2017). The reason may be that 9 years is relatively a longer period. Due to low value of Pakistani currency and high interest/discount rate, the NPW decreases because trees take too long to become mature and salable (Ayyaz *et. al.*, 2014). In the second rotation option (5+4=9), NPW increased because the first sale of tree/tree products was relatively early (after short period of time i. e. 5 years). The same trend continued in third and fourth rotation options. It means, early harvest leads to more income and late harvest leads to low income. These results are in line with the findings of (Roja and Zeller, 2005) who reported that economic rotation of a broad leaved forest was 860 Dollars at 20 years rotation. When rotation was reduced to 10 years, NPW increased to 2086 Dollars. These results are also confirmed by the findings of (Ayyaz *et. al.*, 2014) who reported that NPW of a hardwood forest was Rs. 52,11,669 per hectare at rotation of 21 years. When 21 years rotation was converted into three shorter rotations, each of 7 years, total Net income (NPW) after 21 years became Rs.74,49,253. It means that by reducing the rotation by 1/3rd, the income increased by Rs.2237584 (44.94%).

Sensitivity analysis showed that by increasing costs by 10%, the NPW became Rs. 4213.64 at rotation of (3+3+3=9years). It further decreased minutely by increasing costs by 20%, 30%, 40%, 50% and even by 100%. The difference of NPW, at rotation of (3+3+3=9years) by increasing costs by 10% and 100% is only Rs.4.56 which is negligible. On the other hand, the difference of NPW at same rotation, by decreasing benefits by 10% and 100% is Rs.1269.11. Which seems to be somewhat significant/prominent. But NPW is still positive which indicates that cultivation of *Bombax ceiba* is very profitable and there is almost no threat, of huge economic loss, in any case. These results are in line with the

findings of (Anjum *et. al.*, 2017) who found that cultivation of *Dalbergia sissoo* trees was very profitable even if costs were increased 10 to 20% and benefits were decreased by 10 to 20%. In both cases the NPW was found to be positive.

5. CONCLUSION

It is concluded from this research work that growing of *Bambax ceiba* on farmlands is a profitable business. Although at all rotations, of 3 to 9 years, the NPW is positive and economic return form *B.ceiba* is prominently high. But consecutive rotations of three years each are more profitable. Moreover, there is no risk of economic loss in this deal either in case the costs are significantly increased or benefits/income is prominently decreased. The farmer will get handsome income in all possible scenarios. So, farmers are recommended to grow *B.ceiba* trees on their farmlands at consecutive rotations of 3 years each.

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7. CONFLICT OF INTEREST

There is no conflict of interest among the authors.

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