

# EFFECT OF FOREST VS FRUIT TREES ON WHEAT CROP

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## Introduction

Farmers are growing fruit trees with ~~their~~ agricultural crops since the time immemorial. They hesitate to grow forest trees on their farms as they think them less beneficial and more harmful to farm crops than fruit trees. Although fruits give direct satisfaction to the consumers but wood with several other important utilities has an unavoidable use of cooking food for human life.

Due to fast growing population, wood is becoming a scarce commodity in Pakistan. Productive land is also becoming short due to essential colonization for excessive population. Moreover, to feed this increasing population, more and more land is being put under food production. The above situation leaves no way to increase the area under wood production. So, to cater for wood demand in the country, there exists no alternative except the immediate adoption of agroforestry (Rashid & Hafeez, 1991).

The present study was conducted primarily to determine the economics of wheat crop with Forest vs Fruit trees and also to remove the fears of negative impact of forest trees on agricultural crops from the minds of the farmers for sound agroforestry base.

## Methodology

Data were collected from a farmer's field in T.T. Singh district where wheat crop (PAK-81) had been already grown in combination with Shisham and Mahgo tree rows in east-west direction. Samples were taken on southern side of the rows with Quadrat of 1 m<sup>2</sup>. In the wheat plot having dimension of 33.5 m x 60.4 m (110' x 198') for each tree species, a distance of 10.7 m (35') was left on both sides of the plot as surround. A set of eleven wheat samples with 2 replications at 12.2 m (40') interval was collected with 3 m (10') distance interval starting from 1.22 (4') where the crop starts upto 30.5 m (100') distance from

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tree rows. Total 22 samples in each wheat plot for each tree species were collected for study. Total and grain weight of each sample alongwith age, height, dbh and crown diameter of all the shisham and mango trees were recorded. Data were collected in May, 1991.

## Results and Discussion

### A. Estimated production function

Quadratic production function was used for economic analysis. The estimated production equations for shisham and mango expressing total and grain yield of wheat as a function of distance from the above mentioned tree species are given in Table 1.

An examination of the coefficients of the production equations for grain production revealed the values of  $R^2$  to be 0.20 and 0.85 implying thereby that the independent variable i.e., distance explained about 20 percent and 85 percent of the total variation in grain yield due to shisham and mango respectively. Likewise, the coefficients of the production equation for total production with the values of  $R^2$  as 0.49 and 0.56 explained about 49 percent and 56 percent of the total variation in total yield due to shisham and mango respectively. Moreover, regression equation for the combined effect of shisham rows with 2.431 F-value showed non-significant effect (at 0.1 probability) on grain yield (Subhan, 1990).

Regression coefficients for both the linear and quadratic terms of the independent variable have the signs which were expected according to economic theory i.e., linear terms have positive while quadratic have negative signs (Ahmad & Afzal, 1986). Regression coefficients for the effect of shisham rows on grain production with the values of 2.565 and -0.020 for linear and quadratic terms respectively came to be nonsignificant (at 0.05 probability) while for the effect of mango rows, the co-efficients with the values of 8.890 and -0.068 were highly significant. For the effect on total production, both the linear and quadratic terms with the values of 13.225, -0.101 and 27.772, -0.232 for shisham and mango respectively were significant at 1 percent level.

### 8. Reduction in grain and total production

Trend of reduction in grain yield due to shisham and mango trees has been shown in Table 2. This reduction was estimated through the production equations

selected. At zero distance i.e., adjacent to shisham and mango tree row(s), the reduction in grain yield was 82 and 290 gm per square meter respectively. Negative effect of shisham trees having 9 m average height was observed upto 18.29 m distance from tree rows while mango trees of the same height had average effect of grain yield upto 19.51 m distance from tree row.

Table 3 indicates 433 and 831 gm reduction per <sup>m<sup>2</sup></sup> square meter in total yield adjacent to shisham and mango tree rows(s) respectively and this negative impact of trees was noted upto 18.29 distance from shisham and 15.24 m distance from Mango rows.

### Economics

Tables 4 and 5 depict loss incurred and income added to wheat crop on per hectare basis. Farm gate prices were taken in calculating economics of agroforestry versus agro-pomology. As far as the income from shisham trees is concerned, the trees were not actually sold but the average of the prices offered by local contractors was taken as income from these trees. No doubt, this method of estimation under-estimates income from shisham trees because; firstly Shisham crop at pole stage does not fetch good price, secondly the pole stage being juvenile wood has maximum potential to grow into big trees, thirdly mature crop in successive years causing more or less equal damage to agricultural crops but generates income on geometric basis (Jafri et al. 1981). Standing sale of mango fruits was taken as income and added to agricultural crops in that year. Half of the income earned yearly from each tree species was added to wheat crop as compensation because wheat is six months duration crop.

Table 6 expresses net income added to wheat crop from shisham and mango trees. Shisham trees added 12% of total income or Rs.1235/- while causing loss upto 10% or Rs.1043/- which resulted in net addition of Rs.192/- or 2% income to wheat crop as net income per hectare. Mango trees added 14% or Rs.1705/- as total income, damaged the wheat crop upto 23% worth of Rs.2910/- to wheat crop per hectare.

Table 1. Estimated production functions

Wheat production	Tree species	Independent variable	Regression co-efficients	Standard errors	t-values	F-ratios	R <sup>2</sup> (%)	C.V. .
Grain	Shisham rows	Constant	243.336**	29.746	8.181			
		Distance (X)	2.565 <sup>NS</sup>	1.267	2.024	2.434	20.38	15.285
		(X <sup>2</sup> )	-0.020 <sup>NS</sup>	0.011	1.743			
	Mango rows	Constant	79.747**	22.053	3.604			
		Distance (X)	6.890**	0.939	9.464	53.222	49.26	13.610
		(X <sup>2</sup> )	-0.068**	0.008	8.161			
Total	Shisham rows	Constant	589.737**	78.900	7.474			
		Distance (X)	13.225**	3.361	3.935	9.222	49.26	13.610
		(X <sup>2</sup> )	-0.101**	0.030	3.385			
	Mango rows	Constant	497.025**	133.078	3.735			
		Distance (X)	27.772**	5.668	4.899	12.186	56.18	19.129
		(X <sup>2</sup> )	-0.232**	0.050	4.598			

\*\* = Significant at 1% level

NS = Non-significant at 5% level

Table 2. Trend of reduction in grain production of wheat (gms/m<sup>2</sup>)

Distance from tree rows (m)	Shisham	Mango
0	82.18	290.56
3.05	58.54	208.46
6.10	38.90	139.96
9.14	23.26	85.06
12.19	11.62	43.76
15.24	3.98	16.06
18.29	0.34	1.96
19.51	0	0.13
19.96	-	0

Table 3. Trend of reduction in total production of wheat (gms/m<sup>2</sup>)

Distance from tree rows (m)	Shisham	Mango
0	432.92	831.12
3.05	310.77	576.60
6.10	208.82	368.48
9.14	127.07	206.76
12.19	65.52	91.44
15.24	24.17	22.52
18.29	3.02	0
19.96	0	-

Table 4. Per hectare loss to wheat crop due to tree species

Tree species	Av. grain loss (kgs.)	Av. Wheat straw loss (kgs.)	Grain loss (Rs.)	Grain loss (%)	Wheat straw loss (Rs.)	Wheat straw loss (%)	Total loss (Rs.)	Total loss (%)
Shisham	273.53	1191.82	745.37	8.40	297.96	17.10	1043.33	9.83
Mango	873.27	2122.32	2379.65	23.60	530.58	22.15	2910.23	23.32

Table 5. Per hectare income added to wheat crop from tree species

Tree species	Age (yrs)	Av. dia (cm)	Av. crown dia (m)	Av. Height (m)	Av. tree to tree distance (m)	Av. row to row distance (m)	No. of trees per plot	No. of trees per ha.	Income from trees (Rs.)	Income per year (Rs.)	Income added to wheat crop (Rs.)	Income added (%)
Shisham	6	14.05	3.35	8.73	4.38	1.62	20	99	14820	2470	1235	11.64
Mango	30	61.04	7.66	8.78	8.64	-	4	20	3409	3409	1705	13.66

Table 6. Per hectare net income added to wheat crop from tree species

Tree species	Total loss incurred (Rs)	Loss (%)	Total income added (Rs)	Income (%)	Net income added (Rs.)	Net income added (%)
Shisham	1043	10	1235	12	192	2
Mango	2910	23	1705	14	-1205	(-) 9

## Conclusions

Shisham and Mango trees ~~both~~ have negative impact on wheat crop. Shisham trees have non-significant (274 kgs) while mango trees have significant (873 kgs) reduction per hectare in grain yield of wheat and both tree species have 1192 and 2122 kg significant reduction per hectare in the production of wheat straw (Bhosa) respectively. Adverse effect was observed upto the distance double the tree height for both the species. The present study showed net income of Rs.192/hectare for shisham and net loss of Rs.1205/hectare for Mango.

## References

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