
BENEFIT: COST ANALYSIS AND EFFECT OF TREES OF *ACACIA NILOTICA* GROWING IN WHEAT FIELDS

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ABSTRACT

A study was carried out in village Bheaky, District Sialkot. Forty five trees of *Acacia nilotica* were selected to determine their effect on wheat crop. All the trees varied in diameter and height and were on the southern side of the wheat field. The trees were divided into seven diameter classes i.e. D1 = 20 - 24.9 cm, D2 = 25 - 29.9 cm, D3 = 30 - 34.9 cm, D4 = 35 - 39.9 cm, D5 = 40 - 44.9 cm, D6 = 45 - 49.9 cm, D7 = 50 - 55.9 cm. Effect of *Acacia nilotica* on crop height was observed upto a distance of 11.0 m. but was statistically non-significant. Similarly the tree size did not have any significant effect on crop height. Above-ground biomass was significantly affected by the distance from the trees. *Acacia nilotica* reduced wheat biomass yield by 51.69% and grain yield by 55.10% at 1 meter distance as compared to control. The reduction in biomass and grain yield was noted upto 11 meters from the tree trunks. As far as economics is concerned, total loss of grain yield and wheat bhoosa yield was Rs.359/ha during crop growing period of six months. Whereas income from trees was Rs.1071/- hence net profit was Rs.712/- per hectare.

INTRODUCTION

Out of 87.81 million ha. the percentage of area under forests in Pakistan is just 5.2% of the land mass. The productive forests extend over only 1.5% of the country's area and provide only a fraction of the total demand for fuelwood and timber. Since the area under state forests is limited and it is not possible to increase it in near future, the emphasis must be on adopting new methods of their management and promoting agroforestry leading to increased production at low cost. This must be done intelligently and wisely in order to overcome any apprehensions in the minds of

farmers regarding negative effect of trees on their major farm crop i.e. wheat. It constitutes staple food of nearly whole of the population. Wheat is grown on an area of 7.36 m. ha. with an annual production of 13.5 m.tons. However its average yield of 1835 kg/ha is below its maximum potential (Anon, 1987).

In spite of numerous benefits from trees still there exists a controversy about the effect (harmful or useful) of trees on crops. Keeping in view the situation the present study was undertaken to investigate the effect of kikar trees on the grain and biomass yield of wheat crop.

MATERIALS AND METHODS

The proposed study was carried out in village Bheaky, District Sialkot on private farm cultivated by the owner. The area was irrigated by canal as well as tube well water. Soil was silt loam and fertile.

Forty five trees of *Acacia nilotica* were selected to see the tree effect on wheat crop. All the trees varied in diameter and height and were on the southern side of the wheat crop. Diameter at breast height (DBH) was measured with the help of a calliper. Trees were divided into seven diameter classes i.e. D1 = 20 - 24.9 cm, D2 = 25 - 29.9 cm, D3 = 30 - 34.9 cm, D4 = 35 - 39.9 cm, D5 = 40 - 44.9 cm, D6 = 45 - 49.9 cm and D7 = 50 - 54.9 cm.

The wheat variety Pak-81 was sown with a basal dose of fertilizer @ 140 kg urea and 100 kg single super phosphate (SSP). All SSP and half of urea was applied at the time of sowing, whereas remaining urea was applied with second irrigation. Four irrigations were applied during the entire growing period of the crop. All other agronomic

practices were kept normal and uniform for all the treatments.

Five samples of 1m² each were taken at the distance of 1.0, 3.5, 6.0, 8.5 and 11.0 m. from the main trunk of the trees. Sixth sample from shade-free location as a control was taken from the same field and the following parameters of wheat crop were recorded.

- i. Plant height (cm)
- ii. Above-ground biomass (gm)
- iii. Grain yield (gm)

The data were statistically analysed by using Fisher's Analysis of Variance techniques. To determine significant difference among treatment means the Duncan's New Multiple Range Test (DMR) was applied at 5% probability level.

RESULTS AND DISCUSSION

Crop height

The data of table 1 regarding the effect of *Acacia nilotica* indicated lack of any relationship between crop height and distance from tree trunk. The average crop height increased from 93.7 cm to 95.1 cm upto a distance of 11.0 meters from the tree trunk.

Data of table 2 also shows lack of any relationship, whatsoever between tree size and crop height. Further consideration of the data shows that this general pattern of lack of effect of tree size on crop height was equally true at all distances from tree trunk. The possible reason for lack of effect of tree size on crop height appears to be the close proximity of trees of various sizes, which allowed the larger trees to extend their effect on crop height laterally and thus masking the effect of smaller trees. These results confirm the findings of Aydemir (1975) and Vasil'ev (1978) while these findings are contrary to those of Sheikh and Haq (1978), Shetty et al. (1982), Khan (1984) and Lone (1989).

Total Biomass Yield

The data of table 1 indicates clearly that the total biomass yield was significantly affected by the distance from the tree trunk. Maximum biomass yield was obtained at 11.0 m. distance. The biomass yield at 1.0 m. distance was 417 gm and at 11.0 m. distance, was 863.2 gm/m². This general trend of increasing biomass yield with increasing distance from tree trunk was equally true for all size classes.

The data of table 2 did not show any clear pattern of effect of tree size on biomass yield. It was observed that larger size of 40 - 50 cm class did decrease biomass yield from 639.2 to 554.3 gm as compared to yield of all other size classes. This lack of clear pattern may be attributed to insufficiency of the data. The data confirms the results of Castellani and Prevosto (1967), Sheikh (1973), Moursi et al. (1976), Ehsan Ullah (1987) and are contrary to that of Keerio (1982).

Grain Yield

The data of table 1 regarding *Acacia nilotica* depicted clearly that distance from tree trunks have highly significant effect on grain yield of wheat crop. The grain yield reached the peak level at a distance of 11.0 m. The grain yield at 1.0 m. distance was 167.2 gm and at 11.0 m. distance was 372.4 gm.

The data of table 2 did not show any clear pattern of effect of tree size on grain yield. There was some indications that larger size (40 - 50 cm) class did decrease grain yield as compared to yield of all other size classes from 273.5 to 236.9 gm. The reduction in grain yield can be attributed to competition between tree roots and crop roots, for moisture and nutrients and casting of shade by the trees, etc. This data confirmed the results of Sheikh (1973) and Khan (1984). These results, however, are contrary to those of Sheikh and Cheema (1976).

Estimation of crop losses and cost benefit analysis with respect to wheat crop vs. *Acacia nilotica*

FIG. 1 Effect of *Acacia nilotica* on Wheat Crop
(Effect of Distance from tree on Wheat)

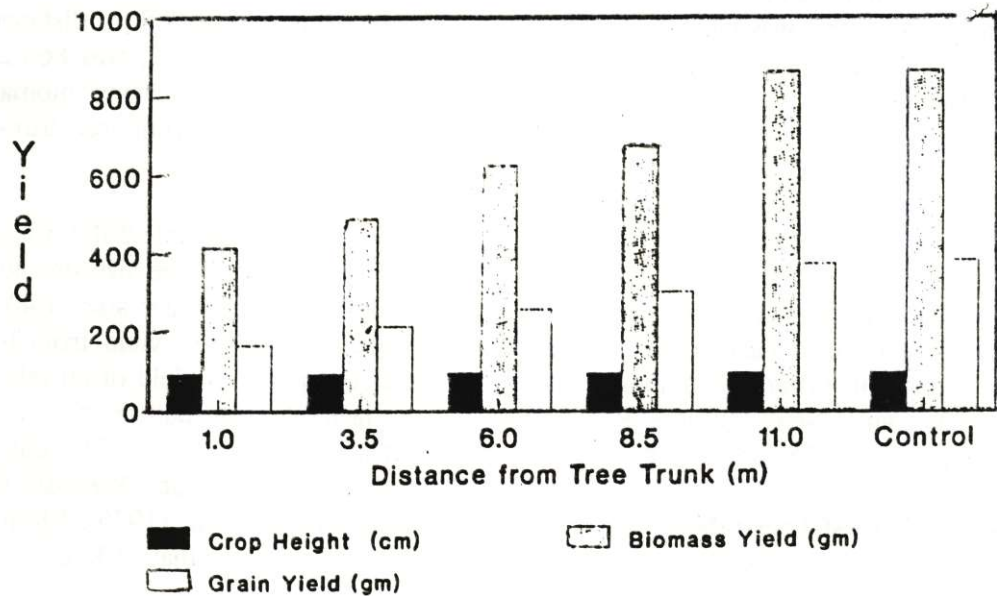
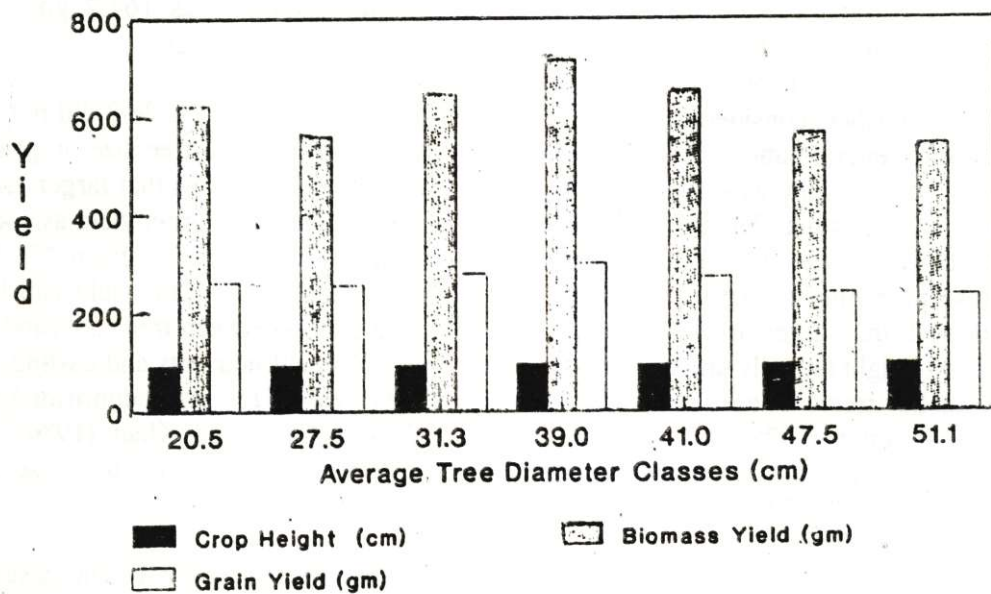


FIG. 2 Effect of *Acacia nilotica* on Wheat Crop
(Effect of Tree Size on Wheat Crop)



Losses

Farm trees growing along field boundaries generally reduce crop yield upto a distance of 11 meters. The average reduction of wheat grain yield was about 117.9 grams/meter², which is equal to 119.06 kg/ha, market value of these losses were Rs.304/ha. Similar losses for wheat bhoosa were calculated to be 135.03 kg/ha which were equal to Rs.54.45/ha. Total loss of grain yield and wheat bhoosa yield was Rs.359/ha due to *Acacia nilotica* trees during crop growth period of six months.

Profits

Based on field observations and personal enquiries from the farmers, it was estimated that 50 trees could be grown along a ha. length at a spacing of 6 feet. Upto the age of 7 years, the average expected DBH of such trees was about 13". Total price for 50 *Acacia nilotica* trees @ Rs.300 per tree in a ha. over a period of 7 years was estimated to be Rs.15000/- and half yearly price increment to match crop growth period was Rs.1071/-.

Based on above estimates, net profit of growing *Acacia nilotica* trees in wheat crop was Rs.712/- per hectare.

It can be safely concluded that planting of *Acacia nilotica* in the wheat field is a profitable practice, which should not only be maintained but should be promoted through transfer of suitable technology of basic farm tree silviculture and through improvement of marketing etc.

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Table 1. Effect of distance from tree on height, biomass yield and grain yield of wheat crop under *Acacia nilotica*.

Distance from Tree (m)	Crop height (cm)	Biomass yield (gm)	Grain yield (gm)
1.0	93.7	417.0	167.2
3.5	93.6	491.4	214.7
6.0	95.4	625.5	258.3
8.5	94.6	677.6	302.4
11.0	95.1	863.2	372.4
Control	91.2	865.0	380.9

Table 2. Effect of tree size on crop height, biomass yield and grain yield of wheat crop under *Acacia nilotica*.

Tree diameter classes (cm)	Crop height (cm)	Biomass yield (gm)	Grain yield (gm)
20.5	93.3	623.0	262.9
27.5	94.3	561.2	255.8
31.3	93.3	643.7	278.1
39.0	95.2	714.9	299.9
41.0	93.9	653.2	270.7
47.5	93.8	365.0	239.0
51.1	97.1	543.5	234.7