

ECONOMICS AND FEASIBILITY OF BAMBOO CULTIVATION ON FARMLANDS

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Introduction

Bamboos attain large size yet are the members of grass family, the Gramineae. They have sometimes been treated as a different family from the Gramineae; however most taxonomists agree to keep them in Gramineae, sub-family Bambusoideae.

Bamboos are indigenously found in all the continents except Europe. It is estimated that about 80% of the bamboo growing areas are confined in south and South-East Asia (Biswas, 1988). The tropical climate of the region is congenial to bamboo's growth and also the limiting factor for their distribution. There are as many as 70 genera and 1200 species of bamboos distributed in tropical, sub-tropical and temperate zones of five continents of the globe (Biswass, 1988).

The plant has a many jointed cylindrical hollow stems called the culms. The stems are connected to a rhizome network that spreads out horizontally beneath the soil, forming a bush known as clump. The propagation of bamboos by seed is most successful but many of the bamboos flower and seed after long intervals. Seeding cycles vary from species to species and may be 30-100 years (Banik, 1980). Due to long interseeding intervals, the propagation is done vegetatively. Bamboo cultivation by rhizome planting is the most common method applied in this country. Normally, it takes 10 years for nonclump-forming (Monopodial) types of Bamboos to reach a size suitable for harvest, but the time is shorter for the clump-forming (Sympodial) types.

Among the diseases of bamboos, bamboo blight is an important one. The blight first affects new culms but may also continue into older ones. Bamboo blight is easily recognized in the field by the presence of truncated culms which show varying degrees of die back. The disease can be controlled by cutting and removing blighted bamboos and burning of clumps in situ.

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Bamboo is called as "Poor man's timber". It has always been a material of great importance to eastern culture. Bamboos have common and economic uses for pulp and paper, constructions, basket making, bows and arrows, mats, hedges, agricultural implements, furniture, fencing, tool handles, hokkah pipes, scaffolding, ladders etc. Some of the common bamboo species planted in Pakistan are:

Scope of bamboo cultivation on farm lands

<i>Dendrocalamus</i> <i>hamiltonii</i> (Black)	<i>Dendrocalamus</i> <i>longispathus</i>
<i>Dendrocalamus giganteus</i>	<i>Dendrocalamus strictus</i> (Local)
<i>Thyrsostachys oliveri</i>	<i>Bambusa vulgaris</i> (Yellow)
<i>Bambusa arundinacea</i>	<i>Bambusa tulda</i>
<i>Bambusa nutans</i>	<i>Bambusa polymorpha</i>
<i>Arundinaria falcata</i> (Local)	<i>Phyllostachys bambusoides</i> (Green)

Bamboos play an important role in the agricultural economies of the countries like Pakistan subject to severe erosion and drought. Inter-locking bamboo rhizomes keep top soil firm in place. Bamboos growing on slopy areas and along river banks can limit destruction to agricultural crops during floods. Bamboo cultivation on marginal as well as on productive lands alongwith agricultural crops has a great potential in uplifting the socio-economic conditions of the poor farmers community.

1. Techniques of bamboo cultivation

Bamboos can be raised both by sexual and asexual means. These are described as under:

By Seed

Sexual propagation by seeds is feasible although not always practical because of the unusually prolonged flowering cycle for most species of bamboo. Seed can be collected from almost all bamboo species. The seeds are sown in bed nurseries or pots, transplanted to polythene tubes and then planted in the field.

Offset, planting

Natural propagation of bamboo is mainly asexual, in the form of branching rhizomes offsets. Offset planting is the asexual method of propagation in bamboo. The planting material for offset planting may be the culm with roots and rhizome, the stalk with roots and rhizome, or just the rhizome. The selection of the rhizome is important in any of the methods. As a rule, the younger the rhizome, the more vigour in the buds.

Culm-cutting

Culm segments 0.5 m to 1.0 m long are used for propagating bamboos. Culm-cuttings are generally placed slanting at about 45° and 7 to 15 cm deep in any rooting medium preferably coarse sand. Cuttings of a young culm is critical for obtaining successful results.

Layering

Bamboos are also propagated through layering. Layering is done mainly in the mid-culm zone but it varies from species to species. Air as well as ground layerings both are successful in bamboo propagation.

Propagation through tissue culture

The recent technique of propagation through tissue culture has been successfully employed for year round propagation programme of some plant species which are generally difficult to propagate by any conventional vegetative means. Leaves, stems, buds, etc., from complete plantlets are used as explants to develop an efficient mass propagation technique for bamboo plants through tissue culture.

Bamboos are cultivated successfully in both spring as well as monsoon seasons.

Management of bamboos

Bamboo crop should be managed on the following lines

- i. Bamboos are generally planted at the spacings of 3x3, 5x5, 6x6m

etc. Plant to plant distance varies from species to species. Variation in distance also depends upon the objective of management. If bamboo is managed as pure crop, plant to plant distance may be decreased upto 2.5m and if it is raised mixed with agricultural crops, the distance may be increased upto 6 or 9 m.

- ii. Unlike a tree, bamboo does not acquire more girth as it grows; the new sprouts emerge with full diameter. It reaches full height in 60 to 120 days. Culms are tender during first year. They grow tough during the second year and are mature during the third year. So, generally all three years old bamboo culms should be harvested.
- iii. Harvesting should preferably be done each year.
- iv. Young twisted culms should be rejected and cut so that the new culms can grow freely.
- v. No felling operation should be carried out from April to October as the culm emergence takes place with maximum intensity in this period.

Mounding or heaping earth around bamboo culms should be carried out each year before the rainy season to save the culms from standing water damage.

Bamboo crop should not be clear felled as the clear felled clumps regenerate into a bushy form. Harvesting of bamboo culms should be done under selection system wherein the culms which reach maturity are felled and the others are left standing for felling during subsequent years.

S.No.	Name of operation	Cost per acre (Rs.)	Rates and remarks
1.	Jungle clearance	250	5 collies/acre
2.	Levelling of area	100	Rs.50/hours (2 hours)
3.	Land preparation	160	Rs.40/ploughing (4 ploughings)
4.	Cost of Farm Yard Manure (F.Y.M.)	432	Rs.54/cartload (8 cartload)
5.	F.Y.M. spreading	100	2 collies/acre
6.	F.Y.M. mixing	40	Rs.40/ploughing (1 ploughing)
7.	Layout and daghbailing	100	2 collies/acre
8.	Earth work	98	Rs.150/28 m ³ and 194 pits of size 0.46m 0.45 m x 0.45 (4.5x4.5m) spacing
9.	Cost of planting stock	4850	Rs.25/-rhizomes (muddi) and 194 rhizomes
10.	Carriage of planting stock	60	L.S.
11.	Cost of planting	58	6 collies/1000 rhizomes
12.	Labour charges for irrigation	450	Rs.15/irrigation (30 irrigations) and 4 irrigations per month for 3 summer months and 2 per months for rest of the months.
13.	Weeding charges	300	6 collies/year
14.	Water charges	100	Rs.100/acre, double of the maximum water charges for agricultural crops (sugarcane)
15.	Land rent	2500	L.S.
16.	Unforeseen	200	L.S. Restocking, tying culms together, etc.
	Total Rs.	9,998	
	2nd year	Rs.3,200	(Maintenance, including labour charges for irrigation and weeding, water charges and rent)
	3rd year	Rs.3,200	Same
	4th year	Rs.3,200	Same
	5th year	Rs.3,200	Same

2. Financial Aspect

1st Year

At daily wage rate of Rs.50/-)

Cost Benefit Ratio

$$V_n = V_o (1+i)^n$$

$$V_o = \frac{V_n}{(1+i)^n}$$

Present worth of expected future cost:

V_o = Present worth/value

V_n = Future cost

i = Interest rate ($i = 10\%$)

n = Number of years

1st year Rs.9,645.00 ($n = 0$ As the amount will be spent in the start of year)

2nd year Rs.2,909.09 ($n=1$)

3rd year Rs.2,644.63 ($n=2$)

4th year Rs.2,404.21 ($n=3$)

5th year Rs.2,185.64 ($n=4$)

Present worth of expected future income:

Rs. 25,296.34 (same formula)

$$n = 5$$

(Bamboo cultivation is feasible as the ratio is more than one)

3. Economics of bamboo cultivation

Economic studies: Net benefits, tangible as well as intangible being realized by an individual/society from a project, during or at its maturity. The economics of a project is calculated in the form of net worth, commonly net present worth.

Net present worth = 5,507.77 Rs.(Benefit-cost)
per 5 years
or
Rs.1,101.55/year

Bamboo cultivation is more economical than any other agricultural crop as no agricultural crop gives so much net income/acre/year (A report published on cost of production of agricultural crops in irrigated areas of Punjab by Faculty of Economics and Rural Sociology, University of Agriculture, Faisalabad).

Conclusions

To be on safe side, the estimate has been prepared more conservatively than the actual. In addition to this, agricultural crops may also be raised mixed with bamboo crop at least for first two years which would contribute additional returns from the same piece of land without or with nominal additional cost. In fact, cost of bamboo cultivation would be recovered from the sale of agricultural produce during first two or three years. Moreover, the bamboo crop would be yielding revenue continuously every year after first harvest till its maturity, on the same initial investment cost. Bamboo cultivation on farmlands is, therefore, very much feasible technically, financially as well as economically.

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