



Bael: A Highly Remunerative Fruit for Chambal Ravines

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Bael has been proved to be the most suitable fruit in Chambal ravine lands. Looking to its remunerative values, medicinal and nutritional qualities and processing prospects, this fruit requires to be encouraged under degraded and ravine area of the country. The greatest quality of this fruit crop is to grow in such a soil where no other fruits can grow and has capacity to grow purely as a rainfed crop and fits well under hortipastoral system.

Introduction

India is the second largest producer of fruits in the world after surpassing the nearest competitor China in term of fruits production. Still the per capita fruit availability in India is 40 g per day against the ICMR recommendation of a minimum 120 g fruits per capita per day. The fruit production in India can be increased either by increasing new area under horticulture or by increasing the productivity of existing fruit plantations. As there is little opportunity for increasing the area under horticulture in arable lands, we have to look at the opportunities for optimum utilization of degraded lands by bringing them under horticulture. With the increasing demographic pressure degraded lands like ravines might prove to be optimum sites for this use. Rajasthan is estimated to have 452000 ha of ravine lands and thus account for about 12.5% of the total ravinous area in the country. Almost 34.14% of these ravines are infested by medium deep gullies while 33.26% area of ravines is occupied by deep gullies. These areas can scarcely be cultivated as slopes are quite high. But the possibilities of development of fruit crops exist in these areas and evaluation of various fruit species for



economic utilization of ravines needs to be attempted. The farmers holding existing degraded lands specially ravines may not be able to support the high input management system required for prominent horticultural fruits. This necessitates the exploration of the possibilities for introducing less exploited underutilized fruits that are hardy and may provide optimum results in very harsh climatic condition. Bael has been proved to be the most suitable fruit in terms of nutritive value as well as economics for Chambal ravine lands. Looking to its remunerative values, medicinal and nutritional qualities and processing prospects, this fruit requires to be encouraged under degraded and ravine area of our country. The greatest quality of this fruit crop is to grow in such soils where no other fruits can grow and has capacity to grow purely as a rainfed crop as well as hortipastoral system. Recently established Horticulture mission has also emphasized the need for popularizing/commercializing the underutilized fruits for nutritional security of growing population.

Nutritive Value

Bael fruit is a highly nutritious. It has untapped source of nutritive values. It contains water, protein, fat, minerals, carbohydrates, carotene, thiamine, riboflavin, niacin, vitamin C, etc.

Table 1: Nutritive values of bael fruit (per 100g of edible fruit pulp)

Nutrients	Values (quantities)
Water	61.5 g
Protein	1.80 g
Fat	0.39 g
Fibre	2.90 g
Minerals	1.70 g
Carbohydrates	31.80 g
Carotene	55.00 mg
Calcium	85.00 mg
Iron	0.60 mg
Thiamine	0.13 mg
Riboflavin	0.03 mg
Niacin	1.1 mg
Ascorbic acid	65-100 mg
Acidity	0.25-0.36%
Viscosity	12.7-19.0%

Climate

The bael trees grow successfully and produce higher yields in sub-tropical climate where summer is hot and dry and winter is mild. Further, bael tree is reported to be hardy and can be grown up to an altitude of 1219 m and is not damaged by temperature as low as -7°C .

Soil

The bael tree is very hardy; it can thrive well even in swampy, alkaline and stony soil having pH range from 5 to 10, where many other fruit trees fail. However, well drained sandy loam soil is the best.

Production Technology

Planting and vegetation techniques

- Pits of size 1.0 x 1.0 x 1.0m are dug at a desired spacing (8x8m) during the month of May. The dug out pits are left for desiccation during May-June.

- Vegetation debris, pebbles etc. are removed from the piled soils. Prepared soil media with equal quantity of soil, fine sand, farm yard manure along with 100 g methyl parathion dust for each pit. If soils are compact and deficit in phosphorus, add 1 kg of single super phosphate.
- The pits are filled up to rim with prepared mixture during the mid of June. At least one year age of seedlings with improved variety (NB-5) bael fruit trees are planted after onset of first monsoon rains.
- Straw/ polythene wrappings of procured seedlings are removed and inserted in to the prepared pits by making a small hole at the centre of the pit followed by a little compression for allowing the seedling to be in close contact with the mixed soil in the pit for its better establishment.
- Half moon shaped micro catchment shaping is prepared by providing mild slope to the land on the upstream of planted seedling leading the rain water to the roots of planted seedlings and making a crescent shaped bund on the downstream side of the pit at a distance of 0.25m from the stem of tree.
- Earthen up around the stem of tree with 30 cm height to protect fungal infections on the stem. It protects the stem from direct hit of the water.
- Though the bael fruit is rarely affected by insects and drenching with 0.2% solution of chlorpyrifos (25 EC) helps to avoid infestation with termites.
- The system (horti-pastoral) does not require major intercultural practices but periodical weeding and hoeing in the initial stages up to 2nd year of plantation improves growth of planted seedlings.
- For better survival and growth life saving irrigations is required for two years during summer season in initial stage of planting with 20 days intervals.
- Adding of FYM at six monthly intervals @ 25-50 kg per plant will improve production of the fruits and application of 20 kg of nitrogen per hectare during the late September and early October will prolong availability of green fodder during winter.
- Training and pruning also required for sound structures with proper shape of the plants. Removed sprouting of stem below the budding portion of the stem and also remove the weak, damaged and dried branches from the plant.
- Mature bael fruits are harvested individually from the tree alongwith a portion of fruit stalk at the colour turning stage from green to yellowish green. To prevent fruit from falling on the ground fruit picker is used for harvesting.
- It is necessary that fruits are graded based on size, packed with some cushioning materials (paper cuttings or paddy straw) to avoid cracking of the fruits due to impact in transportation, otherwise fruits will contract fungal diseases.
- Bael being a hardy crop, there is no serious insect pest and diseases as of now. But sooty mould has been noticed in commercial bael orchards which can be managed by spraying wetttable sulphur + chlorpyrifos/ methyl parathion dust + gum acacia (0.2+0.1+0.3%). During new leaf emergence, leaf eating caterpillar is causing serious problem and it can be managed by application of thiodan @ 0.1%.
- Fruit cracking and fruit drop are two important physiological disorders found in the bael fruits. These can be managed by providing good irrigation facility, making wind breaks around the orchard and by spraying borax @ 0.1% twice at full bloom and after fruit set.
- Bael trees are raised under hortipastoral system in that case the interspaces are planted with *Cenchrus ciliaris* (Dhaman) and *Dicanthium annulatum* (Karad) grass at 30 cm x 30 cm spacing by making a furrow or pit of 15 cm depth across the general land slope. Fresh and

healthy 3-4 tillers are sufficient enough to be sodden in a single pit to reduce soil erosion hazards.

- Grass production increases form the 2nd seasons of harvest and declines gradually. Hence, about 1/3rd area is resodded or resown at the end of every five years for sustained grass production from the area.

Economics

Bael fruit comes in full bearing on 10-12 years of planting. It produces an average of 100-150 fruits per plant in vegetative propagated plant and 200-300 fruits in seeded plants. Improved cultivars of bael produce superior fruits in terms of size and weight than seeded plants. The yield varies with different factors like; climatic conditions, types of soils, management, etc. Based on our research experience it is estimated that approximately Rs. 50,000/ha as net income can be earned from well managed improved cultivars of bael orchard bael.

Table 2. Economics of bael orchard (per ha)

S. No.	Inputs and operations	Numbers/quantities	Rate (Rs.)	Total expenditure (Rs.)
1.	Layout	5 labours	200/labour	1000.00
2.	Pit digging	156 pits	20/pit	3120.00
3.	Fertilizers and manures	156 pits	10/pit	1560.00
4.	Pit filling	156 pits	5/pit	780.00
5.	Cost of planting materials	156 pits	15/plant	2340.00
6.	Irrigation cost	156 pits	2/plant	1248.00 (four irrigations)
7.	Weeding and hoeing	156 pits	3/plant	1872.00 (four weedings)
			Total cost	11920.00

Expenditures

Intercultural operations from 2 to 4 years Rs. 9360.00
 Intercultural operations from 5 to 25 years (as per need) Rs. 93600.00

Income

Average income from 4 to 25 years Rs. 50000.00
 Average annual expenditure Rs. 5000.00

Note: Income was calculated on the basis of 40 fruits per plant with one kg weight per fruit and market value @ Rs. 8 per kg fruits.