"Profitability of pomegranate orchards based on soil types in Nashik District"

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Abstract: **"**The Nashik is the largest pomegranate growing district in Maharashtra. As well as, the pomegranate can be grown in diverse soil types such as coarse, medium and deep soils but the yield varies. In this context, the field survey data according to yield and soil types of pomegranate farms were collected from 10 tehsils of Nashik District of Maharashtra. The statistical analysis revealed that cost benefit ratio of pomegranate varied with soil types, in descending order medium (1: 2.72), shallow (1: 2.15), deep (1: 2.07) and very shallow soil (1: 1.77). It proves that well drained medium and shallow soils are most profitable natural sites for pomegranate cultivation."

Key words : pomegranate, soil type, yield, cost benefit ratio, profitability.

Introduction

Northeastern portion of Nashik district is popular for production of pomegranate fruits covers Kalwan, Satana, Malegaon, Deola, Nandgaon and Chandwad tehsils. Provided that when all factors are favourable; the average productivity of pomegranate lands in study region is 20 tons ha^{-1} i.e. doubles of state average 10 tons ha^{-1}. Interestingly enough, well managed orchards and free from diseases, yielded as much as 25 tons $ha^{-1.}$ However yield of pomegranate crop were also found to be controlled by soil type of orchard that can be considered as abiotic factors.

The pomegranate fruit crop is not particular about its soil requirement. It can be grown in diverse soil types such as coarse, medium and deep soils with widely ranging characteristics. It thrives on comparatively shallow or even murmy soils, where other fruits fail to flourish (Patil and et. al. 2002). But the pomegranate is a perennial fruit crop, orchard trees stand in a field for 10-12 years. Therefore, it demands proper soil conditions for best economic explorations (Phule 2002). The study of the economics of pomegranate is indispensable since there is no proper farm business data on its cost of production and marketing (Khunt and et. al. 2003). In context to this, comparative economic appraisal of four soil types of pomegranate orchard was attempted (Table 1.2) and cost benefit ratio was computed separately.

Methodology:

Present paper seeks to examine the cost and return structure of the pomegranate crop on the basis of primary data collected during field survey. The methodology adopted for the present investigation can be separated into three parts as:

I) Selection of the sample villages: A list of pomegranate growing villages for 10 tehsil of the district was prepared from secondary data of agriculture offices (GoM). And out of total, 5% villages having highest acreage under this crop were selected for field survey.

II) Selection of sample pomegranate growers: The secondary unit of the sampling was the pomegranate growers. A list of pomegranate growers for each sample village was obtained from village revenue records. Then out of total growers in that respective sample village, 5% growers on the basis of 'pomegranate holding' were selected for the purpose of the interview.

III) Data Analysis: The obtained field survey data pertaining to the year 2014 were sorted according to size of pomegranate holding of the growers. Then the sampled orchards were further micro grouped according to soil types of the orchard. The technique of tabular analysis was employed for financial calculations and average figures of financial inputs made by respondents are considered for interpretation of results.

Results and Discussion:

Table 1.1 Distributions of Sample Growers According to Soil Types

Sr. No.	Soil Type	Soil Depth (cm)	No. of Orchards in Soil Group				Percent of Orchards
			Small	Medium	Large	Total	
i	Very Shallow	0 to 7.5	20	05	07	32	9.12 %
ii	Shallow	7.5 to 25	52	54	35	121	34.47 %
iii	Medium	25 to 50	45	37	27	109	31.05 %
iv	Deep	> 50	44	27	18	89	25.36 %
	Total		161	103	87	351	100.00 %

(Source: Compiled by researcher)

The texture and depth were two major physical characteristics of soil that determines the yield of pomegranate and quality of fruit. According to the depth of orchard soils as stated by respondents at the time of interview, the sampled pomegranate farms were classified into four micro groups (table 1.1). The field survey data in table No. 1.1 indicates the practical feasibility of coarse textured soil type for pomegranate crop. Since, 34.47% and 31.05% orchards were planted in shallow and medium soil types respectively. And the significant proportion of orchards 9.12% was also planted even in 'murumy' or very shallow type. Though deep soils are fertile but only one-fourth orchards were planted in this soil type.

Table 1.2 indicates that average productivity of all sampled orchards was 8.65 tons ha^{-1} and cost benefit ratio for pomegranate crop was 1: 2.16. However, Fig. 1 shows that both significantly varied according to the soil type.

Table 1.2: Cost Benefit Ratio of Pomegranate According to Soil Type (Value in Rs. Ha^{-1})

Soil type	Size of holding	Gross cost	Yield (tons/ ha)	Price per kg	Gross return	Net Profit	CBR
i) Very shallow	Small	197009.3	7.32	43.13	315711.6	118702.41	1 : 1.60
	Medium	213266.8	8.45	46.68	394446.0	181179.2	1 : 1.85
	Large	220898.1	8.01	51.39	411633.9	190735.8	1 : 1.86
	Average	**210391.4**	**7.93**	**47.07**	**373081.8**	**162690.4**	**1 : 1.77**
ii) Shallow	Small	190809.0	8.23	51.31	422281.3	231472.3	1 : 2.21
	Medium	209009.8	10.15	48.37	490955.5	281945.7	1 : 2.35
	Large	219506.4	8.41	49.47	416042.7	196536.3	1 : 1.90
	Average	**206441.7**	**8.93**	**49.72**	**443969.8**	**237528.1**	**1 : 2.15**
iii) Medium	Small	190866.7	8.96	52.39	469414.4	278527.7	1 : 2.46

	Medium	204658.2	10.72	56.12	601606.4	396948.2	1 : 2.94
	Large	207929.9	9.18	61.84	567691.2	359761.3	1 : 2.73
	Average	**201158.3**	**9.62**	**56.78**	**546255.7**	**345097.4**	**1 : 2.72**
iv) Deep	Small	180317.8	7.42	43.69	324179.8	143862.0	1 : 1.80
	Medium	197219.4	8.81	50.21	442350.1	245130.7	1 : 2.24
	Large	201527.3	8.14	54.84	446397.6	241270.3	1 : 2.18
	Average	**194221.5**	**8.12**	**49.58**	**402754.9**	**208533.4**	**1 : 2.07**
Regional Average		**203053.2**	**8.65**	**50.79**	**439304.7**	**236251.4**	**1: 2.16**

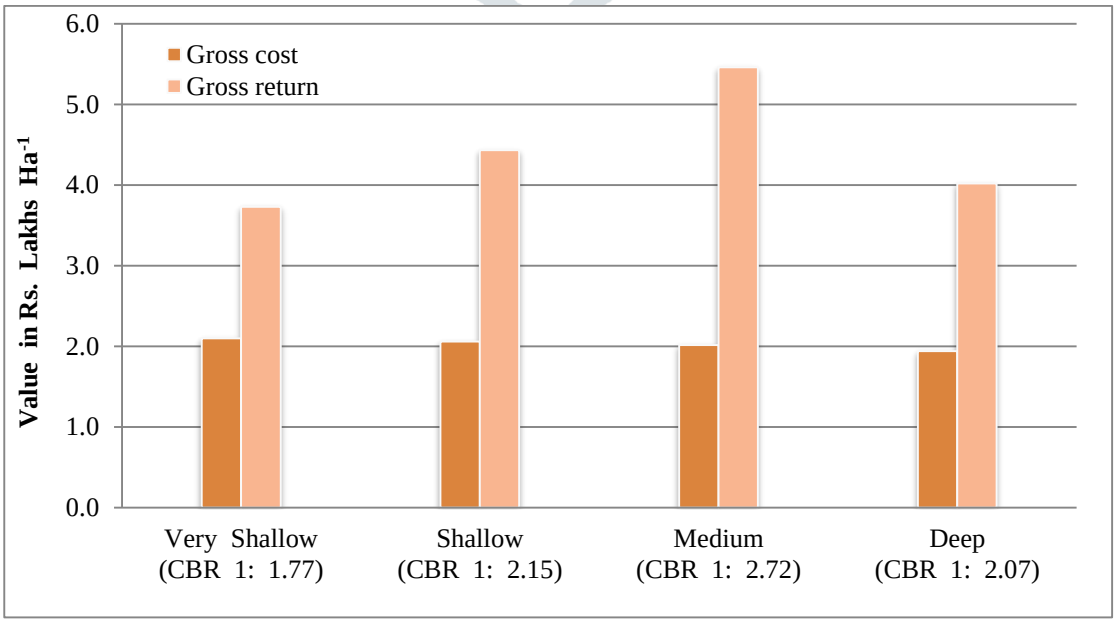
(Source :Compiled by researcher)

i) Very Shallow Soil (Depth 0 to 7.5 cm):

They are very coarse textured known as 'murumy' soils, the thickness of soil restricted to 7.5cm only. The soil horizons were not fully developed. It contains excessively coarser material such as number of rock fragments and more sand particles so attributed too much water porosity. The pomegranate orchards from very shallow soil revealed highest gross cost Rs. 2.10 lakh ha^{-1}. In this regard, it is worth mentioning that formerly this type of soil was either in the form of barren lands or grazing grounds.. But from last two decades very shallow soils had been brought under drought hardy pomegranate crop. Therefore, this soil required more expenses for improvement and preparation of orchard land such as leveling, digging and filling of pits etc.

Even if, these soils was irrigated and fertilized more frequently but satisfactory yields were not obtained. Basically a very shallow soils are lowly fertile in nature. The hard rock beneath or large boulders underlying the thin soil layer does not allow to penetrate down roots of pomegranate trees. Eventually the tree develops on very shallow root systems due to which overall growth of trees, flowers and fruits is hampered. Ultimately, inferior productivity status in this soil type brought lowest gross yield 7.93 tons ha^{-1}. Subsequently, it realized lowest net profit Rs. 1.63 lakh ha^{-1} for growers and demonstrated lowest cost benefit ratio 1: 1.77.

Fig 1: Cost Benefit Ratio (CBR) of Pomegranate According Soil Type



ii) Shallow Soil (Depth 7.5 to 25 cm):

The thickness of shallow soil is restricted to 25 cm. These soils are light, and friable. They are coarse textured contains more sand particles than fines (silt and clay). All free water is drained easily due to domination of coarser grain size. This free water draining characteristic of shallow soils is in favour of pomegranate crop. Because pomegranate tree do not tolerate stagnant soil water for long times that leads to decaying of roots.

In other words, limited moisture storage in soil particles favors development of the proper root system (white roots) and productive growth (flowers and fruits) in pomegranate trees. Therefore, gross yield 8.93 tons ha^{-1} from shallow soil was higher compared to very shallow and deep soil. Nevertheless, it not only requires frequent irrigation but also more fertilizers. The gross cost Rs. 2.06 lakhs ha^{-1} of pomegranate cultivation of this soil type was more as compared to medium soils. As a result, second highest net profits Rs. 2.38 lakhs ha^{-1} as well as cost benefit ratio 1: 2.15 was realized by respondents in shallow soil groups (Table 1.2).

iii) Medium Soil (Depth 25 to 50 cm):

The texture of these soils varies from sandy loam to loamy sands so, more number of coarse particles than fines. This type of soil texture not only facilitates vital properties of soil such as good water drainage but also soil aeration, and easy root penetration of pomegranate tree. The medium soils are highly favourable for pomegranate farming because of two reasons. Firstly, due to good fertility condition, the expense on fertilizers was low and secondly, it required small amount of irrigation water compared to shallow soils. In this context, Table 1.2 indicates lowest cost of cultivation Rs 2.01 lakh ha^{-1} was incurred by respondents belonging to this soil group.

As well as, good fetility status of this soil type encourages prolific growth of flowers and fruits of pomegranate trees. Consequently, utmost yields 9.62 tons ha^{-1} was harvested from medium soils. Those yields also contained superior quality of fruits and net profit Rs. 3.45 lakh ha^{-1} was gained by respondents. Overall, pomegranate orchards developed in medium soils proved most cost-effective, that demonstrated uppermost cost benefit ratio 1: 2.72. This provides evidence of the good potential of medium soils for pomegranate production in the study area.

iv) Deep Soil (Depth above 50 cm):

First group of deep soils are popularly known as ‘Black cotton soils’. As this soil is derived from basalt rock, it retains the color of parent material containing ferrous or iron hence they are reddish brown, dark brown to grayish brown in color and 50 to 100 cm in depth. Second group differs from the above soil in the thickness of profile i.e. much deeper (100 cm to 150 cm) and color which is much darker. In fact, these are alluvial soils which occupy the valleys, terraces and flood plains of Godavari and Girna river as well as their tributaries had deposited their alluvium at the lower parts of basins.

Although deep and very deep soils are fertile in nature but it was not suitable for pomegranate cultivation.

- Due to more proportion of clay, these soils are compact and impervious and moisture retentive in nature. And pomegranate cannot tolerate water beyond 60% of soil moisture capacity (Anonymous, 2006).Excess amount of moisture causes decay or rotting of roots. Ultimately, it leads to dying of plants known as ‘wilting of pomegranate’.

- The compact nature of soils leads to develop wide cracks in soils during summer season. Such soil cracks may cause physical damage to the shallow roots of pomegranate tree that develops in shallow root system.

- Highly fertile deep soils favour more vegetative growth (green foliage like leaves and branches) than productive growth (flowers and fruits) in pomegranate trees. It is one of characteristic of deep soil with respect to pomegranate crop. Therefore, the yield of pomegranate crop was not satisfactory from deep soil.

Moreover, maximum green foliage attracts more sucking pest and fungal diseases that affect on yield and quality of fruits. Therefore, the yield 8.12 tons ha^{-1} obtained from deep soils is lower than regional average 8.65 tons ha^{-1} (Table 1.2). But deep soils have good natural fertility so that minimized the cost of fertilizers and irrigation too. Hence, lowest gross cost Rs. 1.94 ha^{-1} of pomegranate cultivation was calculated for deep soils. Despite of that, lower yields brought down the net profit Rs. 2.09 lakh ha^{-1}. By and large, orchards planted in deep soils revealed poor response to pomegranate, which stood in third place in cost benefit ratio 1: 2.07.

Findings:

i) In brief, cost benefit ratio of pomegranate varied with soil types, in descending order medium (1: 2.72), shallow (1: 2.15), deep (1: 2.07) and very shallow soil (1: 1.77). It proves that well drained medium and shallow soils are most profitable natural sites for pomegranate cultivation. Because the pomegranate tree develops on a shallow root system, which do not requires a thick soil profile. In contrast, moisture retentive deep black cotton soils and alluvial river plains were lowly profitable. Besides, extremely porous very shallow soils were found too expensive to cultivate pomegranates in existing water resource in the study area.

ii) Together, the shallow and medium soils occupy 67.19% of cultivable area so that indicates the abundant availability of area for growing pomegranates in the study region. This soil type is mostly found in scarcity zone particularly in Sinnar, Chandwad and Malegaon tehsils. If provided with better irrigation facilities like drip irrigation systems then it can be best utilized for dry land horticulture development. In addition to pomegranate, other sturdy and drought tolerant fruit crops like ber, aonla and custard apple; those posses ability to bear the moisture stress for several days can also be adopted for cultivation.

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