Area Development Scheme on Pomegranate Cultivation in Erode District during 2018-19 to 2020-21

1. Introduction

Pomegranate (*Punica granatum*) is an ancient favourite table fruit of tropical and sub-tropical regions of the world. The fruit is symbolic of plenty and very much liked for its cool, refreshing juice and valued for its medicinal properties. The juice of pomegranate is believed to be good for leprosy patients. The grains of the fruit are also eaten fresh in most of the hot countries and are also used as condiment. The bark and rind of the fruits are commonly used to control dysentery and diarrhea. The rind is also used as dying material for cloth. The versatile adaptability, hardy nature, low maintenance cost, steady but high yields, better keeping quality, fine table and therapeutic values and possibilities to throw the plant into rest period when irrigation potential is generally low, indicate the avenues for increasing the area under pomegranate in Erode District.

Pomegranate was cultivated in isolated pockets in Tamil Nadu for about 10-15 years back. However, due to poor pigmentation in fruit pulp, the fruits fetched low price in the market and as a result, the crop was either abandoned or not promoted in a big way. However, with the advent of new variety called "Bhagwa", there is a renewed interest among the farmers to take up the crop, as the variety is performing well in the State. A group of enterprising farmers of Chennampatti area of Ammapettai block in Erode district have brought the grafted planting materials from Maharashtra State & planted the same in their field and surprisingly, it has come up very well and harvested bumper crops. The farmers who have planted pomegranate about 2 years back in Erode district have already harvested good crops. The average farm gate price realized was Rs.80 per kg. In the second year of plantation itself, the farmers were able to get back 50% of the cost invested by them. The farmers feel that on an average a net income of Rs.1.5 lakh to Rs.2.0 lakh per acre can be earned from this crop. Similar such success stories have been reported in various districts such as Coimbatore, Tirupur districts, etc.

Keeping in view of the above, it is proposed to develop an Area Development Scheme for Pomegranate cultivation in Erode District.

2. Agro climatic conditions

2.1 Climate

Pomegranate is adaptive to a wide range of agro climatic and soil conditions. Pomegranate prefers dry climate. During fruit development, prolonged hot and dry climate is required to crop properly. Optimum temperature congenial for fruit development is 38 degree C. In humid climate the fruits are severely damaged by pomegranate butterfly (fruit borer) and do not develop sweetness. It is winter hardy and very drought tolerant. However, the plant is not tolerant of wet conditions. It can grow up to an elevation of 1850 meters.

2.2 Soil

It grows under wide range of soils and can tolerate even alkalinity and salinity to certain extent. However, Pomegranates need the following soil requirements:

- Prefers well drained, sandy loam to deep loamy or alluvial soils
- Soil pH between 6.5 to 7.5 is ideal
- Tolerates soil salinity up to 6 dS/m
- Quality and colour development is good in light soils
- It is not tolerant to wet conditions, as it causes fruit cracking.

3. Varieties

The popular varieties of pomegranate are Ganesh, Dholka, Ruby, Jalore Seedless, Mridula, Paper Shells, **Bhagwa**, etc. However, it is proposed to promote only Bhagwa variety, as it has very good demand in the market. The seeds are soft, deep red, thick rind to withstand longer transportation, good export potential, etc.

4. Cultural Practices

4.1 Planting material and planting

Generally, grafted planting materials are used for planting. The crop can be planted at various spacing from 3m x 3m to 6m x 6m. However, it is proposed to adopt high density planting concept, in which the plants will be planted at a spacing of 3m x 3m, accommodating 440 plants acre.

Plant materials are available in plenty with M/s Jain Irrigation Agro Farm at Ilayamuthur village near Udumalpet in Tirupur district. Planting materials can also be sourced from neigbouring States such as Karnataka, Andhra Pradesh and Maharashtra, if required.

4.2 Training & Pruning

Training and pruning are important operations to regulate the cropping. Training is basically done at younger / pre bearing age of the plant with a purpose of getting the desired size and shape of the tree, whereas pruning is done to get regular / desired crop.

4.2.1 Training

The Central Leader system of training is followed in pomegranate. In this method, the main trunk is allowed to grow to certain height which is referred as leader and then it is cut back to allow the branches to grow. Initially the side shoots up to 10-15 cm are removed at the time of planting. After planting, the trees are allowed to grow vigorously for the initial period of 18 months. During this period, these trees are trained leaving 4-5 well-distributed shoots all around

forming main structure of the plant. All the sprouts arising on these shoots are removed up to 30, 60 and 100 cm during the first 6, 12 and 18 months respectively.

4.2.2 Pruning

Pruning is important aspect of pomegranate cultivation to get desired crop. The pomegranate has a tendency to produce water shoots and suckers from the base. These suckers arise as multiple stems, which grow vigorously without branching and reach the top. They bear very little crop. Hence, the suckers should be removed as soon as they arise. This apart, removal of criss-cross branches, dead & diseased twigs, are to be done to give a shape to the tree.

The fruits are borne terminally on short branches known as spurs. These spurs arise on the mature shoots. The spurs may bear fruits for 3-4 years but with advance in age they lose capacity to bear and are therefore pruned. These older spurs are to be cut down and new spurs encouraged. Also, those inward growing shoots are removed. It is most desirable to encourage the growth of new shoots on 1-3 year old main branches.

4.2.3 Some of the useful tips for pruning

Fruitful and differentiated buds are located at the distal portion of the one year old branches and therefore, it is advised to prune just tip of the spur to get good crop. Heavy pruning of terminal portion of a branch lowers down the total flower production. However, moderate to high intensity pruning is done in order to get better size and quality fruits and by this way one can get a fruit size weighing not less than 350 g per fruit. One should not allow to bear more than 100 to 150 fruits per plant to get better quality fruits. This also minimizes the bending of branches and staking. Rejuvenation pruning may be required with advance in age as the fruit bearing capacity of old mature branches declines.

5. Water and Irrigation Management

Although, pomegranates are highly tolerant to drought, they respond very well to irrigation. Hence, adequate and regular irrigation without large variation in the root zone is essential for better fruit development and to avoid fruit cracking. In this model, drip system with fertigation unit is recommended for irrigating the crop, as it not only minimise the water usage but also for better nutrient use efficiency. This will also help in to get more yield (30-35%) over conventional basin system of irrigation.

6. Nutrition

The recommended doses of manures of fertilizers are given in the table below;

Year	Recommended dose of Fertilizers/Plant/Year			
	FYM (kg)	N (g)	P (g)	K(g)
1	5	250	125	125

2	10	250	125	125
3	15	500	125	250
4	20	500	125	250
5	25	500	125	250
Above 5 years	30-40	625	250	250

The FYM is applied 2 split doses, whereas the fertilizers may be applied in 2-3 split doses, if basin irrigation is formed. Since, drip with fertigation unit is recommended under this model, fertilization may be applied once in 7-10 day's intervals for better nutrient use efficiency.

7. Flower regulation

Pomegranate flowers continuously when watered regularly. The plants under such conditions may continue bearing flowers and bear small crop irregularly at different period of the year, which may not be desirable commercially. To avoid this, trees are given *bahar* treatment. In this treatment, the irrigation is withheld for about 45 days, followed by light earthing up in the basin. This is followed by spray of Ethrel @ 2.0 ml to 2.5 ml per 10 litre of water and sprayed to entire canopy of plants. This facilitates the shedding of leaves. The trees are then medium pruned and the recommended doses of fertilizers are applied immediately after pruning. Then the field is irrigated. This leads to profuse flowering and fruiting. The fruits are ready for harvest 4-5 months after flowering.

In tropical condition, there are three flowering seasons, viz., January-February (*Ambia bahar*) June-July (*Mrig bahar*) and September-October (*Hasta bahar*). The choice of flowering/fruiting is regulated taking into consideration the availability of irrigation water, market demand and pest/disease incidence in a given locality. The fruits of *Ambia bahar* are ready for harvest in the month of June to September. As the fruit development takes place during dry months, they develop an attractive colour and quality thus suitable for exports. Similarly due to dry weather, the incidences of pest and disease attack are limited. However, *Ambia bahar* can be taken only areas having assured irrigation facilities. The *Mrig bahar* crop is harvested in the month of December to February. Usually this *bahar* is favoured, as the flowering and fruiting period coincides with rainy season or immediately after rains, and the crop is taken without much irrigation. As the fruits develop during the rainy season and mature during winter, the colour and sweetness of the fruit may get affected. The fruits from Hasta bahar are harvested during the month of March to April. They have very attractive rind with dark coloured arils. Since the availability of the fruits during this season is limited, they fetch high value. Optimum water stress cannot be developed during this period as withholding of irrigation coincides with the rainy season. This leads to poor flowering and thus affects the yield. In Tamil Nadu, *Ambia bahar* and *Mrig bahar* crops are taken. Though, *Mrig bahar* crop develops and matures during winter, the colour development is not a problem, as the winter is not severe like Northern States and bright sunny days are available. The *Mrig bahar* fruits fetches better price in the market as the arrival is limited.

8. Flower and fruit thinning

The main objective of flower and fruit thinning is to regulate the flower & fruit load on the tree to get large sized export quality fruits. The fruits borne on strong spurs attain better size and quality and hence it is advisable to retain only 100 – 140 fruits (weighing 350-400g/fruit) on a fully grown tree i.e., from 6th year onwards. The following types of fruits may be thinned out to get better crop:

- Fruits borne on weak spurs and terminal portions of spur
- Deformed fruits
- Insect and disease infested fruits
- Retain 1 or 2 fruits per cluster
- Remove thorns nearby the fruits to prevent skin damage to fruits

9. Pests & Diseases

Fruit borer (Pomegranate butterfly) and bark eating caterpillar are the common pests of Pomegranate. The pomegranate butterfly, *Virachola isocrates*, lays eggs on flower-buds and the calyx of developing fruits; in a few days the caterpillars enter the fruit by way of the calyx. The conspicuous symptoms of damage are offensive smell and excreta of caterpillars coming out of the entry holes, with excreta found stuck around the holes. The fruits rot and drop off. These fruit borers may cause loss of an entire crop unless the flowers are sprayed 2-3 times 30 days apart. A stem borer sometimes makes holes right through the branches. Twig dieback may be caused by either *Pleuroplaconema* or *Ceuthospora Phyllosticta*. Discoloration of fruits and seeds results from infestation by *Aspergillus castaneus*. Excessive rain during the ripening season may induce soft rot.

Control measures for fruit borer

a. Covering of individual fruits with butter paper before maturity should be done.
b. Remove and destroy all the affected fruits (fruits with exit holes).
c. Removal of flowering weeds, especially of composite family, should be carried out on a regular basis as it act as alternate host plants to the pest.
d. Frequent release of egg parasitoid *Trichogramma chilonis* @ 1 lakh/acre was found effective to control the pest.

Chemical control

Spray Deltamethrin at 0.002 per cent at the time when more than 50 per cent of fruits have set. Repeat after two weeks with Carbaryl at 0.2 per cent or Fenvalerate at 0.005 per cent in non-rainy season. Quinalphos at 0.06 per cent is also effective.

10. Physiological disorder

Fruit cracking is a most serious physiological disorder in pomegranate which limits its cultivation. In young fruits it could be due to boron deficiency but fully grown fruits crack is due to moisture imbalances as the cop is very sensitive to variations in soil moisture and humidity. Prolonged drought causes hardening of peel and if this is followed by heavy irrigation or down pour then the pulp grows and the peel cracks.

This problem can be overcome by

a) Maintaining soil moisture and not allowing wide variations in soil moisture depletion,
b) Cultivation of tolerant varieties,
c) Early harvesting not allowing the fruits to crack and
d) Spray of calcium hydroxide on leaves and on fruit set.

11. Harvesting, Yield and Marketing

Normally, pomegranate flowers take 5 to 6 months to be ready as mature fruits. Since, pomegranate being a non climacteric fruit (will not ripen after harvest), it should be harvested at mature stage which can be judged by change in skin colour to pink or red and metallic sound when tapped. A grown up well kept tree should give about 100 to 150 fruits per year. A high density system with 3 x 3 m may give about 50-75 fruits per tree, which will be about 15-20 kg / tree.

After harvesting, fruits can be cured in shade for about a week so that the skin becomes hard and fruits can stand transportation better. Thereafter, the fruits can be graded according to weight

‘A’ grade - 350 g & above

‘B’ grade - 200 to 350 g & above

‘C’ grade - Less than 200 g.

Cured fruits have good keeping quality which can further be prolonged through cold storage. When stored at 0^0C to 4.5^0C with 80% relative humidity fruit remain safe even for seven months.

12. Unit Cost

The unit cost has been worked out to 1.666 lakh per ac and the same is given in the table below. The item-wise and year-wise unit cost details are given in Annexure I. The orchard can give economic yield up to 30 years.

Sr.No.	Activity	Unit cost (Rs.Lakh)
1	Cost of cultivation per acre	1.366
2	Cost of drip irrigation / acre	0.300
3	Total unit cost / acre	1.666
4	Margin money (15%)	0.250

5	Bank loan (85%)	1.416

13. Margin Money

As per NABARD norms, the margin money should be for marginal farmers 5%, small farmers 10% and big farmers 15%. However, in the present model, 15% margin has been assumed.

14. Interest rate for ultimate borrowers

Banks are free to decide the rate of interest within the overall RBI guidelines. However, for working out the financial viability and bankability of the model project we have assumed the rate of interest as 12.5% p.a.

15. Interest rate for refinance from NABARD

As per the circulars of NABARD issued from time to time.

16. Security

Banks may take a decision as per RBI guidelines.

Results of financial analysis are as under:

BCR : 3.29 : 1

NPW : Rs.749254

IRR : 70.10 %

17. Repayment Schedule

Bank loan along with the interest can be repaid in 5 years including 2 years grace period

18. BACKWARD AND FORWARD LINKAGES

18.1 Training

Pomegranate being a new crop, training of farmers is absolutely necessary before taking up the activity. The trainings to farmers are regularly given by M/s Jain Irrigation Farm located near Udumalpet. Farmers can also be trained by College of Horticulture and Research Institute, TNAU, Coimbatore. NABARD would organise the training programme to the farmers with help of aforesaid Institutes.

18.2 Availability of planting materials

As stated earlier, enough planting materials are available in the State and as such it is not a major problem.

18.4 Availability of inputs and Technical support

The agricultural inputs such as fertilizers including water soluble fertilizers, plant protection chemicals (pesticides & fungicides) are readily available in the district. Initially, the skilled man power to perform the training & pruning operations, may be sourced from nearby Andhra Pradesh and Karnataka and it is expected that the farmers may acquire sufficient skills to do training and pruning activities.

18.5 Marketing of fruits

Presently, the whole sale traders from Tamil Nadu and Kerala are procuring the fruits directly from the fruit orchards. The minimum and maximum price per kg offered to the farmers was Rs.60 and Rs.120 respectively and on an average a farm gate price of Rs.80 per kg was paid to the farmers.

19. ROLE OF STAKEHOLDERS OF THE SCHEME

19.1 Role of Dept. of Horticulture and TNAU

State Horticulture Department and also the existing Farmers' club members will select the beneficiaries, source the planting materials and skilled man power from Tamil Nadu or from nearby States including Maharashtra State. The Horticultural Collage and Research Institute, Coimbatore, M/s Jain Irrigation Farm at Udumalpet would provide need based training to beneficiaries. After the training programme eligible loan applications will be sponsored to the banks concerned.

19.2 Role of NABARD

NABARD would identify the farmers with help of existing farmers clubs and enrol the new farmers into farmers club. NABARD would also help in organising the training programme for the farmers. NABARD in association with Dept. of Horticulture and Agri Business & Agri Marketing would try to form Farmers Producer Company for pomegranate, so as to facilitate for direct marketing of fruits by the Company.

19.3 Role of Banks

After the training programmes the State Horticulture Department / Farmers clubs will sponsor the eligible loan applications to the banks for sanction of loan. Banks will process the loan applications and sanction the eligible loan assistance.

19.4 Role of Farmers Clubs/ Panchayats/ JLGs

Farmers Clubs/ JLGs may sponsor eligible beneficiaries for training programmes being conducted by TNAU / Jain Irrigation Farm. After the training programme, eligible applications for loan assistance will be forwarded to banks.

19.5 Banking Plan

NABARD had prepared a Banking Plan for Pomegranate Cultivation for Erode District – 2018-21, envisaging an outlay of 300 acres with financial outlay of Rs. 500 Lakhs covering Ammapet, Anthiyur, T N Palayam, Sathyamangalam, Nambiyur and Modakkurichi blocks. The salient features of the scheme are as below:

Out of 300 acres envisaged for this financial year, the following allocation is made amongst various blocks:

S NO	Name of the block	Area (acres)	Financial outlay (Rs. In Lakhs)
1	Ammapet	60	100
2	Anthiyur	60	100
3	Nambiyur	40	66
4	Sathyamangalam	40	67
5	Modakkurichi	60	100
6	T N Palayam	40	67
	Total	**300**	**500**

The bank-wise allocations made are as below:

S No	Name of the bank	Area (in acres)	Financial outlay (Rs. In Lakhs)
1	Canara Bank	50	83
2	Indian overseas Bank	50	83
3	State Bank of India	50	83
4	Karur Vysya Bank	30	51
5	EDCC Bank	30	51
6	Bank of Baroda	20	33
7	Indian Bank	20	33
8	Corporation Bank	20	33
9	Bank of India	30	50
	Total	**300**	**500**

Annexure - I

The item-wise and year-wise cost of cultivation and economics of pomegranate are as under;

Sr. No.	Particulars	Cost of cultivation (Rs./year)			
		1	2	3	4
A	**Material Cost**				
1	Planting material (incl.10% extra)	14535			
2	Staking material	880			
3	Farm yard manure	1650	3300	4950	6600
4	Fertilizers	5990	5990	7387	7387
5	Plant Protection Chemicals	5000	10000	15000	20000
6	Irrigation	1500	1500	2000	2000
	Sub total	**29555**	**20790**	**29337**	**35987**
B	Cost of operation & labour	23200	14600	18400	21000
C	Cost of drip system	30000			
D	Miscellaneous cost	245	210	263	213
	Grand total	**83000**	**35600**	**48000**	**57800**
	Cost of cultivation per acre (capitalized upto 3rd year)	**166600**			

Maintenance cost for 5th year Rs.60900 and from 6th year onwards – Rs.64600

Income and expenditure details

Year →	3	4	5	6	7.....25
Yield (kg / tree)	**5**	**8**	**10**	**12**	**15**
Farm gate price (Rs.50/kg)					
Total Income per acre	110000	176000	220000	264000	330000
Expenditure	0	57800	60900	64600	64600
Net Income	**110000**	**118200**	**159100**	**199400**	**265400**

Financial analysis (Economics, BCR and IRR)

(Amount in Rs.)

Year→	1	2	3	4	5	6	7 ….25
Capital cost	83000	35600	48000	0	0	0	0
Main. Cost	0	0	0	57800	60900	64600	64600
Total cost	83000	35600	48000	57800	60900	64600	64600
Total income		0	110000	176000	220000	264000	330000
Net income	-83000	-35600	62001	118201	159101	199401	265401

Results of financial analysis

IRR	**70.10%**
PW of costs (15%)	327599
PW of benefits (15%)	1076853
NPW at 15% DF	**749254**
BCR	**3.29 : 1**

Repayment Schedule

Assumptions: (1) Interest rate assumed: 12.5%, (2) Bank loan : 141610/- (85%)
(3) Net income taken into account for repayment of loan – 50%

Year	**Loan details**		**Repayment details**				
	Loan Disb.	Loan O/s	Interest	Principal	Total	**Net Income**	**Surplus**
1	70550	70550	8819	0	8819	0	-8819
2	30260	100809	12601	0	12601	0	-12601
3	40800	141609	17701	37299	55000	110000	55000
4		104310	13039	46062	59100	118201	59100
5		58248	7281	58248	65529	159101	93571

Bank loan can be repaid in 5 years including 2 years grace period