



Economics of production and marketing of guava in Maharashtra

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Abstract : The present study is an attempt to analyse the feasibility of investment in guava orchards and to find out the profitability of guava crop. So, present study was taken up with overall objective of enquiring into economics of guava production and marketing, with the objectives to examine the per hectare resource use pattern and costs and return structure, to study the marketing costs, price spread and problems faced in production and marketing by guava growers. The methodology adopted was, on the basis of area under hi-tech farming of guava, Ahmednagar, Pune and Nasik districts was selected purposively. The data for the year 2011-12 was collected with the help of specially design schedule. The simple statistical tools like averages and percentages were used for interpretation of the results. On the basis of results it is concluded that, the inputs viz., manure, nitrogen, phosphorus and potash were used at lower level than the recommended levels for guava, therefore there is gap in yield. The guava fruit crop is economically viable as B:C ratio is more than unity. The N fertilizers, plant protection and human labour was significant, indicating that these are the important variable for raising the production of guava. Channel observed in marketing of guava is: Producer-Pre-harvester contractor-Wholesaler-Retailer-Consumer. The arrivals of guava are fluctuating in all the markets under study.

Key Words : Economics of production, Marketing of guava

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INTRODUCTION

Guava (*Psidium guajava*) belong to family Myrtaceae, the apple of tropics, has been cultivated in India since early 17th century and is one of the most common fruit in India. It is now cultivated all over the tropics and sub-tropics. It is a native of tropical America, which is commercially cultivated in Cuba, Malaysia, Myanmar, Hawaii islands, Venezuela, Australia, Bangladesh, Brazil, Colombia, Cameroon, Mexico, Peru, Thailand, Sudan, Kenya and India. In India, it is successfully grown in Karnataka, Uttar Pradesh, Bihar, Madhya Pradesh, Maharashtra, West Bengal, Orissa and Tripura. It is one of the most common fruits in India and has become popular because of its availability almost throughout the year at moderate prices. It occupies important place

immediately after mango, banana, and citrus. Guava is a medium sized tree with about thirty feet height. Being hard, the tree does not demand any closer attention as banana, grapes and citrus. The fruit is a good source of vitamin C, pectin, calcium and phosphorus. The fruit is used for the preparation of processed products like jams, jellies and nectar.

In India, area under guava during the year 1987-88 was 176.8 thousand hectares, which has increased to 234.06 thousand hectares during the year 2011-12. India has made a fairly good progress in production from the year 1987-88 to 2011-12. It increased from 1112.6 thousand tones to 2660.76 thousand tones. The productivity of guava has increased from 6.3 tones to 11.70 tones during above period (Database of NHB Ministry of Agril., Government of India, 2013).

Guava is cultivated in almost all the districts of

Maharashtra state. The predominant guava growing districts are Satara, Beed, Pune, Ahmednagar, Aurangabad and Amravati. In Maharashtra, area under guava in 1987-88 was 2 thousand hectares which has increased to 37.00 thousand hectare during the year 2011-12. The production of guava during 1987-88 was 14.8 thousand tones which has increased manifold to 322 thousand tones during the year 2011-12 (Database of NHB, Ministry of Agril., Government of India, 2013).

In Maharashtra state, the productivity of guava was 7.4 tones per hectare during 1987-88, which is stagnated to 8.70 tones per hectare during 2011.12 (Database of NHB, Ministry of Agril., Government of India, 2013). In the process of production of guava, marketing plays a vital role. Marketing is a part and parcel of production. It is an important stage where the producer converts his labour and other inputs used, into cash and is at this stage that he will be in a position to find out whether his investment on the enterprise is rewarding or not.

Objectives :

- To examine the per hectare resource use pattern.
- To estimate per hectare costs and returns.
- To study the marketing costs and price spread.
- To study the problems faced in production and marketing by Guava growers.

MATERIAL AND METHODS

On the basis of area under guava, Ahmednagar, Pune and Nashik districts were selected purposively. From each district one tahsil was selected on the basis of maximum area under Guava. From each tahsil, two villages were selected randomly. On the basis of area under guava, from each village 5 farmers each from small group (upto 0.41 ha), medium group (0.41 ha. to 0.80 ha) and large group (above 0.81 ha) were selected randomly. Thus the total sample consist of 90 farmers *i.e.* 30 farmers each from small, medium and large group. The data for the year 2011-12 was collected with the help of specially design schedule.

The simple statistical tools like averages and percentages were used for interpretation of the results. The standard cost concepts were used to estimate the profitability. The Cobb-

Douglas type production function was fitted for estimating the resource use productivity. The indices were also estimated for studying the variation in arrivals and prices.

The districtwise distribution of sample farms :

The distribution of guava cultivators is presented in Table 1. The sampling design adopted for the study was three stages stratified random sampling with tahsil as the primary unit, village as the secondary unit and the farmer as the ultimate third sampling unit.

Data analysis :

The analysis was carried out by simple tabular method and the Cobb-Douglas type of production function was used for estimating resource use productivity. The indices of arrivals and prices in APMC market of ten districts have been estimated by simple average method for studying the fluctuations in arrivals and prices for selected market for guava fruit crop. The variability in arrivals and prices of guava were worked out by estimating co-efficient of variation.

Resource use productivity :

The Cobb-Douglas type of production function was employed to estimate the resource use productivity.

$$Y = a x_1^{b_1} x_2^{b_2} x_3^{b_3} x_4^{b_4} x_5^{b_5} x_6^{b_6} x_7^{b_7} x_8^{b_8} e^t$$

where,

Y = Output (q)/ha

X₁ = Human labour (Mandays)/ha

X₂ = Bullock labour (pair days) /ha

X₃ = Manure (q)

X₄ = Nitrogenous fertilizer (kg) /ha

X₅ = Phosphatic fertilizer (kg) /ha

X₆ = Potassic fertilizer (kg) /ha

X₇ = Plant protection charges (Rs/ha)

X₈ = Irrigation charges (Rs/ha)

a = Constant

e = Error term

b_i's = Regression co-efficients.

RESULTS AND DISCUSSION

The results obtained from the present investigation as

Table A : Distribution of sample farms

Sr. No.	District	Taluka	Village	Small (0.01 to 0.40 ha)	Medium (0.41 to 0.80 ha)	Large (0.81 to above)	Overall
1.	Pune	Daund	1. Patas	5	5	5	15
			2. Khadaki	5	5	5	15
2.	Nashik	Nashik	1. Pimpalgaon	5	5	5	15
			2. Jalalpur	5	5	5	15
3.	Ahmednagar	Rahata	1. Ekrukhe	5	5	5	15
			2. Sakuri	5	5	5	15
			Total	30	30	30	90

Table 1 : Itemwise per hectare cost of cultivation of sample farms of guava crop

Sr. No.	Cost items	Small			Medium			Large			Overall		
		Quantity	Value (Rs.)	Per cent	Quantity	Value (Rs.)	Per cent	Quantity	Value (Rs.)	Per cent	Quantity	Value (Rs.)	Per cent
1.	Hired Human labour												
	a. Male	37.23	7446.43	7.33	71.35	14270.97	14.41	89.96	17992.49	19.85	82.29	16458.89	17.69
	b. Female	40.75	4075.00	4.01	72.58	7258.06	7.33	80.03	8002.57	8.83	75.47	7547.38	8.11
2.	Bullock power (pair days)	12.41	4341.88	4.27	2.53	886.29	0.89	8.08	2827.67	3.12	7.43	2600.36	2.79
3.	Machine power in hrs.	8.64	948.18	0.93	12.24	1625.81	1.64	22.58	3010.12	3.32	19.58	2591.57	2.79
4.	Seed (Kgs)			0.00			0.00			0.00			0.00
5.	Manures (Qtls.)	45.14	6450.00	6.35	67.87	10303.23	10.40	50.32	7664.11	8.45	53.07	8042.04	8.64
6.	Fertilizers (Kgs) N	35.20	452.32	0.45	68.53	889.60	0.89	44.42	570.74	0.63	48.02	617.08	0.66
	P	68.91	1181.19	1.15	124.03	2125.80	2.15	91.77	1572.89	1.74	95.73	1640.86	1.76
	K	51.03	368.94	0.35	125.16	904.92	0.91	75.02	542.42	0.60	82.13	593.79	0.64
7.	Irrigation Charges (Rs.)		6271.43	6.17		7330.32	7.40		3752.60	4.14		4604.92	4.95
	Bio-fertilizers+weedicide		146.43	0.14		200.65	0.20		166.48	0.13		171.02	0.18
8.	Plant protection charges (Rs.)		3303.14	3.25		2359.68	2.38		2628.38	2.90		2634.89	2.83
9.	Incidental charges (Rs.)		1112.86	1.10		590.00	0.60		237.08	0.25		372.36	0.40
10.	Repairs		777.86	0.77		371.94	0.38		144.51	0.15		237.32	0.26
11.	Working capital (1 to 11)		36875.64	36.30		49108.25	49.57		49112.06	54.19		4812.48	51.70
12.	Int.on working capital		2212.54	2.18		2946.50	2.97		2946.72	3.25		2886.75	3.10
13.	Depre.on farm imliments		765.63	0.75		749.50	0.76		414.86	0.45		503.98	0.54
14.	Land revenue and other taxes		78.53	0.08		71.86	0.07		71.16	0.08		71.89	0.08
15.	Cost-A (13+15)		39932.34	39.31		52876.11	53.37		52544.80	57.57		51575.10	55.42
16.	Rental value of land		22016.01	21.67		23264.97	23.48		24494.81	27.03		24070.16	25.87
17.	Int. on fixed capital		1406.58	1.38		1416.70	1.43		1484.01	1.64		1465.52	1.57
18.	Amortization cost		8264.36	8.14		8293.47	8.37		7757.72	8.55		7895.92	8.49
19.	Cost-B (16+17+18)		71619.30	70.51		85851.24	86.66		86281.34	95.19		85006.69	91.35
20.	Family labour												
	- Male	114.96	22991.07	22.63	48.10	9620.97	9.71	18.27	3654.94	4.03	31.56	6311.81	6.78
	- Female	69.69	6968.75	6.85	35.97	3596.77	3.63	7.01	700.99	0.77	17.36	1736.08	1.87
21.	Cost-C		101579.12	100.00		99068.98	100.00		90637.27	100.00		93054.58	100.00
22.	Output												
	- Main produce (Qtls.)	110.45	132567.29		181.27	140020.97		188.52	147395.86		180.83	144852.29	
	- Bye-produce (Qtls.)dry	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	
23.	Cost-C net bye produce		101579.12			99068.98			90637.27			93054.58	
24.	per quintal cost (23/22€)		919.68			546.52			480.79			514.59	

well as relevant discussion have been summarized under following heads :

Resource use levels in different size group of holdings :

The production and productivity of guava depends on the judicious and balanced use of inputs such as manure and chemical fertilizers. Therefore, balanced use of these resources as per recommendations is very important. The average per hectare use of important resources is presented in Table 2. The information given in table makes it clear that per hectare resource use of bullock labour is highest in small group (12.41 pair days) and lowest in medium size group (2.53 pair days). Total human labour were highest in small group (262 mandays) and lowest in large group (195 mandays). The machine power use was observed higher in large size group (22.58 hours) and lowest in small size group (8.64 hours). The manure use was more in medium size (67.87 q) and lower in small size group (45.14 q).

The fertilizers use is more in medium size group and lower

in small and large size group. Irrigation charges is more in medium size group and lower in large and small size group. Plant protection use have decreased with increase in size groups of holding.

Per hectare cost of cultivation of guava :

The per hectare cost of cultivation of guava was worked out by using standard cost concept for different size groups of holdings and presented in Table 1.

It could be seen from Table 3 that at the overall level, per hectare cost of cultivation of guava *i.e.* cost 'C' worked out to be Rs. 93054.58.

At the overall level, amongst the different items of cost, rental value of land was the highest Rs. 24070.16 (25.87 %). The other important items of cost were hired human labour Rs. 24006.27(25.80 %), family human labour Rs. 8047.89 (8.65 %), manures Rs. 8042 (8.64 %), annualized establishment cost Rs. 7895.92 (8.49 %), irrigation cost Rs. 46040.92 (4.95 %), fertilizers Rs. 2851.73 (3.06 %), interest on working capital Rs

Table 2 : Per hectare resource use levels of guava crop

Sr. No.	Particulars	Small	Medium	Large	Overall
1.	Total human labour (mandays)	262.63	228.01	195.27	206.69
	– Male	152.19	119.46	108.24	113.85
	– Female	110.44	108.55	87.04	92.83
2.	Bullock power (pair days)	12.41	2.53	8.08	7.43
3.	Machine power in (hrs)	8.64	12.24	22.58	19.58
4.	Manures (Qtls.)	45.14	67.87	50.32	53.07
5.	Fertilizers (Kgs.)				
	N	35.20	68.53	44.42	48.02
	P	68.91	124.03	91.77	95.73
	K	51.03	125.16	75.02	82.13
6.	Irrigation charges (Rs.)	6271.43	7330.32	3752.60	4604.92
7.	Plant protection charges (Rs.)	3303.14	2359.68	2628.38	2634.89

Table 3 : Per hectare costs, return, gross income and B.C. ratio for guava

Sr. No.	Particulars	Unit	Size groups			Overall
			Small	Medium	Large	
1.	Total cost					
	Cost 'A'	Rs.	39932.34	52876.11	52544.80	51575.10
	Cost 'B'	Rs.	71619.30	85851.24	86281.34	85006.69
	Cost 'C'	Rs.	101579.12	99068.98	90637.27	93054.58
2.	Profit at					
	Cost 'A'	Rs.	92634.95	87144.86	94851.06	93277.19
	Cost 'B'	Rs.	60947.99	54169.73	61114.52	59845.60
	Cost 'C'	Rs.	30988.17	40951.98	56758.59	51797.71
3.	Production	Qtls.	110.45	181.27	188.52	180.83
4.	Gross income	Rs.	132567.29	140020.97	147395.86	144852.29
5.	B:C ratio					
	Cost 'A'		3.32	2.65	2.81	2.81
	Cost 'B'		1.85	1.63	1.71	1.70
	Cost 'C'		1.31	1.41	1.63	1.56

2886.75 (3.10 %), plant protection Rs. 2634.89 (2.83 %), bullock labour Rs. 2600.36 (2.79 %) and machine power Rs.2591.57 (2.79 %). Interest on fixed capital had negligible share Rs. 1465.52 (1.57 %).

The cost 'A' was Rs. 51575 (55.42 %) and cost 'B' was Rs. 85006 (91.35 %). As regards these items, the similar trend was observed among different size groups. The cost 'C' was minimum in large size group followed by medium and large size group. The percentage share of cost 'A' and cost 'B' in cost 'C' at the overall level was 55.42 and 91.35 per cent, respectively.

The cost 'A' was minimum in small size group Rs. 39932, followed by Rs. 52.544 in large size and Rs. 52876 in medium size groups, respectively. The cost 'B' was Rs. 71619, Rs. 85851 and Rs. 86281 for small, medium and large groups, respectively. While total cost *i.e.* cost 'C' was Rs. 101579, Rs. 99068 and Rs. 90637 for small, medium and large groups, respectively.

It could be revealed from the above discussion that pattern of cost on various items of cost of cultivation of guava have declined over the different size group of holdings. It indicates economies of scale.

Costs and returns structure :

The per hectare cost and returns structure for Guava has been estimated and are presented in Table 3. The detailed cost of cultivation is given in Table 1.

It can be seen from Table 3 that per hectare total yield obtained from Guava at the overall level was 180.83 quintals. Among the size group of holdings the per hectare yield was 110.45, 181.27, and 188.52 quintals in small, medium and large size groups of holdings, respectively. It indicates that the per hectare yield of guava increased with an increase in the size of holdings.

The gross income received from guava was observed to be Rs. 132567.29, Rs. 140020.97 and Rs. 147395.86 in small, medium and large size groups, respectively, while at the overall level, it was Rs. 144852.29. The gross returns also depicted the similar trend as that of per hectare yield.

The per hectare net profit at cost 'A' was highest (Rs. 94851.06) in medium group followed by small group (Rs. 92634.95). At the overall level, it was (Rs. 93277.19). The net returns at cost 'C' was highest in large group (Rs. 56758.59), followed by medium group (Rs. 40951.98) and small group (Rs.30988.17), respectively. At the overall level, it was Rs.51797.71. The per hectare net profit increased with increase in size group.

At the overall level, B:C ratio is 1.56. The B:C ratio was highest in large size group (1.63), followed by medium group (1.41) and small group (1.31), respectively. From the above discussion, it is indicated that the per unit cost of cultivation is declining as size group increases and that resulted into the more (1.63) profitability in large size group.

Production function analysis :

In order to examine the relation between the input and output, the Cobb - Douglas type of production function was used. The results of the estimated production function are presented in Table 4. It can be revealed from the table that, eight independent variables have jointly explained 70 per cent variation in the production of guava.

Table 4 : Results of cobb-douglas production function for guava

Sr. No.	Particulars	Regression co-efficient	Std. error
1.	Constant (a)	2.01693	
2.	Human labour (man days) (X ₁)	0.1966*	0.1119
3.	Bullock labour (pair days) (X ₂)	-0.0384*	0.0194
4.	Manures (qtls) (X ₃)	-0.0278 NS	0.0356
5.	Fertilizers (Kgs) N(X ₄)	0.0883 ***	0.0372
6.	P(X ₅)	-0.0502 NS	0.0400
7.	K(X ₆)	-0.0199 NS	0.0186
8.	Plant protection charges (Rs.) (X ₇)	0.0395 ***	0.0185
9.	Irrigation charges (Rs.) (X ₈)	-0.0568 NS	0.1313
10.	R ²	0.70	
11.	F value	18.95	

* and *** indicate significance of values at P=0.10 and P=0.01, respectively

The nitrogenous fertilizers and plant protection charges were highly significant at one per cent level, indicating that these are the important variables for raising the production of guava. The human labour is significant at 10 per cent level. The regression co-efficients of manure and bullock labour were negative which indicate the excess use of these inputs.

Marketing channels :

All the farmers on sample farms sell guava fruit through pre harvest contractor. So the channel is Producer - Pre-harvester contractor- Wholesaler- retailer- consumer. The per quintal marketing cost of guava is presented in Table 5.

It can be noted from the Table that, the per quintal cost of marketing of guava was Rs. 286.34. There is only one channel observed in the marketing of guava because all the producer sold their produce to pre-harvester contractor. Among the marketing cost transport and commission charges were the major items and contributed highest share (70 %) and (12 %), respectively.

Price spread in marketing of guava :

It can be noted from the Table 6 that, the per quintal price received by the producer is Rs.801.04 (57.81 %) means producers share in consumer rupee is 58 per cent. The producers sold the produce to the pre-harvester contractor

Table 5 : Marketing cost for guava (₹/qtl.)

Sr. No.	Particulars	Marketing cost	Per cent
1.	Grading	16.46	5.75
2.	Packing charges	5.99	2.09
3.	Transport	202.12	70.59
4.	Commission charges	35.48	12.39
5.	Hamali	26.29	9.18
6.	Market cess	0.00	0.00
7.	Other	0.00	0.00
8.	Miscellaneous cost	0.00	0.00
Total marketing cost (₹/qtl)		286.34	100.00

Channel : Producer-Pre-harvester contractor-Wholesaler-Retailer-Consumer.

Table 6 : Price spread in marketing of guava (₹/qtl.)

Sr. No.	Particulars	Channel
1.	Gross price received by the producers	801.04 (57.81)
2.	Market expenses incurred by the producers	0.00 (0.00)
3.	Net price received by the producers	801.04 (57.81)
4.	Expenses incurred by the pre-harvester contractor (Including harvesting charges)	486.34 (35.10)
5.	Expenses incurred by the wholesalers	25.24 (1.82)
6.	Margin of the wholesalers	15.30 (1.10)
8.	Expenses incurred by the retailers	32.35 (2.33)
9.	Margin of the retailers	25.37 (1.83)
10.	Price paid by consumers in the market	1385.64 (100)

Figures in parentheses are percentage to the final price paid by the consumers
Channel: Producer-Pre-harvester contractor-Wholesaler-Retailer-Consumer.

directly therefore harvesting, packaging, grading, transport etc. charges are minimized from producers side.

From the above discussion, it is observed that the share of middleman's was 42 per cent.

Yearwise indices of arrivals and prices of guava in different APMC markets of western Maharashtra :

The yearwise indices in arrivals and prices of guava in different APMC markets is presented in Table 7. It is noted from the table that, the arrivals of guava was highest in

Table 7 : Year wise trends in arrival and prices of guava in different APMC markets

Sr. No.	Name of the market		2006-07	2007-08	2008-09	2009-10	2010-11	C.V.
1.	Pune	A	107.98	98.00	114.34	88.48	91.20	85.97
		P	74.67	82.17	92.74	113.19	137.23	30.77
2.	Ahmednagar	A	223.96	74.05	60.67	63.77	77.55	93.09
		P	68.90	93.45	92.77	121.42	123.47	19.65
3.	Nasik	A	109.73	137.18	99.10	75.98	78.01	39.53
		P	65.78	82.58	89.54	104.75	157.35	22.99

A= Arrivals in qtls., P = Price in Rs.

Ahmednagar APMC markets in the year 2006-07, while it was highest in Nasik market during 2007-08 and in Pune APMC market during the year 2008-09. The prices are highest in Nashik market during the year 2010-11 and lowest in Ahmednagar market during the same year. In the case of arrivals, co-efficient of variation is highest in Pune market and lowest in Ahmednagar market, while, in case of prices, the co-efficient of variation is highest in Pune market and lowest in Nashik market. The higher co-efficient of variance, indicated the higher variation in yearwise arrivals and prices of guava in APMC market during the five years.

Correlation co-efficient between arrival and prices of guava in different APMC's market in western Maharashtra :

The correlation co-efficient between arrivals and prices of guava in different APMC markets are presented in Table 8.

Table 8 : Correlation co-efficient between arrival and prices of guava in different APMC's of western Maharashtra

Sr. No.	APMC Market	Correlation co-efficient
1.	Pune	-0.05***
2.	Ahmednagar	-0.77***
3.	Nashik	-0.69***

*** indicate significance of values at P=0.01, respectively
Priod 2006-07 to 2010-11

It is noted from the Table 8 that, in general, the arrivals and prices are negatively correlated and accordingly it was observed in Pune, Ahmednagar and Nashik APMC market for guava.

Problems in production and marketing of guava :

It is noted from the Table 9 that, There were many problems faced in production and marketing of guava fruit crop. The major problems are Planting material are costly, loan facilities are not available timely, fruit processing facilities are not available, grading and packaging facilities are not available and low market prices.

Conclusion :

- The inputs viz., manure, nitrogen, phosphorus and potash were used at lower level than the

Table 9 : Problems in production and marketing of guava crop

Sr. No.	Particulars	n=90
I	Problems in guava cultivation	
1.	Digging out pits and labour requirements are costly	60 (66.67)
2.	Planting material – costly	75 (83.33)
3.	Unawareness of Improved layering methods	20 (22.22)
4.	Identification problem of pest and diseases	45 (50.00)
5.	Identification problem of harvesting stages	25 (27.78)
6.	Unavailability of loan as per requirement and time	80 (88.89)
7.	Fruit processing industries are not available in areas	85 (94.44)
8.	No Irrigation facility	50 (55.56)
9.	Irregular flow supply of electricity	60 (66.67)
10.	Labour shortage and high wage rates	62 (68.89)
II	Problems in marketing guava	
11.	Grading and packing facility are not available	75 (83.33)
12.	Transportation and storage are not available and costly	65 (72.22)
13.	Method of sale by pre harvester contractor	88 (97.78)
14.	Low market prices	85 (94.44)
15.	Perishable commodity	86 (95.55)

recommended levels for guava , therefore there is gap in yield.

- The guava fruit crop is economically viable as B:C ratio is more than unity.
- The N fertilizers, plant protection and human labour was significant, indicating that these are the important variable for raising the production of guava.
- Channels observed in marketing of guava is Channel: Producer-Pre-harvester contractor-Wholesaler-retailer-consumer.
- The arrivals of guava are fluctuating in all the markets under study during the period 2006-07 to 2010-11, whereas, the prices of guava are increasing in all the APMC markets under study.
- The arrivals and prices for both are negatively correlated and accordingly it was observed in Pune, Ahmednagar and Nashik APMC markets for guava crop.

Suggestions :

- The guava growers should use recommended levels of inputs for better yield. The growers should sell their produce during the month of December to March at Nasik, Pune and Ahmednagar APMC markets for getting higher prices.
- Loan facilities, processing and marketing facilities should be provided to encourage the producer.

- Farmer should adopt drip irrigation method for guava cultivation to enhance the water use efficiency.

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