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Study on operational management levels of guava growers in flood prone eastern plain Zone of Rajasthan

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Abstract
Guava fruit known as the "poor man's fruit" or "apple of the tropics" was a popular tree fruit of the tropical and subtropical climates. It had been adopted in India so well that it appeared to be an almost Indian fruit. The rapid changes in technological innovations, fluctuating economic trends, changing policy initiatives and several uncertain factors operating in the production and marketing environment have made the decision-making task of farmers exceedingly complex. To minimize the risk in decision-making, availability and access to accurate, reliable, and timely information become all the more important. It provides how problems are recognized, defined and eventually solved. If the information is better, complete, accurate, more reliable and timelier available, it is easier for farmers to make the right and rational decision through their management skills. According to the data of 2019, the production share of guava in India was 45.89% followed by Indonesia 5.9% and China at 4.32%, respectively, of the Total World Production of guava. According to Horticulture Statistics Division, DAC&FW in 2018-19, the total area of 276,000 hectares is dedicated to guava production in this country. This land area represents just over a 70% increase since the early 2000s. Cultivation has also increased by around 54%. India produces 42,53,000 metric tonnes of guava annually. Out of the total cultivated area, fruits occupy 65.97 lakh hectares and 967 lakh tonnes of production. The present study was conducted in the flood-prone eastern plain zone (IIIb) of Rajasthan. From the purposely selected Sawai Madhopur and Bharatpur districts, 10-gram panchayat of Sawai Madhopur and 5-gram panchayat of Bharatpur district were selected. Separate lists of all the guava growing villages from each of the selected gram panchayat were prepared and 20 villages from Sawai Madhopur district and 10 villages from Bharatpur district, comprising a total of 30 villages were selected randomly by proportional allocation method. From the selected villages, 7 guava growers having at least one-acre guava orchard for the last three years and a total of 210 guava growers from all 30 villages were selected randomly for the study purpose. In the present study, the *"Ex-post facto"* research design was used. For the computation of operational management level, the variables like Adoption Index, Size of land holding, Annual income, borrowing of total credit, Guava yield index, Farm mechanization index, Irrigation potentiality, Level of farm wage payment have been computed. It is has found that more than half the majority of guava growers belonged to the 36 to 50 years age group in both Sawai Madhopur and Bharatpur districts, the majority of guava growers were educated up to the primary level. In the present study majority of guava growers were under the medium level of adoption, more than two-fifth were observed in the marginal farmer category, majority of guava growers were in the annual income group from Rs 1.00 to 2.00 lakhs. It has also been found that the guava growers had medium borrowing of credit, medium guava yield index, medium farm mechanization, medium irrigation potentiality on their farm, medium level of farm wage payment.

Keywords: Operational management levels, guava growers, flood prone eastern plain

Introduction
The Guava, botanically known as *Psidium guajava* belongs to the family of Myrtaceae. Guava is a quite hardly plant and gives assured production even with very little care. It is adaptable to various soil and climatic conditions. Guava is successfully grown up to 1500 meters above mean sea level. It can grow with an annual rainfall of about 100 mm and temperature between 15 to 30^{0}C. It requires a dry atmosphere during flowering and fruiting. However, the young plants are susceptible to drought and cold. Guava grows well in high sandy loam to clay soils. However, According to IIHR, Bangalore, the crop performs best on red sandy loams with a pH range of 5 to 6 (source: http://webapps.iihr.res.in:8086/cp-soilclimate1.html). The high acceptability of guava is due to its high nutritive value, pleasant aroma good flavor and availability of moderate price. Thus, it is an ideal fruit for nutritional security.
Guava fruit known as the "poor man's fruit" or "apple of the tropics" was a popular tree fruit of the tropical and subtropical climates and was native to tropical America stretching from Mexico to Peru.

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It had been adopted in India so well that it appeared to be an almost Indian fruit.

Guava is considered to be one of the most exquisite and nutritionally valuable remunerative crops. Guava fruits were used for both eating fresh and also for processing. As soon as, one got accustomed to its penetrating aroma, it became the most delicious and the most fascinating fruit for consumers and it also excelled most of the other fruit trees in respect of its productivity, hardiness, adaptability and its Vitamin C contents. Besides its high nutritive value, it yielded a heavy crop every year and it also gave handsome economic returns involving very little inputs. This had prompted several Indian farmers to take up Guava Cultivation on a commercial scale. Its cultivation was not seriously affected by the extremes of temperature, hot winds, scanty rainfall, saline and poor soil, waterlogging condition and above all, the non-availability of water, fertilizers and other inputs. Guava trees were not difficult to grow and could survive in a range of soil and climatic conditions. However, precise management was needed to produce a highly profitable crop.

All the enterprises are interested in increasing productivity. Agriculture being an enterprise is not an exception to this. The farmers as the manager of the enterprise are expected to bring about maximum profit with available resources. Irrespective of the economic, social, cultural, physical and technological environment, the farmers manage a production system to get a return from it, consciously or unconsciously.

Farmers need to innovate and updated information on modern cost-effective and adaptable crop production techniques, post-harvest and plant protection measures along market information and weather reports, it's to be looked at as a management activity deserving serious attention. It serves as a tool for making the right decisions at the right time.

The rapid changes in technological innovations, fluctuating economic trends, changing policy initiatives and several uncertain factors operating in the production and marketing environment have made the decision-making task of farmers exceedingly complex. To minimize the risk in decision-making, availability and access to accurate, reliable and timely information become all the more important. It provides how problems are recognized, defined and eventually solved. If the information is better, complete, accurate, more reliable and timelier available, it is easier for farmers to make the right and rational decision through their management skills.

Every country wants an inclination and indispensability for the economic recovery and socio-economic development of its masses. Indian agricultural enterprise sector is vast and has continued to be the backbone of our economy where an estimated 57.8% of rural households are agricultural households in the country (Anonymous, 2014) National Sample Survey Office (NSSO, 70th round report). It contributes 16.5 per cent of GDP (Gross Domestic Production) in 2019-20 and generates about 9.9 per cent of export earnings during 2018-19 and provides employment for approximately 44 per cent of the workforce (Anonymous, 2019) [3] National Sample Survey Office (NSSO). According to the latest National Sample Survey Office (NSSO) out of 1000 households in India, fruit consumption was reported by 608 (rural) and 777 (urban) residents. It also provides raw material to several industries. During the last seventy years of Indian agriculture has changed from a food-deficit image to self-sufficiency through the green revolution and now is capable of exporting fruits. The various revolutions such as Green, White, Blue, Brown and Red are the most striking success stories of the post-independence era.

Being prominent crops after food grains and oilseeds, horticulture will be treated as a lead sector in agriculture and rural development. According to Horticulture Division, ICAR the Horticulture has become a key driver for economic development in many of the states in the country and it contributes 30.4 per cent to the GDP of Indian agriculture. The agriculture sector grew by an average of 1.6 per cent per annum in the first four years of the twelfth five-year plan (2012-17) as against the targeted 4.6 per cent annual growth due to lower production. The achievement of this growth rate would be possible if the annual growth rate of horticulture is maintained at 6 to 8 per cent. This is feasible and achievable.

The massive transformation has been possible owing to concerted efforts in implementing an agricultural strategy that consists of technological break-through and their application in agriculture. There has been a great role of agricultural scientists, extension workers as well as hard and dedicated work by Indian farmers and supportive policies of the government.

India stood second in the international ranking in the production of various fruit crops and number one guava-producing country in the world. According to the latest available data (Source: https://www. tridge.com/intelligences/guava/production) of 2019, the production share of guava in India was 45.89 per cent followed by Indonesia 5.9 per cent and China at 4.32 per cent, respectively, of the Total World Production of guava. China, Mexico and Pakistan had a Production share of 4 per cent approximate each in the guava production of the World. Major importers include the Malawi, Brazil, Thailand and Egypt.

According to Horticulture Statistics Division, DAC&FW in 2018-19, the total area of 276,000 hectares is dedicated to guava production in this country. This land area represents just over a 70% increase since the early 2000s. Cultivation has also increased by around 54%. India produces 42,53,000 metric tonnes of guava annually. Out of the total cultivated area, fruits occupy 65.97 lakh hectare and 967 lakh tonnes of production.

Few studies have been conducted on the managerial ability of farmers in the cultivation of various crops, but the study on the managerial ability of guava growers is lacking.

Research Methodology
The Present investigation was conducted in the flood-prone eastern plain zone (IIIb) of Rajasthan. Out of these the flood-prone eastern plain Zone (IIIb) was selected purposively because this zone is having the maximum area and highest production and many guava growers were awarded at state and national level lies in this zone. Also, the area under guava cultivation is increasing regularly and the climatic conditions are suitable for quality production. From the purposely selected Sawai Madhopur and Bharatpur districts, 10 gram panchayat of Sawai Madhopur and 5 gram panchayat of Bharatpur district were selected because of having maximum area and production in their respective districts. Separate lists of all the guava growing villages from each the selected gram panchayat was prepared and 20 villages from Sawai Madhopur district and 10 villages from Bharatpur district, comprising a total of 30 villages were selected randomly by proportional allocation method. From the selected villages, 7 guava growers having at least one acre guava orchard for the last three years and a total of 210 guava growers from all 30 villages were selected randomly for the study purpose.

Research design
In the present study, the "Ex-post facto" research design was used.

Adoption Index
The adoption index of guava growers was measured by the adoption quotient developed by Chattopadhyay (1974), which was slightly modified as suggested by the experts.
The adoption quotient developed by Chattopadhyay (1974) was used with slight modifications as suggested by experts.

$$AQ = \frac{\left(\frac{e_1}{P_1}\right)W_1 + \left(\frac{e_2}{P_2}\right)W_2 + \ldots + \left(\frac{e_n}{P_n}\right)W_n}{W \times N} \times 100$$

Where,
AQ = Adoption quotient
$e_1 - e_n$ = Extent of adoption in terms of score obtained by the guava growers for the particular practice.
$p_1 - p_n$ = Potentiality of the guava growers in terms of score obtained for the particular practices.
$W_1 - W_n$ = Weightage of the particular practice
W = Summation of weightages of all practices included
N = Number of years for which adoption quotient was calculated.

For the adoption quotient, one-year data were obtained. The respondents were grouped into three categories based on mean and standard deviation as follows.
Low adoption index = Below (Mean - S.D.)
Medium adoption index = From (Mean ± S.D.)
High adoption index = Above (Mean + S.D.)

Size of land holding
It was operationalized as the total number of hectares of land owned and leased by the individual family to operate the farming system by own at the time of the study. It was determined by a schedule developed for the same. The respondents were classified into marginal, small, semi-medium, medium and large farmers categories as follows as suggested by 2001 (GOI).

Marginal farmers = Upto 1.00 ha.
Small farmers = 1.0 to 2 ha.
Semi-medium farmers = 2.0 to 4.00 ha.
Medium farmers = 4.0 to 10.00 ha.
Large farmers = More than 10.00 ha.

Annual income
The annual income includes the quantum of money obtained or earned by all family members during the year from the farm and non-farm sources.
The data collected from the respondents about their annual income was categorized into three groups as follows.
Low annual income = Below ₹ 100000
Medium annual income = From ₹ 100000 to 200000
High annual income = Above ₹ 200000

Borrowing of total credit
The total amount borrowed annually by a guava grower for purchase of variable inputs for management of orchard may be regarded as his total management credit and is calculated as the proportion of total amount borrowed annually from different sources to the total annual cash requirement for management of orchard per acre per year, expressed in

percentage. The index was calculated as follows.

$$\text{Index of borrowing of total management credit} = \frac{\text{Total amount borrowed for management of orchard from different sources annually}}{\text{Total annual cash requirement for management of orchard}}$$

The guava growers were classified into three categories by using mean and standard deviation as follows.
Low borrowers = Below (Mean - S.D.)
Medium borrowers = From (Mean ± S.D.)
High borrowers = Above (Mean + S.D.)

Guava yield index
The average fruit yield of guava growers compared with the average fruit yield of 100 guava growers (q/ha) in terms of percentage.

$$\text{Guava yield index} = \frac{\text{Average yield of guava orchard of 100 guava growers}}{\text{Average yield of guava orchard of individual guava growers}} \times 100$$

The guava growers were classified into three categories by using mean and standard deviation as follows.
Low guava yield index = Below (Mean - S.D.)
Medium guava yield index = From (Mean ± S.D.)
High guava yield index = Above (Mean + S.D.)

Farm mechanization index
To measure the farm mechanization index of the guava growers, the index developed by Singh and Singh (1970) was used with slight modification after experts' opinions (Appendix II, Part-I, 2.6).

$$FMI = \sum_{i=1}^{n} W_i \times n_i \times t_i$$

FMI = Farm mechanization index
W_i = Weightage of the ith item possessed by the guava growers
n_i = The number of the ith item possessed by an individual guava growers
t_i = The total period in years, the ith item has been possessed
n = Total number of items selected
∑ = Summation

The score obtained by each respondent is calculated by the above-mentioned formula. The respondents were grouped into three categories based on the mean and standard deviation as follows.

Low farm mechanization index = Below (Mean - S.D.)
Medium farm mechanization index = From (Mean ± S.D.)
High farm mechanization index = Above (Mean + S.D.)

Irrigation potentiality
The guava growers were asked to mention the total area being irrigated for the guava and it was expressed in terms of percentage. The guava growers were categorized in the categories by using mean and standard deviation as follows.

Low irrigation potentiality = Below (Mean - S.D.)
Medium irrigation potentiality = From (Mean ± S.D.)
High irrigation potentiality = Above (Mean + S.D.)

Level of farm wage payment
To measure the level of farm wage payment the index developed by Bora (1986) was used. The cost of hired labour for all crops was added and divided by the gross cropped area which gave the level of farm wage payment of a guava grower. The guava growers were classified into three categories by using mean and standard deviation as follows.

Low = Below (Mean - S.D.)
Medium = From (Mean ± S.D.)
High = Above (Mean + S.D.)

Results and Discussion
Personal Characteristics
Age
Age is an important factor in the decision-making of the managerial ability of the guava growers and orchard planning for the future. Age of the guava growers at the time of investigation was recorded by asking their age in completed years and data were classified into three groups as per the categorization given by NSSO *viz.,* up to 35 years, from 36 to 50 years and above 50 years. The data concerning age are presented in Table 1.
The data presented in Table 1 indicated that the majority (56.20 per cent) of guava growers belonged to the 36 to 50 years age group, whereas 28.60 per cent of guava growers were in the above 50 years age group and only 15.20 per cent of guava growers were in less than 35 years of age group.

Table 1: Distribution of guava growers according to their age group

S. No.	Category	Sawai Madhopur (n₁=140)		Bharatpur (n₂=70)		Total respondents (n=210)	
		F	%	F	%	F	%
1	Young (up to 35 years)	22	15.70	10	14.30	32	15.20
2	Middle (from 36 to 50 years)	76	54.30	42	60.00	118	56.20
3	Old (above 50 years)	42	30.00	18	25.70	60	28.60
	Total	140	100.00	70	100.00	210	100.00

$\bar{x}$ = 46.73 s = 13.216

Education
The education level of the guava growers at the time of investigation was recorded by asking their education level and data were classified into four groups *viz.,* Illiterate, Primary, Secondary, and Higher education. The data concerning age are presented in Table 2.

Table 2 reveals that 43.80 per cent of the guava growers were educated up to primary level, whereas 35.70 per cent of them were educated up to secondary level, 10.50 per cent were educated above higher secondary and college level and 3.81 per cent were illiterate.

Table 2: Distribution of guava growers according to their education level

S. No.	Category	Sawai Madhopur (n₁=140)		Bharatpur (n₂=70)		Total respondents (n=210)	
		F	%	F	%	F	%
1.	Illiterate (unable to read or write)	16	11.40	5	7.10	21	10.00
2	Primary (up to 8th standard)	61	43.60	31	44.30	92	43.80
3	Secondary (9th to 12th standard)	48	34.30	27	38.60	75	35.70
4	Higher education (above 12th standard)	15	10.70	7	10.00	22	10.50
	Total	140	100.00	70	100.00	210	100.00

The data in Table 2, further revealed that the majority of Sawai Madhopur (43.60 per cent) and Bharatpur (44.30 per cent) districts guava growers were educated up to the primary level, whereas 34.30 per cent of guava growers of Sawai Madhopur and 38.60 per cent of guava growers of Bharatpur districts were educated up to secondary level,10.70 per cent guava growers of Sawai Madhopur and 10.00 per cent of guava growers of Bharatpur districts were educated above higher secondary and college level and only 11.40 per cent guava growers of Sawai Madhopur and 7.10 per cent guava growers of Bharatpur districts were illiterate.
The probable reason for this finding might be that the guava growers might be benefited from the existing educational facilities prevailing in the area. Hence, the majority of the guava orchard growers were educated up to the primary level followed by the secondary level of education.
Similar findings were reported by Satrola (1991), Chothani (1999), Jadav (2005), Sharma (2009) and Kamal (2016).

Operational management characteristics
Adoption of recommended production technology of guava
For the measurement of adoption, the data collected were analyzed and presented in two parts (i) adoption level of guava growers (ii) practice-wise adoption of recommended guava production technology.

Adoption level of guava growers
The data with regard to the extent of adoption of recommended cultivation of guava were collected and based on the response values, the adoption quotient (AQ) was calculated for each of the respondents. Owing to AQ value the respondents were classified into three categories by using mean and standard deviation as per Table 3.
The data presented in Table 3 indicated that the majority (70.00 per cent) of the respondents were categorized under the medium level of adoption. There was 18.10 per cent of the respondents with a low level of adoption and 11.90 per cent of the respondents had a high level of adoption.

Table 3: Distribution of guava growers according to their adoption of guava production technology

S. No.	Category	Sawai Madhopur (n₁=140)		Bharatpur (n₂=70)		Total respondents (n =210)	
		F	%	F	%	F	%
1.	Low adoption index (below 47.48 score)	22	15.70	16	22.90	38	18.10
2	Medium adoption index (from 47.48 to 70.46 score)	103	73.60	44	62.90	147	70.00
3	High adoption index (above 70.46 score)	15	10.70	10	14.30	25	11.90
	Total	140	100.00	70	100.00	210	100.00

$\bar{x}$ = 58.97 s = 11.49

The data in Table 3, It can be described that the majority of Sawai Madhopur (73.60 per cent) and Bharatpur (62.90 per cent) guava growers were having medium adoption, whereas 15.70 per cent of guava growers of Sawai Madhopur and 22.90 per cent of guava growers of Bharatpur districts were having low adoption, 10.70 per cent guava growers of Sawai Madhopur and 14.30 per cent of guava growers of Bharatpur districts were having high adoption.

It can be concluded from the above finding that the overall adoption of guava growers about recommended cultivation of guava was medium. This might be due to the medium level of annual income, mass media exposures, and economic motivation of the majority of respondents resulting in a medium adoption level of guava growers. Moreover, the extension workers might have convinced guava orchard growers and they might have desired to increase the production of guava by adopting the recommended scientific cultivation practices in guava orchards.

This finding was in conformity with findings that of Gorfad (1993), Pandya and Vekaria (1994), Dangar (1996), Patel (1996), Chothani (1999), Poonia (2002), Jadav (2005) and Sharma (2009).

Practice-wise adoption of recommended guava production technology by the growers
To ascertain the practice-wise adoption of recommended guava cultivation practices by the guava growers, the scientific practices were grouped under 13 major practices (as given in the methodology) and practice-wise scores were assigned, making a total of 100 scores. On the basis of the practice-wise scores obtained by the respondents in adopting a particular practice, the mean per cent scores were worked out for all the practices and based on mean per cent scores, ranks were assigned to each practice. The results are presented in Table 4.

Table 4: Practice-wise extent of adoption of recommended guava production technology by guava growers

S. No	Practice-wise of guava production technologies	Practice wise potential score (100)	Mean per cent scores with Rank					
			Sawai Madhopur		Bharatpur		Overall	
			MPS	Rank	MPS	Rank	MPS	Rank
1	Tillage	4	75.18	VI	74.29	IV	74.73	V
2	Variety	14	95.26	I	93.67	I	94.46	I
3	Planting distance	5	77.14	V	66.29	VII	71.72	VI
4	Organic manure	8	79.38	IV	74.11	V	76.74	IV
5	Chemical fertilizer	12	51.13	IX	48.45	IX	49.79	IX
6	Irrigation	10	89.00	II	81.29	III	85.14	III
7	Insect/pest control	9	69.29	VII	59.52	VIII	64.41	VIII
8	Disease control	8	67.05	VIII	69.46	VI	68.26	VII
9	Micro-nutrients	5	1.71	XIII	1.14	XIII	1.43	XIII
10	Intercropping	4	20.18	XI	23.21	XI	21.69	XI
11	Growth hormones	6	1.90	XII	1.19	XII	1.54	XII
12	Weed control	5	30.86	X	28.29	X	29.58	X
13	Bahar treatment	10	88.50	III	86.00	II	87.25	II
	Overall MPS		57.43		54.38		55.90	

NB: multiple response

The perusal of data in Table 4 showed that the highest adoption was obtained by guava growers for adopting the recommended variety (94.46 MPS) placed at first rank, with the majority of bahar treatment practices (87.25 MPS) on the second rank, Irrigation (water management) practices were adopted (85.14 MPS) on the third rank, uses of organic manures are 76.74 MPS with the fourth rank, tillage practices by 74.73 MPS were adopted with the fifth rank and the planting distance practices are 71.72 MPS on the sixth rank respectively. The medium adoptions were observed in practices of disease control 68.26 MPS and Insect/pest control 64.41 MPS on seventh and eighth ranks respectively. While the poor adoption was found in uses of chemical fertilizers 49.79 MPS on the ninth rank, Weed control practices 29.58 MPS on the tenth rank, intercropping 21.69 MPS on the eleventh rank, and very few guava growers have adopted

growth hormones/regulators by 1.54 MPS which stand on twelfth rank and micro-nutrients by 1.43 MPS in the last rank in overall cultivation practices of guava.
Further reveals of Table 4, district wise adoption highly obtained by the guava growers with the majority of adopting the recommended variety for Sawai Madhopur (95.26 MPS) and Bharatpur (93,67 MPS) are on the first rank, followed by bahar treatment practices in Sawai Madhopur (88.50 MPS) on the third rank and Bharatpur (86.00 MPS) district on the second rank, Irrigation (water management) practices for Sawai Madhopur (89.00 MPS) on the second rank and Bharatpur (81.29 MPS) district, respectively. Least adoption followed by the guava growers for Intercropping in Sawai Madhopur (20.18 MPS) and Bharatpur (23.21 MPS) on the eleventh rank, uses of growth hormones in Sawai Madhopur (1.90 MPS) and Bharatpur (1.19 MPS) on twelfth rank. The

Micro-nutrients uses obtained in lowest for guava growers of Sawai Madhopur (1.71 MPS) and Bharatpur (1.14 MPS) on the last rank, respectively.

It was also revealed from Table 4 that the adoption of guava production technology by guava growers was more in Sawai Madhopur district as compared to Bharatpur district.

This might have happened due to the fact that they were not aware of the role of micro-nutrients and growth regulators in the cultivation of guava and also complexity in use. This could also be attributed to the reason that most of the guava growers believed that the application of fertilizers increased the vegetative growth of plants and weeds resulting in the infestation of more diseases and insects/pests problems. In case of diseases and insects/pest control, they were not aware of the recommended dose of pesticides and insecticides and also dependents on the advice of agriculture input dealers.

The findings are in agreement with the findings of Yawalkar *et al.,* (1991), Gorfad (1993), Mayani & Patel (1998), Poonia (2002), Jadav (2005) and Sharma (2009).

Size of land holding
It is quite clear from Table 5 that out of total guava growers 42.38 per cent respondents were observed as marginal farmers, 25.71 per cent respondents were observed as small farmers, 17.14 per cent respondents were observed as semi-medium farmers, about 10.95 per cent respondents were observed as medium farmers and only 3.81 per cent respondents were observed as large farmers.

The data in Table 5 further indicated that the majority of guava growers of Sawai Madhopur (42.86 per cent) and guava growers of Bharatpur (41.43 per cent) districts were observed in the marginal farmer category, whereas 26.43 per cent guava growers of Sawai Madhopur district and 24.29 per cent of guava growers from Bharatpur district were found in small farmers category. Only 4.29 per cent guava growers of Sawai Madhopur and 2.86 per cent guava growers of Bharatpur districts were found in the large farmer category.

Table 5: Distribution of guava growers according to their size of land holding

S. No	Category	Sawai Madhopur (n₁=140)		Bharatpur (n₂=70)		Total respondents (n =210)	
		F	**%**	**F**	**%**	**F**	**%**
1.	Marginal farmers (up to 1.0 ha)	60	42.86	29	41.43	89	42.38
2	Small farmers (from 1.0 to 2.0 ha)	37	26.43	17	24.29	54	25.71
3	Semi-medium farmers (from 2.0 ha to 4.00 ha)	23	16.43	13	18.57	36	17.14
4	Medium farmers (from 4.0 ha to 10.00 ha)	14	10.00	9	12.86	23	10.95
5	Large farmers (more than 10.00 ha)	6	4.29	2	2.86	8	3.81
	Total	140	100.00	70	100.00	210	100.00

From the findings, it can be concluded that the majority of the guava growers had the marginal size of land holdings and more than one-fourth of the guava growers were from the small size land holding category. Only about one-seventh of the guava growers had possessed medium to large size land holding.

The reason may be that the parents used to give a part of the land as a share of their children after their marriage. This continuous fragmentation process resulted in the emergence of a large number of nuclear families that divides the ancestral property might have caused the reduction in the land holding of families. Industrialization and urbanization may also be the potent reasons for reducing the per capita availability of land. The finding of Singh *et al.,* (2005), conformed with the present finding while the findings of Jadav (2005) and Sharma (2009) differed from this finding.

Annual income
The data presented in Table 6 revealed that 53.33 per cent of guava orchard growers belonged from Rs. 1.00 lakh to Rs. 2.00 lakh annual income group, while 23.34 and 23.33 per cent of guava growers fell under the group up to Rs. 1.0 lakh and annual income group above Rs. 2.0 lakh, respectively.

Table 6: Distribution of guava growers according to their annual income

S. No.	Category	Sawai Madhopur (n₁=140)		Bharatpur (n₂=70)		Total respondents (n=210)	
		F	**%**	**F**	**%**	**F**	**%**
1.	Income group (Below Rs. 100000)	33	23.60	16	22.90	49	23.34
2	Income group (from Rs. 100000 to 200000)	73	52.10	39	55.70	112	53.33
3	Income group (above Rs. 200000)	34	24.30	15	21.40	49	23.33
	Total	140	100.00	70	100.00	210	100.00

The data in Table 6, It can be described that majority of Sawai Madhopur (52.10 per cent) and Bharatpur (55.70 per cent) districts guava growers were from the annual income group from Rs. 1.00 lakh to Rs. 2.00 lakh, whereas 23.60 per cent of guava growers of Sawai Madhopur and 22.90 per cent of guava growers of Bharatpur districts came under up to Rs. 1.0 lakh annual income group and 24.30 per cent guava growers of Sawai Madhopur and 21.40 per cent of guava growers of Bharatpur districts were fell under above Rs. 2.0 lakh annual income group.

This might be being to the fact that the majority of the respondents had the marginal, small and semi- medium size of land holding. In addition to this initial investment and cost of cultivation of guava orchard is high and guava growers get more returns in terms of yield.

The finding differed from the findings of Kanani (1998), Singh *et. al.* (2005) and Jadav (2005).

Borrowing of credit
It is apparent from Table 7 that 69.04 per cent of guava orchard growers were found to have medium borrowing of credit followed by 17.16 and 13.80 per cent respondents

having high and low borrowing of credit, respectively. It can be concluded that about two-thirds of the guava orchard growers had borrowed total management credit from the different sources.

The data in Table 7, It can be described that majority of Sawai Madhopur (72.85 per cent) and Bharatpur (61.40 per cent) districts guava growers were found to have medium

borrowing of credit, whereas 14.30 per cent of guava growers of Sawai Madhopur and 22.90 per cent of guava growers of Bharatpur districts come under high borrowing of credit and 22.85 per cent guava growers of Sawai Madhopur and 15.70 per cent of guava growers of Bharatpur district were fell under low borrowing of credit.

Table 7: Distribution of guava growers according to their borrowing of credit

S. No	Category	Sawai Madhopur (n₁=140)		Bharatpur (n₂=70)		Total respondents (n=210)	
		F	%	F	%	F	%
1.	Low borrowers (below ₹ 0.42 lakh)	18	12.85	11	15.70	29	13.80
2.	Medium borrowers (from ₹ 0.42 to 0.72 lakh)	102	72.85	43	61.40	145	69.04
3.	High borrowers (above ₹ 0.72 lakh)	20	14.30	16	22.90	36	17.16
	Total	140	100.00	70	100.00	210	100.00

$\bar{x}$ = 0.57 s = 0.15

In fact, the majority of guava growers had marginal, small and medium-size land holdings and 76.60 per cent of guava growers had medium and high annual income groups. Thus, guava growers have to borrow credits for managing the critical financial crisis from their relatives, friends and private & nationalized bank either through Kisan credit cards or medium-term loan. The similar findings were observed by Jadav (2005) and Sharma (2009).

Guava yield index
The data presented in Table 8 indicates that 70.95 per cent of the guava growers had medium guava yield index, whereas 16.19 per cent of respondents had high guava yield index and 12.86 per cent of the respondents had low guava yield index. It can be concluded that the majority of the guava growers had medium guava yield index.

Table 8: Distribution of guava growers according to their guava yield index

S. No.	Category	Sawai Madhopur (n₁=140)		Bharatpur (n₂=70)		Total respondents (n =210)	
		F	%	F	%	F	%
1.	Low yield index (below 93.71 score)	19	13.57	8	11.42	27	12.86
2	Medium yield index (from 93.71 to 150.71 score)	103	73.58	46	65.71	149	70.95
3	High yield index (above 150.71 score)	18	12.85	16	22.87	34	16.19
	Total	140	100.00	70	100.00	210	100.00

$\bar{x}$ = 122.21 s = 28.50

The data in Table 8, It can be described that majority of Sawai Madhopur (73.58 per cent) and Bharatpur (65.71 per cent) districts guava growers had medium guava yield index, whereas 12.85 per cent of guava growers of Sawai Madhopur and 22.87 per cent of guava growers of Bharatpur district had High guava yield index and 13.57 per cent guava growers of Sawai Madhopur and 11.42 per cent of guava growers of Bharatpur district had low guava yield index.

The probable reason for the finding might be due to the majority of farmers belongs to the medium adoption index (70.00 per cent) which helped guava growers to increase and maintain the productivity of guava trees, resulting in the high guava yield index of these guava growers.

Similar findings were reported by Gorfad (1993), Chothani (1999), Jadav (2005) and Sharma (2009).

Farm mechanization
The data presented in Table 9 revealed that a higher percentage of the respondents (62.86 per cent) had medium farm mechanization. It was followed by 24.29 and 12.85 per cent of the respondent who had low and high farm mechanization, respectively. It can be inferred that the majority of guava growers had medium farm mechanization.

The data in Table 9, It can be described that majority of Sawai Madhopur (62.86 per cent) and Bharatpur (62.85 per cent) districts guava growers had medium farm mechanization, whereas 22.85 per cent guava growers of Sawai Madhopur and 27.15 per cent of guava growers of Bharatpur district had low farm mechanization and 14.29 per cent guava growers of Sawai Madhopur and 10.00 per cent of guava growers of Bharatpur district had high farm mechanization.

Table 9: Distribution of guava growers according to their farm mechanization

S. No.	Category	Sawai Madhopur (n₁=140)		Bharatpur (n₂=70)		Total respondents (n=210)	
		F	%	F	%	F	%
1.	Low farm mechanization index (below 9.42 score)	32	22.85	19	27.15	51	24.29
2	Medium farm mechanization index (from 9.42 to 61.8 score)	88	62.86	44	62.85	132	62.86
3	High farm mechanization index (above 61.8 score)	20	14.29	7	10.00	27	12.85
	Total	140	100.00	70	100.00	210	100.00

$\bar{x}$ = 35.61 s = 26.19

The modern farm implements become the different agriculture operation easy in guava orchard which overcomes

the routine operation *i.e.* tractor, spray pump, rotavator etc. might be the reason for medium farm mechanization. The

findings of Khodifad (1993), Jadav (2001) and Jadav (2005) were confirmed with the present finding.

Irrigation potentiality
The data pertains to the irrigation potentiality are given in Table 10 revealed that (69.05 per cent) respondents possessed

medium irrigation potentiality on their guava orchard, whereas 19.05 per cent had high irrigation potentiality and 11.90 per cent had low irrigation potentiality on their farm. It inferred that more than half of the guava growers had medium irrigation potentiality.

Table 10: Distribution of guava growers according to their irrigation potentiality

S. No.	Category	Sawai Madhopur (n_1=140)		Bharatpur (n_2=70)		Total respondents (n =210)	
		F	%	F	%	F	%
1.	Low irrigation potentiality (below 61.01 score)	16	11.43	9	12.86	25	11.90
2	Medium irrigation potentiality (from 61.01 to 92.61 score)	98	70.00	47	67.14	145	69.05
3	High irrigation potentiality (above 92.61 score)	26	18.57	14	20.00	40	19.05
	Total	140	100.00	70	100.00	210	100.00

$\bar{x}$ = 76.81 s = 15.80

The data in Table 10, It can be described that the majority of Sawai Madhopur (70.00 per cent) and Bharatpur (67.14 per cent) districts guava growers had medium irrigation potentiality on their farm, whereas 18.57 per cent of guava growers of Sawai Madhopur and 20.00 per cent of guava growers of Bharatpur districts had high irrigation potentiality and 11.43 per cent guava growers of Sawai Madhopur and 12.86 per cent of guava growers of Bharatpur districts had low irrigation potentiality in guava orchard.
Majority of the guava growers having a marginal, small to semi-medium size of farm holding and might have medium irrigation potentiality proportionate to their farms. Sufficient groundwater is available for irrigation to guava crop in the

investigated area through well/bore well/river etc. as the area comprising under flood-prone eastern plain zone of Rajasthan. Similar findings were reported by Gorfad (1993), Dangar (1996) and Jadav (2005).

Level of farm wage payment
The data presented in Table 11 revealed that 80.95 per cent of the guava growers had medium level of farm wage payment, whereas 16.20 per cent guava growers high and 2.85 per cent guava growers had low level of farm wage payment.
It can be inferred that the majority of the guava growers were from the medium level of farm wage payment group.

Table 11: Distribution of guava growers according to their level of farm wage payment

S. No	Category	Sawai Madhopur (n_1=140)		Bharatpur (n_2=70)		Total respondents (n=210)	
		F	%	F	%	F	%
1.	Low wage payment (below RS. 5427.2)	6	4.30	0	0.00	6	2.85
2	Medium wage payment (from RS. 5427.2 to 30269.94)	112	80.00	58	82.90	170	80.95
3	High wage payment (above RS. 30269.94)	22	15.70	12	17.10	34	16.20
	Total	140	100.00	70	100.00	210	100.00

$\bar{x}$ = 17848.57 s = 12421.37

The data in Table 11, It can be described that majority of Sawai Madhopur (80.00 per cent) and Bharatpur (82.90 per cent) districts guava growers had medium level of farm wage payment, whereas 15.70 per cent of guava growers of Sawai Madhopur and 17.10 per cent of guava growers of Bharatpur district had high level of farm wage payment and
4.30 per cent guava growers of Sawai Madhopur had low level of farm wage payment for their guava orchard.
Generally, the medium and large size of land holding requires more labour, particularly during the harvesting period. Harvesting in the peak period of guava ripening requires time-bound transportation, grading, etc. for getting remunerative prices in the market. Sometimes natural hazards force them to pay high wages.
The similar findings were observed by Gorfad (1993), Chothani (1999) and Jadav (2005).

Summary
1. More than half majority of guava growers belonged to 36 to 50 years age group, whereas more than one forth of guava growers were in the above 50 years age group and only 15.20 per cent of guava growers were in the less than 35 years of age group. In both Sawai Madhopur and Bharatpur districts more than half majority of guava

growers belonged to the 36 to 50 years age group.
2. More than two fifth of the guava growers were educated up to primary level, whereas approx one third of them were educated up to secondary level, one tenth were educated above higher secondary and college level and 3.81 per cent were illiterate. In both Sawai Madhopur and Bharatpur districts majority of guava growers were educated up to the primary level.
3. Majority (more than two third) of the respondents were categorized under the medium level of adoption. There were 18.10 per cent of the respondents with low level of adoption and 11.90 per cent of the respondents had high level of adoption. In both Sawai Madhopur and Bharatpur districts majority of more than two third guava growers were having medium level of adoption.
4. About more than two fifth of guava growers were observed as marginal farmers, approx one fourth guava growers were observed as small farmers, less than one sixth of guava growers were observed as semi-medium farmers, about one tenth of guava growers were medium farmers and only 3.81 per cent guava growers were large farmers. In both Sawai Madhopur and Bharatpur districts majority of guava growers more than two fifth were observed in the marginal farmer category.

5. Majority (more than half) of guava orchard growers were having from ₹ 1.00 lakh to ₹ 2.00 lakh annual income, while less than one forth of guava growers fell under the group of up to ₹ 1.0 lakh annual income and above ₹ 2.0 lakh annual income group, respectively. In both Sawai Madhopur and Bharatpur districts more than half majority of guava growers were in the annual income group from ₹ 1.00 lakh to ₹ 2.00 lakh.
6. More than two third of guava orchard growers were found to have medium borrowing of credit followed by 17.16 per cent and 13.80 per cent respondents having high and low borrowing of credit, respectively. In both Sawai Madhopur and Bharatpur districts majority of guava growers (more than two third and more than three fifth, respectively) had medium borrowing of credit.
7. Majority (more than two third) of the guava growers had medium guava yield index, whereas 16.19 per cent of respondents had high guava yield index and 12.86 per cent of the respondents had low guava yield index. In both Sawai Madhopur and Bharatpur districts majority of guava growers (more than two third) were having medium guava yield index.
8. Majority (more than three fifth) of the guava growers had medium farm mechanization. It was followed by less than one forth and approx one eighth of the respondent who had low and high farm mechanization, respectively. In both Sawai Madhopur and Bharatpur districts more than three fifth majority of guava growers had medium farm mechanization.
9. More than two third of guava growers possessed medium irrigation potentiality on their guava orchard, whereas less than one fifth had high irrigation potentiality and more than one tenth had low irrigation potentiality on their farm. In both Sawai Madhopur and Bharatpur districts majority (more than two third) of guava growers had medium irrigation potentiality on their farm.
10. Majority (more than four fifth) of the guava growers had medium level of farm wage payment, whereas 16.20 per cent of guava growers had high and 2.85 per cent of guava growers had low level of farm wage payment. In both Sawai Madhopur and Bharatpur districts majority (more than four fifth) of guava growers had medium level of farm wage payment.

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