Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

Sunil Kumar
Assistant Professor, Department of Agriculture Economics, R.M.P. (P.G.) College, Gurukul Narsan (Haridwar) Uttarakhand, India

To identify the current situation of marketable surplus and post-harvest losses of guava in Saharanpur district of Uttar Pradesh

Sunil Kumar

Abstract
A study was conducted at two blocks namely Behat and Punwarka of district Saharanpur, U.P. to identify the current situation of marketable surplus and post harvest losses of guava. A total of seven villages from each block were selected by random sampling technique, guava farmers were categorised into three categories on the basis of area under guava cultivation as small (upto 1 hectare), medium (1 to 2 hectare) and large (2 hectare and above).

Keywords: Marketable surplus, post-harvest losses, guava, transportational losses, marketing channel

Introduction
Horticultural crops are main part of Indian cropping system accounting about 25.9 % in total output of agricultural produce in 2015-16. India ranks second for the production of both vegetables and fruits in the world accounting 90.2 million tonnes of food and 169.1 million tonnes of vegetable in 2015-16 [1]. Due its fast and diverse climatic conditions almost all kind of fruits and vegetables can be grown here. Tropical fruits such as mango aonla, banana, sapota, grape, citrus etc. are grown in tropical regions of south, west and east India, though being subtropical climatic region most of such fruits are also grown in U.P., Haryana, Punjab and plains of Uttarakhand. Temperate fruits such as apple, cashew, almond, apricot, walnut etc. are grown in temperate regions of J&K, Himachal Pradesh, in hilly region of Uttarakhand. Same is for vegetables almost all kind of tropical, subtropical and temperate vegetables are grown in different parts of India.

This study is about current situation of marketable surplus and past harvest losses of guava in Saharanpur district of U.P. Guava is a major horticultural crop grown in India, due to its perishable nature it is more prone to post harvest losses due to fastening in maturity. The main reason behind post harvest losses of fruits are unavailability of processing and preservation units. The estimated losses in fruits and vegetables are higher and range between 30 to 40%. These percentages are not acceptable and adversely affect the Indian economy [2]. In 2015-16 a total of 4048 thousand metric ton of guava was produced in India over 255 thousand land [3], therefore to get marketable surplus from guava effective measures should be taken to avoid post harvest losses.

The objectives of this study are
1. To find production and marketable surplus of guava.
2. To find out total losses during different post harvest procedures.

Methodology
The study about current situation of marketable surplus and post harvest losses of guava in Saharanpur district of U.P. was conducted in two blocks namely Behat and Punwarka of district Saharanpur. These two blocks were chosen for study due to old trend of cultivation of fruits in these parts of district and guava is a popular fruit grown on large scale in these two blocks. Multi-stage random sampling technique was adopted for selection, villages were arranged into descending order on the basis of production seven villages from each block are selected for study making total of 14 villages. Guava growing farmers are categorised into three groups on the basis of land under guava cultivation. Farmers having land upto 1 hectare under guava cultivation are grouped as small farmers, having land between 1 to 2 hectare under guava cultivation are grouped as medium farmers and those farmers who have more than 2 hectare land under guava production are grouped as large farmers. After making the list of respondents 20% respondents were selected randomly from all three groups which makes total

Corresponding Author:
Sunil Kumar
Assistant Professor, Department of Agriculture Economics, R.M.P. (P.G.) College, Gurukul Narsan (Haridwar) Uttarakhand, India

number of respondents = 125. Saharanpur fruits and vegetables market and Behat fruit market were selected for the study. All information required for study such as post harvest losses, marketable surplus etc. were collected from the respondents through a schedule designed for this purpose only. Simple statistical analysis was done to estimate and interpret the outcome. Three popular and common varieties grown in both the block namely Behat Coconut, Allahabad Safeda and L-49 were selected to study the situation.

Marketable surplus
That quantity of total produce which is provided to market for selling or for exchange of service or product is called marketable surplus. It could also be define as that part of produce which is provided to non- producer after keeping produce for family consumption. In the early 1950s in India about 30-35 percent of food grains output was marketed which has now increased to more than 70%. In this context the marketed surplus is proportionately higher in the case of commercial crops than subsistence crops. Recognizing its importance the Government of India initiated in nationwide survey to estimate marketable surplus and post harvest losses in the 1970, which continued up to late 1990s [4].

Marketable surplus can be calculated by following formula:-

MS = P – C

Here, MS = Marketable surplus

P = Total production

C = Total requirement i.e. personal consumption such as family requirement, payment to labour, payment for social and religious work etc.

Estimation of post harvest losses
Guava is a commercial fruit crop in many tropical and subtropical countries of the world. The fruit is a rich source of vitamins, minerals, fibre, and dietary antioxidants. High perishability and capability to physical damage, chilling injury, diseases and insect-pests are the major post harvest constraints of guava fruit [5].

Guava have very thin people present over it as fruit get mature people become softer and get more prone to physical injuries during harvesting and post harvesting process. To prevent such losses to production measures should be taken during harvesting, pre-cooling, cleaning, packing, transporting and in other related operations. Proper equipments and knowledge is required in this scenario.

Post harvest losses were assessed at -
1. During harvesting
2. In wholesale market
3. In retail market

Post harvest losses of guava were estimated as two types -
1. Loss of fruit due to physical damage
2. Low price of fruit which become of inferior quality.

Results and discussion
Following marketing channels of selling guava to final consumers are identified as -
1. Farmer – contractor – commission agent – retailer – consumer
2. Farmer – commission agent – retailer - consumer
3. Farmer- contractor – commission agent – wholesaler – commission agent – retailer – consumer.
4. Farmer – commission agent – wholesaler – commission agent – retailer – consumer.
5. Farmer – consumer.

These are five common marketing channels popular among farmers through which guava fruit reaches to final consumer. In these villages farmer plant there orchard and prepare trees to the stage of fruiting and as the orchard reaches to the stage of bearing fruits they hired out contractor which provide them money for the time period of two or three years with common understanding. A contract refers to any type of agreement between two or more people, explicit with little or no role for implicit understandings or entirely implicit [6]. More than 60% of your cards were taken care by such contractors who do further operation for providing fertilizers manure plant protection and sell fruits to market.

Table 1: Area and production of guava

S. No.	Size-group	Average area under guava (ha)	Average production (q)	Productivity q/ ha
1.	Small	0.48	46.23	96.31
2.	Medium	1.28	149.49	116.78
3.	Large	3.44	352.63	102.51
4.	Sample average	1.73	182.78	105.20

As per table 1, average area under small, medium and large farmers was 0.48 hectare, 1.28 hectare and 3.44 hectare respectively. Maximum production of guava 352.63 quintal was recorded in large farm size group followed by medium and small size group with the production of 149.49 quintals and 46.23 quintals respectively. Though productivity per hectare was recorded highest in medium size group with production of 116.78 q/ha. followed by large and small size group with production of 102.51 q/ha. and 96.31 q/ha. respectively.

Table 2: Variety wise production of guava. (Quantity in quintals)

S. No.	Size-group	Varieties	Average no. of plants	Average age (years)	Average production (q/plant)	Average total production
1.	Small	Behat coconut	15.88	6.90	0.38	6.03
		Allahabad Safeda	52.23	8.74	0.47	24.55
		L-49	28.53	8.95	0.42	11.98
2.	Medium	Behat Coconut	59.37	9.88	0.57	33.84
		Allahabad Safeda	132.12	12.40	0.60	79.27
		L-49	159.44	10.90	0.59	94.07
3.	Large	Behat Coconut	171.62	12.32	0.57	97.82
		Allahabad Safeda	238.23	13.50	0.66	157.23
		L-49	161.23	11.50	0.61	98.35

As per table 2, the average number of plants viz. Behat coconut, Allahabad Safeda and L-49 varied widely among sample growers. The average number of plants of all the three varieties was the highest in large size-group (Allahabad Safeda 238.23 plants, Behat coconut 171.62 plants, L-49 161.23 plants),followed by medium (Allahabad safeda 132.12 plants, L- 49 159.44 plants and Behat coconut 59.37 plants) and small (Allahabad Safeda 52.23 plants, L-49 28.53 plants and Behat coconut 15.88 plants).

The average production per plant varied in all the three categories because of the age factor. It is clear from the table 2 that the average production of all the three varieties of guava varies widely highest in large (Allahabad Safeda157.23 quintals, Behat coconut 97.82 quintals and L-49 98.35 quintals) followed by medium (Allahabad safeda 79.27 quintals, L-49 94.07 quintals and Behat coconut 33.84 quintals) and small (Allahabad Safeda24.55 quintals, L-49 11.98 quintals and Behat coconut 6.03 quintals).

Table 3: Utilization pattern and marketable surplus of guava: (quantity in quintals)

S. No.	Particulars	Size group			Sample average
		Small	Medium	Large	
1.	Average no. of guava plants	98.44	252.36	563.79	236.26
2.	Average quantity of produce in farm level	44.34(100.00)	161.23(100.00)	354.42(100.00)	118.43(100.00)
3.	Post-harvest losses at farm level (excluding partially damaged)	0.38(0.86)	1.88(1.17)	4.78(1.35)	1.52(1.28)
4.	Actual quantity ready for consumption and market (2-3)	43.96 (99.14)	159.35 (98.93)	349.64 (98.65)	116.91(98.82)
5.	Utilization pattern				
	(a) Home consumption	0.38(0.90)	0.47(0.27)	0.81(0.23)	0.43(0.40)
	(b) Paid for wages in kind	0.24(0.54)	0.40(0.26)	0.39(0.11)	0.23(0.21)
	(c) Gift and religious purposes	0.17(0.38)	0.21(0.13)	0.14(0.039)	0.11(0.09)
	(d) Others total	0.05(0.11)	0.08(0.049)	0.10(0.028)	0.38(0.032)
6.	Total	0.84 (1.93)	0.87(0.71)	1.44(0.41)	1.15 (0.73)
	Marketable surplus = (4+5)	43.12 (98.08)	158.48 (99.45)	348.2 (96.66)	115.76 (97.74)

(Figures in parentheses indicate percentage to total)

Consumption and marketable surplus of guava shown in table-3 revealed that the average number of guava plants varied widely from 98.44 plants on small to 563.79 plants in large farms. It was observed that the average retention of guava by sample growers was 0.73 percent beside the average post-harvest loss (excusing partially damaged) at farm level was 1.28 percent and this left a marketable surplus of 97.74 percent. For the individual categories of farmers, both the average retention of guava at farm level and marketable surplus varied widely. The retention of guava by small group was 1.93 percent, medium 0.71 percent and large 0.41 percent which constituted an average of 1.01 percent respectively. The quantity retained by the guava growers was mostly for

home consumption. Some of the quantity was used as kind payments to labours as wages and some of it was used as gifts and for religious purposes. The table also indicated that the highest marketable surplus was found in medium 99.45 percent followed by 98.25 percent in large 97.54 percent in small size group. This makes the sample average of 97.74 percent of the total production.

The table 4 shows that per hectare an average marketable surplus varied widely among size-groups. Per hectare marketable surplus was the highest in medium size-group (109.64 quintals), large (98.44 quintals) and small (90.42 quintals) respectively.

Table 4: Marketable surplus. (Quantity in quintals)

S. No.	Size-group	Average area (hectare)	Marketable surplus	
			Quantity per hectare	Average of sample growers (q/ha)
1.	Small	0.48	90.42	43.40
2.	Medium	1.39	109.64	152.40
3.	Large	3.32	98.44	326.82
4.	Sample average	1.22	99.75	121.695

The sample average was 99.75 quintals. The average marketable surplus was highest in large size-group (326.82 quintals), followed by medium (152.40 quintals) and small (43.40 quintal) which constituted the sample average of

121.695 quintals). The average marketable surplus varied widely among sample growers as the area of land under guava varies in all the three categories.

Table 5: Channel wise disposal of guava for sample growers. (quantity in quintals)

S. No.	Particulars	Size-group			Sample average
		Small	Medium	Large	
1.	Total production of sample growers	44.34(100.00)	161.23 (100.00)	354.42(100.00)	118.43(100.00)
2.	Throw out (Not fit for processing and consumption)	0.38(0.86)	1.88 (1.17)	4.78(1.35)	1.52(1.28)
3.	Personal consumption	0.84 (1.93)	0.87(0.71)	1.44(0.41)	1.15 (0.73)
4.	Marketable surplus [1- (2+3)]	43.12 (97.24)	158.48 (98.29)	348.2 (98.24)	115.76 (97.74)
5.	Channel wise disposal				
	a. Channel -1	10.87(25.21)	56.73 (35.80)	119.78 (34.40)	38.80(33.51)
	b. Channel -2	6.83 (15.84)	18.22 (11.50)	32.43 (9.31)	13.65(11.79)
	c. Channel -3	5.80 (13.45)	9.28 (5.85)	09.47 (2.72)	5.65(4.88)
	d. Channel -4	12.54(28.28)	56.42 (35.60)	146.42 (42.05)	48.19(32.72)
	e. Channel -5	7.08(16.41)	17.83 (11.25)	40.1 (11.52)	9.47(8.18)

Table 5, indicates that the channels –I and IV were most prevalent channels adopted by the growers of the study area, as the highest percentage of the produce was transacted through these channels i.e., 33.51 percent through channel I and 32.72 percent through channel IV followed by 11.79

percent, 8.18 percent and 4.88 percent through channel II, V and III respectively.

Post- harvest losses in guava

Table 6: Post-harvest losses of guava at farm level. (quantity in quintals)

S. No.	Particulars	Sample growers			Sample average
		Small	Medium	Large	
1.	Average production of guava	44.34(100.00)	161.23 (100.00)	354.42(100.00)	118.43(100.00)
2.	Thrown out (physical loss) not fit for processing and consumption	0.38(0.86)	1.88 (1.17)	4.78(1.35)	1.52(1.28)
3.	Partially damaged (economic loss) a- Picking and assembling b- Grading c- Packing d- Storage	0.45(1.01) 1.77(3.99) 0.14(0.31) 0.23(0.52)	2.11(1.31) 5.48(3.40) 2.37(1.47) 2.32(1.44)	6.32(1.78) 12.81(3.61) 6.40(1.80) 6.17(1.74)	2.08(1.76) 5.71(4.82) 1.39(1.17) 1.72(1.45)
4.	Personal consumption	0.84 (1.93)	0.87(0.71)	1.44(0.41)	1.15 (0.73)
5.	Loss during transportation from road head to market	1.20(2.70)	4.25(2.63)	8.70(2.45)	3.45(2.91)
6.	Good quality fruit sold in market (1-(2+3+4+5))	39.33 (88.70)	141.95 (88.04)	307.8 (86.45)	101.41 (85.63)
7.	Partially damaged fruits sold in market (3+5)	3.79 (8.55)	16.53 (0.10)	40.40 (11.40)	14.35 (12.11)
8.	Total quantity sold in market (6+7)	43.12 (97.24)	158.48 (98.29)	309.24 (98.24)	115.76 (97.74)
9.	Total post-harvest losses at farm level	4.17 (9.40)	18.41 (11.41)	41.92 (11.83)	15.87 (13.40)

(Figures in parentheses indicates percentage to total)

It could be seen from table 6 that the post harvest losses at farm level varied widely among sample growers. The post-harvest losses was higher in large size-group at 11.83 percent followed by medium at 11.41 percent and small at 9.40 percent which constituted the sample average of 13.40% out of the total post-harvest losses, an average quantity of guava was thrown out i.e. 1.2 percent as it was not even fit for the processing. The physical losses of guava were found the highest in large size-group at 4.78 quintals, 1.17 quintals in medium size group and 0.86 quintal at small size group. The remaining quantity was sold in the market at lower prices than the good quality fruits. This quantity (partially damaged fruits) of guava is countered in economic loss at it fetches lower prices in market. The percentage of good quality fruits

sold in the market was found the highest in small size-group (88.70%), followed by medium (88.04%) and large (86.45%), which constituted the sample average of 85.63 percent of the total production. The losses were mostly by fruit flies, parrots and rupturing of mature guava fruits at the time of picking assembling and grading. On the other hand, guava fruits attached by diseases also fall in the category. The loss during transportation from road head to market was mainly due to the poor road infrastructure and still prevalent traditional packaging in the study area. It was found as high as 2.70 percent in small followed by 2.63 percent in medium and 2.45 percent in large. This constituted the sample average of 2.91 percent of the total production.

Table 7: Per hectare and average post-harvest losses of guava.

S. No.	Size-group	Average area under guava orchard (ha)	Per ha. post-harvest losses (q)	Average post-harvest loss of guava (q)
1.	Small	0.48	0.38	4.17
2.	Medium	1.28	1.88	18.41
3.	Large	3.44	4.78	41.92
4.	Sample average	1.73	1.52	15.897

Table 7 reveals that the average area under guava was 0.48 hectare on small, 1.28 hectare on medium and 3.44 hectare on large size-group. Per hectare post-harvest losses were as high as 4.78 quintals in large size-group, 1.88 quintals in medium and 0.38 quintals in small size-group, which constituted the

sample average of 1.52 quintal. It was also observed that average post-harvest loss was higher in large size-group (52.48 quintals), followed by medium (18.89 quintals) and small (3.94 quintals) size group.

Table 8: Post-harvest losses of guava at different stages of marketing.

S. No.	Particulars	Marketing	
		Sample average (q)	Loss percentage
1.	Average production	118.43	(100)
2.	At farm level a- Thrown out (physical loss) not for processing and consumption b- Partially damaged c- Sub-total	 1.65 10.2 11.85	 (1.40) (8.61) (10.01)
3.	At wholesaler's level a- Thrown out b- Partially damaged c- Sub-total	 0.57 1.18 1.75	 (0.48) (0.99) (1.48)
4.	At retailer's level a- Thrown out	 0.75	 (0.63)

	b- Partially damaged	1.24	(1.05)
	Sub-total	2.24	(1.62)
5.	Total post-harvest loss at different stages of marketing (2+3+4)	15.84	(13.37)
6.	Total good quality fruit sold in market (5-1)	102.59	(86.62)

Table 9: Post-harvest economic losses of guava

S. No.	Particulars	Post-harvest loss	Returns (Rs./qtls)
1.	Total quantity of fruits in percentage (100%)	@ Rs. 11.91/kg*	1191.00
2.	Good quality fruits sold (86.62%)	@ Rs. 11.91/kg*	1031.64
3.	Partially damaged fruits sold economic loss (10.65%)	@ Rs. 4.20/kg*	44.73
4.	Thrown out 2.50% (physical loss not fit for consumption and processing)	@ Rs. 11.91/kg*	29.77
5.	Total return realization	-	1105.50
6.	Total economic loss	-	86
7.	Percent economic loss	-	7.22

(* If there is no loss)

Economics of post-harvest losses
The total post-harvest losses was estimated in the form of monetary value, the value of post harvest losses was calculated and the value of guava if there was zero damage in the production was also calculated, which by subtracting the real output value gives the total post harvest loss per quintal of the produce.

Conclusion
From this study the conclusion can be drawn is:
- As the size of orchard increases production and marketable surplus also increase.
- The post harvest loss of guava is occurring at both field and market stage.
- Lack of scientific knowledge, infrastructure, management and high transportation charges are major problems faced by farmers.

References
1. Horticultural statistics at a glance Ministry of agriculture & farmers welfare, Govt. of India, 2016,
2. Hegazy, Rashad. Post-harvest situation and losses in India. 10.6084/mg. Figshare, 3206851, 2013,
3. National Horticultural Board Ministry of agriculture & farmers welfare, Govt. of India, 2016.
4. Sharma, Vijay, Wardhan Harsh. Marketed and marketable of major food grains in India. 10.1007/978-81-322-3708-2, 2017.
5. Singh SP. Guava (*Pridium guajava* L.). Post harvest biology and technology of tropical and subtropical fruits, 2011, 213-246.
6. Hveth B, Ligon E, Walf S, Lex S. Incentive instruments in fruits and vegetable contact: Input, Control, Monitoring, Measuring and Price risk. Review of agricultural economics. 1999; 21(2):389.