

THE EXTENT OF WASTAGE IN AZADPUR *MANDI* (A CASE STUDY)

A STUDY SUBMITTED TO MINISTRY OF AGRICULTURE

BY

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Executive Summary

- The study estimates the wastage of ten fruits and vegetables at the Azadpur *mandi*. Firstly, it analyses the economics of cultivation of these crops and identifies the implication of wastage to farm household. Then it looks at the volume each of these commodities is traded in Azadpur *mandi*. Then we estimate the wastage of these commodities through survey method and compare it with the study conducted by Central Institute of Post-Harvest Engineering and Technology (CIPHET) in 2010.
- An analysis of economics of cultivation of all the crops in the study (apple, banana, mango, papaya, grapes, onion, tomato, potato, green peas and green chillies) indicates that all fruits generate high value to the farmer. Vegetables, except potato, also generate high value compared to staple crops cultivated by farmers.
- Findings from survey indicate that farmers trade in Azadpur *mandi* because they have liquidity and credit constraints and also because they felt the infrastructure to reach other markets were bad. Traders like wholesalers, retailers, commission agents, intermediaries and sub-retailers mostly cited convenience as the reason for trading in Azadpur *mandi*.
- Friends and other farmers/traders was the most important source of price information for the survey respondents. Most farmers stored their produce in godown while traders stored in cold storage.

- When asked on how they responded to reduction in quality of the goods bought, most traders told that they mix the low quality good with the high quality purchase and sold it off. Some of them reduced prices and sold it and very few traders returned it back to the sellers.
- The traders in the sample earned INR 12,10,872 in a year while farmers earned INR 5,27, 213 per year. The variability in incomes was much higher for farmers as compared to traders. About 14 of the 18 potato farmers and 2 out of 21 apple farmers had negative incomes while none of the traders in the sample had negative incomes.
- Volumes of trading was highest in apple with 6.97 lakh tonnes traded on 2010 and 5.47 lakh tonnes traded in 2014. Most of the arrivals happened in the months from August to February.
- Volumes of trading in potato were also high with 3.85 lakh tonnes traded in 2010 and 3.32 lakh tonnes in 2014. Potato had arrivals which were similar all through the year, but prices exhibited seasonality with June to September prices being higher than the prices in the rest of year.
- Volumes of trading in onion were 3.04 lakh tonnes in 2010 and 2.81 lakh tonnes in 2014. Arrivals did not exhibit any seasonality and prices showed volatility which was unrelated to seasonal fluctuations.
- Around 1.3 lakh tonnes and 1.52 lakh tonnes of tomato were traded in 2010 and 2014 respectively. Arrivals of tomato do not exhibit any seasonality while prices exhibit seasonality with price from July to October being higher than the prices in the rest of the year.

- Trading volumes of mango was 1.63 lakh tonnes in 2010 and 2.04 lakh tonnes in 2014. All arrivals happened from April to September for mangoes.
- Banana trading volumes were 1.36 lakh tonnes in 2010 and 0.56 lakh tonnes in 2014. While the arrivals in banana showed some seasonality, prices do not show much seasonality.
- Grapes trading volumes were 0.24 lakh tonnes in 2010 and 0.25 lakh tonnes in 2014. Almost all arrivals of Grapes happened between January and April.
- Papaya trading volumes were 0.57 lakh tonnes in 2010 and 0.47 lakh tonnes in 2014. There was some seasonality in arrivals and prices but there were reasonable arrivals all through the year in papaya.
- Green Pea trading volumes were 0.32 lakh tonnes in 2010 and 0.33 lakh tonnes in 2014. Most arrivals happened between November and February and prices from March to September become much higher than the prices in the rest of the year.
- Green chillies trading volumes were 0.84 lakh tonnes in 2010 and 0.95 lakh tonnes in 2014. Most arrivals happen between November to February and prices do not exhibit seasonality.
- Apple traders reported a loss of 11.08% in winter and 15.38% in summer. Farmers lost 13.48% in winter and 10.99% in summer. CIPHET study had indicated a total loss of 12.3% for apple with 11.14% for farmers and 1.16% at stages from wholesaler onwards. The study indicates slightly higher losses than that.

- Potato traders reported a loss of 0.89% in winter and 0.57% in summer. Farmers lost 4.06% in winter and 2% in summer. CIPHET study had indicated a total loss of 9% for potato with 7.06% for farmers and 1.84% at stages from wholesaler onwards. Our study indicates lower losses than that.
- Onion traders in our sample lost 2.42% in winter and 2.78% in summer on average. The losses ranged from 0.5% to 5% for traders in winter and summer. The CIPHET study had indicated losses for onion at 7.5% with losses to farmers at 5.74% and the remaining contributing at 1.76%. Our study indicates that the losses at Azadpur *mandi* for onion traders seem to be somewhat higher than that reported in CIPHET study.
- Tomato traders in our sample on average lost 1.68% in winter and 1.12% in summer. The losses ranged from 0.8% to 2.4% for traders in winter and summer. The CIPHET study had indicated losses for tomato at 12.4% with losses to farmers at 10.07% and the remaining contributing to 2.33%. The losses at Azadpur *mandi* for tomato traders seem to be somewhat lesser than that reported in the CIPHET study.
- Banana losses for traders in our sample averaged 5.83% in winter and 4.58% in summer. It ranged from 1.67% to 10% for different traders in the sample. The CIPHET study had indicated losses for banana at 6.6% with losses to farmers at 4.24% and the remaining contributing to 2.36%. The losses at Azadpur *mandi* for banana traders seem to be higher than that reported in the CIPHET study.
- Grapes traders on average lost 2.4% in winter and 1.4% in summer. The losses ranged from 0% to 4% for traders in winter and summer. The CIPHET study had indicated losses for

banana at 8.3% with losses to farmers at 7.01% and the remaining contributing to 1.29%. The losses at Azadpur *mandi* for grapes traders seem to be higher than that reported in the CIPHET study.

- Papaya traders on average lost 1.08% in winter and 0.95% in summer. The losses ranged from 0.3% to 1.7% for traders in winter and summer. The CIPHET study had indicated losses for banana at 7.4% with losses to farmers at 5.18% and the remaining contributing to 2.22%. The losses at Azadpur *mandi* for papaya traders seem to be lower than that reported in the CIPHET study.
- Green pea traders on average lost 0.90% in winter and 0.80% in summer. The losses ranged from 0.6% to 1.4% for traders in winter and summer. The CIPHET study had indicated losses for banana at 10.3% with losses to farmers at 8.66% and the remaining contributing to 1.68%. The losses at Azadpur *mandi* for green pea traders seem to be much lower than that reported in the CIPHET study.
- In summary, the view that there is no wastage as low quality fruits and vegetables are sold at lower prices to different consumer segments doesn't seem to be correct in case of Azadpur *mandi*. Quantity loss is real. Some traders do reduce value losses by mixing it with high quality goods and selling it to others. But, some of them have to sell it at lower prices and only a few traders return the purchase to sellers.
- We have largely restricted our study to descriptive statistics and do not explain any causal effects because of sample size restrictions. A larger study with a wider scope can look into issues of causation and exact estimates. With our study and sample size, it seems that losses in

Azadpur might be less than that reported at national level for green pea, papaya, tomato and potato and higher than national level for apple, onion, banana and grapes.

1. Introduction

The focus of food policy has shifted from production to processing and value addition in the recent years. The shift in policy is also due to acknowledgement that losses have occurred at various stages of the food supply chain (Dev and Rao, 2005; Rao and Dasgupta, 2009). The extent of losses has been studied by various scholars for variety of fruits and vegetables over a long time and the numbers have been debated a lot (Srinivas et al., 1997; Murthy et al., 2002; Gajanana et al., 2002; Singh, 2002; Wanjari et al., 2002; Murthy et al., 2004; Rana et al., 2005; Singh and Vaidhya, 2005; Kumar et al., 2006; Murthy et al., 2007; Gangwar et al., 2007; Gupta and Daftari, 2007; Murthy et al., 2009; Singh, 2012; Sudarshan et al., 2013; IIHR 2014). In this regard, as a followup to macro studies like the ones conducted by CIPHET in 2010, an attempt is made to do micro level studies at various *mandis* as case studies. This study attempts to estimate the losses at Azadpur *mandi*, one of the largest fruits and vegetables mandi in the country.

Azadpur *mandi* is located in New Delhi and is covered under the Delhi Agricultural Produce Marketing Regulation Act of 1998. It caters to the fruits and vegetables requirement of the people living in city of Delhi and has a notified list of 50 fruits and 68 vegetables. The annual handling by the market is around 45 lakh tonnes in a year with apple being the most traded commodity. On discussions with the ministry ten commodities were to be studied for this purpose. Apple, banana, papaya, grapes and mango were selected among the fruits while onion, potato, tomato, green peas and green chillies were selected among vegetables.

In order to understand the issues related to production, marketing and wastage of these commodities, the study tries to integrate a multi-level approach to the analysis. Firstly, we look at the economics of cultivation of these crops to understand what wastage means to farmers. Then, we look at mandi level information to understand the marketing aspects like months in

which arrivals happen and how prices respond to them. The data for this purpose was collected from the website of Directorate of Marketing & Inspection, Ministry of Agriculture, Government of India (<http://agmarknet.nic.in>)

Then, we enquired the farmers and traders on issues related to marketing, storage and price information for farmers and traders and their extent of wastage. 82 respondents involving 43 traders and 39 farmers were surveyed for this purpose. All crops except mango and chillies were considered in the primary survey. The estimates of wastage were compared with the findings from the CIPHET (2010) study. The report is structured as follows. The next section looks at economics of cultivation of the ten crops. Section 3 then looks at mandi level data collected at *mandi* level and through enquiry with farmers and traders for each of the ten commodities. Section 4 concludes.

2. Economics of Cultivation – All India View

This section presents the economics of cultivation of the ten crops considered in the study. The estimates of total value to a farm household and costs across different components are estimated using a large scale nationally representative data. The situation assessment survey of the 70th round of National Sample Survey (NSS) is used for the purpose. The study was conducted across large number of farm households over the year January to December 2013. The data was collected pertinent to two reference periods – July to December 2012 and January to June 2013. We present the economics of cultivation of fruits and vegetables we have considered for the study.

2.1.Economics of Cultivation for Fruits

Table 2.1 presents the economics of cultivation for the fruits considered in the study over reference period 1 (July to December 2012).

Table 2.1 Economics of Cultivation for Fruits (July to December 2012)

CROP	Apple	Banana	Papaya	Mango	Grapes
Proportion of Farm Households Cultivating the crop	0.27%	0.93%	0.06%	0.25%	0.01%
Land Cultivated by those households (hectares)	0.485	0.676	0.681	1.010	2.564
Land under the crop for these households(hectares)	0.307	0.185	0.136	0.379	1.376
Irrigated Land(hectares)	0.145	0.145	0.129	0.258	1.143
Unirrigated Land(hectares)	0.161	0.039	0.007	0.084	0.000
Yield (Kg/ha)	15936	23965	23831	15514	28184
Yield in Irrigated Land (Kg/ha)	19485	32211	33199	17314	36804
Yield in Unirrigated Land (Kg/ha)	10148	14913	8901	15063	6000
Total Value (INR)	188412	35438	28477	24321	1283419
Seed Cost (INR)	281(1.2)	833(9)	2098(22.8)	29(0.4)	6319(12.2)
Fertilizer Cost(INR)	4121(17.6)	2067(22.4)	3782(41.1)	1339(19.6)	11581(22.3)
Manure Cost(INR)	513(2.2)	506(5.5)	273(3)	178(2.6)	1551(3)
Plant Protection Chemicals Cost(INR)	4535(19.3)	615(6.7)	589(6.4)	982(14.4)	6294(12.1)
Diesel Cost(INR)	376(1.6)	121(1.3)	124(1.4)	644(9.4)	137(0.3)
Electricity Cost (INR)	1(0)	188(2)	267(2.9)	41(0.6)	2064(4)
Human Labor Cost (INR)	5514(23.5)	2453(26.6)	774(8.4)	1894(27.7)	18218(35.1)
Animal Labor Cost (INR)	180(0.8)	96(1)	1(0)	23(0.3)	1703(3.3)
Irrigation Cost (INR)	7(0)	141(1.5)	328(3.6)	436(6.4)	984(1.9)
Repair (INR)	281(1.2)	121(1.3)	16(0.2)	171(2.5)	236(0.5)
Interest (INR)	0(0)	36(0.4)	0(0)	22(0.3)	185(0.4)
Hiring Cost (INR)	16(0.1)	179(1.9)	876(9.5)	432(6.3)	2401(4.6)

CROP	Apple	Banana	Papaya	Mango	Grapes
Lease Rent (INR)	0(0)	1669(18.1)	0(0)	236(3.5)	0(0)
Other Expense (INR)	7622(32.5)	190(2.1)	80(0.9)	403(5.9)	211(0.4)
Total Cost (INR)	23448(100)	9214(100)	9209(100)	6830(100)	51883(100)
Returns (INR)	164965	26224	19268	17491	1231536
GVO/Costs	8.04	3.85	3.09	3.56	24.74

Table 2.1 shows that relatively small number of farm households in the country cultivates fruits. The proportion of the farm households cultivating apple, banana, papaya, mango and grapes is in the range of 0.01% to 0.93%. But, given we are talking about a total of approximately 90,20,000 farm households, all these proportions become large number of farm households. In terms of numbers, the range is from 10,599 households in case of grapes to 8,38,918 households in case of banana. Banana is the fruit that is most cultivated among the five crops considered followed by apple, mango, papaya and then grapes. These farmers cultivate, on average 0.485 ha in case of apple to 2.564 in case of grapes. But the land allotted to the fruits is much smaller in some fruits than others. On average, papaya is cultivated in 0.136 ha, banana is cultivated in 0.185 ha, apple on 0.307 ha, mango in 0.379 ha and grapes in 1.376 ha. So, there is a bias of larger farmers cultivating in grapes while marginal and small farmers seem to be cultivating other fruits and allotting a small share of land to it. The average irrigated land is 47.2% of average land cultivated under apple. The numbers for mango is 68.2%, for banana is 78.3%, grapes is 83.1% and papaya is 95%. The average yield in irrigated land as a percentage of average yield in unirrigated land is highest for grapes at 613%. Papaya's yield in irrigated land is 373% of yield in unirrigated land. This might be one of the reasons why irrigation is high in these crops compared to other crops. In other fruits, banana's yield with irrigation is 216% of yield without

irrigation, apple's yield with irrigation is 192% of yield without irrigation and mango's yield with irrigation is only 115% of yield without irrigation.

The average total value generated from cultivation is highest for grapes (INR 12,83,419) and lowest for mango (INR 24,321) in July-December 2012. In terms of profitability (defined as Total Value to Total Cost ratio) again, the highest is for grapes at 24.74 which means that spending INR 1 yielded a farmer approximately INR 25 during July to December 2012. This ratio was 8.04 for apple, 3.85 for banana, 3.56 for mango and 3.09 for papaya. For farming as a whole in this period, this ratio was 2.61. The values for all fruits are much higher and are rightly called high value crops. As a share of total cost, fertilizer cost, human labour cost, seed cost and pesticide cost constitute a high share of total cost. Fertilizer cost is 17.6%, 22.4%, 41.4%, 19.6% and 22.3% of total cost for apple, banana, papaya, mango and grapes respectively. Human labour cost is 23.5%, 26.6%, 8.4%, 27.7% and 35.1% for the five fruits. Seed cost share is less for apple as it does not seed every year and pesticide costs constitute 19.3% of total cost for it. Apart from seed cost (9%) and pesticide cost (6.7%), lease rent constitutes 18.1% of total costs in banana. For papaya, machine hiring costs (9.5%) constitute a high share of costs along with seed cost(22.8%) and pesticide cost (6.4%). There is no significant seed cost for mango, but pesticides (14.4%), diesel cost (9.4%), irrigation cost (6.4%) and machine hiring cost (6.3%) constitute a high share of total cost. For grapes, seed and pesticide costs constitute to 12.2% and 12.1% of total costs respectively. The economics of cultivation for the fruits were similar in the reference period 2 as well with an exception of apple which was cultivated by much lesser households. Table 2.2 provides the economics of cultivation for fruits in the second reference period January 2013 to June 2013.

Table 2.2 Economics of Cultivation for Fruits (January to June, 2013)

Crop	Apple	Banana	Papaya	Mango	Grapes
Proportion of Farm Households Cultivating the crop	0.004%	1.05%	0.14%	0.83%	0.007%
Land Cultivated by those households (hectares)	0.355	0.511	0.170	1.066	2.006
Land under the crop for these households(hectares)	0.103	0.136	0.055	0.324	0.937
Irrigated Land(hectares)	0.085	0.093	0.042	0.203	0.881
Unirrigated Land(hectares)	0.018	0.042	0.013	0.042	0.000
Yield (Kg/ha)	0	31294	39736	14136	17294
Yield in Irrigated Land (Kg/ha)	0	39612	30730	10768	18309
Yield in Unirrigated Land (Kg/ha)	0	22393	45272	17197	0
Total Value (INR)	0	14008	4903	20629	867940
Seed Cost (INR)	0(0)	734(13.6)	255(9.1)	1(0)	2134(1.2)
Fertilizer Cost(INR)	680(47.2)	872(16.1)	789(28)	1138(21.5)	75173(41.8)
Manure Cost(INR)	0(0)	359(6.6)	0(0)	348(6.6)	1273(0.7)
Plant Protection Chemicals Cost(INR)	190(13.2)	273(5)	752(26.7)	1043(19.7)	57202(31.8)
Diesel Cost(INR)	0(0)	176(3.3)	1(0)	219(4.1)	578(0.3)
Electricity Cost (INR)	0(0)	44(0.8)	0(0)	584(11)	4447(2.5)
Human Labor Cost (INR)	275(19.1)	1480(27.3)	667(23.7)	882(16.6)	32080(17.8)
Animal Labor Cost (INR)	0(0)	62(1.2)	6(0.2)	66(1.2)	0(0)
Irrigation Cost (INR)	0(0)	39(0.7)	20(0.7)	196(3.7)	917(0.5)
Repair (INR)	62(4.3)	25(0.5)	80(2.8)	206(3.9)	162(0.1)
Interest (INR)	0(0)	100(1.8)	1(0)	6(0.1)	0(0)
Hiring Cost (INR)	0(0)	148(2.7)	108(3.9)	271(5.1)	3906(2.2)
Lease Rent (INR)	0(0)	885(16.3)	0(0)	93(1.7)	0(0)
Other Expense (INR)	235(16.3)	219(4)	135(4.8)	251(4.7)	1983(1.1)

Crop	Apple	Banana	Papaya	Mango	Grapes
Total Cost (INR)	1443(100)	5416(100)	2813(100)	5305(100)	179855(100)
Returns (INR)	-1443	8592	2090	15324	688085
GVO/Costs	0.00	2.59	1.74	3.89	4.83

From Table 2.1, we find that the total cost incurred by household in July-December 2012 is INR 478, INR 208, INR 285, INR 116 and INR 134 per quintal for apple, banana, papaya, mango and grapes respectively. So, a loss of a quintal through wastage at harvest would mean that the household incurs these amounts as losses. In terms of opportunity cost though, the loss to the household is much higher – INR 3800, INR 800, INR 900, INR 400 and INR 3300 per quintal for apple, banana, papaya, mango and grapes respectively.

From Table 2.2, we find that the total costs incurred by household in January to June 2013 are INR 128, INR 129, INR 116 and INR 1110 per quintal for banana, papaya, mango and grapes respectively. So, a loss of a quintal through wastage at harvest would mean that the household incurs these amounts as losses. In terms of opportunity costs though, the loss is much higher – INR 300, INR 200, INR 500 and INR 5400 for banana, papaya, mango and grapes respectively. So we find that fruits are more valuable to the farmer in period July to December and less so in January to June. This indicates that the value of wastage in terms of rupees will differ for the farmer based on which season or which months the losses occur. Also, a high profitability in these crops might mean that the loss if viewed from cost perspective is much lesser than the loss viewed from opportunity cost perspective or profit foregone because of loss. Some of this might be compensated by the farmer by increasing the prices of the quantity that remains after loss, but even this would not be able to compensate the farmer if losses are high at harvest.

2.2.Economics of Cultivation for Vegetables

Table 2.3 presents the economics of cultivation for the vegetables considered in the study over reference period 1 (July to December 2012).

Table 2.3 Economics of Cultivation for Vegetables (July to December, 2012)

Crop	Onion	Tomato	Green Chillies	Potato	Green Pea
Proportion of Farm Households Cultivating the crop	0.41%	0.86%	0.45%	1.87%	0.10%
Land Cultivated by those households (hectares)	1.791	0.887	0.722	0.776	0.612
Land under the crop for these households(hectares)	0.482	0.196	0.081	0.137	0.111
Irrigated Land(hectares)	0.275	0.141	0.065	0.081	0.080
Unirrigated Land(hectares)	0.205	0.055	0.015	0.056	0.031
Yield (Kg/ha)	12783	10398	4074	7641	2868
Yield in Irrigated Land (Kg/ha)	15269	10815	3943	8690	3502
Yield in Unirrigated Land (Kg/ha)	2830	9605	4313	6220	1902
Total Value (INR)	22905	16852	10232	8816	8627
Seed Cost (INR)	1773(18.2)	1117(20.2)	324(12.3)	636(20.5)	529(17.1)
Fertilizer Cost(INR)	2392(24.6)	1324(24)	499(18.9)	454(14.6)	518(16.8)
Manure Cost(INR)	299(3.1)	300(5.4)	89(3.4)	51(1.7)	331(10.7)
Plant Protection Chemicals Cost(INR)	645(6.6)	553(10)	258(9.8)	173(5.6)	293(9.5)
Diesel Cost(INR)	136(1.4)	40(0.7)	153(5.8)	97(3.1)	107(3.4)
Electricity Cost (INR)	185(1.9)	56(1)	15(0.6)	13(0.4)	5(0.2)
Human Labor Cost (INR)	1987(20.4)	1279(23.1)	486(18.4)	494(15.9)	485(15.7)
Animal Labor Cost (INR)	340(3.5)	208(3.8)	102(3.9)	27(0.9)	15(0.5)
Irrigation Cost (INR)	423(4.3)	24(0.4)	67(2.5)	76(2.4)	31(1)
Repair (INR)	74(0.8)	46(0.8)	8(0.3)	19(0.6)	45(1.4)
Interest (INR)	508(5.2)	47(0.9)	217(8.2)	80(2.6)	39(1.3)

Crop	Onion	Tomato	Green Chillies	Potato	Green Pea
Hiring Cost (INR)	259(2.7)	288(5.2)	304(11.5)	188(6)	114(3.7)
Lease Rent (INR)	393(4)	56(1)	39(1.5)	669(21.5)	120(3.9)
Other Expense (INR)	314(3.2)	185(3.4)	76(2.9)	127(4.1)	458(14.8)
Total Cost (INR)	9727(100)	5525(100)	2639(100)	3103(100)	3090(100)
Returns (INR)	13177	11327	7592	5713	5537
GVO/Costs	2.35	3.05	3.88	2.84	2.79

The proportion of the farm households cultivating onion, tomato, green chilly, potato and green pea is in the range of 0.1% to 1.87%. These are slightly high proportions compared to fruits, but still quite less if looked on its own. But, given we are talking about a total of approximately 90,20,000 farm households, these proportions become large number of farm households. In terms of numbers, the range is from 91,864 households in case of green pea to 16,89,248 households in case of potato. Potato is the vegetable that is most cultivated among the five crops considered followed by tomato, green chillies, onion and then green pea. These farmers cultivate, on average 0.612 ha in case of green pea to 1.791 in case of onion. But the land allotted to the vegetables is much smaller in some vegetables than others. On average, green chillies are cultivated in 0.081 ha, green peas are cultivated in 0.111 ha, potato on 0.137 ha, tomato in 0.196 ha and onion in 0.482 ha. So, it seems that farmers allot only small land to cultivation of each of the crops. The average irrigated land is 57.1% of average land cultivated under onion. The numbers for potato is 59%, for tomato is 71.7%, for green peas is 72.1% and green chillies is 81.2%. The average yield in irrigated land as a percentage of average yield in unirrigated land is highest for onion at 540%. Yield of green pea in irrigated land is 184% of yield in unirrigated land. Tomato's yield with

irrigation is 113% of yield without irrigation, green chillies' yield with irrigation is 91% of yield without irrigation and potato's yield with irrigation is only 140% of yield without irrigation.

The average total value generated from cultivation is highest for onion (INR 22,905) and lowest for green peas (INR 8,692) in July-December 2012. In terms of profitability (defined as Total Value to Total Cost ratio), the highest is for green chillies at 3.88 which means that spending INR 1 yielded a farmer approximately INR 4 during July to December 2012. This ratio was 2.35 for onion, 3.05 for tomato, 2.84 for potato and 2.79 for green peas. For farming as a whole in this period, this ratio was 2.61. The values for most vegetables are higher than this ratio. As a share of total cost, seed cost, fertilizer cost, human labour cost and pesticide cost form the major costs for all the vegetables considered in our analysis. For onion, fertilizer cost, human labour cost, seed cost and pesticide costs account to 24.6%, 20.4%, 18.2% and 6.6% of total costs respectively during the first reference period. For tomato, these figures are 24%, 23.1%, 20.2% and 10% respectively. For green chillies the numbers are 18.9%, 18.4%, 12.3% and 9.8%. For potato, pesticide costs form a lesser share and lease rent forms 21.5% of the total costs while seed costs, fertilizer costs and human labour costs come to 20.5%, 14.6% and 15.9% respectively. For green peas, along with seed cost (17.1%), fertilizer cost (16.8%), human labour cost (15.7%) and pesticide cost (9.5%), manure costs (10.7%) forms a high cost of total cost share. The economics of cultivation for the vegetables were similar in the reference period 2 as well with lot more farmers cultivating potato in Rabi. Table 2.4 provides the economics of cultivation for vegetables in the second reference period January 2013 to June 2013.

Table 2.4 Economics of Cultivation for Vegetables (January to June, 2013)

CROP	ONION	TOMATO	GREEN CHILLIES	POTATO	GREEN PEAS
Proportion of Farm Households Cultivating the crop	1.21%	1.21%	0.49%	5.20%	0.58%
Land Cultivated by those households (hectares)	0.568	0.413	0.378	0.588	0.549
Land under the crop for these households(hectares)	0.187	0.137	0.091	0.177	0.139
Irrigated Land(hectares)	0.169	0.103	0.069	0.133	0.116
Unirrigated Land(hectares)	0.018	0.034	0.023	0.044	0.023
Yield (Kg/ha)	8929	10735	7366	13339	4140
Yield in Irrigated Land (Kg/ha)	9511	12253	10777	15121	3502
Yield in Unirrigated Land (Kg/ha)	3505	7518	2373	6341	5484
Total Value (INR)	20856	20734	7204	14941	10788
Seed Cost (INR)	1134(17.2)	865(15.7)	364(16.9)	1616(25.3)	758(20.8)
Fertilizer Cost(INR)	1548(23.5)	965(17.6)	479(22.2)	1386(21.7)	820(22.5)
Manure Cost(INR)	98(1.5)	240(4.4)	39(1.8)	173(2.7)	16(0.4)
Plant Protection Chemicals Cost(INR)	573(8.7)	758(13.8)	296(13.8)	340(5.3)	263(7.2)
Diesel Cost(INR)	171(2.6)	50(0.9)	159(7.4)	146(2.3)	172(4.7)
Electricity Cost (INR)	236(3.6)	48(0.9)	41(1.9)	34(0.5)	91(2.5)
Human Labor Cost (INR)	1775(27)	1288(23.4)	466(21.7)	1265(19.8)	667(18.3)
Animal Labor Cost (INR)	141(2.1)	168(3.1)	29(1.4)	152(2.4)	37(1)
Irrigation Cost (INR)	95(1.5)	80(1.5)	36(1.7)	413(6.5)	94(2.6)
Repair (INR)	130(2)	61(1.1)	34(1.6)	46(0.7)	78(2.1)
Interest (INR)	9(0.1)	63(1.1)	32(1.5)	23(0.4)	4(0.1)
Hiring Cost (INR)	387(5.9)	651(11.8)	88(4.1)	418(6.5)	204(5.6)
Lease Rent (INR)	88(1.3)	25(0.4)	23(1.1)	206(3.2)	189(5.2)
Other Expense (INR)	196(3)	233(4.2)	66(3.1)	168(2.6)	245(6.7)
Total Cost (INR)	6579(100)	5494(100)	2153(100)	6386(100)	3638(100)
Returns (INR)	14277	15240	5051	8555	7149
GVO/Costs	3.17	3.77	3.35	2.34	2.97

From Table 2.3, we find that the total cost incurred by household in July-December 2012 is INR 214, INR 555, INR 2311, INR 544 and INR 1746 per quintal for onion, tomato, green chillies, potato and green peas respectively. So, a loss of a quintal through wastage at harvest would mean that the household incurs these amounts as losses. In terms of opportunity cost though, the loss to the household is higher – INR 372, INR 825, INR 3115, INR 839 and INR 2720 per quintal for onion, tomato, green chillies, potato and green peas respectively.

From Table 2.4, we find that the total costs incurred by household in January to June 2013 are INR 394, INR 373, INR 320, INR 270 and INR 634 per quintal for onion, tomato, green chillies, potato and green peas respectively. So, a loss of a quintal through wastage at harvest would mean that the household incurs these amounts as losses. In terms of opportunity costs though, the loss is higher – INR 1250, INR 1407, INR 1070, INR 632 and INR 1881 for onion, tomato, green chillies, potato and green peas respectively. So we find that some vegetables are more valuable to the farmer in period July to December and some less so as compared to January to June. This indicates that the value of wastage in terms of rupees will differ for the farmer based on which season or which months the losses occur.

3. Findings from Mandi

In this section we analyse the arrivals and prices in Azadpur mandi for the ten crops. For analysing this we use both primary and secondary data. The primary data is based on the survey conducted by a team of surveyors during January and February, 2015. The secondary data is useful in estimating the total value and quantity of commodities traded at the mandi. We will first describe the general characteristics of the sample respondents in the survey. Then, for each of the ten commodities, we will estimate the seasonality, arrival and total value added in the last

five years using secondary data. Also, for each commodity we will discuss the wastages mentioned by the survey respondents.

3.1. Sample Characteristics

A primary survey was conducted which looked at the cost of doing business and issues related to marketing and storage among 43 traders and 39 farmers during January and February, 2015. The survey also enquired the wastage incurred by the respondent along the different stages in the supply chain. The questionnaire that was used among farmers and traders are presented in Appendix A and Appendix B respectively. Table 3.1 presents the sample characteristics of farmers and traders surveyed by us. The sample was selected randomly. Efforts were made to have heterogeneity among traders in terms of the commodities traded and the size of the trader. Few of the traders had offices of their own and some of the traders were small and did not own any office in the *mandi*. As far as farmers were concerned, we were able to survey only potato and apple farmers as they were the only farmers who were selling in the *mandi* directly at the time of the survey. The other farmers were not coming to the *mandi* directly and other aggregators were buying from them and selling it in *mandi*. Also, mango and green chilles were not traded at the time of the survey.

Table 3.1 Sample Characteristics of Survey Respondents

	Farmer	Trader
N	39	43
Age	43.08	44.49
Experience	21.38	21.05
Experince in Vegetable/Fruits Cultivation	19.90	
Education	8.08	8.05

	Farmer	Trader
Ability to read a newspaper	92%	98%
Ability to write own name	79%	98%
Household Size	7.36	6.84
MPCE	2205	2369
Land Owned	8.37	
Irrigated Land (%)	70%	
Wholesaler		72%
Intermediary/Commission Agent		16%
Retailer/ Sub-retailer		12%
Has an office in Mandi		67%

From Table 3.1, we find that the average age of traders was 44.49 while that of farmers was 43.08. As experience in their business ventures (farming and trading), traders and farmers had an average experience of 21.05 years and 21.38 years. The average experience of farmers in vegetable/fruits cultivation was 19.90 years. So, farmers for most of their farming careers had been involved in cultivating fruits and vegetables. The average number of education for farmers and traders was pretty much the same with farmers having experiences 8.08 years of schooling on average and traders having gone through 8.05 years of schooling experience. But, there seem to be vast differences in the ability to read and write among these two groups. While 98% of traders were able to read a Hindi newspaper, only 92% of farmers were able to do so. And more strikingly, when 98% of traders were able to write their own name in Hindi, only 79% of farmers were able to write their names in Hindi. The average household size of the farmer was 7.36 and that of trader was 6.84. The average monthly per capita expenditure of farm household was INR 2205, 7% lesser than the average monthly per capita expenditure of a trader household which was INR 2369. The average landholding of the farm household was 8.37 acres or 3.35 ha. From the

previous section, we can understand that these farmers are somewhat larger farmers as compared to an average farmer in India who is cultivating these fruits and vegetables. Of the 43 traders, 31 (72%) were wholesalers; 7 (16%) were commission agents/intermediaries and 5(12%) were retailer/sub-retailers. Also, 29 (67%) traders had a office in Azadpur *mandi* while the remaining 14 did not own any office in the *mandi*.

3.2.Reasons for trading in Azadpur *mandi*

We asked the traders and farmers on why they preferred trading in Azadpur *mandi*. The reasons they suggested are tabulated in the Table 3.2.

Table 3.2 Reasons for Trading in Azadpur Mandi

Reason	Farmer	Trader
It is convenient	2.56%	93.02%
Transportation cost is high for other markets	0.00%	88.37%
Pre-sowing Commitment	20.51%	0.00%
Liquidity or Credit constraints	74.36%	2.33%
Lack of Time	12.82%	9.30%
Bad infrastructure to reach other markets	53.85%	69.77%
Best Prices	53.85%	44.19%
Sell off quickly	12.82%	0.00%

Among the farmers, liquidity or credit constraints was the most important reason for trading in Azadpur *mandi* with around 75% farmers citing that as one of the reason. 54% suggested that the infrastructure to reach other markets was bad and 54% suggested that they received the best

prices in the *mandi*. Around 21% farmers cited pre-sowing commitment as the reason for selling in Azadpur *mandi*. 13% farmers suggested that they lacked the time to look for prices in various markets and they typically sold only in Azadpur and 13% suggested that given the demand situation in a large *mandi* like the one in Azadpur, they were able to sell off their produce quickly, even sometimes at a price lesser than they might get in their local markets. Only 1 farmers felt that it was convenient to sell at Azadpur *mandi* none of them felt that transportation cost was higher for other markets as the transportation cost to this market itself would have been high for these farmers.

When it came to traders, the situation was almost the reverse. 93% and 89% traders felt that trading in Azadpur *mandi* was convenient and traveling to other markets was costly. 70% felt that the infrastructure was bad to reach other markets. 44% of the traders felt that the price was best in Azadpur *mandi*. 9% of the traders felt that lack of time was an issue for them to travel to other markets and 2% indicated liquidity or credit constraints as the reason to sell at Azadpur *mandi*.

There were two issues to be noted here. Some of the reasons are interconnected like liquidity/credit constraints, lack of time and selling off quickly are quite related and we do find that farmers state one or two reasons together. Also, it interesting to see that around 50% of farmers and more than 50% traders do not feel that getting the best price is a reason to trade in Azadpur *mandi*. This would mean that they feel they could get better prices in other market yards but trade in Azadpur *mandi* because it is more convenient or they feel travelling to other markets was costly as in case of traders and liquidity constraints and bad infrastructure to travel to other markets. This has implications of spatial arbitrage and the prices might not converge in nearby

markets. There are other aspects that could influence arbitrage which are price information sources and storage. Some finding related to these issues are presented in the next subsection

3.3.Issues related to Price Information Sources and Storage

Table 3.3 presents the price information sources for traders and farmers.

Table 3.3 Price Information Sources for Traders and Farmers

Information Source	Farmers	Traders
Friends/Other farmers or traders	82.1%	100%
Progressive Farmers in the Village	87.2%	0.0%
Extension Agents	7.7%	0.0%
Mandi Agents	10.3%	2.3%
TV	0.0%	2.3%

We find that friends and other farmers or other traders from a very important source of price information. Progressive farmers in the village form another important source of price information for farmers. The other sources of price information are generally minor and very farmers and traders use them to obtain information related to crop prices. Table 3.4 presents data on storage by farmers and traders.

Table 3.4 Storage by Farmers and Traders

Storage Location	Farmers	Traders
Own House	69.2%	9.3%
Godown	79.5%	0.0%
Government Cold Storage	0.0%	27.9%
Private Cold Storage	0.0%	16.3%

Most farmers use own house (69.2%) and godown (79.5%) for storage. Not all traders in the survey store their produce. 9.3% traders use own house for storage. 27.9% use Government cold storage facilities while 16.3% traders use private cold storage facilities. We also asked what were the major risks faced by farmers and traders in storage. Table 3.5 provides the results in this regard.

Table 3.5 Constraints faced in Storage

Issues in Storage	Trader	Farmer
Risk of Damage	95.3%	53.8%
Risk of Commodities getting Rotten	95.3%	100.0%

Traders considered damage and getting rotten as equal risks while storing while for the farmers, commodities getting rotten was a problem for all farmers while risk of damage was only a problem for roughly half the farmers.

We also asked the traders what they did if the quality of the product they bought got reduced. Table 3.6 provides the results in this regard.

Table 3.6 Responses to Decline in Quality

	Trader
Reduce prices and sell	95.3%
Return to seller	7.0%
Mix with good quality commodities and sell it	100.0%
Send it to cold storage	30.2%

In response to decline in quality, all traders reported that they mixed the low quality crops with higher quality good and sold it. 95.3% traders reduced the prices and sold while 30.2% traders

sent the commodities to cold storage for maintaining the quality. Only 7% of the traders returned the crops to the seller when the quality was reduced.

We also collected information on cost and value of the fruits and vegetables among farmers and traders. The crop wise details of the incomes for different traders are provided in Table 3.7. Income from farmers was calculated as the difference between total value (price x production) and total cost incurred by the farm household in its cultivation. Incomes from traders was calculated as total quantity sold in the year multiplied by difference between average selling price and average cost price.

Table 3.7 Incomes of Farmers and Traders

Incomes of Trader					
Commodity	N	Mean	Minimum	Maximum	Average Margin
Onion	9	727667	375000	1015000	21%
Potato	7	821357	30000	3900000	15%
Tomato	4	259000	40000	1000000	5%
Green Pea	4	374500	288000	440000	9%
Apple	5	1773000	525000	3400000	19%
Banana	4	254000	56000	540000	7%
Papaya	4	5562500	3500000	6750000	66%
Grapes	6	807500	150000	2860000	17%
All	43	1210872	30000	6750000	20%
Incomes of Farmer					
Commodity	N	Mean	Minimum	Maximum	Average Margin
Potato	18	47406	-110400	532650	60%
Apple	21	938476	-9470000	12030000	62%
All	39	527213	-9470000	12030000	61%

The average income of the traders considered in the study was INR 12,10,872 while that for the farmers was 5,27,213. The highest profitability was for traders who traded in papaya and lowest was for potato farmers. Though average margins were higher for farmers, there was a huge variability in margins among farmers and less of it among traders. Also 14 of 18 potato farmers had negative margins while 2 of 19 apple farmers had negative margins. None of the traders had negative margins.

3.4. Arrivals, Prices and Wastage at Azadpur mandi

Given that we now have background of production and marketing of the fruits and vegetables considered in the study, we now look into value generated and extent of wastage at Azadpur *mandi* for these crops. Each of the subsections looks at these issues for each of the commodities.

3.4.1. Apple

Table 3.8 and Table 3.9 present the total monthly arrivals (in tonnes) and monthly average prices (in Rs./Quintal) for apple in the years between 2010 to 2014 respectively.

Table 3.8 Monthly Arrivals of Apple in Azapur Mandi (in tonnes)

	Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec
2010	45049	21712	9422	3835	3596	3061	47653	117723	125060	124464	109222	86552
2011	33099	15980	7150	5545	2006	189	14950	53395	78187	115348	94066	64272
2012	39970	30036	12018	4396	3941	2206	10700	67831	96492	100686	96916	52561
2013	33738	18146	10601	3915	1435	399	36521	81200	84874	117730	88614	56317
2014	37751	18325	8620	1784	832	267	7666	56794	81878	86821	82416	63716

Table 3.9 Average Monthly Prices of Apple in Azapur Mandi (in Rs./Quintal)

	Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec	Average
2010	2589	2503	2902	2973	2392	2031	5337	5098	3832	3427	2941	3266	3274
2011	2227	1949	2658	4265	5644	4719	4919	5963	4610	4617	3583	3684	4070
2012	3379	4041	4627	5870	5458	5521	3079	1890	2385	3482	2494	2900	3761
2013	2813	3194	4344	4754	4314	6120	1744	3023	3616	3571	4122	4865	3873
2014	4876	5249	6551	9399	10120	10375	6963	5953	5396	5917	6573	4157	6794

In all, during the years 2010 to 2014, the apple arrivals in Azadpur *mandi* was 6.97, 4.84, 5.18, 5.33 and 5.47 lakh tonnes. The prices in response were INR 3,274, INR 4,070, INR 3,761, INR 3,873 and INR 6,794 respectively. The high price in 2014 was largely due to low arrivals of apple in month of April, May and June in that year. The seasonality index of arrivals and that of prices of apple for the five years are presented in figure 3.1 and 3.2. Seasonality index of arrivals was calculated as arrivals in the particular month divided by average of monthly arrivals in that year. Seasonality index of prices was calculated as monthly average price divided by the average of monthly average prices in that year.

Figure 3.1 Seasonality Index of Arrivals of Apple

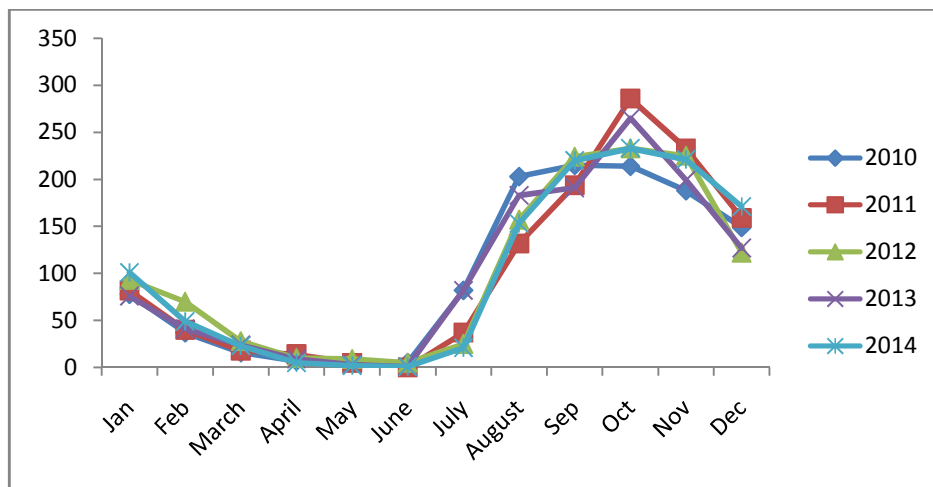
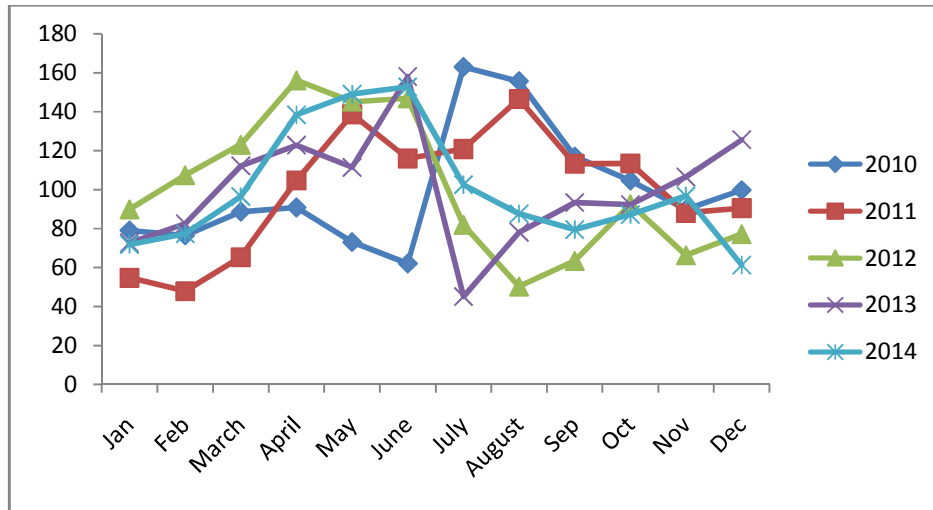


Figure 3.2 Seasonality Index of Prices of Apple



From the figures 3.1 and 3.2, we observe that arrivals follow a similar pattern of seasonality every year, while prices do not seem to. Most of the arrivals happen in the five months from August to January. The extent of wastage of apple was enquired among farmers and traders. We had interviewed 21 farmers and 5 traders. Since the number of traders is very small we provide the data for all the individual traders. For farmers we provide the summary statistics of wastage for 21 farmers.

Table 3.10 Wastage of Apple for Individual Traders (Winter)

	Loading	Transportation	Rotting during Transportation	Storage	Rotting in Storage	Total
1	4.62%	0.00%	0.00%	3.08%	4.62%	12.31%
2	0.00%	4.62%	6.15%	0.00%	3.08%	13.85%
3	4.62%	3.08%	0.00%	4.62%	0.00%	12.31%
4	0.00%	3.08%	3.08%	0.00%	3.08%	9.23%
5	0.00%	3.08%	3.08%	0.00%	1.54%	7.69%
Average	1.85%	2.77%	2.46%	1.54%	2.46%	11.08%

Table 3.11 Wastage of Apple for Individual Traders (Summer)

	Loading	Transportation	Rotting during Transportation	Storage	Rotting in Storage	Total
1	3.08%	4.62%	0.00%	3.08%	6.15%	16.92%
2	4.62%	0.00%	0.00%	4.62%	6.15%	15.38%
3	6.15%	3.08%	0.00%	4.62%	0.00%	13.85%
4	4.62%	0.00%	0.00%	6.15%	4.62%	15.38%
5	4.62%	0.00%	0.00%	6.15%	4.62%	15.38%
Average	4.62%	1.54%	0.00%	4.92%	4.31%	15.38%

Table 3.12 Wastage of Apple among Farmers

	Winter	Summer
Damage in Harvest	1.61%	1.32%
Rotting in Harvest	0.44%	0.00%
Storage at House	0.29%	0.00%
Rotting during storage at house	0.51%	0.29%
Storage in Godown	4.98%	3.88%
Rotting during storage at Godown	3.15%	2.12%
Transportation	2.49%	3.00%
Rotting during Transportation	0.00%	0.37%
Total	13.48%	10.99%

We find that farmers and traders report similar amounts as wastage in apple. For farmers, wastage happens the most during storage in godown followed by transportation and then during harvest. For traders, wastage happens the most during storage followed by loading and then by transportation. For farmers, the losses are higher in summer as compared to winter while it was reverse for traders. The CIPHET study has indicated that there was around 12.3% wastage in apple at All India level with farm level operations and storage contributing to 11.14% of wastage

and storage from wholesaler level contributing to 1.16% . Even though these are small samples, we can suggest that farmers and traders involved in Azadpur *mandi* face higher losses than that mentioned in CIPHET study. Only a larger and detailed study would be able to indicate if the extent of wastage is really higher than that mentioned in CIPHET study.

3.4.2. Potato

Table 3.13 and Table 3.14 present the total monthly arrivals (in tonnes) and monthly average prices (in Rs./Quintal) for potato in the years between 2010 to 2014 respectively.

Table 3.13 Monthly Arrivals of Potato in Azapur Mandi (in tonnes)

	Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec
2010	32718	28464	31836	31961	28381	26243	30513	28369	31564	28832	39435	32053
2011	30562	28965	35623	33301	26990	24021	27790	30106	35543	30480	39003	31951
2012	31897	31576	33538	25966	28503	23390	25459	26401	28531	32567	39708	30498
2013	35297	29472	30975	33632	27645	23923	27867	25745	25668	33280	36699	30252
2014	31233	24890	26555	25456	20393	18829	25729	23166	37689	22686	36384	27645

Table 3.14 Average Monthly Prices of Potato in Azapur Mandi (in Rs./Quintal)

	Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec	Average
2010	560	414	385	438	467	735	838	605	865	752	905	540	625
2011	415	407	496	476	537	661	742	823	870	855	680	343	609
2012	417	441	601	909	1020	1170	1401	1389	1312	1157	1053	669	962
2013	678	682	701	839	932	1091	1165	1209	1366	1733	1704	1159	1105
2014	914	773	951	1238	1626	2892	1754	2048	2401	2425	2652	1538	1768

In all, during the years 2010 to 2014, the potato arrivals in Azadpur *mandi* was 3.85, 3.83, 3.66, 3.63 and 3.32 lakh tonnes. The prices in response were INR 625, INR 609, INR 962, INR 1,105 and INR 1,768 respectively. The high price in 2014 was largely due to low arrivals in the year 2014. The seasonality index of arrivals and that of prices of potato for the five years are presented in figure 3.3 and 3.4.

Figure 3.3 Seasonality Index of Arrivals of Potato

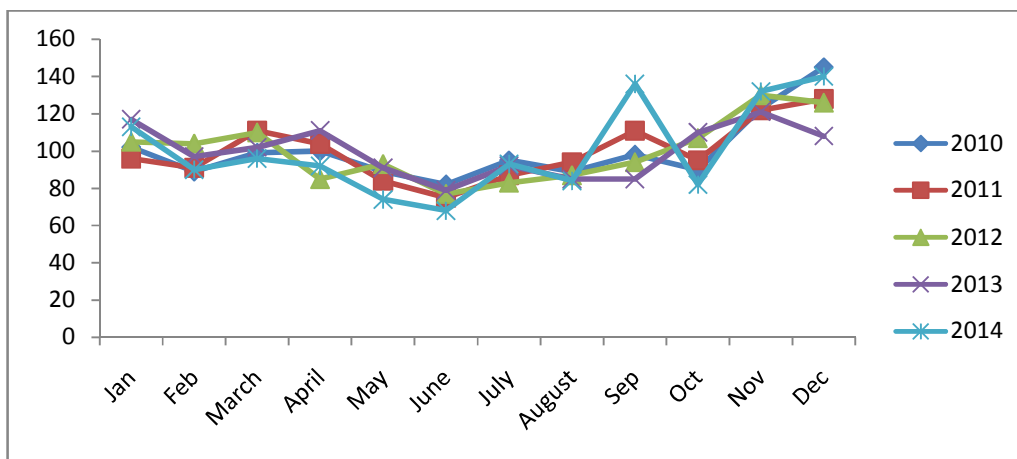
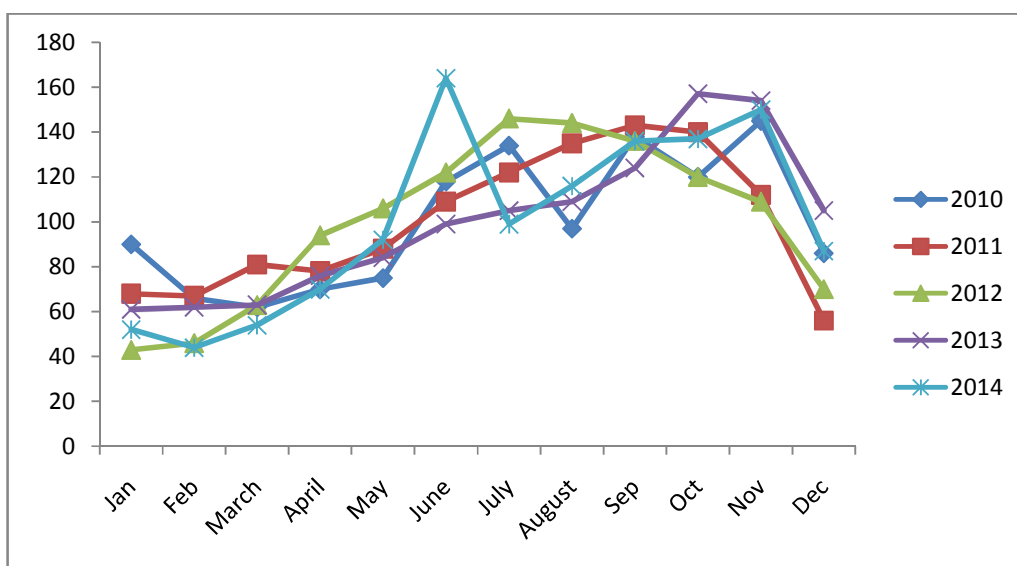


Figure 3.4 Seasonality Index of Prices of Potato



From the figures 3.3 and 3.4, we observe that arrivals do not show much seasonality while prices show some seasonality in that it is higher in the months August to November compared to other months. This might be because of seasonality in demand for potato.

We had interviewed 18 farmers and 7 traders trading in potato. Since the number of traders is very small we provide the data for all the individual traders. For farmers we provide the summary statistics of wastage for 18 farmers.

Table 3.15 Wastage of Potato for Individual Traders (Winter)

	Loading	Transportation	Storage	Rotting in Storage	Total
1	0.00%	0.40%	0.20%	0.00%	0.60%
2	1.00%	0.40%	0.00%	0.20%	1.60%
3	0.40%	0.00%	0.00%	0.40%	0.80%
4	0.00%	1.00%	0.40%	0.00%	1.40%
5	0.40%	0.20%	0.00%	0.00%	0.60%
6	0.40%	0.20%	0.00%	0.00%	0.60%
7	0.40%	0.20%	0.00%	0.00%	0.60%
Average	0.37%	0.34%	0.09%	0.09%	0.89%

Table 3.16 Wastage of Potato for Individual Traders (Summer)

	Loading	Transportation	Storage	Rotting in Storage	Total
1	0.20%	0.20%	0.00%	0.00%	0.40%
2	0.60%	0.00%	0.20%	0.00%	0.80%
3	0.00%	0.00%	0.00%	0.00%	0.00%
4	1.00%	0.00%	0.00%	0.00%	1.00%
5	0.20%	0.40%	0.00%	0.00%	0.60%
6	0.20%	0.40%	0.00%	0.00%	0.60%
7	0.20%	0.40%	0.00%	0.00%	0.60%
Average	0.34%	0.20%	0.03%	0.00%	0.57%

Table 3.17 Wastage of Potato among Farmers

	Winter	Summer
Damage in Harvest	0.44%	0.22%
Rotting in Harvest	0.56%	0.00%
Storage at House	0.61%	0.72%
Rotting during storage at house	0.44%	0.13%
Storage in Godown	0.89%	0.22%
Rotting during storage at Godown	0.33%	0.06%
Transportation	0.67%	0.26%
Rotting during Transportation	0.11%	0.39%
Total	4.06%	2.00%

We find that farmers report high wastage as compared to traders for potato. For farmers, wastage happens the most during storage in godown followed by transportation and then during harvest. For traders, wastage happens the most during loading followed by storage and then by transportation. For both farmers and traders, the losses are higher in winter as compared to summer. The CIPHET study has indicated that there was around 9% wastage in potato at all India level with farm level operations and storage contributing to 7.06% of wastage and storage from wholesaler level contributing to 1.84% . Even though these are small samples, we can suggest that farmers and traders involved in Azadpur *mandi* face lower losses than that mentioned in CIPHET study.

3.4.3. *Onion*

Table 3.18 and Table 3.19 present the total monthly arrivals (in tonnes) and monthly average prices (in Rs./Quintal) for onion in the years between 2010 to 2014 respectively.

Table 3.18 Monthly Arrivals of Onion in Azapur Mandi (in tonnes)

	Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec
2010	17211	21173	23278	29439	27099	32636	27812	24638	26013	17596	26215	30600
2011	15941	19192	27730	24287	25922	29029	24862	23960	24877	24840	33349	40091
2012	30005	26210	24007	24046	29698	29470	27374	26312	28150	24408	29006	34170
2013	27127	22741	28387	29398	31212	26811	23473	16837	13907	19749	23951	22969
2014	21202	19850	22085	22452	24446	27045	23516	21302	21428	20059	32931	24382

Table 3.19 Average Monthly Prices of Onion in Azapur Mandi (in Rs./Quintal)

	Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec	Average
2010	1335	1107	810	705	505	491	672	842	1243	1405	1849	2392	1335
2011	2657	1037	732	604	538	586	813	1086	1200	1094	905	614	2657
2012	491	534	605	621	544	583	679	696	690	1013	1059	1145	491
2013	1347	1464	1153	1004	860	1172	1978	3456	4520	4185	3479	1671	1347
2014	1151	929	968	1025	1145	1253	2038	1747	1715	1639	1513	1611	1151

In all, during the years 2010 to 2014, the onion arrivals in Azadpur *mandi* was 3.04, 3.14, 3.33, 2.87 and 2.81 lakh tonnes. The prices in response were INR 1,113, INR 989, INR 722, INR 2,191 and INR 1,395 respectively. The prices of onion are volatile and exports might play a role in determining this volatility. The seasonality index of arrivals and that of prices of onion for the five years are presented in figure 3.5 and 3.6.

Figure 3.5 Seasonality Index of Arrivals of Onion

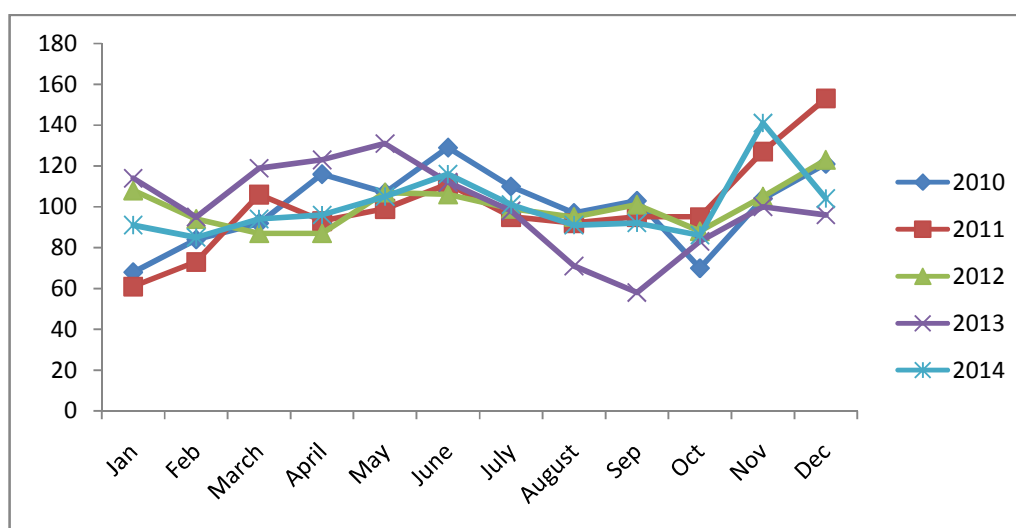
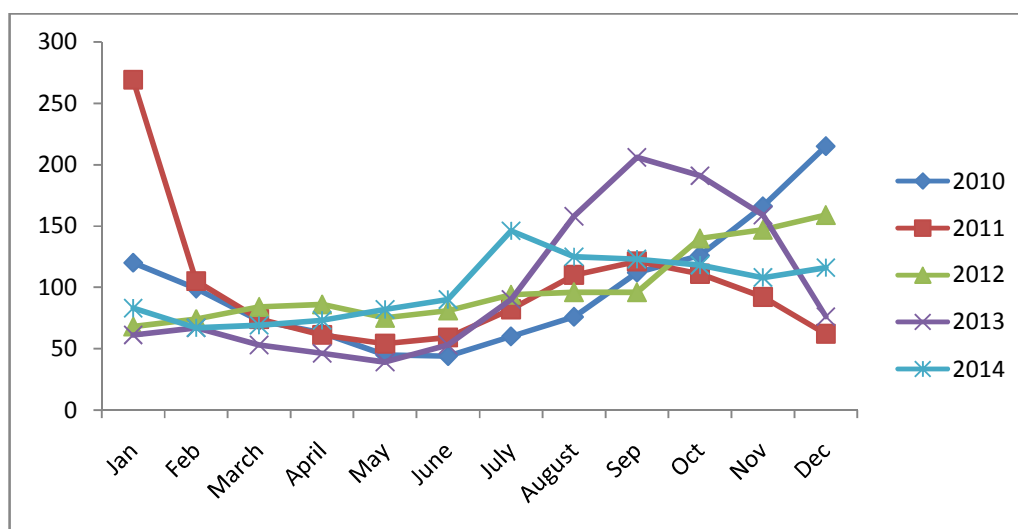


Figure 3.6 Seasonality Index of Prices of Onion



From the figures 3.5 and 3.6, we observe that arrivals do not show much seasonality and prices do not show any discernible seasonality. We had interviewed 9 onion traders. Since the number of traders is very small we provide the data for all the individual traders.

Table 3.20 Wastage of Onion for Individual Traders

Sr No	WINTER			SUMMER		
	Loading	Transportation	Total	Loading	Transportation	Total
1	2.50%	2.50%	5.00%	2.50%	2.50%	5.00%
2	1.25%	1.25%	2.50%	2.50%	1.25%	3.75%
3	1.25%	1.25%	2.50%	2.50%	2.50%	5.00%
4	1.25%	1.25%	2.50%	1.25%	1.25%	2.50%
5	1.25%	0.75%	2.00%	1.00%	0.75%	1.75%
6	1.25%	0.50%	1.75%	1.25%	1.25%	2.50%
7	0.25%	0.25%	0.50%	0.25%	0.25%	0.50%
8	1.00%	0.75%	1.75%	1.25%	0.75%	2.00%
9	1.75%	1.50%	3.25%	1.25%	0.75%	2.00%
Average	1.31%	1.11%	2.42%	1.53%	1.25%	2.78%

From Table 4.20, we find that the onion traders on average lost 2.42% in winter and 2.78% in summer. The losses ranged from 0.5% to 5% for traders in winter and summer. The CIPHET study had indicated losses for onion at 7.5% with losses to farmers at 5.74% and the remaining contributing to 1.76%. The losses at Azadpur *mandi* for onion traders seem to be somewhat higher than that reported in the CIPHET study.

3.4.4. Tomato

Table 3.21 and Table 3.22 present the total monthly arrivals (in tonnes) and monthly average prices (in Rs./Quintal) for tomato in the years between 2010 to 2014 respectively.

Table 3.21 Monthly Arrivals of Tomato in Azapur Mandi (in tonnes)

	Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec
2010	10076	11933	12011	10343	8786	9488	8547	9691	8654	10692	16775	12529
2011	13820	8331	10881	11500	10681	10372	11122	11304	10116	9616	13780	15336
2012	11227	11432	9384	10322	8298	9608	8858	9890	10091	11669	13313	14724
2013	17400	14831	14778	12287	8717	9892	7122	10091	8142	10863	9130	10267
2014	18339	14805	21000	13449	9222	9202	9347	7902	9748	10934	13349	15102

Table 3.22 Average Monthly Prices of Tomato in Azapur Mandi (in Rs./Quintal)

	Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec	Average
2010	1027	675	634	655	534	828	1958	1681	1890	1187	652	1510	1102
2011	2334	772	909	699	225	517	1133	1011	1161	1701	940	414	985
2012	524	638	1201	1071	689	567	1764	1888	1389	1349	915	570	1047
2013	728	667	956	1051	896	1192	2647	2098	2214	1852	3197	1903	1617
2014	1001	867	744	1095	402	391	1881	3272	2603	1933	970	1368	1377

In all, during the years 2010 to 2014, the tomato arrivals in Azadpur *mandi* was 1.30, 1.37, 1.29, 1.34 and 1.52 lakh tonnes. The prices in response were INR 1,102, INR 985, INR 1,047, INR 1,617 and INR 1,377 respectively. The seasonality index of arrivals and that of prices of tomato for the five years are presented in figure 3.7 and 3.8.

Figure 3.7 Seasonality Index of Arrivals of Tomato

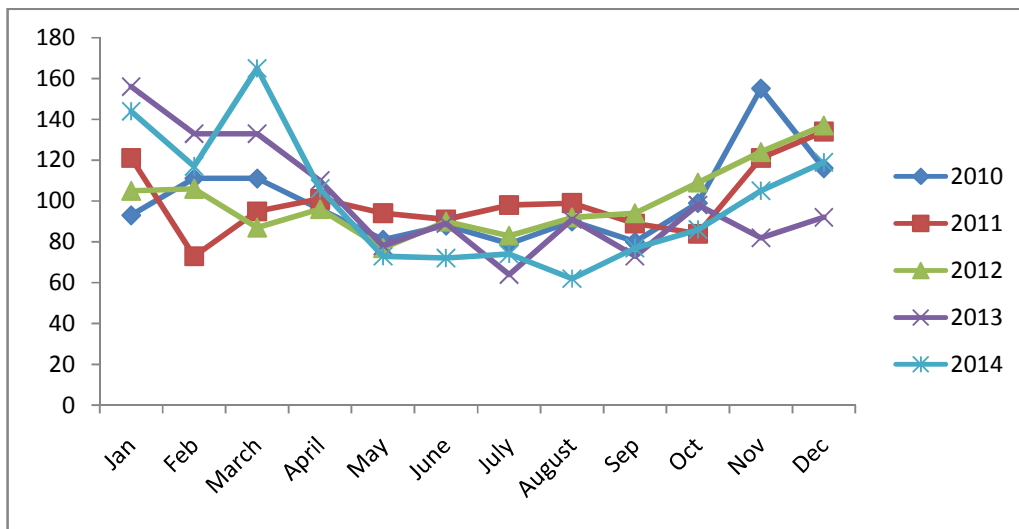
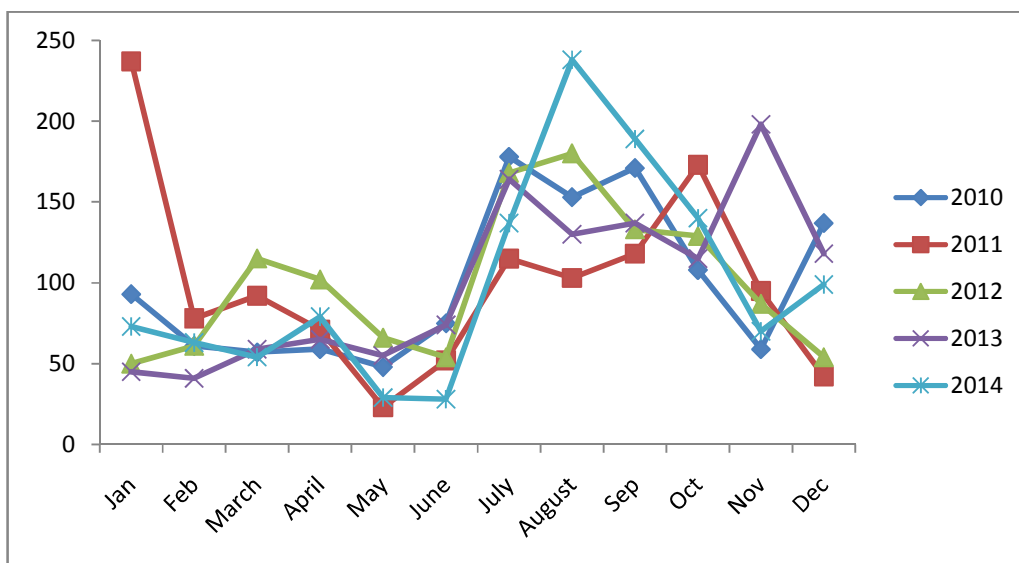


Figure 3.8 Seasonality Index of Prices of Tomato



From the figures 3.7 and 3.8, we observe that arrivals do not show much seasonality and prices show seasonality and this could be because of seasonality in demand in tomato. We had interviewed 5 tomato traders. Since the number of traders is very small we provide the data for all the individual traders.

Table 3.23 Wastage of Tomato for Individual Traders

Sr No	WINTER			SUMMER			
	Loading	Transportation	Total	Loading	Transportation	Storage	Total
1	0.40%	0.80%	1.20%	0.40%	0.80%	0.00%	1.20%
2	0.80%	1.20%	2.00%	1.20%	0.00%	0.00%	1.20%
3	0.80%	1.20%	2.00%	0.40%	0.80%	0.00%	1.20%
4	2.00%	0.40%	2.40%	0.40%	0.80%	0.00%	1.20%
5	0.40%	0.40%	0.80%	0.40%	0.00%	0.40%	0.80%
Average	0.88%	0.80%	1.68%	0.56%	0.48%	0.08%	1.12%

From Table 3.23, we find that the tomato traders on average lost 1.68% in winter and 1.12% in summer. The losses ranged from 0.8% to 2.4% for traders in winter and summer. The CIPHET study had indicated losses for tomato at 12.4% with losses to farmers at 10.07% and the remaining contributing to 2.33%. The losses at Azadpur *mandi* for tomato traders seem to be somewhat lesser than that reported in the CIPHET study.

3.4.5. Mango

Table 3.24 and Table 3.25 present the total monthly arrivals (in tonnes) and monthly average prices (in Rs./Quintal) for mango in the years between 2010 to 2014 respectively.

Table 3.24 Monthly Arrivals of Mango in Azapur Mandi (in tonnes)

	Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec
2010	0	0	23	3749	33247	64486	55400	6277	126	32	75	0
2011	60	38	726	12967	34600	51212	53210	8357	0	0	0	0
2012	0	0	1346	14641	43134	52749	64628	17629	1319	221	59	60
2013	94	351	2822	13927	39364	49642	45517	9599	138	227	155	157
2014	97	326	1335	16002	43535	49240	72317	19712	1018	0	5	0

Table 3.25 Average Monthly Prices of Mango in Azapur Mandi (in Rs./Quintal)

	Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec	Average
2010	0	0	0	3283	1832	1822	1921	4874	6644	6029	9540	0	2995
2011	5462	10075	7306	5384	3963	4592	2289	3733	0	0	0	0	3567
2012	0	0	5990	2978	2105	2213	2449	3056	4996	7524	9247	9740	4192
2013	8552	8443	5778	4353	4401	4785	2373	3189	6034	8248	9953	7897	6167
2014	8812	10142	9764	4420	2958	4231	3489	2813	9243	0	8000	0	5323

In all, during the years 2010 to 2014, mango arrivals in Azadpur *mandi* was 1.63, 1.61, 1.96, 1.62 and 2.04 lakh tonnes. The prices in response were INR 2,995, INR 3,567, INR 4,192, INR 6,167 and INR 5,323 respectively. The seasonality index of arrivals and that of prices of mango for the five years are presented in figure 3.9 and 3.10.

Figure 3.9 Seasonality Index of Arrivals of Mango

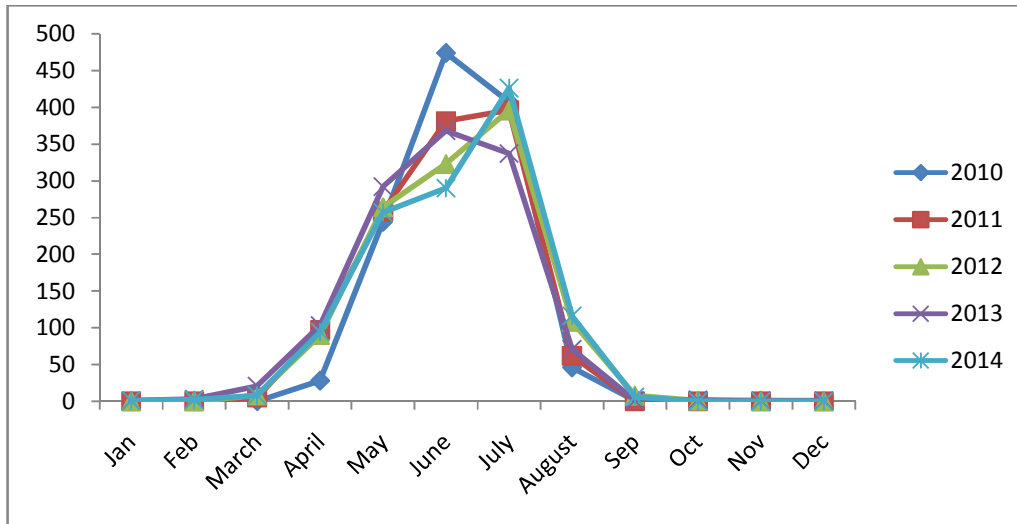
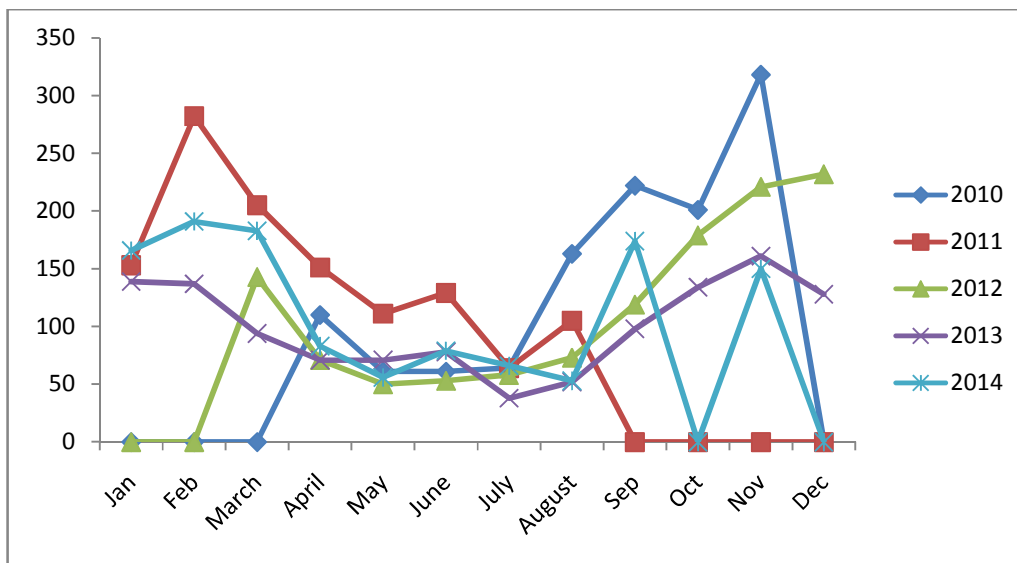


Figure 3.10 Seasonality Index of Prices of Mango



From the figures 3.9 and 3.10, we observe that mango is a highly seasonal fruit with arrivals focussed on April to September of any year only. The prices are lower during those months. We were not able to interview traders or farmers as we did the survey from January and February.

CIPHET study reports loss of 10.66% at farmer level and 2.04% at other levels. This could be verified in our study.

3.4.6. *Banana*

Table 3.26 and Table 3.27 present the total monthly arrivals (in tonnes) and monthly average prices (in Rs./Quintal) for banana in the years between 2010 to 2014 respectively.

Table 3.26 Monthly Arrivals of Banana in Azapur Mandi (in tonnes)

	Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec
2010	6013	4904	12193	18702	19168	14804	9101	12600	12517	12076	8987	4597
2011	2858	4757	6510	6895	6007	7166	13560	13690	17687	11747	9877	5587
2012	3041	8976	9529	10751	4748	7013	8351	10211	9510	9982	4260	4362
2013	2314	2538	4027	7773	5957	6079	7367	8416	5619	7396	3873	101
2014	2245	2437	4711	4542	6951	8265	7797	5036	7561	3288	2986	299

Table 3.27 Average Monthly Prices of Banana in Azapur Mandi (in Rs./Quintal)

	Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec	Average
2010	881	1036	984	808	894	894	808	1006	979	1113	1059	862	944
2011	951	1201	1260	1780	1315	1315	960	1035	900	954	954	926	1129
2012	891	1070	1296	1513	1712	1279	1277	1108	866	1148	1298	1051	1209
2013	1000	1164	1250	1275	1268	1079	1112	1155	1236	1424	1426	1492	1240
2014	1695	1976	1921	1693	1341	1198	1349	1289	1307	1395	1370	1485	1502

In all, during the years 2010 to 2014, the banana arrivals in Azadpur *mandi* was 1.36, 1.06, 0.91, 0.61 and 0.56 lakh tonnes. The prices in response were INR 944, INR 1,129, INR 1,209, INR 1,240 and INR 1,502 respectively. Banana arrivals have reduced over years and the prices have

gone up over the years. The seasonality index of arrivals and that of prices of banana for the five years are presented in figure 3.11 and 3.12.

Figure 3.11 Seasonality Index of Arrivals of Banana

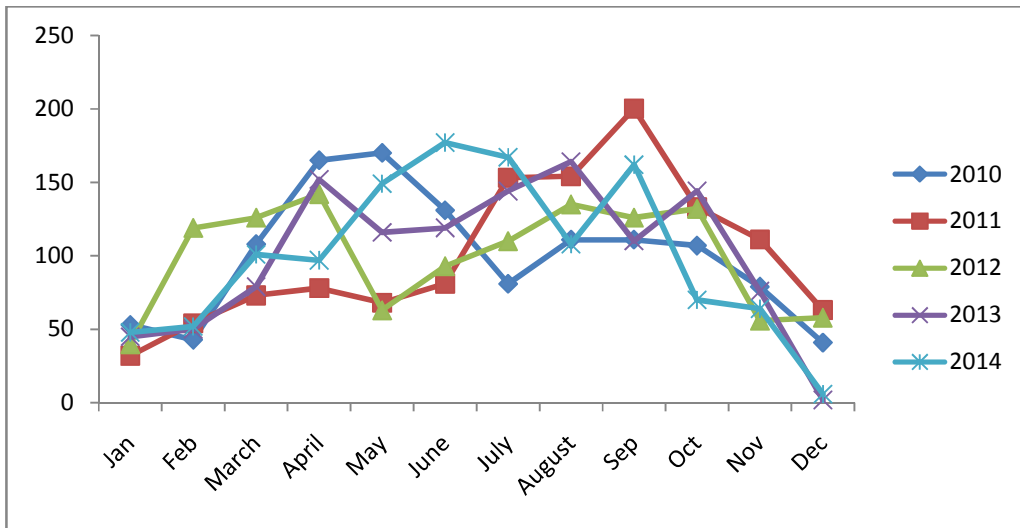
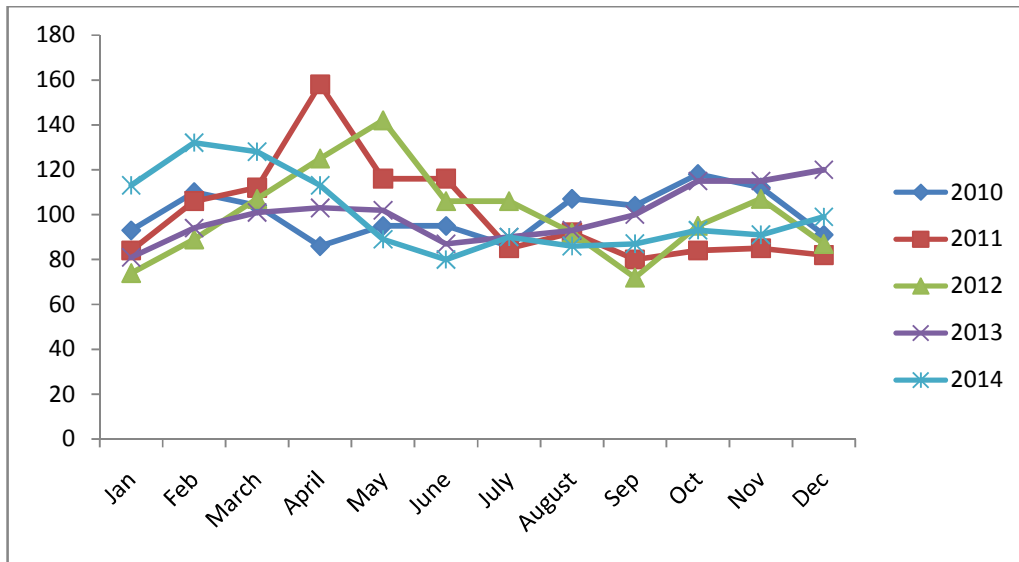


Figure 3.12 Seasonality Index of Prices of Banana



From the figures 3.11 and 3.12, we observe that arrivals show some seasonality while prices do not exhibit much seasonality. We had interviewed 4 banana traders. Since the number of traders is very small we provide the data for all the individual traders.

Table 3.28 Wastage of Banana for Individual Traders

Sr No	WINTER	SUMMER
	Total	Total
1	10.00%	5.00%
2	5.00%	6.67%
3	3.33%	1.67%
4	5.00%	5.00%
Average	5.83%	4.58%

From Table 3.28, we find that the banana traders on average lost 5.83% in winter and 4.58% in summer. The losses ranged from 1.67% to 10% for traders in winter and summer. The CIPHET study had indicated losses for banana at 6.6% with losses to farmers at 4.24% and the remaining contributing to 2.36%. The losses at Azadpur *mandi* for banana traders seem to be higher than that reported in the CIPHET study.

3.4.7. Grapes

Table 3.29 and Table 3.30 present the total monthly arrivals (in tonnes) and monthly average prices (in Rs./Quintal) for banana in the years between 2010 to 2014 respectively.

Table 3.29 Monthly Arrivals of Grapes in Azapur Mandi (in tonnes)

	Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec
2010	3613	7256	5962	3775	1156	201	106	83	148	368	917	829
2011	3196	6421	7423	3563	667	150	106	114	155	367	786	975
2012	0	9483	12795	6378	1860	189	45	84	122	89	723	55
2013	154	0	0	0	0	0	0	58	4	0	75	5
2014	2145	7300	8854	4387	766	137	51	23	64	134	909	0

Table 3.30 Average Monthly Prices of Grapes in Azapur Mandi (in Rs./Quintal)

	Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec	Average
2010	3170	2964	3540	3462	3990	5137	6165	5174	4989	5846	5867	6323	4719
2011	5049	3761	4439	6009	6563	4526	5273	6115	5760	5902	7389	6147	5578
2012	0	4106	4001	4175	4899	3704	3664	3568	3600	8117	8384	7683	4658
2013	5233	0	0	0	0	0	0	7221	8000	0	9750	7100	3109
2014	5725	4904	4482	5624	7309	6343	6068	7058	7000	10500	9523	0	6211

In all, during the years 2010 to 2014, the grapes arrivals in Azadpur *mandi* was 0.24, 0.24, 0.32, 0.003 and 0.25 lakh tonnes. The prices in response were INR 4,719, INR 5,578, INR 4,658, INR 3,109 and INR 6,211 respectively. Grapes arrivals have been pretty constant except 2013 when there was almost no arrival of grapes in Azadpur. The seasonality index of arrivals and that of prices of grapes for the five years are presented in figure 3.11 and 3.12.

Figure 3.13 Seasonality Index of Arrivals of Grapes

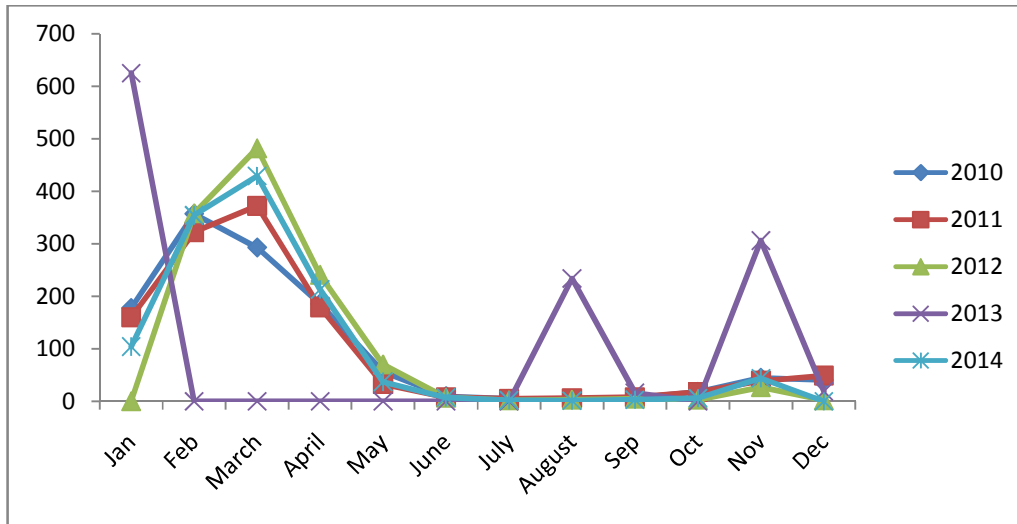
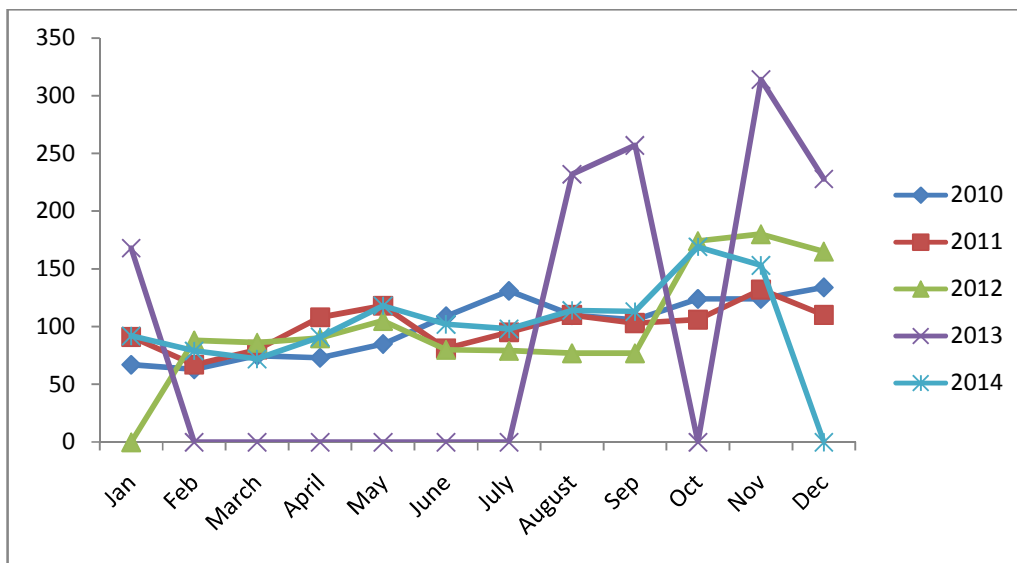


Figure 3.14 Seasonality Index of Prices of Grapes



From the figures 3.13 and 3.14, we observe that arrivals show seasonality while prices do not exhibit much seasonality. We had interviewed 5 grapes traders on wastage incurred by them.

Table 3.31 Wastage of Grapes for Individual Traders

Sr. No	WINTER			SUMMER		
	Loading	Transportation	Total	Loading	Transportation	Total
1	2.00%	2.00%	4.00%	2.00%	0.00%	2.00%
2	0.00%	2.00%	2.00%	0.00%	0.00%	0.00%
3	2.00%	1.00%	3.00%	1.00%	0.00%	1.00%
4	2.00%	0.00%	2.00%	0.00%	3.00%	3.00%
5	1.00%	0.00%	1.00%	1.00%	0.00%	1.00%
Average	1.40%	1.00%	2.40%	0.80%	0.60%	1.40%

From Table 3.31, we find that the grapes traders on average lost 2.4% in winter and 1.4% in summer. The losses ranged from 0% to 4% for traders in winter and summer. The CIPHET study had indicated losses for banana at 8.3% with losses to farmers at 7.01% and the remaining contributing to 1.29%. The losses at Azadpur *mandi* for grapes traders seem to be higher than that reported in the CIPHET study.

3.4.8. Papaya

Table 3.32 and Table 3.33 present the total monthly arrivals (in tonnes) and monthly average prices (in Rs./Quintal) for papaya in the years between 2010 to 2014 respectively.

Table 3.32 Monthly Arrivals of Papaya in Azapur Mandi (in tonnes)

	Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec
2010	3062	4904	6068	5749	4447	4272	4700	5480	5044	4735	4440	4533
2011	4162	5782	7601	7647	4960	4198	4309	6812	5288	3866	4120	5305
2012	4932	5928	7788	6773	4730	3292	4521	3669	4166	3409	2846	5305
2013	4919	5612	6073	5611	3400	2882	4328	3146	3066	2356	2277	2911
2014	2145	7300	8854	4387	766	137	51	23	64	134	909	0

Table 3.33 Average Monthly Prices of Papaya in Azapur Mandi (in Rs./Quintal)

	Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec	Average
2010	953	847	766	798	684	614	585	679	625	728	731	518	711
2011	564	513	685	668	652	690	606	730	613	575	700	513	626
2012	492	515	453	611	809	1097	1067	894	823	1038	1209	513	793
2013	351	638	714	866	985	1065	1182	1364	1188	1602	1705	1199	1072
2014	754	1028	1883	2011	1090	1281	1521	1503	1549	2496	2395	1701	1601

In all, during the years 2010 to 2014, the papaya arrivals in Azadpur *mandi* was 0.57, 0.64, 0.57, 0.47 and 0.47 lakh tonnes. The prices in response were INR 711, INR 626, INR 793, INR 1,072 and INR 1,601 respectively. Papaya arrivals have been pretty constant over the years while prices have gradually increased over years. The seasonality index of arrivals and that of prices of papaya for the five years are presented in figure 3.15 and 3.16.

Figure 3.15 Seasonality Index of Arrivals of Papaya

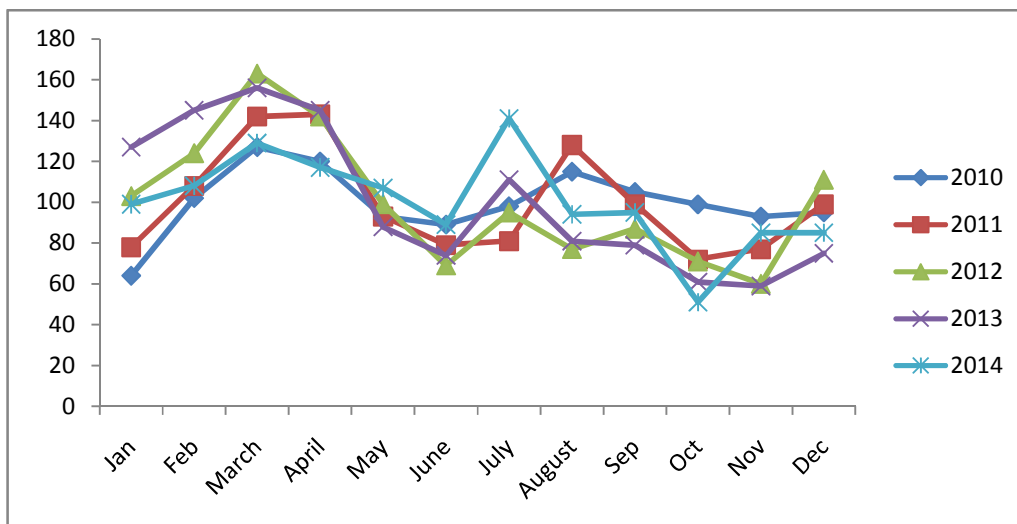
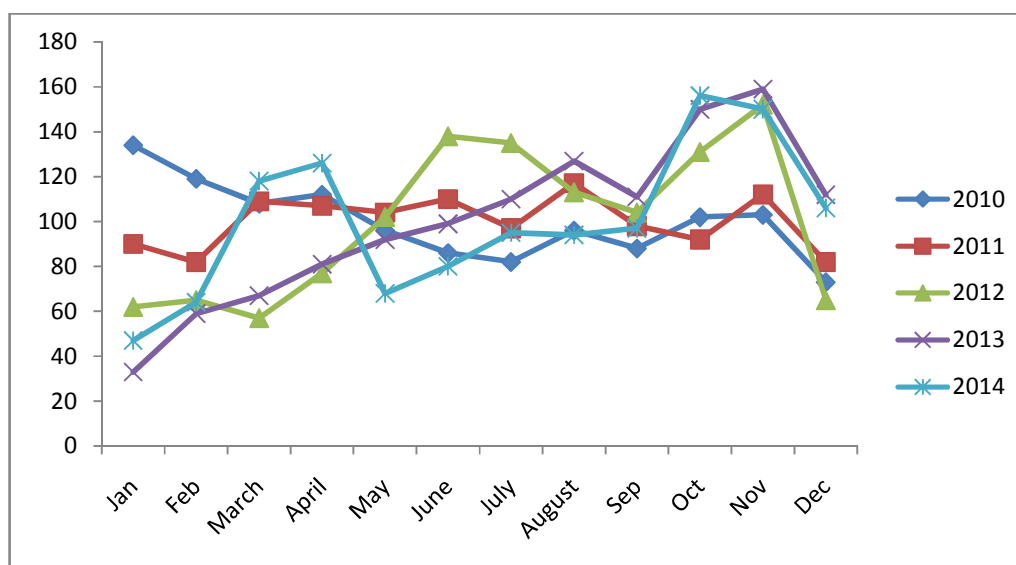


Figure 3.16 Seasonality Index of Prices of Papaya



From the figures 3.15 and 3.16, we observe that arrivals and prices exhibit reasonable seasonality. We had interviewed 4 grapes traders on wastage incurred by them.

Table 3.34 Wastage of Papaya for Individual Traders

Sr. No	WINTER			SUMMER		
	Loading	Transportation	Total	Loading	Transportation	Total
1	1.00%	0.50%	1.50%	0.50%	1.00%	1.50%
2	0.30%	0.50%	0.80%	0.30%	0.50%	0.80%
3	0.70%	1.00%	1.70%	1.00%	0.00%	1.00%
4	0.10%	0.20%	0.30%	0.50%	0.00%	0.50%
Average	0.53%	0.55%	1.08%	0.58%	0.38%	0.95%

From Table 4.34, we find that the papaya traders on average lost 1.08% in winter and 0.95% in summer. The losses ranged from 0.3% to 1.7% for traders in winter and summer. The CIPHET study had indicated losses for banana at 7.4% with losses to farmers at 5.18% and the remaining

contributing to 2.22%. The losses at Azadpur *mandi* for papaya traders seem to be lower than that reported in the CIPHET study.

3.4.9. Green Pea

Table 3.35 and Table 3.36 present the total monthly arrivals (in tonnes) and monthly average prices (in Rs./Quintal) for green peas in the years between 2010 to 2014 respectively.

Table 3.35 Monthly Arrivals of Papaya in Azapur Mandi (in tonnes)

	Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec
2010	6293	6227	3490	1792	1020	571	1121	2033	1036	358	1978	6269
2011	8045	7074	5519	2909	2821	1632	1535	1806	654	697	2759	8970
2012	8563	7089	5274	3415	1677	1729	1559	2129	569	593	3212	8494
2013	9031	7775	5615	1885	1737	1353	1054	1291	383	724	2333	4573
2014	7701	4324	4635	2057	1754	1175	990	706	625	786	2048	5997

Table 3.36 Average Monthly Prices of Papaya in Azapur Mandi (in Rs./Quintal)

	Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec	Average
2010	1256	893	1287	2302	3228	4156	4070	4007	4511	5902	4147	1904	1256
2011	1349	1014	907	1755	2002	3308	4445	4604	6545	6542	3568	1180	1349
2012	827	1315	1418	1042	3152	3045	4185	3807	5969	6177	3768	1407	827
2013	1398	1186	1295	2631	3009	3535	5242	5066	6579	6260	3895	2213	1398
2014	1199	1117	1766	2151	2265	3219	4772	4949	5772	6649	5111	2315	1199

In all, during the years 2010 to 2014, the papaya arrivals in Azadpur *mandi* was 0.32, 0.44, 0.44, 0.38 and 0.33 lakh tonnes. The prices in response were INR 1,256, INR 1,349, INR 827, INR 1,398 and INR 1,199 respectively. Green pea arrivals have been pretty constant over the years

while prices have gradually increased over years. The seasonality index of arrivals and that of prices of papaya for the five years are presented in figure 3.17 and 3.18.

Figure 3.17 Seasonality Index of Arrivals of Green Pea

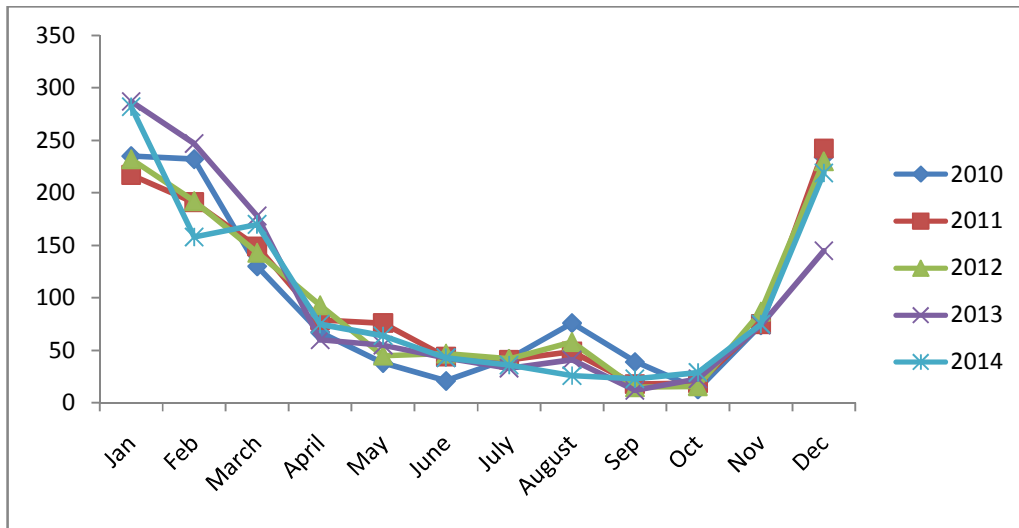
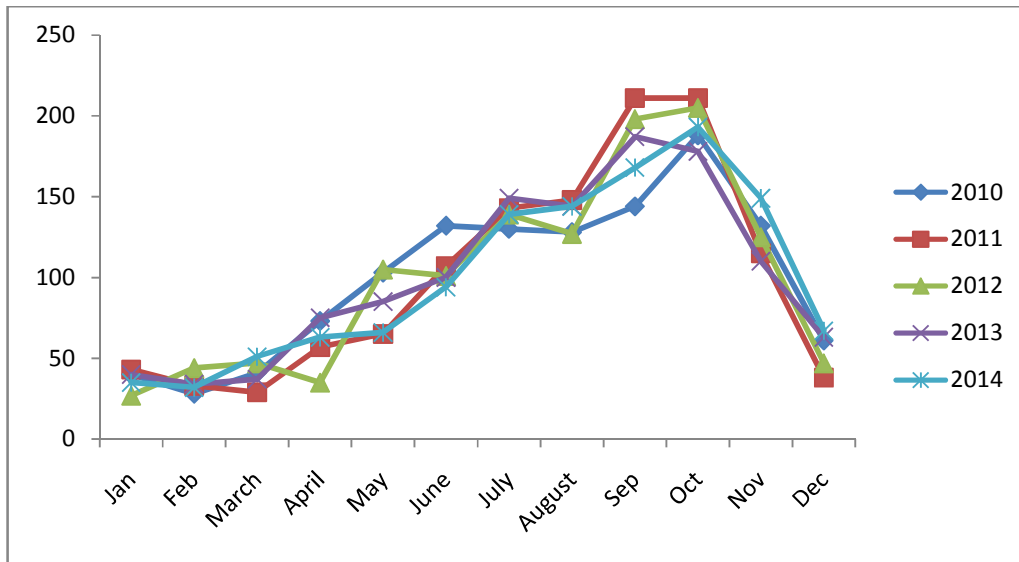


Figure 3.18 Seasonality Index of Prices of Green Pea



From the figures 3.17 and 3.18, we observe that arrivals and prices exhibit substantial seasonality with most arrivals happening from November to February. We had interviewed 4 green pea traders on wastage incurred by them.

Table 3.37 Wastage of Green Pea for Individual Traders

Sr. No	WINTER			SUMMER		
	Loading	Transportation	Total	Loading	Transportation	Total
1	1.00%	0.00%	1.00%	1.00%	0.00%	1.00%
2	0.60%	0.00%	0.60%	0.40%	0.00%	0.40%
3	0.80%	0.60%	1.40%	0.60%	0.00%	0.60%
4	0.60%	0.00%	0.60%	0.80%	0.40%	1.20%
Average	0.75%	0.15%	0.90%	0.70%	0.10%	0.80%

From Table 3.37, we find that the green pea traders on average lost 0.90% in winter and 0.80% in summer. The losses ranged from 0.6% to 1.4% for traders in winter and summer. The CIPHET study had indicated losses for banana at 10.3% with losses to farmers at 8.66% and the remaining contributing to 1.68%. The losses at Azadpur *mandi* for green pea traders seem to be lower than that reported in the CIPHET study.

3.4.10. Green Chillies

Table 3.38 and Table 3.39 present the total monthly arrivals (in tonnes) and monthly average prices (in Rs./Quintal) for green peas in the years between 2010 to 2014 respectively.

Table 3.38 Monthly Arrivals of Green Chillies in Azapur Mandi (in tonnes)

	Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec
2010	6293	6227	3490	1792	1020	571	1121	2033	1036	358	1978	6269
2011	8045	7074	5519	2909	2821	1632	1535	1806	654	697	2759	8970
2012	8563	7089	5274	3415	1677	1729	1559	2129	569	593	3212	8494
2013	9031	7775	5615	1885	1737	1353	1054	1291	383	724	2333	4573
2014	7701	4324	4635	2057	1754	1175	990	706	625	786	2048	5997

Table 3.39 Average Monthly Prices of Papaya in Azapur Mandi (in Rs./Quintal)

	Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec	Average
2010	1347	1461	1824	1793	1844	1503	1751	1951	1980	1494	905	1009	1572
2011	1636	1812	2058	1009	875	1171	1111	2096	1921	1760	1265	1066	1482
2012	1801	2053	2120	2120	1678	3396	3370	1532	1173	1552	1098	973	1906
2013	1644	1797	1971	1758	2310	2109	1932	3060	2918	2191	1871	2105	2139
2014	2368	2307	2287	1631	1099	995	2047	2232	2877	2754	2019	1776	2033

In all, during the years 2010 to 2014, the green chilly arrivals in Azadpur *mandi* was 0.84, 0.9, 0.99, 0.95 and 0.95 lakh tonnes. The prices in response were INR 1,572, INR 1,482, INR 1,906, INR 2,139 and INR 2,033 respectively. Green chilly arrivals have gradually increased over the years and so have the prices. The seasonality index of arrivals and that of prices of papaya for the five years are presented in figure 4.19 and 4.20.

Figure 3.19 Seasonality Index of Arrivals of Green Chillies

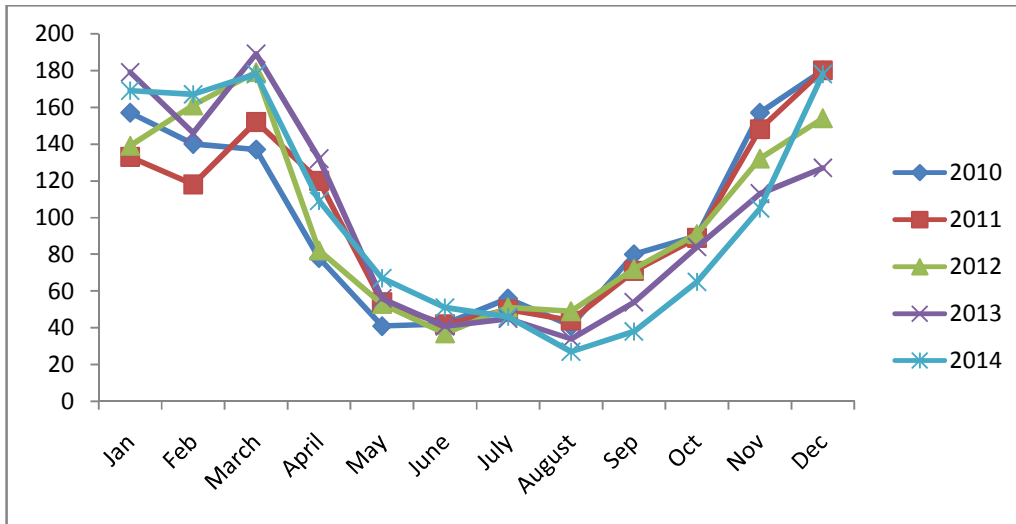
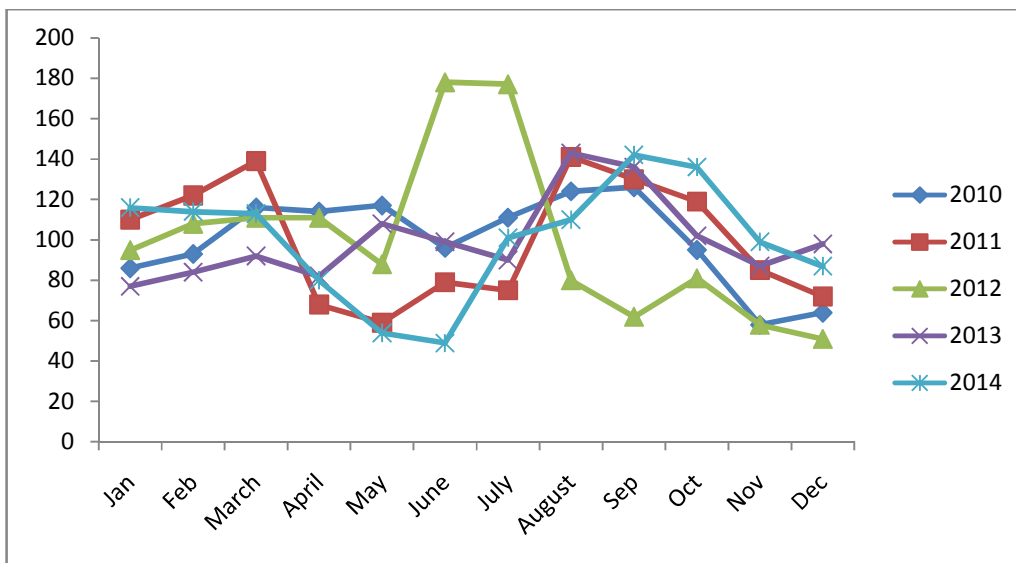


Figure 3.20 Seasonality Index of Prices of Green Chillies



From the figures 3.19 and 3.20, we observe that arrivals exhibit substantial seasonality while prices do not. We were not able to interview any green chilly trader and so have no estimate of wastage in that. The CIPHET study had indicated losses for banana at 5.6% with losses to farmers at 3.93% and the remaining contributing to 1.67%.

4. Conclusions

The study attempts to estimate the wastage of different fruits and vegetables in Azadpur *mandi*. The study uses various sources of data to understand different issues related to marketing and wastage. Firstly, we use data from the 70th round of national sample survey (NSS) to understand the production costs and total value generated for farm households cultivating various fruits and vegetables considered for the study. Then, we look at arrival and price data in Azadpur *mandi* to understand seasonality and total value generated in Azadpur *mandi*. We also surveyed traders and farmers to obtain information on their extent of wastage of different crops.

In the analysis of economics of cultivation, we find that we find that total cost incurred by households in July-December 2012 is INR 478, INR 208, INR 285, INR 116 and INR 134 per quintal for apple, banana, papaya, mango and grapes respectively. Loss of a quintal through wastage at harvest would mean that the household incurs these amounts as losses. In terms of opportunity cost though, the loss to the household is much higher – INR 3800, INR 800, INR 900, INR 400 and INR 3300 per quintal for apple, banana, papaya, mango and grapes. Total costs incurred by household in January to June 2013 are INR 128, INR 129, INR 116 and INR 1110 per quintal for banana, papaya, mango and grapes respectively. So, a loss of a quintal through wastage at harvest would mean that the household incurs these amounts as losses. In terms of opportunity costs though, the loss is much higher – INR 300, INR 200, INR 500 and INR 5400 for banana, papaya, mango and grapes respectively.

Total cost incurred by household in July-December 2012 is INR 214, INR 555, INR 2311, INR 544 and INR 1746 per quintal for onion, tomato, green chillies, potato and green peas respectively. So, a loss of a quintal through wastage at harvest would mean that the household incurs these amounts as losses. In terms of opportunity cost though, the loss to the household is

higher – INR 372, INR 825, INR 3115, INR 839 and INR 2720 per quintal for onion, tomato, green chillies, potato and green peas respectively. Total costs incurred by household in January to June 2013 are INR 394, INR 373, INR 320, INR 270 and INR 634 per quintal for onion, tomato, green chillies, potato and green peas respectively. So, a loss of a quintal through wastage at harvest would mean that the household incurs these amounts as losses. In terms of opportunity costs though, the loss is higher – INR 1250, INR 1407, INR 1070, INR 632 and INR 1881 for onion, tomato, green chillies, potato and green peas respectively.

In terms of findings from the survey, liquidity or credit constraints was the most important reason for trading in Azadpur *mandi* for farmers while trading in Azadpur *mandi* was convenient and travelling to other markets was costly for traders and the main reasons why they were trading at Azadpur *mandi*. Friends and other farmers or other traders were the most important source of price information. In terms of storage, farmers used warehouses (godowns) while traders used cold storage.

Our estimates of losses for farmers cultivating apple is 13.48% and 10.99% in winter and summer. The losses for traders in apple are 11.08% and 15.38% in winter and summer. The estimate of losses for farmers cultivating potato is 4.06% and 2% for farmers in winter and summer. The same for traders was much lesser at 0.89% and 0.57%. The losses for onion traders were 2.42% and 2.78% in winter and summer respectively. The same for tomato traders was 1.68% and 1.12%. The loss for banana traders is high at 5.83% and 4.58%. The loss for grapes is 2.4% and 1.4% in winter and summer. The loss for papaya traders was 1.08% and 0.95% while that for green pea traders was 0.9% and 0.8%.

Few caveats are applicable in interpreting the results of the study. Firstly, given the seasonal nature of various commodities involved in the study we were not able to survey farmers and traders of all fruits and vegetables. Also, the scope of study was such that ideal sample size for estimating wastage would have been very high and it would have needed much more time for conducting the survey. We have thus presented a largely descriptive picture of the things happening in a *mandi*. Even with this small sample, we are able to see that there are quite substantial differences in the wastage estimated at national level and the wastage incurred by farmers and traders. More commodity specific studies would give a more proper estimate of wastage. We also do not comment on any causal effects in the study and it would require a more focussed study and questions to look into these effects. Our study finds that the claim of no losses in market as low quality products are sold off at lower prices is incorrect. The losses are real atleast in terms of quantity. Some of the products that lose quality are sold off at lower price sometimes and are mixed with high quality products and sold off as acknowledged by traders. But, even after that there are losses due to transportation, handling and wastage. These numbers vary based on the stakeholder (farmer/trader), season (summer/winter) and commodity under consideration.

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Appendix A Questionnaire Administered on Farmers in the Survey

आधारभूत सर्वेक्षण तथा बाद के सर्वेक्षण – 2015: यूनिवर्सल आई डी : [] [] [] []

आजादपुर मंडी में फल और सब्जियों का अपव्यय सर्वेक्षण – 2015

अन्वेषक: पहले इस खंड को पूरा करे

0.1 प्रतिवादी का नाम : _____

0.2 ग्राम/नगर/शहर : _____

0.2. पता : _____

0.3. संपर्क नंबर : (मोबाईल) _____ (लैंडलाइन) _____

0.4 निरीक्षण की तिथि : दिन महीना साल

0.5 अन्वेषक का नाम : _____

अन्वेषक: अगले खंड पे जाने से पहले इस खंड को पूरा करें।

सहमति

हम भारत सरकार के खाद्य प्रसंस्करण उद्योग मंत्रालय के लिये एक अध्ययन कर रहे हैं। इस अध्ययन का उद्देश्य आजादपुर मंडी में फलों और सब्जियों की दुलाई, भंडारण एवं विपणन के दौरान होने वाले नुकसान का आंकलन करना है। अध्ययन के दौरान आपसे आपके बारे में सवालों की एक श्रृंखला का जबाब देने को कहा जायेगा। इस सर्वेक्षण को पूर्ण करने में करीब एक घंटे का समय लगेगा। हम सर्वेक्षण से संबंधित आपके सारे प्रश्नों का उत्तर देंगे।

क्या आप सर्वेक्षण में सम्मिलित होना चाहते हैं?

हाँ1 जारी रखें

नहीं2→ समाप्त

अन्वेषक: साक्षात्कार के पूर्ण होने पर भरें

पूर्ण: हाँ1 नहीं.....2

अवधि: घंटे मिनट

आधारभूत सर्वेक्षण तथा बाद के सर्वेक्षण – 2015: यूनिवर्सल आई डी : [] [] []

A1. व्यक्तिगत जानकारी		
A1.1	आपकी उम्र क्या है?	_____ साल
A1.2	आप खेती का कार्य कितने सालों से कर रहे हैं?	_____ साल
A1.3	आपने कितने वर्ष तक स्कूली शिक्षा प्राप्त की है?	_____ साल
A1.4.	क्या आप हिन्दी का समाचार पत्र पढ़ सकते हैं?	हाँ1 नहीं2
A1.5.	क्या आप हिन्दी में अपना नाम लिख सकते हैं?	हाँ ... 1 नहीं ... 2
A.1.6.	आपके घर में कितने सदस्य हैं?	_____
A1.7.	आपके घर का औसत मासिक खर्च क्या है?	INR _____

B. भूमि क्षेत्र तथा कृषि भूखण्ड की जानकारी

B1.	क्या आपके पास आपके घर के अलावा कोई और भूमि है?		
B2.	अभी आपके पास कृषि योग्य कितनी भूमि है? (सर्वेक्षण की तिथि तक)		
B3.	आप कितने समय से अपनी जमीन पर फलों एवं सब्जिया उगा रहे हैं? साल	
B4.	पिछले 12 महीनों के दौरान क्या आपने:	हाँ नहीं	
B4.1	किराये पर कोई भूमि अथवा किसी भूमि में पट्टा	1 2	एकड़ बीघा..... गुटा
B4.2	बंटाई पर किसी और का खेत?	1 2	एकड़ बीघा..... गुटा
B4.3	किसी भूमि पर गिरवी?	1 2	एकड़ बीघा..... गुटा

B5.	पिछले 12 महीनों के दौरान क्या आपने:	हाँ नहीं	
B5.1	कोई भूमि किराये/पट्टे पर दी	1 2	एकड़ बीघा..... गुटा
B5.2	अपनी भूमि किसी को बंटाई पर दी?	1 2	एकड़ बीघा..... गुटा
B5.3	कोई भूमि गिरवी रखी?	1 2	एकड़ बीघा..... गुटा
B6.	आपके द्वारा जोती गयी कितनी जमीन सिंचित है?	[] [] %	DK.....999
B7.	आपका सिंचाई का मुख्य स्रोत क्या है? साक्षात्कारकर्ता: गोला सभी पर लागू होता है		नहर1 कुँआ2 बोरवेल....3 नलकूप.....5 टैंक5 अन्य (निर्दिष्ट करें)....888
B8.	पिछले 12 महीनों के दौरान आपने कौन सी सब्जिया एवं फल उगाये। किस फसल की आपने कितना क्षेत्रफल आबंटित किया और कितना उत्पादन मिला/अपेक्षित है? साक्षात्कारकर्ता: बताई गयी इकाई को कुंटल में बदले एवं पुनः जाँच करें। 100 किलो= 1 कुंटल; 1 मन = 20किलो =0.2 कुंटल 1 मन = 40 किलो = 0.4 कुंटल 1 धड़ी = 5 किलो = 0.05 कुंटल		
फसल के लिये कोड (गोल करें)	फसल	एकड़ में क्षेत्र (ए)	कुल उत्पादन/कुंटल में उत्पादन (बी)
B8.1	प्याज		
B8.2	टमाटर		
B8.3	टालू		
B8.4	हरी मिर्च		
B8.5	हरी मटर		
B8.6	सेब		
B8.7	बेला		
B8.8	पपीता		
B8.9	टाम		
B8.10	टंगुर		

आधारभूत सर्वेक्षण तथा बाद के सर्वेक्षण – 2015: यूनिवर्सल आई डी : []

C. खेती में व्यय

साक्षात्कारकर्ता: अब मैं आपसे पिछले 12 महीनों के दौरान किये गये विभिन्न प्रकार के निवेश के बारे में पूछूंगा। यह प्रश्न बहुत महत्वपूर्ण है इसलिये ध्यान से सुने।

कोड	फसल	संकर बीज (ए)	विकसित बीज / जी एम / बीटी (बी)	देशी / सीधी किस्म (सी)	उर्वरक (डी)	खाद (इ)	कीटनाशक (एफ)	सिंचाई (बिजली बिल, पंप का किराया, मरम्मत / रख-रखाव (जी)	शारीरिक श्रम (भूमि की तैयारी के लिये, बुनाई, निराई, टाईलिंग, स्प्रे की कीमत, फसल कटाई / चुनाई) (एच)	बैल परिश्रम (आई)	ट्रैक्टर किराये पर लेना / या अन्य कार्यान्वयन (जे)
C1	प्याज										
C2	टमाटर										
C3	टालू										
C4	हरी मिर्च										
C5	हरी मटर										
C6	सेब										
C7	केला										
C8	पीता										
C9	टाम										
C10	टंगुर										
C11.	रूपये में खर्च की गई कुल राशि										

आधारभूत सर्वेक्षण तथा बाद के सर्वेक्षण – 2015: यूनिवर्सल आई डी : [II II]

D. कृषि उत्पादों का विपणन

D1.	आप सामान्यतः अपने उत्पादों को कहाँ बेचते हैं? (फल/सब्जियाँ)	गाँव/ नगर के बिचोलियों को ... 1 आगत व्यापारी2 गाँव/ नगर मंडी.....3 आजादपुर मंडी4 दिल्ली की अन्य मंडी....5 सहकारी/ सरकारी संस्था6 संसाधक ...7 कंपनी से अनुबंध ...8 अन्य ...999 -----
D2.	आप सामान्यतः वहाँ क्यों बिक्री करते हैं?	यह सबसे उपयुक्त है1 विपणन की अन्य प्रणाली में दुलाई का महँगा होना2 बुनाई से पहले की प्रतिबद्धता....3 नकदी/ऋण भुगतान बाध्यता4 समय की कमी.....5 अन्य मंडी में जाने के लिये खराब मूलभूत व्यवस्थाएँ/सड़कें5 सही दाम....6 ईमानदार व्यवसायी.....7 लागत/ऋण की प्रतिबाध्यता8 अन्य...999 -----
D3.	माल के दाम की सूचना आपको कहाँ से प्राप्त होती है?	टीवी.....1 समाचार पत्र.....2 रेडियों.....3 किसान काल सेंटर4 मोबाइल एप्लीकेशन5 मित्र/अन्य किसान6 प्रगतिशील किसान....7 विस्तार दलाल8 एन जी ओ.....9 मंडी के दलाल10 देशी बिचोलिये11 अन्य 999 -----
D4.	बेचने से पहले आप अपनी उपज का कहाँ भंडारण करते हैं?	स्वयं के घर/खेत.....1 भंडारघर.....2 शक्तिग्रह.....3 अन्य...999 -----
D5.	मंडी में बिक्री से पूर्व औसतन आप कितने समय के लिए उत्पादन का भंडारण करते हैं? दिन/सप्ताह/महीने/वर्ष

D6.	क्या आप बोरी/पेटी को खुले में रखते हैं?	बोरी....1 पेटी....2 खुले में....3
D7.	एक महीने तक अपने उत्पाद को भंडारण में कितनी लागत आती है?	\$..... प्रति कुंटल/बोरी/पेटी/अन्य माप
D8.	क्या आप आपनी इच्छानुसार समय सीमा के लिये भंडारण कर पाते हैं?	हाँ1 नहीं2
D9.	भंडारण में आपको क्या-2 कठिनाईयाँ आती है। (बहुविकल्प को चुनने के लिये गोल बनायें)	गोदाम की अनुपलब्धता1 नुकसान का खतरा.....2 सड़ने का खतरा3 कर्ज का भुगतान....4 अन्य...999
D10.	पिछले 12 महीनों में कितनी बार आप अपने उत्पाद बेच दिया होगा?	जनवरी ----- बार फ़रवरी ----- मार्च----- अप्रैल----- मई ----- जून ----- जुलाई ----- अगस्त ----- सितम्बर ----- अक्टूबर ----- नवम्बर ----- दिसम्बर -----
D11.	इसमें से कितनी बार आप अलग अलग स्थानों के लिए इसे बेच दिया ?	गाँव/ नगर के बिचौलियों को ... बार आगत व्यापारी गाँव/ नगर मंडी आजादपुर मंडी दिल्ली की अन्य मंडी सहकारी/ सरकारी संस्था संसाधक ... कंपनी से अनुबंध ... अन्य ... -----
D12.	कुल उत्पादन में से, कितना राशि (क्विंटल / किलोग्राम / maunds) आप अलग अलग स्थानों के लिए बेच दिया होगा?	गाँव/ नगर के बिचौलियों को ... बार आगत व्यापारी गाँव/ नगर मंडी आजादपुर मंडी दिल्ली की अन्य मंडी सहकारी/ सरकारी संस्था संसाधक ... कंपनी से अनुबंध ... अन्य ... -----

D13. आप मौसम के दौरान किए गए वस्तुओं में से प्रत्येक के लिए विपणन लागत का अनुमान. यह आपके द्वारा दर्ज की गई है के रूप में के लिए प्रति बॉक्स या जूट बैग या प्रति 100 किलोग्राम प्रति प्रभार कृपया बताएं.

साक्षात्कारकर्ता: इकाइयों के साथ कृपया सावधान.

फसल	पैकिंग (यूनिट)	लदान और उतराई लागत (यूनिट)	भंडारण लागत (यूनिट)	परिवहन लागत (यूनिट)	कमिशन (यूनिट)	अन्य (यूनिट)
प्याज						
टमाटर						
टालू						
हरी मिर्च						
हरी मटर						
सेब						
केला						
पीता						
टाम						
टंगुर						

D14 A. सर्दियों के मौसम (औसत) के दौरान आप किए गए वस्तुओं में से प्रत्येक के लिए बर्बादी (औसत) की हद तक का अनुमान करें. यह आपके द्वारा दर्ज की गई है के रूप में 100 किग्रा या प्रतिशत प्रति बॉक्स या जूट बैग या प्रति यूनिट टुकड़े कृपया बताएं. इसके अलावा नुकसान और सड़ में अपव्यय के प्रकार का संकेत करें.

. साक्षात्कारकर्ता: इकाइयों के साथ कृपया सावधान.

सल	पैकिंग (यूनिट)		लदान और उतराई लागत (यूनिट)		भंडारण लागत (यूनिट)		परिवहन लागत (यूनिट)		कुल (यूनिट)	
	नुकसान	सड़ना	नुकसान	सड़ना	नुकसान	सड़ना	नुकसान	सड़ना	नुकसान	सड़ना
प्याज										
टमाटर										
टालू										
हरी मिर्च										
हरी मटर										
सेब										
केला										
पीता										
टाम										
टंगुर										

D14 B. गर्मी के मौसम के दौरान आप किए गए वस्तुओं में से प्रत्येक के लिए बर्बादी (औसत) की हद तक का अनुमान करें. यह आपके द्वारा दर्ज की गई है के रूप में 100 किग्रा या प्रतिशत प्रति बॉक्स या जूट बैग या प्रति यूनिट टुकड़े कृपया बताएं. इसके अलावा नुकसान और सड़ में अपव्यय के प्रकार का संकेत करें.

. साक्षात्कारकर्ता: इकाइयों के साथ कृपया सावधान.

सल	पैकिंग (यूनिट)		लदान और उतराई लागत (यूनिट)		भंडारण लागत (यूनिट)		परिवहन लागत (यूनिट)		कुल (यूनिट)	
	नुकसान	सड़ना	नुकसान	सड़ना	नुकसान	सड़ना	नुकसान	सड़ना	नुकसान	सड़ना
प्याज										
टमाटर										
टालू										

हरी मिर्च										
हरी मटर										
सेब										
केला										
पपीता										
टाम										
टंगुर										

Appendix B Questionnaire Administered on Traders in the Survey

आधारभूत सर्वेक्षण तथा बाद के सर्वेक्षण – 2015: यूनिवर्सल आई डी : [] [] []

आजादपुर मंडी में फल और सब्जियों का अपव्यय सर्वेक्षण – 2015

अन्वेषक: पहले इस खंड को पूरा करे

0.1 प्रतिवादी का नाम : _____

0.2 ग्राम/नगर/शहर : _____

0.2. पता : _____

0.3. संपर्क नंबर : (मोबाईल) _____ (लैंडलाइन) _____

0.4 निरिक्षण की तिथि : दिन महीना साल

0.5 अन्वेषक का नाम : _____

अन्वेषक: अगले खंड पे जाने से पहले इस खंड को पूरा करें।

सहमति

हम भारत सरकार के खाद्य प्रसंस्करण उद्योग मंत्रालय के लिये एक अध्ययन कर रहे हैं। इस अध्ययन का उद्देश्य आजादपुर मंडी में फलों और सब्जियों की दुलाई, भंडारण एवं विपणन के दौरान होने वाले नुकसान का आंकलन करना है। अध्ययन के दौरान आपसे आपके बारे में सवालों की एक श्रृंखला का जबाब देने को कहा जायेगा। इस सर्वेक्षण को पूर्ण करने में करीब एक घंटे का समय लगेगा। हम सर्वेक्षण से संबंधित आपके सारे प्रश्नों का उत्तर देंगे।

क्या आप सर्वेक्षण में सम्मिलित होना चाहते हैं?

हाँ1 जारी रखें

नहीं2→ समाप्त

अन्वेषक: साक्षात्कार के पूर्ण होने पर भरें

पूर्ण: हाँ1 नहीं.....2

अवधि: घंटे मिनट

आधारभूत सर्वेक्षण तथा बाद के सर्वेक्षण – 2015: यूनिवर्सल आई डी : [] [] []

A1. व्यक्तिगत जानकारी		
A1.1	आपकी उम्र क्या है?	_____ साल
A1.2	कितने साल से आप व्यापार कर रहे हो है ?	_____ साल
A1.3	आपने कितने वर्ष तक स्कूली शिक्षा प्राप्त की है?	_____ साल
A1.4.	क्या आप हिन्दी का समाचार पत्र पढ़ सकते है?	हाँ1 नहीं2
A1.5.	क्या आप हिन्दी में अपना नाम लिख सकते है?	हाँ1 नहीं2
A.1.6.	आपके घर में कितने सदस्य हैं?	_____
A1.7.	आपके घर का औसत मासिक खर्च क्या है?	INR _____

B. BUSINESS संबंधित जानकारी

B1.	आप एक थोक व्यापारी / माध्यमिक / उप- फुटकर व्यापारी / फुटकर व्यापारी हैं?	थोक व्यापारी ... 1 माध्यमिक ... 2 उप- फुटकर बिक्री ... 3 फुटकर बिक्री ... 4 अन्य ... 888 _____
B2.	आप किस-किस से अपना माल खरीदते हैं? (बहुविकल्पिक उत्तर लागू हो सकता है। (लागू होने वाले सभी उत्तरों को चिन्हित करें)	किसान ... 1 थोक व्यापारी ... 2 उप- फुटकर बिक्री ... 3 मध्यस्थ एजेंट ... 4 अन्य ... 888 _____
B3.	आप किस- किस बाजार से फल और सब्जियाँ को खरीदते हो ?	केवल आजादपुर मण्डी ... 1 आजादपुर और दिल्ली में अन्य मण्डी ... 2 आजादपुर और देश भर के अन्य मण्डी.. 3 अन्य ... 888 _____

B4.	आप किसे अपनी फल और सब्जियाँ बेचते हैं?	थोक विक्रेताओं ... 1 उप- खुदरा विक्रेताओं ... 2 मध्यस्थ एजेंट ... 3 व्यक्तिगत उपभोक्ताओं ... 4 कारोबारी को (जैसे होटलों को) ... 5 दूसरों ... 888 _____
B5	आप के पास व्यापार के लिए खुद की एक दुकान क्या है ?	हाँ, मैं खरीदने और बेचने काम करता हु और मैं यहाँ मंडी से खरीदता हु... 1 हाँ, मेरे पास एक छोटा ऑफिस आजादपुर मंडी में है ... 2 हाँ, मेरे पास एक छोटा ऑफिस दिल्ली में है ... 3 हाँ, मेरे पास अन्य शहर / शहर में एक छोटे से कार्यालय है4 हाँ, मेरे पास देश में कई छोटे छोटे ऑफिस है ... 5
B6	व्यापार से आपकी वार्षिक आय क्या है? (शुद्ध आय और सकल आय दोनों की जांच करे। जांच करे अगर वह शुद्ध आय या सकल आय के बारे में बात कर रहे है)	सकल आय _____ रूपए व्यय _____ रूपए शुद्ध आय _____ रूपए
B7	आप ने पिछले 12 महीनों में अपने व्यापार में सब्जियों और फलों के कितने सौदे किये है? आय जो आप ने इन फसलों में से प्रत्येक फसल से ली ? और कितनी- कितनी मात्रा में आप ने कारोबार किया? 100 किलो = 1 क्विंटल ; 1 मण = 40 किलो = 0.4 क्विंटल , 1 धड़ी dhi = 5 किग्रा = 0.05 क्विंटल बताइये.	

फसलों के लिए कोड (सभी के लिए लागू होता है)	फसल	व्यापार की मात्रा (क्विंटल में)	खरीदी गई उपज का औसत मुल्य (रूपए)	औसत कीमत जिस पर उपज को बेच दिया गया था (रूपए)	उस विशेष वस्तु से पिछले 12 महीनों में व्यापार से होने वाली आय (रूपए)
B7.1	पयाज				
B7.2	आलू				
B7.3	टमाटर				
B7.4	हरी मिर्च				
B7.5	हरे मटर				
B7.6	सेब				
B7.7	केला				
B7.8	पपीता				
B7.9	टाम				
B7.10	अगूर				

C1.	आप कहाँ-कहाँ से आम तौर पर अपने लिए (फल / सब्जियाँ) खरीद करते हैं?	गांव / शहर स्तर मध्यस्थ ... 1 इनपुट डीलरों ... 2 गांव / शहर स्तर मंडी ... 3 आजादपुर मंडी ... 4 अन्य मंडी ... 5 सहकारी / सरकार । एजेंसी ... 6 प्रोसेसर ... 7 कंपनियों के लिए ... 8 अन्य ... 999 -----
C2.	आप वहाँ से आमतौर पर क्यों खरीदते हैं?	यह सबसे सुविधाजनक है ... 1 परिवहन ... 2 विपणन के अन्य साधनों के लिए महंगा है लिविडिटी / क्रेडिट पुनर्भुगतान की कमी ... 3 समय की कमी के कारण ... 4 सर्वश्रेष्ठ कीमतों ... 5 ईमानदार व्यापारियों ... 6 अन्य ... 888 -----
C3.	आप संबंधित वस्तुओं की कीमतों के बारे में जानकारी कहाँ से प्राप्त करते हैं? (विकल्प को चुनने के लिये एक से अधिक स्रोत हो सकते हैं)	टीवी 1 अखबारों 2 रेडियो ... 3 मोबाइल एप्लीकेशन 4 दोस्त / अन्य व्यापारियों ... 5 मंडी एजेंट ... 6 अन्य 888 -----
C4.	आप बेचने से पहले अपने माल को कहाँ-कहाँ स्टोर करते हैं ?	खुद का हाउस ... 1 गोदाम 2 कोल्ड स्टोरेज 3 अन्य ... 888
C5.	आप बिक्री के लिए बाजार में अपने माल को लाने से पहले औसतन कितना समय स्टोर में रखते हो ? दिन / सप्ताह / माह / वर्ष
C6.	आप खुले में / बैग / बॉक्स में स्टोर में रखते हो ?	बैग ... 1 बक्से ... 2 खुला ... 3 म
C7.	एक महीने के लिए अपनी उपज के भंडारण की अनुमानित लागत कितनी है?	भारतीय रुपये । क्विंटल / बैग / बॉक्स / अन्य इकाइयों प्रति
C8.	क्या आप लम्बी अवधि के लिए स्टोर करने में सक्षम हैं?	हाँ ... 1 नहीं ... 2

C9.	आप के सामने भंडारण में शामिल कठिनाइयों क्या क्या हैं?? (बहुवकल्प चुनने के लिए एक से अधिक चिन्हित करें)	गोदामों की उपलब्धता नहीं होना ... 1 नुकसान का खतरा2 सड़ने का खतरा3 नकदी और क्रेडिट की कमी ... 4 अन्य ... 999.....
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C10	पिछले 12 महीनों में कितनी बार आपने अपने माल को विभिन्न बाजारों से खरीदा है ? आपको उस महीने में औसत मूल्य क्या मिला था ? (ब्रैकेट में औसत कीमतों लिखें)
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फसल	जनवरी 2014	फरवरी 2014	मार्च 2014	अप्रैल 2014	मई 2014	जून 2014	जुलाई 2014	अगस्त 2014	सितम्बर 2014	अक्टूबर 2014	नवम्बर 2014	दिसम्बर 2014
प्याज												
आलू												
टमाटर												
हरी मिर्च												
हरे मटर												
सेब												
केला												
पपीता												
आम												
अगूर												

C11	इसमें से कितनी बार आप अलग अलग स्थानों में उत्पाद को खरीदते दिया ?
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फसल	गाँव/ नगर के बिचौलियों का	आगत व्यापारी	गाँव/ नगर मंडी	आजादपुर मंडी	दिल्ली की अन्य मंडी	सहकारीस रकारी संस्था	प्रॉसेसर	कंपनी से अनुबंध	अन्य
प्याज									
आलू									
टमाटर									
हरी मिर्च									
हरे मटर									
सेब									
केला									
पपीता									
आम									
अगूर									

C 12		कुल उत्पादन में से, कितना राशि (क्विंटल / किलोग्राम / maunds) आप अलग अलग स्थानों में खरीदते दिया?							
फसल	गाँव/नगर के बिचौलियों का	आगत व्यापारी	गाँव/नगर मंडी	आजादपुर मंडी	दिल्ली की अन्य मंडी	सहकारी सरकारी संस्था	प्रॉसेसर	कंपनी से अनुबंध	अन्य
पयाज									
आलू									
टमाटर									
हरी मिर्च									
हरे मटर									
सेब									
केला									
पपीता									
आम									
अगूर									
C13.		कैसे आप अपने माल को पैक करते हैं?			बक्से 1 जूट बैग2 अन्य 3				
आप सीजन के दौरान किए गए प्रत्येक वस्तुओं के लिए विपणन की लागत का अनुमान लगा सकते हो क्या है। लागतों का अनुमान के लिए प्रति बॉक्स या जूट बैग प्रति या यह आपके द्वारा दर्ज की गई है के रूप में 100 किलोग्राम प्रति आरोपों का संकेत देते हैं।									
फसल	पैकिंग (यूनिट)	लदान और उतराई लागत (यूनिट)	भंडारण लागत (यूनिट)	परिवहन लागत (यूनिट)	कमिशन (यूनिट)	अन्य(यूनिट)			
पयाज									
आलू									
टमाटर									
हरी मिर्च									
हरे मटर									
सेब									
केला									
पपीता									
आम									
अगूर									

सर्दियों के मौसम (औसत) के दौरान आप के द्वारा किए गए वस्तुओं की बर्बादी का अनुमान क्या है। यह आपके द्वारा दर्ज की गई बर्बादी के रूप में 100 किग्रा या प्रतिशत प्रति बॉक्स या जूट बैग या प्रति यूनिट टुकड़े बताएं। इसके अलावा नुकसान और सड़ में अपव्यय के प्रकार का बताएं ।

फसल	लोड और खाली करना (यूनिट)		परिवहन (यूनिट)		भंडारण (यूनिट)		कुल (यूनिट)	
	शारीरिक क्षति	पाजी	शारीरिक क्षति	पाजी	शारीरिक क्षति	पाजी	शारीरिक क्षति	पाजी
पयाज								
आलू								
टमाटर								
हरी मिर्च								
हरे मटर								
सेब								
केला								
पपीता								
आम								
अगूर								

गर्मी के मौसम (औसत) के दौरान आप के द्वारा किए गए वस्तुओं की बर्बादी का अनुमान क्या है। यह आपके द्वारा दर्ज की गई बर्बादी के रूप में 100 किग्रा या प्रतिशत प्रति बॉक्स या जूट बैग या प्रति यूनिट टुकड़े बताएं। इसके अलावा नुकसान और सड़ में अपव्यय के प्रकार का बताएं ।

फसल	लोड और खाली करना (यूनिट)		परिवहन (यूनिट)		भंडारण (यूनिट)		कुल (यूनिट)	
	शारीरिक क्षति	पाजी	शारीरिक क्षति	पाजी	शारीरिक क्षति	पाजी	शारीरिक क्षति	पाजी
पयाज								
आलू								
टमाटर								
हरी मिर्च								
हरे मटर								
सेब								
केला								
पपीता								
आम								
अगूर								

Appendix C Comments from Institute of Social and Economic Change (ISEC), Bangalore and Response to Comments

Comments:

" THE EXTENT OF WASTAGE IN AZADPUR MANDI: A CASE STUDY"

Submitted by IEG, New Delhi

Date of submission: 8 April 2015
Date of comments dispatch: 11 May 2015
Title of the study: The Extent of Wastage in the Azadpur Mandi: A Case Study
By: Thiagu Ranganathan

Comments:

This study attempts to estimate the losses at Azadpur Mandi. The study uses 70th Round NSS data on Farmer Assessment Survey conducted in the year January-December 2013 to chalk out economics of cultivation in terms of cost and returns of 10 selected commodities. Subsequently farmer and traders survey was carried out at Azadpur Mandi pertaining to marketing, storage and price information. The comments on the study are the following:

- Data presented in different tables like Table-2.1, 2.2, 2.3, 2.4, 3.1, 3.7, the unit of measurement has not been given anywhere, also total number of households for which survey was done needs to be given. In Tables - 2.1, 2.2 how is value of yield different from the returns obtained by the farmers is not clear. For grapes in Table-2.1 average value of yield is Rs 28,184, while it is not clear the value given is per household or per hectare. Land under grapes per household is 1.376. How then value of output could be 12, 83,419. Return for fruits calculated by author are ranging between Rs.26 thousand for banana, 17 thousand for mango, 19 thousand for papaya, 1.65 lakh for apple and Rs.12.31 lakh for grapes. It is mind bogling that farmers get Rs 12 lakh per annum return from 1.3 hectare of land

under grapes. By these standards every grape growing farmer should be ultra rich as this average has been calculated for 8,38,918 grape growing households and thereby there is hardly any scope for any outliers.

Response:

The unit of measurement has been included in the four tables 2.1 to 2.4. The economics of cultivation pertain to that of a farm/farm household. The yield represents physical output per farm household while the total value represents the monetary value of the physical output. Table 2.1 and 2.2 represents the economics of cultivation for two six months period in which the NSS survey was conducted. The returns for all the crops are indicative and are only operating profits. They do not include the fixed/sunk costs incurred by the farm households. This profit might be more relevant when it comes to considering wastage than the profit that deducts fixed costs. Also, there are few other issues with the costs that have been indicated. Since NSS does not provide costs on crop to crop basis for farm households we divided the costs proportionate to land cultivated and this might overestimate returns.

- The problem lies in ignorance of huge cost incurred by the farmers in establishment of grape garden. There is high capital cost incurred in fruits especially in grapes by the farmers that author has not taken any note of and moreover the cost incurred during gestation period as well has been ignored. This is known as fixed cost in plantation crops and the same is discounted and distributed across the life cycle of the plant. This completely has been ignored by the author. See for recalculation NHM report by ISEC which has return on grapes after calculating all the cost aspects.

Response: It is true that fixed costs are important and might have to be incurred over the gestation period. Given the paucity of data like the years for which grapes tree has been planted, we have not considered the wastage. As mentioned in the response to previous comment, we also believe that operating profit might be more relevant in the context of wastage.

- The author needs to discuss yield from irrigated and unirrigated land in terms of quintal per hectare and not in percentage terms, what is average margin in Table-3.7 and how author has arrived to negative margin for 14 potato farmers and 2 apple farmers.

Response: In Table 3.7, Average margin is (Total Sales Income-Total Cost)/Total Costs for the farmer and (Selling Price-Buying Price)/Buying Price for the trader. For the 14 potato and apple farmers, the sales income (total value) was lesser than total cost incurred by them so the negative margins. This was largely due to low prices of potato in the reference period.

- The study titles as Extent of Wastage in Azadpur Mandi – However, nowhere in the study the theme of the study has been followed. The author simply takes NSS data and calculates returns for the selected crops and then visits Azadpur Mandi at a time which is harvesting time only for Apple and Potato and interviewed few farmer selling these crops in Azadpur Mandi and also interviewed few traders for these two crops and few other crops. While in the case of mango and green chilli, even no trader was interviewed. The study only presents seasonal behaviour of arrival and prices for the time series of four years collected through market committee in Azadpur Mandi. The generalisation made on the basis of 4 or 5 traders interviewed for 10 crops does not hold any credibility. It would have been better if the author restricted himself to one or two commodities and did a detailed analysis of wastage based on secondary and primary data of traders and shop keepers alone in Azadpur Mandi. There was no need of selecting farmers for this purpose. Otherwise, the study should have concentrated to household level wastage of selected commodities and detailed survey should be conducted at farm level at the village and not at Azadpur Mandi. The present study looks like analysis of seasonality in arrival and prices of fruits and vegetables in Azadpur market. The author needs to make appropriate change in the final draft to bring some credibility to the study.

Response: The study is to look into extent of wastage in Azadpur mandi, but unlike an econometric study. Dr. Rao had proposed it to be a case study which will look at descriptive issues and look for validation of CIPHET study in 2010 in his proposal to the ministry. So, the study was conducted in a case study based method. Also, given the short duration of the study of less than a year in which it had to be completed, there were issues related to covering all the seasonal crops in the study. On the selection of crops, initially, Dr. Rao has suggested doing the study for only 2 vegetables and 2 fruits. But, then the ministry of food processing has insisted that the study be done for the mentioned 5 fruits and 5 vegetables. With these things in mind, a case study based approach was used which also gave macro issues (economics of cultivation to give an idea of value wasted), meso issues (market seasonality in arrivals and

prices which impacts wastage) and micro aspects (through farmers and traders). Farmers also were surveyed as they also face the drunt of wastage in a mandi.

Final remarks: The draft report can be accepted for publication and further submission to the ministry after it's been revised in accordance with the comments/suggestions.