CHAPTER 8

POST HARVEST VALUE ADDITION AND ITS DETERMINANTS
FOR THE SAMPLE FARMERS

8.1 Following the definition of value addition for the study (in Chapter 2), this chapter examines the impact and determinants of such value addition activities at farm level. Value addition helps the farmers in targeting better market and thus a better price of the produce. Besides, the practice of value addition lowers the post harvest losses and thus it works as an addition to the profit of the value added farmers. Therefore, in this chapter, the extent and determinants of value addition has been examined to have an insight of the status of such practices among the sample farmers. But to reap the best benefit of value addition, the farmers must have access to adequate post harvest management infrastructural facilities in the study area. Therefore, the present chapter also examines the role played by the availing post harvest management system in ensuring a better return to the sample farmers. This chapter has four sub sections. The first section of the chapter compares the socio economic characteristics between the farmers following value addition activities and others prefer instant selling. Then it examines the impact of such value addition on the margin of the farmers and is followed by the exploration of the factors influencing the value addition decision of the farmers. Finally, the chapter examines (section 8.5) how the existing post harvest infrastructural facilities impacts on the return of the farmers.

8.2 Socio-economic Characteristics of Value Adders and Non Value Adders in the Study Area

In this section, an attempt has been made to compare the socio-economic characteristics of the surveyed crop growers separately on the basis of their value addition decision. The results have been presented in terms of averages and percentages for all the three selected crops simultaneously. The justification for providing this information is to highlight socio-economic differences between the two groups (if any). The Table 8.1 explains about the
socioeconomic characteristics of both value adders and non value adder farmers in the study area. Of the total 223 surveyed farmers for the three crops, 59% added value to their produce against 41% prefers instant selling of their produce.

Table 8.1: Socio-Economic Characteristics of both Value Added and Non-value Added Farmers for all the Three Selected Crop Growers in the Study Area

<table>
<thead>
<tr>
<th>Determinants</th>
<th>Value Adders</th>
<th>Non Value Adders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (in years)</td>
<td>39.78</td>
<td>41.36</td>
</tr>
<tr>
<td>Family Size (in number)</td>
<td>5.98</td>
<td>5.13</td>
</tr>
<tr>
<td>Education Level (years of schooling)</td>
<td>8.91</td>
<td>8.67</td>
</tr>
<tr>
<td>Non Farm Income (in %)</td>
<td>Yes</td>
<td>65.89</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>42.15</td>
</tr>
<tr>
<td>Access to Market Information (in %)</td>
<td>Yes</td>
<td>61.67</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>49.21</td>
</tr>
<tr>
<td>Farm Size (in bigha)</td>
<td>3.02</td>
<td>3.78</td>
</tr>
<tr>
<td>Level of Production</td>
<td>Pineapple (in no.)</td>
<td>26,195</td>
</tr>
<tr>
<td></td>
<td>Tomato (in kg)</td>
<td>5427.04</td>
</tr>
<tr>
<td></td>
<td>Chilly (in kg)</td>
<td>304.76</td>
</tr>
<tr>
<td>Travel Time to the Nearby Markets (in Hr)</td>
<td>0.26</td>
<td>0.34</td>
</tr>
<tr>
<td>Market Distance to the Nearby Market (in k.m.)</td>
<td>4.31</td>
<td>5.12</td>
</tr>
<tr>
<td>Market Distance to the Urban Market (in k.m.)</td>
<td>09.33</td>
<td>10.89</td>
</tr>
<tr>
<td>Access to Extension Facility (in %)</td>
<td>Yes</td>
<td>62.88</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>38.26</td>
</tr>
<tr>
<td>Members of Farm Based Organisation (in %)</td>
<td>Yes</td>
<td>72.01</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>32.12</td>
</tr>
</tbody>
</table>

Source: Field Survey

The average age difference between value added and non value added indicates young farmers’ preferences to go for value addition activities in the study area. The number of family members of the value added farmers also has been found to be higher than non-value added farmers. This may be due to the reason that more family members minimises the labour cost value addition under the condition of participation of family members in farming activity. Since, the participation of family members in the farming activity has been noticed during survey in the study area, therefore, the possibility of the above reason can not be ignored. The level of education has been found to be more or less similar for both the two categories of value added and non-value added farmers. A major portion of the farmers having non farm income
add value to their produce. The reason may be that the farmers with non farm income have less money constraint to go for instant selling of the produce. Besides, they may also cover the cost of value addition from their non-farm earning. A major portion of the farmers having market information in terms of the cost and market prospect of value addition activities follow value addition activity of their produce. The value added farmers have lower average size of land holding than the non value added farmers, but at the same time for all the three crops they have higher level of production. This may be due to the reason that the farmers with small land holdings try to maximize their return through both pre and post production efforts. Their efforts at pre production stage help them to have a higher return. Again, they also go for value addition to have the best possible return from their harvested produce. Thus, small pieces of land prompting them to go for value addition to maximize returns out of small land holdings. The differences in travel time and distance both for nearby and urban market centers indicate that easily accessible market encourages the farmers to go for value addition. It is basically applicable to the urban market centers as value added farmers often target urban market and so a short distance enhance the extent of value addition. But, the farmers have reported to follow value addition activities with the increase in market distance to avoid post harvest losses. So, a proper explanation can not be given here. Farmers with access to extension services and membership of any farm based organistaion follow more value addition activity. This is because their access to these basic facilities helps in carrying out value addition activities on both cost and information sharing way.

The above analysis has reported some basic differences among value added and non value added famers in the study area. In the next section, the extent, nature and impact of value addition activities of the value added farmers has been presented.

8.3 Distribution of Farmers by Value Addition Techniques Practiced in the Study Area

This section highlights about the distribution of farmers by value addition techniques followed at farm level. No secondary value addition activities, like
processing has been found practiced by the sample farmers. All the farmers in the area have followed only primary value addition activities, like storing, grading, packaging and sun and the like. The nature of such value addition activities differ from crop to crop and a particular value added farmer follows more than one value added activity. The following figure (Fig. 8.1) explains about the distribution of total farmers by their decision to practice value addition activity.

**Fig. 8.1 Distribution of Farmers by Value Addition Decision of the Selected Crops (in %)**

Chilly growers have the highest percentage of farmers practicing the value addition activities in the study area. Tomato growers have a lower percentage share compared to the other selected crops. The following Table (Table. 8.2) explains about the nature of such value addition techniques practiced by sample farmers for all the three selected crops.

**Table 8.2: Value addition Techniques Practiced for Different Crops by Value added Farmers (in %)**

<table>
<thead>
<tr>
<th>Crops</th>
<th>Storing</th>
<th>Grading</th>
<th>Packaging</th>
<th>Sun drying</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pineapple</td>
<td>21</td>
<td>67</td>
<td>14</td>
<td>6</td>
</tr>
<tr>
<td>Tomato</td>
<td>26</td>
<td>32</td>
<td>59</td>
<td>19</td>
</tr>
<tr>
<td>Chilly</td>
<td>52</td>
<td>12</td>
<td>12</td>
<td>52</td>
</tr>
</tbody>
</table>

Source: Field Survey

The pineapple growers in the study area mainly follow grading practices of their harvested produce. The grading is followed just after the harvesting at field level. They separate the pineapples based on the weights and have been categorized in to pineapples having the weight of below and above 1 kg. The average weight of upper grade pineapple has been reported as in
between 1-1.5 kg. Although the grading is based on the weights of pineapple, but separation has been done by the farmers mainly examining the size of the pineapple. The pineapple growers charge different prices for these two grades of pineapple. Thus, the advantage of grading is that the farmers have different prices for different sizes of pineapple, whereas, the non-value added farmers get the same price irrespective of the size of the crop. After grading, the mostly followed value addition technique is storing and is followed by 21% of the total value added farmers. They store the pineapples for a maximum of four days and the farmers following storing value addition technique mainly target the Silchar town market. The farmers following grading as the single value addition practice mainly targets the nearby assembly and wholesale market. The practice packaging has been followed only a small percentage (14%) of value added farmers to target the retail outlet. Packaging is mainly followed for the upper graded pineapple and the price difference between upper graded packed and non-packed pineapples varies on an average Rs 3.21/ unit of pineapple. Only 6% of the value added pineapple growers practice sun drying technique and this is mainly followed for the pineapples harvested at immature stage. Thus, the practice of sun drying is not profit rewarding, but helps in marketing some pineapples not ready for direct sale. The farmers have also reported the disadvantages of value addition technique grading. As informed by them, the act of separation on the basis of weights of pineapple makes sometimes the marketing of low graded pineapple difficult. Besides, they have a lower average price for the low graded pineapple than they have without grading. Thus, the increased return earned from upper graded pineapples may neutralize the total profit when they face such difficulties in marketing the lower graded pineapple.

For the vegetable crop tomato, packaging has been found as the mostly practiced value adding activity. The crops are packed in paper cartoons of different sizes (basically with a weight of 25kg) with rice straw/ newspaper cushioning. The packaged tomato provides higher price to the farmers than the loose selling. The other advantages of packaging are that it has lower amount of post harvest losses and can be transported easily to the distant market places. Besides, being packed in standard sizes, they need not to be
weighted and rechecked at every stage of the supply chain. Storing comes as the next mostly practiced value addition technique among the sample farmers. Storing comes next to packaging for the pre mature harvesting tomato crop section. The decision of the framers to go for immature harvesting to avoid field level losses requires storing as the value addition activity to enhance the shelf life of the produce. The stored portion is washed, sundried and some chemicals have been added to make the produce ready for sell. Besides, the tomato growers follow the practice of storing to target timey market or to target better rewarding market.

Storing and Sun drying are two equally mostly practiced value addition activities for the crop chilly. The farmers store the chillies on an average for 5 days and follow the steps like washing, sun drying and adding chemicals to enhance the shelf life of the produce. Then some framers grades the stored chilly on the basis of the level of maturity and target different markets and thus have different prices. Although the price difference in grading is not so significant but it can reduce the level of post harvest losses as there is more chances of losses for the more matured crops. Packaging is loosely followed up to 5 kg polythene bags to target the retail market. The average price difference that the sample farmers have for the major kind of value addition activity followed for the specific crop has been presented in the following figures (Fig. 8.2).

**Fig. 8.2: Price Difference of Selected crops for Major Value Addition Activities in the Study Area**

![Price Difference Chart](image-url)
The above figure provides the average price difference that the sample farmers have per unit of the crop as a reward for value addition. The practice of grading makes on an average a price difference of Rs. 3 per unit of pineapple. The per unit cost of doing this value addition activity is at maximum of Rs. 0.78/unit considering the cost of hired labour and other imputed labour costs in to account. The cost estimation has not taken in to account the cost of storage and the cost of possible post harvest losses during storage. Following packaging as value addition activities at household level, the sample farmers make on an average a price difference up to Rs. 3.20- Rs 4.12 for per kg of tomato. The chemicals used during post harvest operations for packaging cost only Rs. 15 and it can be used up to 50 kg of tomato. Again, if we consider the other costs, like the cost of cartoon used, labour cost packaging and other imputed cost, then the figure goes maximum of Rs. 0.94/kg of tomato. In case of the crop chilly, the price difference between the selling after storing( including the other steps mentioned above) and for the sun dried chilly goes above Rs. 6/ kg of chilly. But the treatment cost is very negligible and is only on an average Rs. 1.20/ kg considering all costs in to account. But the direct selling provides the famers only Rs. 13/ kg of the crop.

The above analysis makes it clear that the practice primary value addition activity has not received the attention of a major section of sample farmers. Leaving alone the secondary value addition activity, only 54% of the total
sample farmers have practiced the primary value addition activity. The analysis also makes it clear that by paying a minimum operational cost of value addition, farmers may have differences in their profit margin. Since, the sample farmers are producing sizeable amount of the specific cop and so they have scope to earn more through such activities. An examination of the factors influencing the value addition decision of the farmers would help us in suggesting the ways to enhance the extent of value addition. Therefore, an analysis of the factors affecting participation of farm level value addition has been included in the next section.

8.4 Factors Affecting the Participation and Extent of Value Addition Decision at Farm Level

In the light of the available primary data, this section examines how various farmers and farm related characteristics along with the available institutional arrangements affect the value addition decision of the farmers.

8.4.1 A Brief Description the Method Applied

We are examining here the extent of value addition at farm level. All the sample farmers are not practicing value addition activity. Therefore, we have the situation where the value of the dependent variable will be zero for the non participant farmer. Generally, using Probit model is justified under such situation to consider the responses of participation and non participation. But this model is inefficient to through any information when the value of the dependent variable is available. This is the situation in the present study. Here, we have the value for those farmers who have gone through value addition. Multiple regressions would have been appropriate if there has been no concentration at lower limit. But here we have concentration of values of the dependent variable at lower level. Since a section of farmers are not adding value to their produce, which makes OLS estimates biased. Therefore, suing Tobit model is justified as a solution to both the problems.

Functional Specification of the Model

The extent of value addition is the dependent variable here and is calculated as a proportion of the total quantity of the crops available excluding
household consumption and post harvest losses. The value of this variable will be zero when the farmers follow instant selling after harvesting. For the identified Tobin or censored regression model, the value of Y is observed only for values greater than 0 but not observed for values of zero or less (Sigelman et al., 2000). The standard Tobit model is defined as:

\[ Y_i^* = \beta X_i + \varepsilon_i \]

\[ Y_i = Y_i^* \quad \text{if} \quad Y_i^* > 0 \]

\[ Y_i = 0 \quad \text{if} \quad Y_i^* \leq 0 \]

Where, \( Y_i^* \) is latent dependent variable

\( Y_i \) is observed dependent variable

\( X_i \) is vector of the independent variables

\( \beta \) is the vector of co-efficients and

\( \varepsilon_i \)'s are assumed to be independently normally distributed

In the present study, \( Y_i = \frac{\text{Quantity of Value Added Crop}}{\text{Total Quantity of Crops Available for Sale}} \)

\( X_i \) = the vector of independent variables representing farm and farmer characteristics and market and institutional characteristics. Here, \( Y_i \) is observable only for the farmers following value addition activities or for the observations where value is greater than zero. The following table details about the symbols and hypothesized signs of the factors assumed to have impacts on the value addition decision of the farmers. The model is presented below empirically:

\[ Y_i = \alpha + \beta_1 \text{AGE}_i + \beta_2 \text{EDU}_i + \beta_3 \text{HSIZ}_i + \beta_4 \text{NFI}_i + \beta_5 \text{PROD}_i + \beta_6 \text{FZ}_i + \beta_7 \text{MKT}_{-}\text{DIST}_i + \beta_8 \text{UMKT}_{-}\text{DIS}_i + \beta_9 \text{TRAVEL}\_\text{TIME}_i + \beta_{10} \text{MI}_i + \beta_{11} \text{EXTNSN}_i + \beta_{12} \text{MEMBR}_i \]
Table 8.3: Definition of Explanatory Variables and the Expected Sign of their Co-efficients

<table>
<thead>
<tr>
<th>Variable Definition</th>
<th>Symbol</th>
<th>Hypothesized sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents age (Years)</td>
<td>AGE</td>
<td>±</td>
</tr>
<tr>
<td>Education level of the respondent (Years of Schooling)</td>
<td>EDU</td>
<td>+</td>
</tr>
<tr>
<td>Household Size (15-60 years members in the family)</td>
<td>HSIZ</td>
<td>+</td>
</tr>
<tr>
<td>Non-farm Income of the farmer (1= Yes, 0= No)</td>
<td>NFI</td>
<td>±</td>
</tr>
<tr>
<td>Production (Pineapple in number, tomato and chilly in kg)</td>
<td>PROD</td>
<td>+</td>
</tr>
<tr>
<td>Farm Size or area under the crop (in bigha)</td>
<td>FZ</td>
<td>+</td>
</tr>
<tr>
<td>Distance to the nearest Urban Market (Kilometer)</td>
<td>MKT_DIST</td>
<td>+</td>
</tr>
<tr>
<td>Distance to the nearest urban Market (Kilometer)</td>
<td>UMKT_DIS</td>
<td></td>
</tr>
<tr>
<td>Travel Time Utilised to the nearest urban market (in hour)</td>
<td>TRAVEL_TIME</td>
<td>–</td>
</tr>
<tr>
<td>Market Information (Dummy considers whether the farmers are aware of price difference and possible market prospect)</td>
<td>MI</td>
<td>+</td>
</tr>
<tr>
<td>Extension service availability (1=Yes, 0=No)</td>
<td>EXTNSN</td>
<td>+</td>
</tr>
<tr>
<td>Membership of any farm based organisation (1=Yes, 0=No)</td>
<td>MEM</td>
<td>+</td>
</tr>
</tbody>
</table>

**Explanation of the Explanatory Variables**

An explanation of the explanatory variables and the rationale behind their expected sign has been given in the following analysis.

Age of the farmer (AGE): The age of the farmer may affect either positively or negatively in the extent of value addition decision. The reason behind is that most of the aged farmers being risk averse and less flexible to adopt new ways of value addition of their produce. They prefer to go for instant selling of whatever being produced. On the other hand, it could be that the aged farmers are more experienced and have better access to value addition techniques.
Education of the farmer (EDU): The years of formal education affect positively on the value addition decision of the farmers. Educated farmers have better information about scope and benefits of value addition and they can grasp these techniques easily.

Household size (HSIZ): This explanatory variable represents the number of household members in the working age group. The expected sign of the variable is positive. The larger working age group household size has the added advantage to go for value addition with a lower hired labour cost.

Non-farm Income of the farmer (NFI): Households with off-farm income may affect in both direction on the value addition decision. They may not go for value addition as off farm employment offers additional income to the households. The argument on the other side is that having off-farm enhances the ability of the farmers to go for acquisition of value addition techniques and thus have more chances of value addition.

Production (PROD): The quantity of the crop produced has a positive influence on the extent of value addition at farm level. This is due to the fact that increased production ensures availability of surplus and also the fear of post harvest losses. Besides, conducting such value addition activities at a large scale is also cost effective.

Farm size (FZ): The area under the specific crop is also expected to influence positively on the value addition decision. A larger farm land has more production and increased production stimulates value addition at farm level.

Distance to the nearby market (MKT_DIS): This variable is expected to influence positively the level of value addition decision of the farmers. More the distance between home and nearby market, greater will be the probability of value addition to increase the shelf life of the produce.

Distance to the nearest urban market (UMKT_DIS): The distance to the nearest urban market is expected to be negatively associated with the value addition decision. The farmers may earn more in the urban centres through
value adding activities and such activities are not awarded in the collector and wholesale markets.

A lower distant urban market offers an opportunity to earn more through value addition activities as such activities are encouraged in urban centres through increased price.

Travel time to the urban market (TRAVEL_TIME): More the travel time required to the urban market, lesser is the probability of value addition. Farmers prefer instant selling rather to go for value addition in the absence of nearby urban market as the efforts of value addition not awarded by the collectors and so on as mentioned above.

Access to market information (MI): Farmers with access to adequate market information follow value addition activities for their harvested produce. Farmers equipped with such information are aware of the price difference for the same harvested produce before and after value addition. This is a dummy variable and is captured through the farmers’ response of his awareness of market prospect and margin difference for the value added products and is hypothesised to be positively related with the dependent variable.

Access to extension services (EXTNSN): Access to extension services regarding production and post harvest handling increases the awareness and possible prospect of value addition and hence hypothesised to impact positively the value addition decision of the farmers. But in the study area, such services were merely confined to the production aspect of the farmers.

Membership in farm based organisation (MEMBR): Farmers being the membership of farm based organisation increases the probability of value addition. This is because farmers under such organisation have access to value addition techniques easily and cost effectively. Besides they have adequate market information to follow the required trend of value addition and bargaining power which encourages for value addition of the farmers.

The table (Table 8.4) explains the nature and level of significance of various factors separately for the three selected crops.
The above table shows the results of Tobit estimation regarding the factors affecting the extent of value addition at farm level. In some instances, the same factors impact differently for different crops. The field level experiences have been cited below as the rationale of the nature of influence of different variables.

The estimates show that the probability of adding value declines by 0.249 units an increase in production level of the crop pineapple. The main reason is due to the preferences of the sample farmers to go for instant selling with an increased production. The higher level of production makes grading to
face faces labour, storage facility and market constraint. The timely unavailable labourers and inadequate storage facility make grading unmanageable with increased production. Besides, as reported by the farmers, many times grading makes marketing low graded (weight with less than 1 kg) difficult with lower average return. The possibility of having low graded pineapple increases with the increased production. Therefore with increased production farmers prefer to go for instant selling than grading the crop pineapple. But the production impacts positively on the value addition decision of the farmers. This is because the practice of following sun dried activity becomes cost effective and profitable with increased production. As reported by the farmers, in the reference period, they had a higher percentage of sundried value addition due to increase in the level of production.

The land size under the referred crop is found to affect differently at different significant level for the crop pineapple and tomato. The probability of adding value decreases by 0.532 units with the increase in the land size by one bigha. This is due to the association of increased production with the increased land under the crop. The result for the crop tomato is found to be positively related with the land size at 95% confidence interval. This is due to the fact that farmers cultivating tomato at small scale finds it convenient to go for value addition as it requires proper storage places and handling facilities. But for the farmers growing in large land sized have larger quantity of the crop and the available household infrastructure in the study area is not sufficient to deal with the produce. Therefore, the farmers prefer to instant selling most of the produce. On the other hand, for the crop tomato an increase in land size leads to an increased in the value addition. This is due to the extremely perishable nature of the crop tomato. Since farmers could not harvest the entire tomato in a day and daily marketing facilities are also not available. Therefore, they have to follow various value addition activities to avoid post harvest losses for the increased output due to increased area under the crops.
The level of value addition is positively related to the distance to the nearby market for the crop tomato. Farmers in the study area reported that they do not receive extra price of value addition for the amount sold in the nearby market. But the perishable nature of the crop tomato demands minimum level of such value addition to lower losses during transportation. But such value addition activities are well paid in the urban market centers of the district. But this variable bears negative association for both the crop tomato and chilly at 10 and 5 percent significant level. This happens as the selling in the urban centers is time consuming and they need to work in the agricultural field for the other crops they grow. Besides, the bond of trust among the next agents in urban areas is weak and with the increased in distances they fear to be deceived by the agents in the urban market. In fact, as reported by the farmers, sometimes in the urban centers some middle men collect the produce and give the assurance to the farmers to give them the money after selling the produce. But they do not return again. Farmers also could not follow the agents since they have the other section of the produce. But this is very rare but repeated within the interval and with different farmers.

The extension service is found to be positively statistically significant at 95% confidence level for the crop chilly. There is no direct relation between extension service and the level of value addition. Because such services in the study area are mostly concerned with production related. But with the increase in such extension services increase level of production and this ultimately leads to an increase in the level of value addition of the crop chilly. The farmers with market information regarding price difference and possible market for value added products are found to have a positive relation with the extent of value addition. The value of this variable is significant only for the crop tomato at 10% significance level.

The pineapple growers with membership of any farm based organisations have higher probability of value addition. As observed in the study area, the farmers who are the members of pineapple grower society have the basic collective facilities to carry out the value addition activities. The society has its own storage facility and they follow the cost sharing approach which makes value addition activity economically viable for all the society members. The
large working age group family members works as a proxy of the cost and availability of the hired workers for value addition. Therefore, large working age family size enhances the probability of value addition.

Thus, the above analysis makes it clear that the different variables have different level of influence on the outlet channel decision of the sample farmers. Now, the importance of a developed post harvest system in ensuring a better price realization for the sample farmer has been explained in the next section.

8.5 An Examination of the Existing Post Harvest Management System and Its Impact on Farmers’ margin

An organised post-harvest system is the one which can provide the required infrastructural as well as institutional back up for the harvested produce. A post-harvest system can be defined as an organized system if the farmers have access to adequate storage facilities, efficient marketing channel and also have access to a wider market for the produce. The existence of cold storage facilities provides an opportunity to the crop growers to follow adequate value addition activities of the produce. Besides, having such facilities lower the risk of post-harvest losses and thus farmers may wait for a better market than distant selling.

The next required component of an orgainsed post harvest system is the farmers’ access to an efficient marketing channel. It is only an efficient marketing channel which can maximize the farmers’ return. An efficient marketing channel is the one which provide the farmers the highest percentage share of consumers’ rupee\(^37\). In the absence of such facilities a farmers always have a lower return than what he should have.

A developed post harvest system also requires that the farmers should have access to a lower distance ‘wider market’ of the specific crop. The wider market has been defined by the major market for that specific crop in the study area. The distance to the wider market is an important determinant of farmers’ margin in two ways. The first one is that the farmers can easily

\(^{37}\) The definition of the efficient marketing channel and the most efficient channel for each crops has been explained in chapter 7.
access a lower distance market easily without time and transportation costs constraint. Secondly, the other agents in the markets, like wholesalers and retailers could also easily access the production centre and this minimizes the problem of traders’ monopoly. Thus, more chances of better price realization of the farmers. Therefore, in the present study, an organized post harvest system has been defined in terms of the following three indicators.

**Fig. 8.3: Indicators of Organised Post Harvest System**

Organised Post Harvest System
- Access to Storage Facilities
- Access to Efficient Marketing Channel
- Access to Wider Market of the Specific Crop

**8.51 Analytical Technique**

The examination of the impact of an organized post harvest system on farmers’ margin has been carried out in two stages. The first on comprises of the construction of the indices and is followed by the regression of the constructed indices. Below we explain the ways of constructing the indices.

**Constructing Indices**

**Net Price Realisation Index (NPRI):** The net price realisation for selected crop growers has been calculated as the weighted average of the net price received by the farmers from all the channels used to dispose the produce. For example if a farmer chooses four channels to dispose his entire produce, then his produce share in each channel is multiplied by the net price received for that respective channel. The net price is the price received by the farmer excluding marketing costs per unit of the produce. The marketing costs comprises of the costs of transportation, costs of post-harvest losses,
post harvest imputed labour costs etc\textsuperscript{38} and it varies based on the marketing channel choice decision of the farmers. Then the average net price for all the channels has been calculated for each farmer. Now, the maximum average net price attainable by sample farmers for the three selected crops has been calculated and the index value for each farmer is obtained with the help of the following method:

\[
\text{Net Price Realisation Index (NPRI)} = \frac{\text{Actual Average Net Price}}{\text{Maximum Average Net Price}}
\]

**Access to Storage Facility Index (ASFI):** The access to storage facility is a categorical variable and has been defined as:

- ‘0’ = for the farmers having no storage facility at farm level
- ‘1’ = for the farmers having storage facility at farm level
- ‘2’ = for the farmers having access to cold storage facility

Then the indexed value for each farmer will be obtained by:

\[
\text{Access to Storage Facility Index} = \frac{\text{Farmers' Access to Storage Facility}}{2}
\]

Here, each farmer’s access to storage facility being divided by ‘2’, value assigned to the highest category of storage. The farmers having access to cold storage facility being the most efficient provision, this value has been used to normalise the value of this categorical variable.

**Access to Efficient Marketing Channel Index (AEMCI):** To construct access to efficient marketing channel index, the weighted sum of marketing share through different channels for each farmer have been divided by the efficient marketing channel. For example, if a farmer disposes 20% of his produce through marketing channel 3, then this multiplied value will give weighted share of the farmer through this channel. Accordingly, weighted share for other channels have been calculated and added for each farmer.

\textsuperscript{38} The details of various marketing costs components considered for the study have been detailed in the value chain performance of the chain actors
Then this value is divided by the most efficient marketing channel for the respective crop\(^{39}\).

\[
\text{AEMCI} = \frac{\text{Sum of Weighted Share through Different Channels}}{\text{The Most Efficient Channel for Each Crop}}
\]

**Access to Wider Market Index (AWMI):** Access to wider market distance has been measured by the travel time required to such market through motorised vehicles. Like the previous indicators, the value of this variable has also been normalised but in a different way.

\[
\text{AWMI} = \frac{\text{Minimum Value of the Travel Time to Organised Market}}{\text{Actual Travel Time to the Organised Market}}
\]

Since the lowest travel time required will be more desirable for having a better price realisation, therefore, the minimum value instead of the actual value has been put in the numerator of the normalisation procedure. To examine the impact of this organised post-harvest system on the price realisation of the farmers, the following Logistic regression has been carried out.

**Model Specification**

Here, the dependent variable is the Net Price Realisation Index of the farmers for the respective crops. The value of this index will lie in between ‘0’ and ‘1’. There is no possibility of a zero value as the actual average net price of the farmers cannot be zero. But there may be the possibility of getting value ‘1’ for some cases. Hence, the linear functional form of regression model will not be appropriate. Therefore, the following logistic function has been specified as the basic model.

\[
Y = \frac{1}{1 + e^{-Z}}
\]

\[
\ln \left( \frac{Y}{1 - Y} \right) = Z
\]

\[
Z = \beta_1 \text{ASFI}_i + \beta_2 \text{AEMCI}_i + \beta_3 \text{AOMI}_i + \beta_4 \text{HC}_1i + \beta_5 \text{HC}_2i + U_i
\]

The above analysis details about the first three independent variables, i.e., ASFI, AEMCI and AOMI. These variables expected to have a positive impact on the dependent variable. The explanation of the HC variable is given below.

---

\(^{39}\) Marketing outlet choice decision section of the study detailing about the efficient marketing channel for each referred crop
Horticultural Crop/Location Dummies (HC\(_1\) and HC\(_2\)): Three are three selected horticultural crops, viz., pineapple, tomato and chilly in the present study. Each crop has been surveyed in three separate districts and therefore we have the following crop as well as location dummies in the study. Taking pineapple as the reference category, two crop dummies have been used, viz., HC\(_1\) and HC\(_2\), where,

\[
\begin{align*}
HC_1 &= 1, \text{ for tomato} \\
&= 0, \text{ otherwise} \\
HC_2 &= 1, \text{ for chilly} \\
&= 0, \text{ otherwise}
\end{align*}
\]

The sign of the co-efficient of these two variables can not be predicted and they may bear either positive or negative value. The result of the logistic regression has been presented in the following table (Table 8.5).

**Table 8.5 Logistic Regression Estimates of the Impact of Organised Post Harvest System on Price Realisation by the Farmers**

<table>
<thead>
<tr>
<th>Variables/ Constant</th>
<th>Breusch – Pagan for heteroscedasticity (\chi^2(5) = 2.65)</th>
<th>Prob &gt; chi2 = 0.7537</th>
<th>Result: H(_0) of no Heteroscedasticity not rejected</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASFI</td>
<td>0.053</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.039)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AEMCI</td>
<td>1.202***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0497)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AWMI</td>
<td>0.293**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.075)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HC(_1)</td>
<td>-0.018*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.007)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HC(_2)</td>
<td>0.017</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.010)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-1.056***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.027)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R(^2)</td>
<td>0.7466</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F [5, 208]</td>
<td>132.58***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Calculated from Survey Data
Figures within ( ) and [ ] are robust standard error and degrees of freedom respectively.
***, ** and * indicate significant at 1, 5 and 10 percent respectively.

The negative significant value for HC\(_1\) indicates that the net price realisation of the tomato growers is less than the pineapple grower. This can be attributed largely to the reason that tomato has a higher percentage of post-
harvest losses and thus this crop has higher marketing costs compared to the crop pineapple. In case of the other two significant explanatory variables, the direction of impact as per the expectation and thus we may conclude that a organized post-harvest system works as an incentive in terms of better price realisation of the farmers and this proves the presumed hypothesis of the study.

8.6 Summing Up

The above analysis reveals that the practice of value addition has been followed by half of the sample farmers for all the three crops. The value added and non value added farmers have some basic differences in the identified socio-economic aspects. The value addition activities practiced in the study area are storing, sun drying, grading and packaging. The major value addition activity has been found different for different crops. Grading is the mostly practised value addition activity of pineapple. Packaging is the most practiced value addition activity of the crop tomato. Storing and sun drying are two equally most practiced value addition activity for chilly. These value addition activities with minimum operational cost make differences in the profit margin of the farmers. The determinants of the extent of value addition are level of production, area under the crop, distance to the nearby market, distance to the urban market, access to market information, access to extension facility, member of farm based organization and household size. Thus, basically farm and farmer related characteristics influence the value addition decision at farm level. The available institutional background represented by marketing distance, extension services, farmers’ association with farm based organizations have also found to influence the farmers’ value addition decision. These variables have different level of influence for different crops. In some instances, the same variable has been found to influence differently for different crops. The study also proves that an organized or developed post harvest system helps the farmers in better price realization for the produce.