Chapter – VI

EMPIRICAL ANALYSIS OF MARKETED SURPLUS

Section – VI.1: INTRODUCTION

This chapter focuses our attention to examine the functional relationship of net marketed surplus (hereinafter referred to as marketed surplus) with other independent variables like production, farm consumption, retention, prices and profit margin of the farmers. The estimations have been done through the application of regression techniques on the basis of cross-sectional farm data collected through field survey during the agricultural year 2005-06. The periodicity of the study is taken from August, 2005 to August, 2006, during which no severe flood, drought or any other calamity occurred. Therefore the study period is considered as the normal period. The estimation is limited to cross-sectional primary data only, because the secondary time series data on the pattern of marketed surplus is not available from any published or unpublished sources to analyze trend behaviour of marketed surplus in the study area.

In order to estimate the marketed surplus function of paddy with respect to various independent variables the following null hypotheses have been framed.

1. Hypothesis - I: There is no relationship between consumption and marketed surplus.
2. Hypothesis-II: Output level has no association with marketed surplus.
3. Hypothesis-III: The level of retention does not have relationship with marketed surplus.
4. **Hypothesis-IV**: No association between price and marketed surplus.

5. **Hypothesis-V**: No association between profit margin and marketed Surplus.

To test the statistical significance of the above hypotheses we employ both the bi-variate and multi-variate regression techniques to cross-sectional farm data. The following models have been developed to examine the relationship between marketed surplus and other independent variables.

The relationship between marketed surplus of paddy and its retention has been estimated through the following equation.

\[ NMS = a - bR_t \]

Where, \( NMS \) represents Net Marketed Surplus

\( R_t \) represents Total Retention

Again the relationship between marketed surplus and various components of retention has been estimated using multiple regression model as given below.

\[ NMS = a - bR_{td} - cR_{sl} - dR_{fc} \]

Where, \( R_{td} \) represents retention for seed requirement

\( R_{sl} \) represents retention for the purpose of sale

\( R_{fc} \) represents retention for the purpose of future consumption

We then estimate the association between marketed surplus and price of paddy by employing the following model.

\[ NMS = a + bP \]
Where, \( P \) represents the selling price of paddy.

In order to test the statistical significance of the variation in marketed surplus with respect to production, consumption and retention of paddy by the farmers the following multi-variate regression model is employed.

\[
NMS = a - bC + cProd - dRt
\]

Where, 
- \( C \) represents the level of farm consumption
- \( Prod \) represents the level of paddy production
- \( Rt \) represents the level of total retention

The multiple regression equation is also applied to examine the relative weight age of the factors determining marketed surplus. For this purpose we consider production, consumption, retention and price of paddy as dependent variables in order to estimate the marketed surplus.

\[
NMS = a - bC + cProd - dRt + eP
\]

Where, 
- \( Prod \) represents production of paddy
- \( C \) represents farm consumption
- \( Rt \) represents total retention
- \( P \) denotes selling price of paddy.

Further, the estimation of the relationship between marketed surplus and profit margin is done by employing the two-variable regression model as follows.

\[
NMS = a + bMrg
\]

Where, ‘\( Mrg \)’ stands for profit margin to the farmer-sellers.

Based on the results of regression estimations through the above specified models the marketed surplus function of paddy in the Barak Valley of Assam has been analyzed in the following sections.
Section - VI.2: FUNCTIONAL ANALYSIS OF MARKETED SURPLUS

The nature of relationship between net marketed surplus (hereinafter referred to as marketed surplus) and total retention has been estimated through the bi-variate model of regression on the basis of cross-sectional farm data related to the agricultural year 2005-06. It is hypothesized that there exist a negative association between marketed surplus and retention. To test the hypothesis we have estimated the regression equation, and the estimated equation with the value of regression coefficient, test of significance $R^2$-value, and the value of $t$-statistic is given below.

<table>
<thead>
<tr>
<th>Estimated Equation</th>
<th>$R^2$-value</th>
<th>Correlation Co-efficient Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NMS = 68.64 - 1.091Rt*</td>
<td>0.726</td>
<td>0.92</td>
</tr>
<tr>
<td>(5.143)</td>
<td></td>
<td></td>
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</table>

* Significant

( ) Figure in the parenthesis is the $t$-value of the estimate.

It is estimated that 73 per cent of the variation in marketed surplus of paddy is explained by total retention. The regression coefficient of retention is negative and significant as judged by $t$-value. This explains a negative and significant relationship between marketed surplus and total retention of paddy. Thus it satisfies the common thesis of the inverse relationship between marketed surplus and farm level retention, as retention increases marketed surplus decreases and vice-versa. The estimation of the correlation coefficient also shows a negative value to the extent of 0.92 reflecting that as the level of retention increases marketed surplus...
surplus tends to decline. The marginal propensity to marketed surplus with respect to retention turns out to be 1.09 for all the farm sizes under study. This indicates that every increase in total retention will lead to more than 1 per cent decline in marketed surplus according to size class. The intercept value is found out to be positive indicating that net sales constitute the highest level at zero retention. This confirms that even the smallest size group of farmers shows positive net marketed surplus (NMS), whereas negative NMS is found common among their counterparts in other parts of the country as revealed by different other studies. Moreover, the positive value of intercept and negative value of regression coefficient express the highest level of NMS in the absence of retention, and lowest NMS at the highest level of retention which is indicative of inverse relationship between marketed surplus and retention. Therefore, our hypothesis of inverse relationship between retention and marketed surplus is confirmed here, and retention is a significant determinant of marketed surplus.

Further, in order to understand the relative impact of the various components of retention on marketed surplus the total retention has been divided into three categories based on the information obtained from the respondents. These are retention for consumption purpose, retention for sale, and retention for seed requirement. We have already tested that when retention increases marketed surplus declines and reverse is the case. Keeping this relationship constant we can now examine the association between marketed surplus and different kinds of retention through multi-variate regression technique. This may give us the idea about which kind of retention is more influential on the net level of marketed surplus of all the size groups.

The results of multi-variate regression model for all the size groups are given as:
Since the coefficient of multiple determination ‘$R^2$’ is found to be 0.558 it is measured that the magnitude of association between marketed surplus and retentions for various purposes by the farmers comes to 56 per cent. In other words, the change in marketed surplus of paddy explained by independent variables like retentions for domestic consumption, future sales and seed requirements is 56 per cent only if we classify the components of total retention. The regression coefficient of retention for sale turns out to be positive, whereas the coefficients of the retentions for consumption and seed requirement are negative. Using F-statistic it is observed that regression coefficients are statistically significant as the calculated F-value is greater than its critical value ($F = 3.364 > CV = 2.99$) at 5 per cent level of significance.

The positive value of the regression coefficient of retention for sale (1.950) indicates that net sales of paddy increases as the size class increases wherein larger size classes have more and more retention power for sale in future market. This implies that farmers belonging to large size classes can wait for better prices and hence they retain a good proportion of their...
total output for market disposal. However, this is not indicative of the absence of their present sale (at the time of data collection), instead their present marketed surplus is higher than the smaller groups as indicated by the positive value of regression coefficient. This means that farmers belonging to larger size groups possess a considerable amount of marketable surplus, which may either be due to their higher volume of output by virtue of large holdings or lower dependency ratio of population in the farm household.

The negative coefficient of retention for seed requirement (-23.271) is indicative of the presence of using traditional seeds in cultivation mostly by small farmers. Because of higher retention for seed requirement the marketed surplus is negatively influenced, and the affect is very large in case of the small and marginal farmers whose net sales is almost equal to zero. However the impact of retention for future consumption on marketed surplus is very small as indicated by negative value of the coefficient (-0.653). Any increase in retention for future consumption causes a decline in marketed surplus but at a low propensity. This is because the proportion of output retained for consumption purpose by larger size groups is very small on the one hand, and on the other the absolute amount of retention by all the size classes were negligent at the time of data collection since the time was close to the next harvest. Therefore the negative impact of retention for domestic consumption on the net level of marketed surplus is very negligent as the marginal propensity to sell with respect to consumption is 0.653.

The positive value of intercept and the negative values of regression coefficients for consumption and seed requirements indicate that marketed surplus achieves the highest rank in the absence of retentions and it starts declining when the retention level increases. Once again this
result satisfies our hypothesis of inverse relationship between marketed surplus and retention in accordance of size class.

All these reflect that the observation made by M. Upender and K. Sengupta as an inverse association between retention for domestic consumption and marketed surplus with respect to size class is confirmed by our finding (Upender, 1990, Sengupta, 1998). However the same inverse relationship does not hold good in case of retention for future sale. The study thus observes that retention for market sale of the produce increases at an increasing rate as the holding size increases in expectation of receiving better prices.

To understand the net absolute impact of retention for consumption on marketed surplus we consider the same retention as an independent variable to estimate its affect on marketed surplus, and the estimation is done through the bi-variate regression technique.

\[ NMS = a - bRt_{fc} \]

The following are the regression results:

<table>
<thead>
<tr>
<th>Estimated Equation</th>
<th>R²-value</th>
<th>Correlation Co-efficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>NMS=-15.838 - 1.032 Rt_{fc} *</td>
<td>0.060</td>
<td>-0.95</td>
</tr>
<tr>
<td>(0.801)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant

( ) Figure in the parenthesis is the t-value of the estimate.

It is observed that marketed surplus of paddy explained by the component of retention for consumption is only 6 per cent. That is
merely a 6 per cent variation in marketed surplus is due to the variation in retention for consumption. The regression coefficient of retention is negative showing ‘-1.032’ which indicates that marketed surplus declines with respect to an increase in retention for consumption according to size class. This relationship is reliable as it is found statistically significant judged by t-value of the estimate. The estimated equation implies a very weak strength of association between net sales and retention for consumption. The reason being that already consumed level of output by the farmers of all the size classes is much higher than the proportion of output retained for consumption at the time of data collection. This is due to the fact that the period of field enquiry was close to the next harvest of paddy when maximum consumption already held good and little more left for future consumption. However, since the regression coefficient of retention for domestic consumption is negative we conclude that marketed surplus relates inversely with retention for future consumption. This again confirms the finding drawn by Upender and Sengupta that there exist an inverse relationship between retention for domestic consumption and marketed surplus with respect to size class (Upender, 1990, Sengupta, 1998).

In this context, already consumed level of output by the farm household is termed as farm consumption or domestic consumption, which is hypothesized as negatively associated to net marketed surplus. This implies that as the proportion of domestic consumption increases the level of marketed surplus decreases and vice-versa. Moreover, the proportion of domestic consumption will decline with the increase in output level if the actual volumes of consumption as well as retention remain the same. In such a case, definitely there will be positive impact of output on the net level of marketed surplus. In other words marketed surplus rises with respect to an increase in output level. But if retention increases it may cause negative impact on marketed surplus. Based on
these considerations the following hypotheses will be tested through multiple regression model.

Hypothesis-I: Marketed surplus varies directly with the level of paddy output
Hypothesis-II: Marketed surplus varies inversely with the level of farm consumption.
Hypothesis-III: Marketed surplus varies inversely with the level of retention.

We put consumption, retention and output as independent variables in the multiple regression equation treating net marketed surplus as dependent variable. The marketed surplus of paddy has been examined with respect to production, consumption and retention with the objective of knowing the relative strength of the factors determining marketed surplus. The regression results of the designed model are given as follows.

<table>
<thead>
<tr>
<th>Estimated Equation</th>
<th>R²-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NMS = - 98.746 - 0.206C + 0.306Prod - 0.345Rt*</td>
<td>0.794</td>
</tr>
<tr>
<td>(0.0123) (0.786) (0.546)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>F-value</th>
<th>Critical F-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.265</td>
<td>4.68</td>
</tr>
</tbody>
</table>

* Significant at 1 per cent level.
( ) Figures in the parentheses are the t-values of the estimate.
The coefficient of multiple determination indicates that 79 per cent of the variation in marketed surplus is caused by production, consumption and retention of paddy. Thus it is observed that the strength of association between dependent and independent variables is quite strong. This relationship is found statistically significant judged by both t-values and F-statistic at 1 per cent level of significance. The regression coefficients of consumption and retention are found to be negative and significant. Whereas, the production coefficient is positive and significant at 1 per cent level. The marginal propensity to marketed surplus with respect to production turns out to be 0.31 indicating that any increase in paddy output will lead to only 0.31 per cent increase in marketed surplus. Thus it agrees with the usual belief that marketed surplus rises with the increase in production, though marginal propensity to marketed surplus is small. This finding is in conformity with the observation made by Prof. Raj Krishna and others that output level is the significant determinant of marketed surplus (Krishna, 1965, Bardhan, 1970, Prasad, 1989, Upender, 1990, Praduman-Mruthyunjaya, 1989, Thakur et.al, 1997)

However, the marginal propensity to marketed surplus with respect to farm consumption of paddy is revealed as -0.21 implying that as the level of farm consumption rises marketed surplus declines by 0.21 per cent. Since the regression coefficient of consumption is negative and statistically significant at 1 per cent level we can confirm our hypothesis of inverse relationship between marketed surplus and consumption at source. This is a commonly held belief that net level of sales in the market comes down as the proportion of output consumed at farm level increases. Thus it corroborates with the finding drawn by Prof Sengupta who maintains an inverse relationship between consumption and marketed surplus on the condition that production remains the same (Sengupta, 1998). It also satisfies Upender's finding of contradictory
relationship between consumption and marketed surplus according to size class of holdings (Upender, 1990).

Similarly as the coefficient value of retention is negative and statistically significant at 1 per cent level we again confirm the presumption of inverse relationship between marketed surplus and retention. The marginal propensity to marketed surplus with respect to retention turns out to be \(-0.35\) implying that as total retention increases the level of marketed surplus declines by 0.35 per cent. Therefore out of the three independent factors of production, consumption and retention it is observed that the relative strength of retention in determining marketed surplus is higher than production and consumption. This is judged by the estimated values of regression coefficients of production, consumption and retention as 0.306, -0.206, and -0.345 respectively. The second important determinant of marketed surplus is production which has higher coefficient value than the level of domestic consumption. The variable consumption has the lowest strength while determining marketed surplus. These findings led us to conclude that total output of paddy, its consumption by the farm households and its total retention for various purposes are the significant determinants of marketed surplus. Out of these three determinants total retention has much influence on the net level of marketed surplus than production and consumption. Next to retention it is the output level which has better strength while determining the level of marketed surplus. This finding is natural in an economy where paddy is the staple food of the farmers and agriculture is not conducted at a commercial level. The level of farm consumption therefore has also been observed as a significant factor determining marketed surplus, but compared to production and retention its affect on marketed surplus is lower. The value of intercept is found to be negative as indicative of negative net marketed surplus, because the farmers have to repurchase from the market for
consumption needs in the absence of sufficient level of output. This is a typical situation of a poverty stricken agricultural sector.

Apart from the non-price factors of production, consumption and retention the study also considers the selling price of paddy (rice) as an important factor determining marketed surplus. It is also a commonly held belief that with the rise in prices farmers would be inspired to generate more marketed surplus either for cash requirement or with the objective of earning maximum profit. Therefore we hypothesize a positive relationship between marketed surplus of paddy and prices according to size class. To examine this relationship a two-variable linear regression model has been employed and estimated through the use of least square method. The results are given as under.

<table>
<thead>
<tr>
<th>Estimated Equation</th>
<th>R²-value</th>
<th>Correlation Co-efficient Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NMS = - 4010.037 + 8.776Pr*</td>
<td>0.304</td>
<td>0.99</td>
</tr>
<tr>
<td></td>
<td>(3.088)</td>
<td></td>
</tr>
</tbody>
</table>

* Significant
( ) Figure in the parenthesis is the t-value of the estimate.

It is revealed that only 30 per cent of the variation in marketed surplus is explained by the price factor. The regression coefficient of price is positive and reliable as it is significant judged by the value of t-statistic. The result of the coefficient of correlation is found positive showing 0.99, indicating high correlation between marketed surplus and price. This finding confirms our hypothesis of positive relationship between price and marketed surplus of paddy. The equation has a negative intercept.
value showing deficiency in net sales in the absence of remunerative prices. In other words, it indicates that the minimum level of retention is higher at lower prices. That means output is not disposed off at lower prices up to a certain point and thereafter marketed surplus increases with the increase in price. The marginal propensity to marketed surplus with respect to price of paddy is 8.78 for all the size classes, reflecting that any increase in price will lead to much higher increase in marketed surplus at a rate of more than 8 per cent. Thus it satisfies the hypothesis of positive association between marketed surplus and price, and price plays significant role to determine marketed surplus. This positive response of marketed surplus to its price change confirms the realization made by Kumar-Mruthyunjaya and Reddy-Chengappa-Achoth that the response of marketed surplus of the produce to its price variation is positive (Kumar-Mruthyunjaya, 1989, Reddy-Chengappa-Achoth, 1995). The present nature of finding however does not confirm the observation made by Kalpana Bardhan that marketed surplus as a proportion of production as well as in absolute terms shows negative response to changes in food grain price (Bardhan, 1970).

The study thus confirms that production, consumption, retention and price of paddy play significant role in determining the net level of marketed surplus. It is also a usual belief that both production and price have positive impact upon marketed surplus, while farm consumption and retention affect the same negatively. In order to test the relative strength of each factor in determining marketed surplus we estimate marketed surplus considering production, consumption, retention and price as independent variables in the multiple regression equation and the results are given below.
The variation in marketed surplus explained by the independent factors comes to 86 per cent. In other words, 86 per cent change in marketed surplus is due to the changes in production, farm consumption, retention and prices. The regression coefficients of production and price are positive, while the coefficients of consumption and retention are negative. All these coefficient values are statistically significant at 1 per cent level judged by both t-values and F-statistic. The marginal propensity to marketed surplus with respect to farm consumption and retention are 0.18 and 3.7 respectively. In contrast, marginal propensity to marketed surplus with respect to production and price are found to be 0.36 and 5.39 respectively.

It can thus be observed that farm level retention of paddy has larger negative impact on marketed surplus than consumption at source. On the contrary, price variable of paddy has larger positive impact on marketed surplus than its output level. This indicates that as the levels of farm consumption and retention increase net marketed surplus will start declining throughout the size classes. Conversely, along with the
increase in paddy output and price marketed surplus responses positively, and the increase in marketed surplus with respect to market price is more than the increase with respect to production. These again confirm our hypotheses that marketed surplus relates inversely with farm consumption and retention, and directly with the quantity produced and selling price. The equation has a negative intercept value expressing deficiency in marketed surplus in the absence of output and prices.

All these lead us to conclude that price has the most significant impact on marketed surplus of paddy throughout the size class compared to farm consumption, production and retention. Therefore market price or selling price plays an important part while determining marketed surplus of paddy. Next to price, it is the retention of paddy by the farmers of different size groups which is more effective in determining marketed surplus. Following this, the next significant determinants of marketed surplus are production and farm consumption out of which consumption has relatively lower strength while production is crucial in determining the net level of marketed surplus of paddy in Barak Valley of South Assam.

Besides, the profit margin received by the farmers from the sale of agricultural produce is extremely important for determining the level of marketed surplus. Farmers get incentives to generate higher marketed surplus if and only if they could receive higher and remunerative rate of margins. Therefore a proportionally higher margin implies greater incentive to offer more for sale just as lower margin may discourage them to dispose off more in quantity. Hence, it is assumed that marketed surplus relates positively with profit margin received by the farmer-sellers. This relationship has been estimated through bi-variate linear regression model and the estimated results are given as under.
It is found that the regression coefficient of profit margin received by farmer-sellers is positive and significant as justified by the value of t-statistic. The strength of association between profit and marketed surplus is explained by the calculated value of $R^2$. The $R^2$-value is found as 0.496 indicating that more than 49 per cent of the variation in marketed surplus is due to the change in profit margin. The marginal propensity to marketed surplus with respect to profit is estimated to be 3.49. This indicates that any increase in profit margin induces the net marketed surplus to increase more than three times. Thus there is a positive and significant association between profit margin attained by the farmers and net marketed surplus for all the size classes. This satisfies our hypothesis that marketed surplus relates positively with profit margin, and profit is the significant factor influencing the level of marketed surplus of paddy in the valley.

The intercept value is found to be positive showing to the extent of 496.178. This reflects the existence of net marketed surplus even at no profit. From this it can be realized that farmer-sellers dispose off their
produce even in the absence of profit, which is more true for small farmers who conduct their agriculture on subsistence basis and are under compulsion to sell their produce for obtaining cash amount even if there is no margin. With the rise in profit margin well off farmers have the tendency to sell more in order to receive higher returns which is the common case of large farmers in the area. However, for small farmers this may not be true since they produce only small quantity of output and most of them dispose off during the post harvest season when price comes down to the lowest possible level. Therefore, the observation that farmers are motivated by higher margins is more applicable to large and economically well to do farmers. This result is natural because small farmers are compelled to sell their produce even if the level of profit is low, owing to their distress economic condition. In contrast, farmers belonging to larger size groups can afford to hold back their produce and dispose them off at higher price, at favourable time and at a favourable place. To that extent we can generalize that profit margin acts as one of the most important instruments of generating higher marketed surplus in the study area.

The existence of marketed surplus at no profit zone is indicative of the presence of distress sales. The small and marginal farmers dispose off their produce either on oral agreement before the harvest or just after the harvest at a much lower price which is not remunerative, due to their urgent requirement of cash. Later they repurchase the same for their family consumption needs at a much higher price. This way they are involved in the vicious circle of distress sales.

The findings of our study through econometric analysis reveal that net marketed surplus varies negatively with the retentions for farm consumption and seed requirement. Besides the farm level retention is found to be a significant factor determining marketed surplus. The farm
consumption relates inversely and significantly with the level of net marketed surplus throughout the size class. Apart from retention and consumption, the significant factors determining marketed surplus are price and output which vary positively with the marketed surplus. Out of these significant factors price is the most effective variable on marketed surplus. Next to price it is the level of retention which has relatively better strength in determining the net level of marketed surplus. Following this the level of production determines marketed surplus better than farm consumption. The farm consumption level is found to be the least effective factor determining marketed surplus in the valley. In addition to these, an estimation of marketed surplus with respect to profit margin reveals that profit is the positive and significant determinant of marketed surplus in the Barak Valley of South Assam.

References:


