CHAPTER 5

ANALYSIS OF SAMPLE DATA

Having analysed the profile of sample study locations in Chapter 4, now we are to analyze the data collected from the sample households spread over 12 (twelve) villages located in 6 (six) agricultural sub-division under 3 (three) districts of Barak Valley, viz, Cachar, Karimganj and Hailakandi. As per sample design of the study, we have collected data from 409 households from the 12 sample villages on a number of parameters including production, consumption, sale price, mode of transportation, cost of production per unit, etc, of winter rice cultivation along with several others like capital accumulation in agriculture at the household level, vehicle own by the households which are used for carrying agricultural produce to market, distance from village to market, condition of village road, etc.

Some of the information collected from the survey has already been presented in Chapter 4. Here, analysis has been made in order to examine the proposed hypotheses and arrive at findings and compare as to whether they commensurate to the objectives of the study or not.

5.1 Construction of Agricultural Marketing Facilities Index (AMFI)

One of the main thrusts of the study is to examine as to how agricultural marketing facilities influence the generation of marketable surplus, marketed surplus and capital accumulation in agriculture. We have conceptualize and construct a measure for "agricultural marketing facilities" called "Agricultural Marketing Facilities Index" (AMFI). Agricultural marketing facilities has been broadly divided into three categories: physical facilities, institutional facilities and transportational facilities. Physical facilities include roads and other infrastructural facilities like warehousing, cold storage, etc. Institutional facilities include organizational set ups that facilitate marketing of agricultural produce like agricultural marketing cooperatives, farmers' club and the active assistance of village level extension workers. Transportational

facilities include road conditions, distance between the village and the market, and types of vehicle used for transportation of agricultural produce by the villagers to market.

Table 5.1: Vehicle Own by the Sample Households

Sl No	Village	Types of Vehicle Own			
		Bicycle	Rickshaw	HandCart	Motorbike
1	Boalipar Part-1	13	5	8	5
2	Boalipar Part-2	12	6	7	5
3	Pangram Part -2	16	7	12	5
4	Tikalpar	15	4	7	7
5	Joypur Part-2	24	6	9	7
6	Kanakpur Part-1	15	5	7	5
7	Cleaver House TE	37	8	13	12
8	Barjalenga-7	21	4	6	4
9	Niznabin	23	5	7	6
10	Gopikanagar	6	1	1	1
11	Umarpur Part-1	5	1	1	1
12	Duliakhal Karaibari	12	0	3	7
Total Sample		199	52	81	65

Source: Field Survey, 2013

In our study AMFI has been constructed using variables in three dimensions viz (i) vehicle own to construct a "Vehicle Own Index (VOI), (ii) mode of transportation of agricultural produce from village to market to construct a "Mode of Transportation Index" (MTI) and (iii) other marketing facilitating variables to construct a "Other Facilities Index (OFI). Under the first dimension, i.e., Vehicle Own, binary responses have been recorded for 409 respondent households on 4 types of vehicles viz., bicycle, rickshaw, hand cart and motorbike (table 5.1). Similarly under second dimension, i.e., mode of transportation of agricultural produce from village to market, binary responses have been recorded for 409 sample households across 12 villages spread out in 3 districts of Barak Valley on bicycle, rickshaw, hand cart and head load (table 5.2). These two dimensions have been chosen considering their significant importance in agricultural marketing in rural setting characterized by the socio-economic conditions of rural Barak Valley. Both the institutional and physical

Table 5.2: Mode of Transportation of Agricultural Produce to Market by the Sample Households

Sl No	Village	Frequently Used Mode of Transportation			
		Bicycle	Rickshaw	Handcart	Headload
1	Boalipar Part-1	13	7	13	3
2	Boalipar Part-2	12	11	16	2
3	Pangram Part -2	16	10	20	2
4	Tikalpar	15	9	18	1
5	Joypur Part-2	23	10	22	3
6	Kanakpur Part-1	15	8	17	7
7	Cleaver House TE	37	21	38	13
8	Barjalenga-7	21	6	17	10
9	Niznabin	23	8	17	11
10	Gopikanagar	6	3	4	2
11	Umarpur Part-1	5	2	4	3
12	Duliakhal Karaibari	12	4	12	1
Total Sample		198	99	198	58

Source: Field Survey, 2013

Table 5.3: Availability of "Other Facilities" for the Promotion of Agricultural Marketing in the Sample Villages

Sl No	Village	Other Facilities					
		Farmers Club	VLEW	Middleman	DFVM	Pucca Road	Waterway
1	Boalipar Part-1	No	No	Yes	No	Yes	No
2	Boalipar Part-2	Yes	Yes	No	Yes	Yes	No
3	Pangram Part -2	No	No	No	Yes	Yes	No
4	Tikalpar	No	Yes	Yes	No	No	No
5	Joypur Part-2	No	No	No	Yes	Yes	No
6	Kanakpur Part-1	Yes	Yes	No	No	No	No
7	Cleaver House TE	No	No	Yes	Yes	Yes	No
8	Barjalenga-7	No	No	No	No	No	No
9	Niznabin	Yes	Yes	Yes	Yes	Yes	No
10	Gopikanagar	Yes	Yes	Yes	No	No	Yes
11	Umarpur Part-1	No	No	Yes	Yes	Yes	No
12	Duliakhal Karaibari	No	Yes	Yes	No	No	No

Source: Field Survey, 2013

facilities are clubbed together under the rubric of "other marketing facilities" in third dimension. Binary responses have been recorded for 409 sample households on 6 variables viz., existence of farmers' club, active or inactive status of village level extension worker, visit of the middlemen in the village for procurement of paddy, distance of the village from the nearest market, existence of pucca road in the village, and existence of water ways in the village (table 5.3).

Variables included in these three dimensions have been arranged binarily using 1 for "yes" and 0 for "no". Using the formula following Ezzarari and Verme (2012), AMFI has been calculated:

$$AMFI = \frac{1}{K}\sum_{k=1}^{K}\sum_{j_k=1}^{J_K} W_{j_k}^{K}\, I_{j_k i}^{K}$$

$$W_{j_k}^{K} = \frac{S^{K}}{\sqrt{\lambda}}$$

Where

AMFI: Agricultural Marketing Facilities Index

k = number of dimensions with k = (1,2,.....,K)

j = number of modalities of each dimension with j = (1,2,.....,J_k)

I = binary (0/1) indicator of each modality

W = weight determined with MCA

i = index number indicating households.

S = factor score

$\boldsymbol{\lambda}$ = Eigenvalue

Using the statistical software STATA, we have derived the weights of the binary values. These weights are then multiplied with the binary numbers to get the weights of each modality. The weights of all the modalities are then added to get the weights of a particular dimension. Thus, three separate 409x1 matrix of weights have been calculated for the three dimensions for each of the sample households using Multiple

Correspondence Analysis (MCA) which is suitable for categorical variables . The simple arithmetic mean of these 3 dimensional indices (VOI, MTI and OFI) is then used to measure the Agricultural Marketing Facilities Index (AMFI) which is then used to find relationship with marketable surplus, marketed surplus, and capital accumulation respectively. As the detail of the use of MCA has already been discussed in chapter 1, we are not repeating the same here again.

Two attributes, viz, arithmetic mean and standard deviation, of the three dimensions as well as composite index (AMFI) are shown in table 5.4.

Table 5.4: Mean and Standard Deviation of the Dimensions and AMFI

Name of Index	AM	Std Dev
VOI	0.15	0.16
MTI	0.19	0.13
OFI	0.21	0.12
AMFI	0.19	0.09

Source: Calculation based on field data by the scholar

It might be noted that the variations in the dimensional indices has largely smoothened in the composite index which has been formed taking the simple arithmetic mean of the three dimensional indices.

5.2 Production and Marketable Surplus

Data on production of winter rice have been collected from the sample households. As the fertility of land varies from place to place and plot to plot even within the same village, attempts have been made to capture this dimension by way of averaging production per bigha from different types of cultivable plots under the ownership of a single household.

The data in table 5.5 provides a picture of production of winter rice in the sample villages. It might be noted that villages like Duliakhal Karaibari, Cleaver House,

Niznabin, Tikalpar and Boalipar Part-2 are in a better position as they produce more than average production of the sample villages. It is also important to note that the internal variations in production within a village are more in Niznabin, Duliakhal Karaibari and Cleaver House.

Table 5.5: Particulars of Production of Winter Rice in the Sample Villages during 2012-13

Sl No	Village	No of HH	Mean (in Quintals)	Std Dev	Skewness
1	Boalipar Part-1	26	66.85	31.01	0.37
2	Boalipar Part-2	29	69.41	36.43	0.38
3	Pangram Part -2	30	55.67	31.39	0.94
4	Tikalpar	28	73.39	33.09	0.52
5	Joypur Part-2	42	59.38	31.51	0.42
6	Kanakpur Part-1	34	58.91	39.15	1.15
7	Cleaver House TE	84	76.13	50.75	1.10
8	Barjalenga-7	45	57.67	38.29	1.44
9	Niznabin	47	75.79	68.20	1.91
10	Gopikanagar	12	59.17	32.39	0.66
11	Umarpur Part-1	12	61.75	39.34	1.45
12	Duliakhal Karaibari	20	90.95	48.69	1.13
Total Sample		409	67.89	44.66	1.60

Source: Calculation based on field data by the scholar

Marketable surplus of a household is derived from its level of production. It is generally defined as the residual left with the producer after meeting his requirements for family consumption including the payments to labour in kind and feed for cattle as well as farm needs for seeds (Acharya and Agarwal , 2011).

Marketable surplus can be written as

MS = P-C

Where MS = Marketable Surplus

P = Total Productions

C = Total Requirement or Family Consumption including the Payments to Labour in kind and feed for Cattle + Farm needs for Seeds

Table 5.6: Particulars of Marketable Surplus of Winter Rice in the Sample Villages, 2012-13

Sl No	Village	No. of HH	Mean (in Quintals)	Std Dev	Skewness
1	Boalipar Part-1	26	39.81	24..45	0.04
2	Boalipar Part-2	29	41.63	32.99	0.23
3	Pangram Part -2	30	26.96	27.72	0.59
4	Tikalpar	28	44.76	29.43	0.20
5	Joypur Part-2	42	31.14	26.21	0.30
6	Kanakpur Part-1	34	30.44	36.24	1.15
7	Cleaver House TE	84	47.64	45.09	1.00
8	Barjalenga-7	45	32.02	34.87	1.41
9	Niznabin	47	45.07	58.59	1.82
10	Gopikanagar	12	31.50	27.36	0.62
11	Umarpur Part-1	12	36.58	34.78	1.61
12	Duliakhal Karaibari	20	65.12	44.34	1.04
Total Sample		409	39.92	39.50	1.46

Source: Calculation based on field data by the scholar.

It might be noted that marketable surplus appears to be an increasing function of production. The villages like Duliakhal Karaibari, Cleaver House, Niznabin, Tikalpar

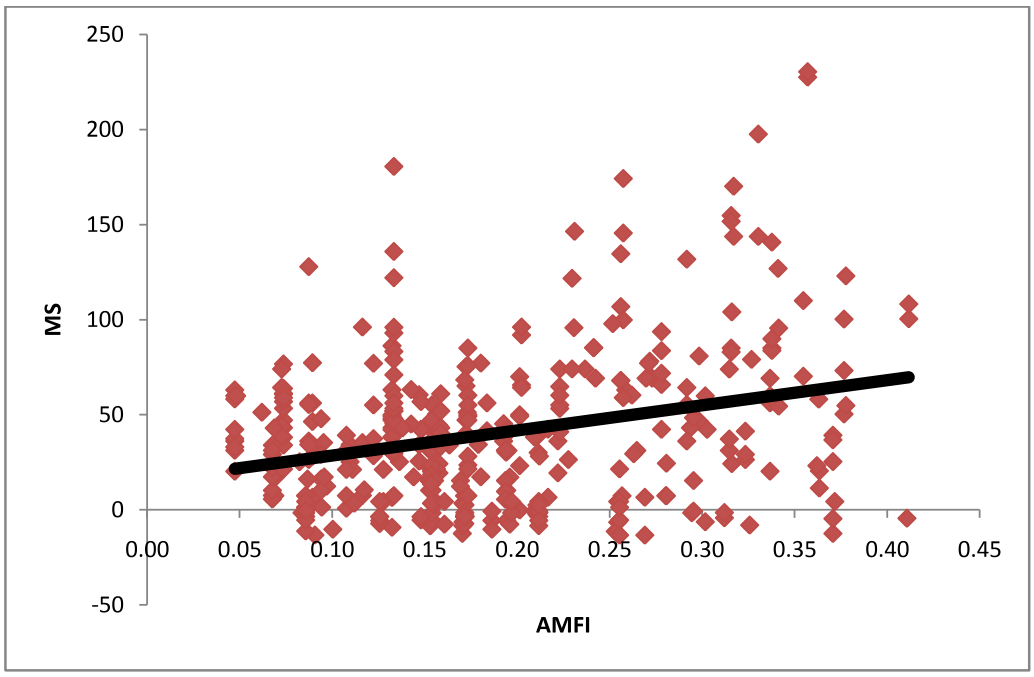
and Boalipar Part-2 having more than sample average of marketable surplus (table 5.6) are also having higher level of production (table 5.5).

5.2.1 Agricultural Marketing Facilities (AMFI) and Marketable Surplus (MS)

In order to test hypothesis 2, i.e, "Agricultural marketing facilities and generation of marketable surplus are positively correlated", using correlation analysis, we have established the nature of relationship between Agricultural Marketing Facilities Index (AMFI) and marketable surplus (MS). It might be observed that there exists a positive correlation (r=0.291) between these two variables as has been hypothesized. Our hypothesis is thus accepted at 1 percent level of significance. This implies out of every 100, in 99 cases the positive correlation between AMFI and MS would likely to hold good.

However, what is important to note is that the degree of association between AMFI and MS is not very high. We shall discuss the plausible reasons for this weak association between these two variables later.

Figure 5.1: Scatter Diagram showing the relationship between AMFI and MS



Note: **. Correlation is significant at the 0.01 level, correlation coefficient (r) =.291**
Source: Calculated by the researcher

As the correlation coefficient (r) does not show the magnitude of meaningful effect of AMFI on MS, we regress MS on AMFI in order to examine the impact of change in AMFI upon MS. Our regression equation is:

$$MS = \beta + \beta_1 AMFI + U_i$$

Table 5.7: Regression Results for Impact of Agricultural Marketing Facilities (AMFI) on Marketable Surplus (MS)

Dependent Variable: MS

Method: Least Squares

Variable	Coefficient	t-statistic
C	15.39	3.48***
AMFI	132.00	6.13***
N=409	R^2=0.08	F=37.60***

Note: *** indicates 1% level of significance

Source: Calculated by the researcher

It might be noted that although AMFI is statistically significant, and a unit change in AMFI is likely to affect 132 point change in MS, however, the predictive power of the model is poor as manifested from the low value of R^2 (0.085). The reason for low R^2 appears to lie with the fact that the coordinates of MS and AMFI are too scattered and hence a poor fit for the linear regression line. This observation may be verified by looking at the scatter diagram shown in Figure 5.1.

Thus, in sum, the hypothesis that "agricultural marketing facilities and generation of marketable surplus are positively correlated" holds good. However, the strength of the association is not proved to be strong enough. Low value of r (0.291) and R^2 (0.085) indicate a weak positive correlation between MS and AMFI.

A plausible explanation for this weak positive correlation lays in the fact that majority of the sample households have reported consumption as the main motive behind their cultivation of rice. After meeting the household consumption needs, whatever is left, they offer it for sale. Thus, the ground level experience suggests that rice cultivation is

more of a consumption-need-based-decision rather than market-guided-decision. Thus, the qualitative factual information corroborates our quantitative results.

As we can see the value of R^2 is very poor and stands at 0.08. It indicates that only 8 percent variation in the dependent variable that is marketable surplus is explained by our independent variable (AMFI). One of the reasons behind this weak association between dependent and independent variables may be that marketable surplus is affected not only by marketing facilities but also by other socio-economic factors. Since in the present study our goal is to examine the association between marketable surplus and AMFI, therefore other socio-economic factors have not been considered in our model.

5.3 Agricultural Marketing Facilities (AMFI) and Marketed Surplus (MTS)

As has already been pointed out, marketable surplus is the portion of farmer's produce which is left with him after deducting his consumption needs and seed requirements for the next harvesting season. However, marketable surplus par se does not guarantee that the same has been actually marketed by the farmer. In fact, farmers might sale more than the amount earmarked as marketable surplus. This often happens with the small and marginal farmers when they sell from the stock that they require to meet family consumption needs in order to meet their cash requirements. In such a case, what the farmer actually sells in the market, i.e., marketed surplus, becomes higher than his marketable surplus. Similarly, when a farmer sells exactly the amount that has been earmarked, marketed surplus becomes equal to the marketable surplus. Similarly, when a big farmer holds a part of his produce in a particular year in order to get the benefit of market opportunity and sells it much later, say next year, in such a case marketed surplus will be smaller than marketable surplus. Thus, marketed surplus is largely determined by the level of production and the marketable surplus (Sengupta, 2010).

It might be noted from the figures in table 5.8 that marketed surplus in our samples is higher than the marketable surplus which signifies that majority of the farmers sale a part of their stock required for household consumption. This holds good for all of our

sample villages, except Duliakhal Karaibari. As the villages are inhabited mostly by the marginal and small holders, who are subjected to perpetual poverty, selling a part of the of stock required for consumption is only expected.

Table 5.8: Production, Marketable Surplus and Marketed Surplus of Winter Rice in the Sample Villages during 2012-13

Sl No	Village	No of Households	Mean of Production (in Quintals)	Mean of Marketable Surplus (in Quintals)	Mean of Marketed Surplus (in Quintals)
1	Boalipar Part-1	26	66.85	39.81	43.62
2	Boalipar Part-2	29	69.41	41.63	48.03
3	Pangram Part -2	30	55.67	26.96	39.17
4	Tikalpar	28	73.39	44.76	50.00
5	Joypur Part-2	42	59.38	31.14	39.76
6	Kanakpur Part-1	34	58.91	30.44	37.38
7	Cleaver House TE	84	76.13	47.64	46.81
8	Barjalenga-7	45	57.67	32.02	36.15
9	Niznabin	47	75.79	45.07	45.32
10	Gopikanagar	12	59.17	31.50	41.33
11	Umarpur Part-1	12	61.75	36.58	41.83
12	Duliakhal Karaibari	20	90.95	65.12	56.90
Total Sample		409	67.89	39.92	43.67

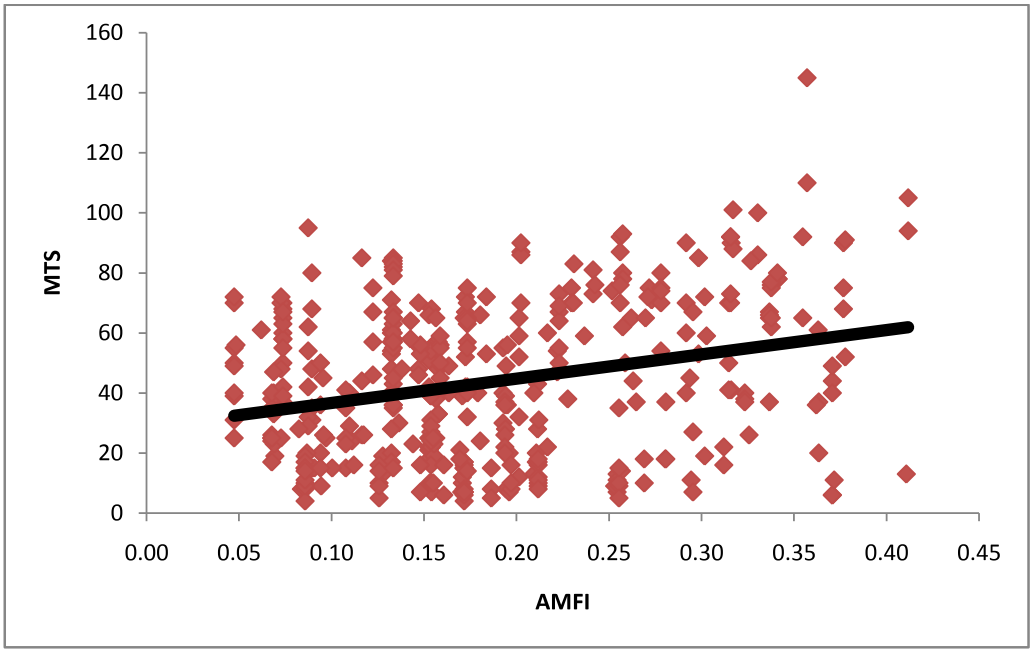
Source: Calculation based on field data by the scholar

In order to test hypothesis 3, i.e, “Agricultural marketing facilities and generation of marketed surplus are positively correlated", using correlation analysis, we have established the nature of relationship between Agricultural Marketing Facilities Index (AMFI) and marketed surplus (MTS).

It might be observed that there exists a positive correlation (r=0.271) between these two variables as has been hypothesized. Our hypothesis is accepted at 1 percent level of significance. This implies out of every 100, in 99 cases the positive correlation between AMFI and MTS would likely to hold good.

However, what is important to note is that the degree of association between AMFI and MTS is not very high.

Figure 5.2: Scatter Diagram showing the relationship between AMFI and MTS



Note: **. Correlation is significant at the 0.01 level, correlation coefficient (r) = .271**

Source: Calculated by the researcher

As the correlation coefficient (r) does not show the magnitude of meaningful effect of AMFI on MTS, we regress MTS on AMFI in order to examine the impact of change in AMFI upon MTS. Our regression equation is:

$$MTS = \beta + \beta_1 AMFI + U_i$$

Table 5.9 : Regression Results for Impact of Agricultural Marketing Facilities (AMFI) on Marketed Surplus (MTS)

Dependent Variable: MTS

Method: Least Squares

Variable	Coefficient	t-statistic
C	28.83	10.00***
AMFI	79.92	5.69***
N=409	R^2=0.07	F=32.35***

Note: *** indicates 1% level of significance Source: Calculated by the researcher

It might be noted that although AMFI is statistically significant, and a unit change in AMFI is likely to affect 79 point increase in MTS, however, the predictive power of the model is poor as manifested from the low value of R^2 (0.074). The reason for low R^2 appears to lie with the fact that the coordinates of MS and AMFI are too scattered and hence a poor fit for the linear regression line. This observation may be verified by looking at the scatter diagram shown in Figure 5.2.

Thus, in sum, the hypothesis that "agricultural marketing facilities and generation of marketed surplus are positively correlated" holds good. However, the strength of the association is not proved to be strong enough. Low value of r (0.271) and R^2 (0.074) indicate a weak positive correlation between MTS and AMFI. As has already been pointed out that rice cultivation is more of a consumption-need-based-decision rather than market-guided-decision, hence both marketable surplus and marketed surplus appear to be less influenced by marketing facilities.

Moreover, the low value of R^2 (0.074) indicates that only 7 percent variation in the dependent variable that is marketed surplus is explained by our independent variable (AMFI). One of the reasons behind this weak association between dependent and independent variables may be that marketed surplus is affected not only by marketing facilities but also by other socio-economic factors. Since in the present study our goal is to examine the association between marketed surplus and AMFI, therefore other socio-economic factors have not been considered in our model.

5.4 Agricultural Marketing Facilities (AMFI) and Capital Accumulation (CA)

Capital formation refers to creation of tangible assets for using in future production (Hooley, 1967). A broad definition of capital formation in agriculture includes agricultural implements and machinery, land and land improvements, laying of new orchards and plantations, irrigation and other constructions, livestock and also tree stock. However, the concept of capital formation in agricultural is generally used in much narrow sense that does not cover livestock, tree stock, and land. While capital formation refers to net addition of capital in a particular accounting period, capital accumulation refers to the "capital stock". There is a positive relationship between capital stock and productivity in agriculture. Low agricultural capital stock is found to have been associated with low labour productivity (FAO, 2001) and hence low agricultural growth.

In the present study we have considered two components of agricultural capital, viz., agricultural implements and machinery including irrigation machinery and livestock as per the practice followed by CSO in estimating household sector investment in agriculture (Bisaliah: 2010). We have collected information from the respondent households in the sample villages on these two components and multiplied their physical units by approximate price at which these are purchased. In case of old items for which the farmers could not specify their procurement price, we have told them to provide us with approximate price as they think they would fetch him if sold to others.

It might be noted from table 5.10 that villages like Kanakpur Part-1, Boalipar Part-1, Umarpur Part-1, Barjalenga-7, Boalipar Part-2 and Cleaver House have average capital stock less than the sample average. This is due to the preponderance of marginal and small holders in these villages (table 4.13). Similarly, villages like Duliakhal Karaibari, Pangram Part -2, Niznabin, and Tikalpar have average capital stock more than the sample average as they have more farmers having larger holding. Due to huge variation in data due to the fact that while the poor farmers lack in capital stock compared to their large counterparts, the standard deviations in them are more than their mean values.

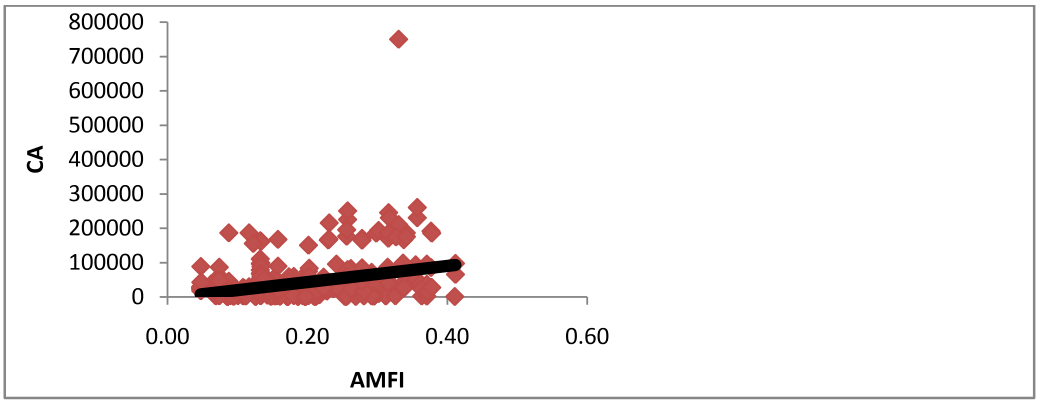
Table 5.10: Particulars of Capital Accumulation in the Sample Villages during 2012-13

Sl No	Village	No of HH	Mean	Std Dev	Skewness
1	Boalipar Part-1	26	25057.69	34481.10	4.25
2	Boalipar Part-2	29	34658.62	41355.66	2.24
3	Pangram Part -2	30	50816.67	60402.38	2.01
4	Tikalpar	28	49110.71	60983.86	1.74
5	Joypur Part-2	42	44726.19	47349.66	1.58
6	Kanakpur Part-1	34	23952.94	34738.76	3.33
7	Cleaver House TE	84	37215.48	46395.11	2.37
8	Barjalenga-7	45	31722.22	45867.34	2.97
9	Niznabin	47	50500.00	120794.41	4.65
10	Gopikanagar	12	40125.00	58959.97	1.96
11	Umarpur Part-1	12	27875.00	47591.12	3.14
12	Duliakhal Karaibari	20	60075.00	67732.89	1.81
Total Sample		409	39593.40	61619.38	5.02

Source: calculation based on field data by the scholar.

In order to test hypothesis 4, we have examined the nature of association between Agricultural Marketing Facilities Index (AMFI) and capital accumulation (CA). It might be observed that there exists a positive correlation (r=0.334) between these two variables as has been hypothesized. Our hypothesis that "agricultural marketing facilities and accumulation of capital in agriculture are positively correlated" is accepted at 1 percent level of significance. This implies out of every 100, in 99 cases the positive correlation between AMFI and CA would likely to hold good. However, what is important to note is that the degree of association between AMFI and CA is not very high.

Figure 5.3: Scatter Diagram showing the relationship between AMFI and CA



Note:· **. Correlation is significant at the 0.01 level, correlation coefficient (r) = 0.334**

Source: Calculated by the researcher

As the correlation coefficient (r) does not show the magnitude of meaningful effect of AMFI on CA, we regress CA on AMFI in order to examine the impact of change in AMFI upon CA. Our regression equation is:

$$CA = \beta + \beta_1 AMFI + \cup_i$$

Table 5.11: Regression Results for Impact of Agricultural Marketing Facilities (AMFI) on Capital Accumulation (CA)

Variable	Coefficient	t-statistic
C	-4314.223	-0.635419
AMFI	236230.2	7.138965***
N=409	R^2=0.11	F=50.96***

Note: *** indicates 1% level of significance, Source: Calculated by the researcher
Source: Calculated by the researcher

It might be noted that although AMFI is statistically significant, however, the predictive power of the model is poor as manifested from the low value of R^2 (0.11) (table 5.14). The reason for low R^2 appears to lie with the fact that the coordinates of CA and AMFI are too scattered and hence a poor fit for the linear regression line. This observation may be verified by looking at the scatter diagram shown in Figure

5.3. Thus, in sum, the hypothesis that "agricultural marketing facilities and accumulation of capital in agriculture are positively correlated" holds good. However, the strength of the association is not proved to be strong enough. Low value of r (0.334) and R^2 (0.11) indicate a weak positive correlation between CA and AMFI.

It might be noted that as the majority of the sample households belong to class of marginal and small holder who basically cultivate rice primarily for family consumption, not much of investment and capital accumulation in terms of ownership of agricultural implements have been noted. However, a section of the households having larger holding size have found to have made higher investment leading to greater accumulation of capital. This has made the distribution of capital accumulation skewed leading to larger variation in the scatter plot.

As we can see the value of $R^{2\ is}$ very poor and stands at0.11. It indicates that only 11 percent variation in the dependent variable that is capital accumulation is explained by our independent variable (AMFI). One of the reasons behind this weak association between dependent and independent variables may be that accumulation of capital is affected not only by marketing facilities but also by other socio-economic factors. Since in the present study our goal is to examine the association between accumulation of capital and AMFI, therefore other socio-economic factors have not been considered in our model.

5.5. Agriculture Marketing and Agricultural Growth

There are multiple drivers of agricultural growth including the elements that add to the fertility of land like fertilizers, elements that protects the plants from diseases and decay like pesticides and insecticides, genetically engineered high yielding variety seeds, irrigational facilities, rural infrastructural facilities, availability and use of power, etc. (Bhatia, 1999). However, unlike these factors, which impact on the level of agricultural production and productivity, agricultural marketing also plays an important role towards the enhancement of agricultural growth via agricultural income. It might be noted that higher productivity may not automatically lead to higher level of income unless produces are sold in the market. It is a common knowledge that farmers have to face market glut for certain horticultural produces like

potato, tomato, etc and are forced either to sale their produces at a price lower than its cost or are forced to destroy the crop on the field itself as the market price does not warrant them to be plucked from the field. In such cases, failure of marketing discourages the farmer to increase their level of production in the next season. Agricultural marketing consists of two broad elements, viz., physical marketing facilities and price. While the price is determined by the forces of demand and supply, the operation of the forces of market can, to a large extent, be influenced by the existence or absence of the physical marketing facilities.

In order to examine as to whether "agricultural marketing is a major determinant of agricultural growth" (hypothesis 5), we have taken agricultural production as a proxy for agricultural growth and agricultural marketing facility index as proxy for agricultural marketing. Although time series data for agricultural production and agricultural marketing would have been the most suitable for the establishment of such causality, however, in the absence of availability of data on agricultural marketing, we intend to make a conjecture based on cross-section data that have been collected through field visit. As 88 percent of the cultivable area in Barak Valley is under rice cultivation and most of the farmers practice mono-cropping by way of cultivating winter rice, the volume of winter rice production plays a significant role in determining the level of annual income in the rural areas of Barak Valley. In fact, none of the sample households reported to have been cultivated autumn rice and boro rice during 2012-13 while field study has been conducted.

The level of income of the sample households is directly linked with the agricultural growth. Higher level of income enables the farmers to invest a part which will go for capital formation in agriculture by way of addition of new agricultural equipments or machineries or new livestock or new plantation or new procurement of land or improvement of existing land which will in turn help in enhancing agricultural growth. Thus, although level of production apparently has little to do with agricultural growth, however, considering its indirect impact via the level of income on the process of agricultural growth, we have used agricultural production as a proxy to agricultural growth.

We have regressed total production of paddy in quintals (winter rice) (TPPQ) on family size (FS), land holding size (HS), average price per quintal of paddy (APPQP)

and AMFI. A summary of the construction of agricultural marketing facilities (AMFI) and production of winter rice by the sample households in the sample villages have already been given in sections 5.1 and 5.2. The summary of family size (FS) and holding size (HS) are shown in table 5.12 and 5.13.

Table 5.12: Particulars of Family Size of the Sample Households

Sl No	Village	No of HH	Mean	Std Dev	Skewness
1	Boalipar Part-1	26	5.46	2.04	1.20
2	Boalipar Part-2	29	5.62	1.21	0.28
3	Pangram Part -2	30	5.6	1.43	1.08
4	Tikalpar	28	5.75	1.62	0.94
5	Joypur Part-2	42	5.69	1.80	1.09
6	Kanakpur Part-1	34	5.76	1.60	0.17
7	Cleaver House TE	84	5.74	1.87	1.25
8	Barjalenga-7	45	5.18	1.56	0.18
9	Niznabin	47	6.19	2.40	1.27
10	Gopikanagar	12	5.58	1.44	0.24
11	Umarpur Part-1	12	5.08	1.16	-0.19
12	Duliakhal Karaibari	20	5.15	1.31	0.48
Total Sample		409	5.64	1.76	1.14

Source: Researcher's calculation based on field data

It might be noted that except Niznabin village, the average family size of the sample households in the sample villages ranges between 5 and 6 (table 5.12). This shows some sort of uniformity in the population structure in the villages of Barak Valley. Further, the mean family sizes in the villages are associated with lower values of standard deviation indicating stable population structure within the villages. The measure of skewness for each village indicates that in most cases the variation in family size is more than the mean value.

Table 5.13: Particulars of Holding Size of the Sample Households

Sl No	Village	No of HH	Mean in (Bigha)	Std Dev	Skewness
1	Boalipar Part-1	26	7.77	3.60	0.30
2	Boalipar Part-2	29	7.17	3.60	0.33
3	Pangram Part -2	30	7.50	4.43	1.23
4	Tikalpar	28	10.79	5.18	0.85
5	Joypur Part-2	42	9.14	4.97	0.62
6	Kanakpur Part-1	34	6.97	4.64	1.20
7	Cleaver House TE	84	9.38	6.04	1.07
8	Barjalenga-7	45	7.51	5.01	1.68
9	Niznabin	47	9.79	8.82	2.12
10	Gopikanagar	12	8.17	4.55	0.89
11	Umarpur Part-1	12	7.25	4.37	1.20
12	Duliakhal Karaibari	20	12.85	6.88	1.11
	Total Sample	409	8.77	5.78	1.70

Source: Calculation based on field data by the scholar.

It might be noted that noted that mean holding size in villages like Duliakhal Karaibari, Tikalpar, Niznabin and Joypur Part-2 is higher than the same for the whole sample (table 5.13). It has been observed that Niznabin, Cleaver House and Tikalpar have tea plantations because of which the average holding size has become large in them. For the same reason, these villages have registered higher standard deviation compared to others. For examining the impact of agricultural marketing on agricultural growth, we have used the following equation for regression. In order to avoid heteroscedasticity problem that might arise due to the large variations in the data series of the variables, we have used log-log regression analysis with the following equation:

In (TPPQ) = $\beta_0 + \beta_1$ In (FS) + β_2 In (HS) + β_3 In (APPQP) + β_4 In (AMFI) + U

Where

TPPQ = Total Production of Paddy in Quintals (Winter Rice)

FS = Family Size

HS = Land Holding Size

APPQP = Average Price Per Quintal of Paddy

AMFI = Agricultural Marketing Facility Index

The result of the regression is given in table 5.14.

Table 5.14: Regression Results for Impact on Total Production of Paddy in Quintals (TPPQ)

Dependent Variable: LOG(TPPQ)

Method: Least Squares

Sample: 409

Included observations: 409

Variable	Coefficient	t-statistic	Standardized Coefficient
C	3.514	7.104***	
FS	-0.003	-0.105	-0.001
HS	0.982	81.973***	0.971
APPQP	-0.203	-2.860***	-0.031
AMFI	0.033	2.025**	0.025
N=409	Adjusted R-squared=0.951	F=2001.571***	

Note:* *5 percent level of significance,*** 1 percent level of significance
Source: Calculated by the researcher

It might be noted that AMFI has some positive impact on the level of production. A 1 percent change in AMFI leads to 0.03 percent change in production. However, as this result holds good at 5 percent level of significance, the statistical reliability is

moderate. Out of every 100 cases, the prediction would hold good in 95 cases leaving a margin of error to the tune of 5 percent. Besides AMFI, land holding size also influences the level of production. One percent change in the holding size is likely to affect 0.98 percent change in production. However, it is important to note that the result relating to the impact of holding size on production of winter rice holds good at 1 percent level of significance indicating the fact that out of every 100 cases, this result is likely to occur in 99 cases. Hence, the impact of holding size on the production is more certain than the impact of AMFI. As the adjusted R-squared is 0.95, the model is robust having high predictive power. But unlike the impact of holding size on production of winter rice, which is direct and instantly visible, the impact mechanism in case of AMFI is not directly comprehensible. AMFI affects the level of production in a roundabout way. Well developed rural connectivity and availability of transport facilities reduce the cost and hazards of agricultural marketing. Lesser transport cost increases the margin of profitability of the farmers leading to higher income which will in turn help in enhancing agricultural growth.

The price component of agricultural marketing also plays some role in influencing production decisions of the farmers. Although, the price (APPQP) is found to be statistically significant (table 5.14), but its coefficient is found to be negative in our model which usually does not corroborate with the basic theoretical framework of market economy which suggests that the suppliers would supply more in the market with the rise in price and less when price declines indicating a direct relationship between price and quantity supplied of a commodity instead of inverse relationship that our model suggests to hold good. However, a plausible explanation of this negative coefficient of price which indicates that a unit increase in price would result into a decline of 0.20 point in production might be sought in the price-output decision making behaviour in agriculture which suggests that the current year production decision is being guided by the price information of the previous year. In that case, the model has its own limitation as it has regressed current level of output on current price. Apart from this, another plausible explanation lies in the behavioural attitude of the farmers. As has already been mentioned that farmers in Barak Valley primarily produce rice for family consumption and the surplus, which is the by-product, is brought to market for earning cash which is needed to buy other requirements. In such circumstances, production decisions of the farmers might have been guided by the

family requirement of rice and lump sum cash requirement. If the production decisions of the farmers are guided by some targeted fixed-income-level, then like work and leisure trade off hypothesis (Lin, 2003), when price is higher farmers would produce less and vice versa that explains the negative coefficient of price in our model.

Thus, in the light of the result of the log-log regression as presented in the table 5.14, our hypothesis, "Agriculture marketing is a major determinant of agricultural growth", gets rejected as the value of the coefficient of HS is higher than the value of coefficient of AMFI which suggests that the HS is the major determinant of agricultural growth rather than AMFI in spite of the fact that AMFI plays a positive role in determining agricultural growth.

5.6. Conclusion

Farmers of Barak Valley practice traditional agriculture. The pace of change in the art of cultivation is very slow. The principal motive for cultivation is household consumption. Food security at the household level is the main driver of cultivation. Commercialization of agriculture, in the true sense of the term, has not yet caught the imagination of the farmers of Barak Valley. Agricultural marketing facilities are extremely poor. As a result, a weak causality has been noticed between agricultural marketing facilities and generation of marketable surplus as well as marketed surplus. The same is also found between agricultural marketing facilities and capital accumulation in agriculture. Although agricultural marketing is supposed to play a significant role in enhancing agricultural growth, in case of Barak Valley, albeit it plays a positive role in agricultural growth measured using agricultural production as a proxy, however, it is not the major determinant of agricultural growth.

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