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RICE MARKETS IN BANGLADESH: A STUDY IN STRUCTURE, CONDUCT AND PERFORMANCE

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TABLE OF CONTENTS

		Page#
I.	EXECUTIVE SUMMARY	(i - xx)
II	INTRODUCTION	1
II. 1	The Role of Rice in the Economy of Bangladesh	1
II. 2	Rice as a Productive Sector	1
II. 3	Defination of a Homogeneous Product	8
II. 4	What is meant by Marketing	9
II. 5	The Stages in Marketing of a Farm Commodity: the Case of rice in Bangladesh	10
II. 6	Transmittal of Price Signals	14
II. 7	The Issues in Rice Marketing	15
II. 8	The importance of Structure as a Determinant of Conduct	16
II. 9	The Cost of Performing Marketing Service	17
II.10	The Marketed Surplus Ratio, and the Size of the Market	17
II.11	Efficiency in Markets Conduct	18
II.12	Objective of the Report	18
III.	A REVIEW OF THE LITERATURE	19
III. 1	How to Study Spatial Market Integration	28
III. 2	Price Expectation Results	30
III. 3	Results about Competitiveness of Markets	31
III. 4	Summing the Literature Up	35
IV.	STRUCTURE OF THE RICE MARKET	38
IV. 1	The Commodities	38
IV. 2	Paddy processing technologies in Bangladesh	39
IV. 3	The Production of byproducts	41
IV. 4	Seasons and the Structure of Markets	41
IV. 5	Grades, Strandards, Weights	43
IV. 6	Role of Traders and Processors in Rice Market: A Classification	46
IV. 7	Aratdars, Wholesalers and Dalals	48
IV. 8	The Clissification of primary and Secondary Levels	51
IV. 9	Storage and Transportation	53
IV.10	Economic Structure of Rice Markets	61
IV.11	Supply of Paddy in Bangladesh	61
IV.12	The Extent of Commercialization	64
IV.13	The Marketing Effort in Bangladesh Rice Economy: A long view	64
IV.14	The Geography of Paddy Marketing: A District Level View	66
IV.15	Spatial Pattern of Farmer Paddy Marketing, 1989/90	71

(Contd.overpage)

IV.16 A Disaggregate Look at Spatial Pattern of Marketing....74
IV.17 Pattern of Spatial Marketing and Prices 76
IV.18 The Structure of Rice Markets: the Number of Establishments 78
IV.19 Size Distribution of Establishment 85
IV.20 Competition, Ease of entry and the Achievement of Mobility 90
IV.21 Market Channels for Rice 95

Appendix-1 to chapter IV

IV.22 Salient Features of the IFPRI Farm Survey Sample 104
IV.23 Representativeness of the Sample in Farm-technology terms 112

Appendix-2 to chapter IV

IV.24 Salient Features of IFPRI Market Survey, 1989/90....116
IV.25 Structure of Paddy Purchase Operation 116
IV.26 Seasonality of Paddy Purchase 121
IV.27 Seasonality of Paddy Prices on the Sample 122
IV.28 The Degree of Competition in the paddy Market ..124
IV.29 Marketing Channels for Rice Salers 129
IV.30 Seasonality in the Mean Scale of Rice Turnover, 1989/90 131
IV.31 Seasonal Veriability in Rice Prices 134

V. CAPITAL AND INFORMATION IN RICE MARKETS

V. 1 Access to Capital, and Role of Capital at Various Levels of Trade 136
V. 2 The Base of Establishment Size-correlated Capital Cost Differences 136
V. 3 Capitalization Levels in Rice Trade 137
V. 4 Fixed Capital Requirements of Paddy Processors..140
V. 5 Access to Capital 145
V. 6 Realities of the Access to Operating Capital in Rice Markets in Bangladesh 145
V. 7 The Extent of Dhaner Upore Credit Contracts 149
V. 8 Access to Bank and other Informal credit 151
V. 9 Some Insights into the Rice Traders' Access to Operating Capital 153
V.10 The Pattern of Disbursements of Trade Credit in the Rice Market 155
V.11 Mechanism of Market Information 161
V.12 The Information Context of Input Purchase and Output Sale 165
V.13 The Range of Option During Buying and selling...171
V.14 Vertical Mobility in Rice Market 173

(Contd.overpage)

b

VI. MARKETING COST OF RICE

VI. 1 Cost of Collection 178
VI. 2 Cost of Collection Differentials Among District Types 179
VI. 3 Structure of Collection 179
VI. 4 Mean Radius of Paddy Market Area 184
VI. 5 Explaining Average Collection Cost 184
VI. 6 Cost of Processing 189
VI. 7 Processing Cost 189
VI. 8 Relative Milling Outturn by Milling Technology..190
VI. 9 Fixed and Variable Costs in Processing 191
VI.10 Determinants of Average Processing Costs 193
VI.11 Spatial Distribution Costs 196
VI.12 The Choice of the Transport Medium 197
VI.13 Explaining Unit Transport Costs in Rice Marketing.....201
VI.14 Directionality of Rice Movement 203
VI.15 Pattern of Specialization 204
VI.16 The Rail and Road System of Transporting Rice in Bangladesh 206
VI.17 State of Competetion between Rail, Road and Water Transport 208
VI.18 Level and Determinants of Private Rice Stocks...211
VI.19 A Survey of the Literature 212
VI.20 The Data and Methodology 213
VI.21 Private Rice Stocks: Level and Composition 217
VI.22 Seasonality and Composition of Private Rice Stocks and Public Stocks 221
VI.23 Rice Market Performance in 1968 and 1990: a Rough Comparison 223
VI.24 Rice Balance Among Farm Size Classes 226
VI.25 Ownership of Rice Stocks by Farm Size Classes...228
VI.26 Agricultural Policy Reforms and Rice Stocks 231
VI.27 The Determinants of Private Rice Stocks 234

Appendix-1 to chapter VI 238

VI.28 A Model of Determination of Private Farm Stocks in Bangladesh 238
VI.29 Objective of this Exercise 239
VI.30 The Analytical Framework 239
VI.31 Estimation and Results 246

Appendix - 2 to Chapter VI 258

VII. PRICE FORMATION AND MARKET INTEGRATION

VII. 1 Marketing Margins for Milled Coarse Rice 265
VII. 2 Some Definitions/Analytical Issues 267
VII. 3 Unidirectionality of Grain Flow 267
VII. 4 Measurement of Key Variables 269
VII. 5 Market Seasons Defined.....270

(Contd.overpage)

VII. 6 Estimation of Market Margins 270
VII. 7 Instantaneous Margins for Milled Coarse Rice ...270
VII. 8 Temporal-cum-spatial Margins : What is a Storage Period? 272
VII. 9 Quantitative Estimate of Storage Period 275
VII.10 Components of Storage cost 275
VII.11 Results and Discussion 278
VII.12 Temporal Marketing Margin 282
VII.13 Market Margin as a Proportion of Retail Price 283
VII.14 Price Relations among Grades of Rice 287
VII.15 Real Wholesale Prices of Rice by Variety, 1976 - 1980 290
VII.16 Seasonal Variability of Rice Prices 293
VII.17 Testing of Market Integration 297
VII.18 Test of Normal/Abnormal Profit at Wholesale level.....306

REFERENCES.....321

APPENDIX ON FARM AND MARKET SURVEY METHODOLOGY 328

LIST OF TABLES

Table #	Title	Page #
1.	Rice setcor in Bangladesh's national accounts, 1985/86 - 1988/89	2
2.	Employment generation by Bangladesh's rice economy, 1989/90	3
3.	Rural household income and its composition, 1989/90	5
4.	Role of rice as a wage good, 1988/89	6
5.	Rice as a source of calorie	7
6.	The Production of byproducts per md. of paddy by milling technologies, by season, 1989/90	42
7.	Unit price of byproducts, 1989/90	43
8.	Seasonality and variations in humidity, temparature and rainfall	45
9.	Farmers' realized prices as % of prices paid by traders/processors	46
10.	Number of establishments on the IFPRI Market Survey sample, 1990	52
11.	Profile of market agents in the paddy market, Bangladesh, 1989/90	55
12.	Personal and economic antecedents of market agents in the rice market, Bangladesh, 1989/90	56
13.	The density of market contacts, by progressive and other districts, 1990	57
14.	Rice and Wheat production, Bangladesh, 1975/76-1990/91	62
15.	Trend deviations for rice production, Bangladesh, 1975-1991	63
16.	Growing farm technological change and commercialization in Bangladesh's rice economy, 1979-1990	65
17.	Geography of the rice economy in the sample households	69
18.	Production and marketing of paddy, a geographical overview, 1989/90	70
19.	Home and primary market sales by farmers, Bangladesh, 1989/90	75
20.	Spatial pattern of paddy marketing by grain varieties, types of districts, and by farm size classes	79
21.	Percentage of sales at home by season by districts and by farm size classes in Bangladesh, 1989/90	82
22.	Number of rice mills and rice output, Bangladesh 1968-1988	86
23.	Size distribution of establishments, 1986, BSIC code 3119 and all other BSIC categories under 31	88
24.	Size distribution of grain traders, Bangladesh, 1986	89
25.	Size distribution of rice mills on IFPRI sample of establishments	90
26.	Conditions of access to rice markets, 1989/90	94
27.	Proportions of sales of paddy by paddy traders, 1989/90	96
28.	Disposal of paddy surplus marketed by the farmers	97

(Contd. overpage)

e

29. Distribution of rice output, privately-marketed and in the aggregate, Bangladesh rice industry, 1989/90 101
30. Market channels of rice, Bangladesh, 1989/90 102

Appendix - 1 to chapter IV

1. Production and marketing regimes in progressive and nonprogressive districts, 1989/90, aman season 106
2. Production and marketing regimes in surplus and deficit districts, 1989/90, boro season 107
3. Percentage share of different farm size classes in progressive and nonprogressive districts in the paddy market, 1989/90, aman season 109
4. Percentage share of different farm size classes in progressive and nonprogressive districts in the paddy market, 1989/90, boro season 110
5. Production and marketing regime in progressive and nonprogressive district on the sample, 1989/90 aman season.....111
6. Production and marketing regime in progressive and nonprogressive district on the sample, 1989/90 boro season.....112
7. Representativeness of IFPRI sample using technological indexes.....114
8. Salient results comparing IFPRI and BIDS surveys.....115

Appendix - 2 to chapter IV

A2.1 Structure of paddy purchase at primary and secondary levels of the paddy market 117
A2.2 Seasonality of paddy purchase at various levels of the paddy market, Bangladesh 125
A2.3 Seasonality of paddy price at various levels of the paddy market, Bangladesh, 1989/90 126
A2.4 The degree of concentration in the quantity of paddy purchase.....127
A2.5 Structure of rice sale at various levels in the rice market, 1989/90 128
A2.6 Pattern of rice sales by paddy processors, 1989/90 132
A2.7 Seasonality of rice sale at various levels of the rice market, Bangladesh 133
A2.8 Seasonality of rice price at various levels of the rice market, Bangladesh 135

31. Standard layout of a 2 THP automatic rice mill in North-west of Bangladesh 141
32. Replacement cost of capital, and the degree of mechanization.....142
33. The extent and character of *dhaner upore* contracts, 1989/90.....149
34. Access to institutional and other noninstitutional credit.151

(Contd. overpage)

35. Receipt of credit or dadan per establishment by source, 1989/90 154
36. Structure of credit or dadan receipt by source, 1989/90 .. 155
37. The structure of the disbursements of trade credit by source and by recipients, Bangladesh rice market, 1989/90 157
38. Disbursements *and receipt* of trade credit, by source and by recipients, 1989/90 158
39. Disbursements and receipt of trade credit, by categories of market agents, 1989/90 160
40. Mean variability of prices by season in 1989/90 in rice market, Bangladesh 163
41. Mean and coefficient of variation of coarse paddy prices by markets and seasons, 1989/90 166
42. Mean and coefficient of variation of noncoarse paddy prices by markets and seasons, 1989/90 168
43. Methods of purchase and sales, rice market, 1989/90 171
44. Incidence of marketing among farmers, 1990 172
45. Per capita income from rice trading/milling, 1989/90 175
46. Vertical economic mobility among rice market agents, Bangladesh, 1989/90 176
47. Vertical economic mobility among rice market agents, Bangladesh, 1989/90 177
48. Structure of collection cost of paddy 181
49. Unit cost of collecting paddy by season, 1989/90 182
50. Level and structure of paddy collection cost, Bangladesh rice market, 1982/83 183
51. Mean radius of market area for paddy collection, 1989/90 . 183
52. Choice of paddy transport medium, 1989/90 184
53. Explaining unit cost in transporting paddy, Bangladesh rice market, 1989/90 187
54. Weighted average mill outturn ratios by technologies, 1989/90 190
55. Fixed, variable and total cost per unit output, by season, 1989/90 192
56. Comparative labor productivity by mill technologies, 1989/90 193
57. Explaining log of average process cost of paddy, Bangladesh rice market, 1989/90 195
58. Pattern of disposal of rice output by rice millers 198
59. Level and structure of selling cost of rice, 1989/90 200
60. Mean rice shipment distance, 1989/90 201
61. Choice of transport medium by rice traders/millers, 1989/90 201
62. Explaining unit transport costs in marketing rice, 1989/90 203
63. Net "Exports" of rice into major deficit regions, 1989/90 205
64. Movement of goods by means of transportation 209
65. Tonnage of rice and paddy carried by Bangladesh railway, 1969/70, 1988/89, 1989/90 210
66. Comparative structure of rial freight, base rate, 1985-1992 211

(Contd. overpage)

67. Rice production, marketing and private rice stocks during year through November 1990 219
68. End-of-period in rice stocks in Bangladesh economy, the year through Nov. 1989/90 221
69. Per capita rice balance of farm economy, Bangladesh, 1989/90.....228
70. Distribution of private farm stocks by farm size classes, 1989/90.....231
71. Farm stocks as multiplies of monthly rice consumption, 1989/90.....233
72. Fertilizer-rice price ratios in Bangladesh, 1982/83-1989/90.....233

Appendix-1 to chapter VI

A6.1 Fixed and variable costs by seasons, 1989/90 249
A6.2 Routewise private movement of rice by season, 1989/90 250
A6.3 Determination of market price farm rice stock and public rice procurement, 1990 252
A6.4 Determination of market price, trade stock and public procurement, 1990 254
A6.5 Determination of market price, combined private stock and public rice procurement, 1990 255
A6.6 Theil Inequality Coefficients for endogenous variables from historical simulations using preffered model versions 256
A6.7 Robustness of the regression coefficients of the model ...257

Appendix-2 to chapter VI

A6.8 Joint determination of rice consumption, market supply, stocks and labor demand, 1990, using SURE 263
A6.9 Mean value of the variables in the model 264
73. Alternative estimates of marketing margins for coarse rice, SR and non SR areas, 1989/90 271
74. Seasonality factors in coarse rice price, Bangladesh, 1973-1990 274
75. Seasonal increase in price realized as % of expected price under alternative storage periods, major assembly markets.280
76. Seasonal increase in price realized as % of expected price under alternative storage periods, major assembly markets.281
77. Market margins using prices from market survey 286
78. Proportion of coarse and noncoarse variety in total rice output 287
79. Time trend in the relative price of fine to coarse rice, various markets in Bangladesh, 1975/76-1989/90 289
80. Time trend in the relative price of medium to coarse rice, various markets in Bangladesh, 1975/76-1989/90 290
81. Real rice price in Bangladesh economy, 1976-1990 292
82. Pattern of seasonal lows and highs, by rice varieties, 1980-1989 295
83. Seasonal fluctuation in rice prices variety, 1980-1989 ...296
84. Results of a test for segmentation of markets, using the error sum of squares, 1985/86-1990/91 303
(Contd. overpage)

h

85. Results of a test for short-run integration of markets, using the index of market connection, 1985/86-1990/91 305
86. Rate of net profit at wholesale and retail level in Bangladesh's rice market, 1989/90 311
A7.1 Farmgate price for coarse paddy, Dec. 1989 - Nov. 1990 316
A7.2 Retail price for coarse milled rice, Dec. 1989 - Nov. 1990 317
A7.3 Marketing margins for individual markets in non-SR areas by season 318
A7.4 Net profit and capital employed at various levels of Bangladesh's rice trade, year through November 1990 319

LIST OF FIGURES

Figure #		Page#
Fig. 1	Percentage deviation from rice output trend	63a
Fig. 2	Market channels of Bangladeshi rice, 1989/90	103
Fig. 3	Allocation of private domestic rice availability year through November 1990	220
Fig. 4	Level and seasonality of private rice stocks, the year through November 1990	220
Fig. 5	Private and public stocks relative to corresponding consumption needs	222
Fig. 6	Composition of farm rice stocks between poor and other farmers, 1990	225
Fig. 7	Farm stocks as multiple of farm level consumption needs, 1990	235

I. EXECUTIVE SUMMARY

The Importance of Rice in Bangladesh Economy

(i) For Bangladesh, where 40% of gross domestic product (GDP) still come from agriculture, the rice economy contributes one half of agricultural product. Combined income from the production, trade and transportation of rice amounts to about 27% of Bangladesh's GDP. This study is about rice markets, a fundamentally important part of Bangladesh economy.

(ii) The growth of the agricultural crop sector since the mid-1970s has mostly been contributed by rice and wheat. Much of the added rice output has been on account of high-yield-variety (HYV) boro. The associated diffusion of dry-season irrigation by stimulating the relative profitability of rice, has led to drops in acreage and output of pulses and oilseed, both cash crops.

(iii) Most people live in rural areas, where production is the single most important determinant of the consumption of cereals. For the economy as a whole, 26% of household expenditures are spent on rice: however, the poorest 40% of households in both rural and urban Bangladesh spend 38% and 32%, respectively, on rice. Therefore, real rice prices are a major determinant of real incomes of poor and rice-deficit households.

Why is Marketing Important?

(iv) Marketing is a service: if it is performed not at all or well, the result will be producers saddled with surplus produce with no place to go, and hungry consumers with frustrated Takas in their hold. To market well is to link up myriad producers and an equally numerous consumers such that

the latter can get at a realistic price the desired quantities of a commodity in the form and at the place and time of their choice. Efficient marketing is extremely important for an economy, via. its setting of prices, which, in the end, allocates resources over agents, time and space: keen prices all around are the motherlode of sustained economic growth. Hence markets and marketing supremely matter.

Key Issue in Rice Marketing

(v) Marketing raises some issues of measurement. These are (a) how do establishments in the market price their produce?; (b) what are the costs, risks and returns to marketing, and what determines them ?; (c) what is the size of the marketed surplus ?; (d) Are there restrictions upon entry and are rates of returns "excessive"? These issues have been addressed, not always satisfactorily, in the literature on Bangladesh's rice markets. The salient strands of this have been summarized towards the end of ch. III below.

The Structure of Rice Markets

(vi) Rice markets are a mirror image of paddy markets. Hence one must start with the structure of latter. In the study year, just under half of paddy output of Bangladesh was marketed (Table 16). Considering that output during the study year was a historic high (Table 14), this represents an impressive feat in the degree of commercialization. Twenty years ago, no more than 15% of output was marketed (ch. III). The size of rice market has thus grown rapidly (p. 65). But so has the diffusion of technical change in rice production (Table 16). Technological change and commercialization have positively interacted.

(vii) All evidence suggests that commercialization has embraced, albeit to varying degrees, all classes of farms, not just the large or medium (pp. 107-8; Table 69). Even functionally landless farms, owning upto only 0.49 acres of land, market one-fourth of their output in the study year, while small farms, with between 0.5 and 2.49 acres of land, market 41% of output (p. 228). Even though these farms on average have to buy back some rice, all classes, even the functionally landless, register positive net marketed surpluses (i.e. gross surplus net of market purchase). These are economy-wide estimates, derived from an adequate blow-up exercise (p. 218). Paddy markets are therefore thick, dense and broad.

(viii) Markets tend to perform efficiently when all market agents price their services keenly or, in the jargon of economics, competitively. The odds for this to happen are large when, for a storeable commodity, there is a large number of both buyers and sellers, each of the participants in both categories with a rough equality in the *inter se* balance of information, access to capital, and other less-tangible forms of market power. Dry paddy and, to a lesser degree, milled rice are storeable grains. Though not strongly homogeneous, rice's heterogeneity is not such as to render the concept of "average price" for coarse rice, say, an useless concept. That means, it is acceptable to use average price data to mount a study of competitiveness.

(ix) Paddy sellers are really a very large group: in the year through November 1990 --- which is the study period in this report --- close to 9 million farmers had some surpluses to sell. The number of agents, of various categories, who transact in paddy and rice while linking the farmers with the consumers is estimated at about 0.19 million in the study year. Virtually all of Bangladesh's rice surplus is consumed

indigenously: the number of consumer households is on the order of 20 million or so. Fairly atomistic conditions abound on both sides.

A Typology among Rice Market Agents

(x) Paddy *farias* and *Paikers*, of which we estimate a little over 40 thousands (Table 28), buy paddy at the farmgate and in primary markets, mostly the former, and then transport it higher up the market chain. Of the approximately 13 million metric ton (MMT) of surplus paddy marketed in study year (Table 28), 69%, or 9 MMT, were sold at the farmgate (Table 19), mostly to *farias*, *paikers* but also to *kutials*/"crushers". (In 1967/68, this proportion was 28% only (ch. VII)). *Beparis*, of which there are a little over seven thousands, operate on scales several times the typical *faria's*. Itineracy is common to all three types, and they mainly sell to paddy wholesalers or to rice millers.

(xi) Two broad classes of mills exist: the Engleberg type hullers and the modern rubber roll sheller. In 1988, the latter numbered only eighty eight, while the former numbered 50780. Of the latter 486 were major rice mills (MRM), 19.67 thousands were small rice mills, and the remaining were husking units (Table 28 and 29). The husking mills specialize in custom milling, and do not buy paddy or sell rice.

(xii) The degree of mechanization is a key aspect of a manufacturing process. The chief distinction between the three major technological options available is in terms of mechanization, measured in this study by capital-labor ratios. In terms of replacement costs, a standard automatic mill uses up nearly eight times and a MRM 2.64 times, the capital per workplace of Tk. 53 thousand by small rice mill (Table 32).

(xiii) *Kutials*, of which we estimate 15.6 thousand in study year, are homebased paddy processors. They parboil and dry paddy at home, using household labor, and custom-mill paddy at a small rice mill or at the husking mill. An upward estimate of the replacement cost of their fixed asset per person employed is Tk. 20 thousands.

(xiv) Crushers are itinerant paddy processors. Without any fixed assets, they purchase paddy using a blend of their own operating capital and paddy advances made to them by the millers whose facilities they would later use. He uses the pre-husking facilities at a certain mill who may or may not have advanced him money, and then husks the paddy there --- all at custom-milling basis. He is free to sell the ensuing rice however he likes. Crushers are alone in facing virtually zero fixed capital per unit of output.

(xv) In the study year, 8.7 MMT of rice was marketed. Of that quantity, the Directorate of Food "procured" 0.92 MMT: the residual of 7.8 MMT was privately marketed. Of this, 53% are by small rice mills and another 34% are by crushers (Table 29). Automatic and major rice mills were mostly milling for the DOF under the aegis of the lucrative "Millgate contract": only 31% of their combined outturn was headed for the market (Table 29). In any case, though, automatic mills and MRMs are dwarfed as components of milled rice output: even when wholly given to the market, automatics and MRMs can at best handle about 15% of the marketed surplus of paddy, as in 1987/88 (p. 86, below), or about 10% of the rice privately marketed. This estimate comes very close to the estimate made independently by a leading rice entrepreneur-cum-industry watcher, who put the estimate at about 5% (p. 85). *Smallest and labor-using paddy processors predominate private marketing of rice in Bangladesh*. This structural facet underscores an important corollary: *the preponderant bulk of the rice supply and of the*

derived paddy demand originates from an extremely large number of geographically scattered small rice mills. And because they are without any visible corner on the balance of market power, they are likely to register greater price competitiveness.

Marketing Channel for Rice

(xvi) The largest flow of rice is from small mills selling to visiting *paikers* who in turn supply virtually all their purchase through rice *arats* in terminal markets. These *aratdars* market 92% of their mobilization through retailers (Table 30). The second most significant route originates from crushers and through the mediation of *paikers* and *aratdars* direct the flow of rice to the consumers (Table 30). The third significant route has rice procured by the Directorate of Food flowing from the supply depots through ration dealers to the consumers, whether directly or through leakages in ration channels. Even the *kutials* market only about one fourth of their output directly to consumers. Overall, reliance on market intermediation is close to 100%.

(xvii) *Aratdars*/wholesalers get their hands on between 80-90% of all rice privately traded (p. 102). This proportion is up from 75-80% in 1967/68, reported by a contemporary Cornell Ph.D thesis (Farruk, 1972). By contemporary theories of market structure, such high sales concentration should be symptomatic of offsets to competition. But Farruk saw no solid evidence for collusion (p. 101). And this study, later on, reports a considerable *geographic* decentralization ever since of the rice flows (ch. VI). And recruitment of new agents, even at the apparently elitist *aratdari* tier, has been considerable.

Marketing Channels for Paddy

(xviii) *Farias* purchase all their paddy needs from farmers directly, at the farmgate (Table 19; Table A2.1). *Beparis* buy 72% of their need from farmers (Table A2.1). Small rice mills and crushers --- the real *icons* of the rice economy --- directly tap farmers on the order of 19% and 27% of their paddy requirements. Even, paddy wholesaler/*aratdars*, acting through their agents, do not go unrepresented at the farmgate (Table A2.1). The farmer is not merely on the marketing stage: he is at its very centre. Surely, he is unlikely to call all the shots: equally surely, the farmer holds much sway over prices. Farmgate prices fetched do not significantly differ between small and nonsmall farmers (Table 19; 20; 21), even though the latter differ radically in their degree of market offerings (Table 69), or their acceptance of *dhaner upore* (DU) loans before-harvest (Table 33). Paddy's market channels have empowered today's rice farmers significantly as compared with two decades ago.

(xix) The other notable result is that paddy *beparis* channelize their paddy collection through *aratdars* to various paddy processors. Automatic mills in nonprogressive districts collect 30% of their paddy needs through spatial purchase-agents.

Size Distribution of Farms

(xx) Census data for 1986 reveal no evidence for any significant concentration in establishment size, measured in terms of employment, against standards set by other industries in food-beverage sector (BSIC 31) (Table 23, p. 88). Wholesalers in rice markets too, did not show excessive concentration in 1986 (Table 24). This correspondence in the structure between millers and wholesalers suggests a stability

of this structure.

Rice: a Thick but Yearround Market

(xxi) As well as having a dense market, paddy and rice are actively marketed throughout the year. There is a on the whole suggestive seasonality in the ebb and flow of paddy circulation (Table A2.2). The month through January 14 represents the high-water-mark of unit paddy turnover seasonality: the months through April 14 and November 14 --- signifying, respectively, the end of the aman and boro/aus market seasons witness the troughs (Table A2.2). The timing of a seasonal dip in turnover is the same for primary and secondary levels of the markets, suggesting a well-coordinated circulation.

(xxii) Starting from seasonal lows, in November-December period, prices go on rising through the month ending April 14. Onset of boro harvest causes seasonal declines of prices in April-May. Prices begin to rise again, reflecting cost of storage upto the month through October-November. And then the seasonal cycle begins all over. The seasonal pattern of both unit turnover and prices remain strikingly similar for both paddy and rice (Appendix 2 to ch. IV). This is a general indication of the effectiveness *in the study year* of an well-coordinated, even integrated, market exchange straddling both grain forms.

The Primacy of Farm Paddy Stocks

(xxiii) The best-kept secret of this cross-grain coordination is due to the fact that seasonal supply and price outcomes in the rice market are at the initiative of the supply of storage decision of 9 million farmers. At any given time, farmers own more than three-fourths of private rice stocks (Table 68). (Farmers hold rice stocks in the form of paddy.) Trade almost entirely holds working stock: speculation in stocks in the study year was a very minor activity. The reason is that temporal storage did not seem to pay, except in the aman season and/or in the deficit regions of Sylhet and Noakhali (Table 76). Farm stocks are the mainsprings from which downloadings amount to trade turnover. Because speculative holdings are not substantial and because price expectations are not bullish, most agents are happy to turn working stocks over at some lean constant margin: an injection of paddy supply from storage is transformed into augmented rice supply after a fixed technological time lag, with attendant repercussions for prices.

A Growing Maturity of Rice Markets

(xxiv) Rice markets have fairly come of age. This shows in several ways. First, private stocks amount to three months' rice requirements of the rice economy: twenty years' ago, this was one month's only (Table 68). Private stocks provide a much deeper margin of security against random production stocks in 1990, roughly equivalent to one fourth of consumption requirements. Even in the flood-ravaged 1988/89, production loss, at about 1.1 MMT, was well-under one month's requirement. Second, the private rice economy, taking good advantage of the favorable growing conditions in study year, built up stocks on the order of 0.5 MMT, raising the rice security cushion from two weeks' to a little under four weeks'

requirements. Third, private rice economy raised its share of economy-wide stocks (public and private) from 32% in October 1989 to about 50% a year later. Fourth, as well as building up needed rice reserves, the farmers registered especially in the dry aman season of study year, a significant capacity to play the market: in regression analyses, market supply was found to be significantly price responsive (Table A6.8). Price increases drew forth larger market offering during the aman season, and the effect is statistically significant. Fifth, farm technological progress and growing commercialization seem to move in unison, whether one looks at aggregate, cross-time data or at cross-section farmlevel data.

A Visible Egalitarianism of Rice Economy

(xxv) The functionally landless and small farms raised their combined share in rice stocks from 38% to 46% during the study period. Most of the gains was at the expense of large farms (Fig.6). Rice input price and supply environment was favorable in the study year (and beyond), thanks to some agricultural policy reforms (Table 72). In the ensuing output spurt, small farms have outyielded large ones and seem to have assigned the gains to reserves. This is the intuition behind the egalitarian streak shown by changing stock distribution across farm classes. Granted, the functionally landless, who are 29% of all farms own only 7% of the boro season carryout in 1990. However, all farm sizeclasses achieve an increase in the stock-consumption ratio during study year. More to the point, the disparity in stock-consumption ratio between the functionally landless and large farms narrowed during the year (Table 71). A growing egalitarianism and an unexpectedly strong degree of commercialization seems, too, to have been fused together.

Balance in Access to Capital and Information

(xxvi) Capital constraints potentially affect rice millers and traders differently: the former can face up to both fixed asset constraints and operating capital constraints. For the latter, the binding constraint is most often about operating or working capital. This summary is therefore disaggregated. Prospective rice millers are likely to face a relatively wide range of technological options, with unit fixed capital requirements to match (Table 32). Best-practice techniques, e.g. automatic mills, price out most except a favored few, to be sure. But the market's response has been to circumvent the capital constraint via adoption of the small rice mill option. Quite against technology- theoretical predictions, the proliferation of the less mechanized SRMs has served the rice farmer well. The conclusion: fixed capital requirements have not significantly barred entry and stifled competition (Table 29) in rice-milling. The qualification implied in the above sentence is deliberate: to muster Tk. 10 lakh (approximately US dollar 25000), which a SRM takes to create was beyond the capacity of innumerable venture capitalists in rice markets.

(xxvii) The extent and character of the demand-supply balance for operating capital, frequently abbreviated as *credit relations*, was perfunctorily researched in the literature (pp. 32-33). It was maintained, all too blithely, that high-cost preharvest trader-farmer credit contracts did not exist in rice system (Farruk, 1972; Islam et al. 1985). This has recently been documented to be incorrect in certain specific cases (Crow, 1989). Using a relatively limited number of case standies, Crow demonstrated the presence of preharvest credit contracts, especially in a few backward farm regions, which ostensibly charged the farmer usurious rates. These contracts have been named *dhaner upore* (DU): the loan is repayed in *predetermined paddy quantities* to be paid after harvest, the implicit prices

being throwaway ones. The present research shows that both Farruk/Islam et al. and Crow/Murshid were off the whole truth. Of course, preharvest DU contracts exist in Bangladesh's rice system, but only 4% of the farms on IFPRI Farm Survey sample had been party to at least one such contract. The incidence of the farmer being haplessly tied via DU contracts is *quantitatively insiginificant in the general case* (Table 33). Less than 20% contracted any noninstitutional credit, though such loans only cost 19% in interest annually, as against 16.6% on bank loans. Only 14% took bank credit for farming. Oveall, the sample strongly suggested the presence of internal finance. Significantly enough, farmers collectively sourced a nonnegligible part of trade credit demand. This incipient solvency was due to greater availability of rice surpluses, even on the populous category of small farms (p. 161).

Trade Credit and Operating Capital Constraints

(xxviii) Trade credit is both actively disbursed and received in virtually all tiers of this market. Networks of trade credit are dense: more than three-fourth of all agents disburse trade credit and about two-thirds receive it. Market-wide disbursement per year amounted to Tk. 16.3 billion, while receipts amounted to Tk. 6.6 billion. Net disbursement was estimated at Tk. 9.7 billion, or Tk. 51 thousand per establishment. The total net disbursement corresponds to seasonal marketing of 2.85 MMT of milled rice, worth about Tk. 23 billions at wholesale stage of the market. Net disbursement is about two-fifths of throughput. Out of this, bank credit was worth Tk. 270 million, or about 2.2%. Thus, informal credit markets have a towering presence. Paddy and rice wholesalers/*aratdars*, who account for only 20% of the sample, account for 60% of disbursement and 58% of receipt of trade credit. A strong circularity in credit flow is here evident, receipts being followed by disbursements. Credit

relations are based upon a *convergence* of business interests cutting *across* primary and secondary levels of the market. Sharing, not exclusion, seem to be the dominant trait of this web of credit relations. Second, *dadan* credit, arguably with greater tying conditionalities than over-the-counter credit, accounts only 24% of firm-to-firm- credit, and only 16% of total disbursements on the sample. *Dadan* is a far cry from being a preeminent credit source. Clearly, this implies that credit relations ameliorate conditions of operating capital paucity on the part of traders.

Balance of Information

(xxix) Access to information is treated here relative to prices agents pay. Paddy prices paid by a wide cross-section of establishments pattern plausibly: lowest farthest upstream, highest downstream. Variability of prices *among* all classes of paddy processors is of the same order of magnitude as that *within* individual classes. Prices therefore stack rather tightly even though they reflect informational performance by establishments that markedly differ in technology and their command over resources (p. 165). The outcomes of the balance of information available to agents and reflected in prices are quite similar. Comparison between coarse and noncoarse varieties show fairly small variability, regardless of variety and season.

(xxx) Information needs continuous updating. Where commodity is well-standardized, price and supply information can be, and is usually, updated impersonally, that is by using radio broadcasts and the like. Standardization is not well-advanced in Bangladesh rice markets. Therefore, three fourths of all paddy requirements are purchased by personal inspection. Information updating is therefore firsthand. This is not surprising. Small farmers, small traders and small paddy

processors all predominate in this market. And there is no vertical integration to speak of. Balance of information is essentially equal.

Marketing Cost of Rice

(xxxi) Marketing cost of rice is summarized in three steps, beginning with cost of paddy collection, followed by processing cost and then by rice selling cost. At 2.6% of paddy purchase price, the relative share of collection cost is lower than in 1982/83, when it was 3.2%. The difference, though not significantly large, is still notable because average haul distance for paddy in 1989/90, at 23 miles, is larger than in 1982/83. In 1989/90, transportation costs absorb fully 58% of paddy collection cost, while brokarage absorbs one fifth. In contrast, in 1982/83, brokerage and transportation cost shares nearly tied at 31%. The share of miscelleneous charges (*hat* toll etc) too has been sharply cut. These changes reflect big changes in how paddy itself is marketed. First, a probably sharp increase in haul distance explains the increase in transportation cost share. Brokerage share has fallen because a much larger proportion of paddy requirement is now bought from the farmer (Table 19; ch VII). Market tolls and other fixed levies share has fallen partly because the number of participants per market and the average purchase per agent both have risen in 1989/90. A decline in share of fixed charges is welcome, as it creates greater space for price-induced substitution. Paddy marketing seems to have become more efficient.

Determinants of Paddy Transportation Costs

(xxxii) We establish that unit transport cost is better measured *qua* cost per md.-mile, not cost per md. A translog-type specification fits the data best, with most variables intuitively signed and statistically significant (Table 53). Unit costs fall with distance over relatively short hauls; increase with distance over medium hauls; decrease with it over long hauls, probably because the probability of remunerative return loads outweighs the increases in fuel costs (p. 188). Controlling for distance, unit costs fall with the cargo: a 10% increase in the cargo saves the shipper to the tune of 0.5%. Millers receive a freight discount relative to paddy traders and crusher/*kutials*. Boats and trucks offer economies. Costs are lower in progressive districts.

Cost of Processing

(xxxiii) Automatic mills register the lowest process cost of Tk. 35/quintal of milled rice (Tk. 8.6 per md. of paddy). Major and small rice mills register Tk. 12.86 and Tk. 13.83 per md. of paddy. As against this, automatic "millgate contractors" are paid milling charge at the rate of Tk. 10.5/md of paddy, while small rice mills are paid at Tk. 9.25/md. The mill rate in Millgate Contract system is not as keen as it can be (p. 191). Unit process costs are the highest for *kutials*. For crushers, they are about the same as for small mills. Crushers hire custom-processing services from small mills, who seem to charge for these on marginal cost pricing basis (p. 191).

Determinants of Process Costs

(xxxiv) Process costs fall significantly with scale of millage: however, the scale diseconomies at large output levels are significant, too. Cost functions are therefore U-shaped. Automatic mills outsave traditional mills in processing: modernization lower costs, quite besides the scale of operation. Finally, "millgate contractors" *per se* process at higher costs than noncontractors perhaps the former are shielded from the chilling winds of market competition or because the system self-selects costhandicapped but clout-wielding firms.

Rice Selling Costs

(xxxv) The most significant mode of spatial rice disposal involves selling rice through local *arats*. This is followed by sales through visiting *beparis*. Direct sales to terminal markets are in a minority, because, while fetching better average prices, this raises working capital requirements, Specialization is the norm : while millers mainly process, leaving spatial arbitrage to *beparis*. There is relatively little vertical integration of milling and transporting (p. 198). Again, this sets the stage of vigorous price competition among numerous rice *beparies*. Rice sales cost works out at 2.2% of rice sales price. Transportation and brokerage absorb 59% and 24% respectively, of rice sales costs. Again, as compared with 1982/83, transport cost share has risen significantly but *aratdari* share has fallen (p. 199). Mean haul distance has risen from 50 miles to 82 miles. Three fourths of haulage are done on trucks. The matched share for 1982/83 was 54%.

Determinants of Rice Transportation Costs

(xxxvi) Transport cost per md.-mile (TCM) decreases significantly with distance, before increasing: again, this cost curve is U-shaped. Trucks and mechanized boats both receive transport savings relative to bullock-cart and the like. Relatively larger rice mills chalk up higher rice transport costs because they consign rice farther afield. Again like for paddy, freight rate is lower in progressive districts.

Directionality of Rice Movement

(xxxvii) Specialization of availability of rice surplus, and the demand for "imports" is such that the directionality of market connection is from rice-surplus North-West to the rest of the country, especially to major cities and industrial areas (Table 63). Three major cities --- Dhaka, Chittagong and Khulna --- absorb 20% of the market supply. This proportion seems lower than in early 1970s. As well as a secularly growing aggregate size, rice markets have geographically diversified. As against in the past, the actions and resources of a more spatially diversified class of wholesalers now determine the price and distributional outcome of rice exchanges in Bangladesh. The producers face a more diversified demand in terms of composition of markets. This fasters price stability.

Marketing Margin for Coarse Rice

(xxxviii) Instantaneous market margins computed upto wholesale stage, for SR and non-SR areas are 17 and 22% respectively during the study year when prevailing paddy-rice outturn data are used (Table 73). Even these exceed the margin proviso currently driving the pricing of rice in the DOF's Open Market Sales (OMS). The above estimates include no spatial or

storage costs: the latter need to be added on. Comparisons between storage costs and seasonality of prices suggest that in the study year temporal storage was not remunerative (Table 76), implying that typical storage period was small, no more than a month. The temporal-cum-spatial margins, reflecting such a storage period, are estimated at 25% and 16% upto the wholesale stage. For the non-SR areas on this sample, many of whom are rice-surplus Districts, temporal spreads are a little lower than instantaneous margins: this reflects the fact that in these markets seasonal gains in prices do not pay for cost of storage. As against this pair of 16% and 25%, the DOF currently allows a price spread of 10% and 15%, piled on the procurement price. This results in setting initial trigger prices in the OMS at an artificially low level. Such misinformed public interventions squeeze private distribution and storage.

(xxxix) In early 1970s, market margins was about 24% of retail price. In 1982/83, this was 26%. In 1989/90, we estimate this at about 21%. It is still too early to say market margins have fallen relative to retail price, because our estimate is for coarse rice, while at least that for 1982/83 was for all rice. However, two aspects deserve underscoring. First, the size of market has grown so impressively. And the commercialization has become geographically decentralized. Amid them, overall distribution costs including traders' profit seem not only to have stayed low relative to retail price but to have perhaps fallen a little. Farmer share in the retail price has either held its own or, even better, has gained a little. This should come as no surprise: the farmer now markets more than two-thirds on farm, while two decades ago this proportion was 28%.

Rates of Net Profits Earned

(xxxx) Net before-tax profits average at 44% of total capital employed per establishment in rice markets in the study year. Earnings at the wholesale level is significantly *lower* than at the retail level. The least profitable are the automatic mills, followed by major rice mills and small rice mills in that order. This profit-ordering survives the progressive-nonprogressive divide. The automatic mills have the highest requirement of technological entrepreneurship. If the selection of an automated rice plant reflects not so much the entrepreneur's technological knowhow as rentseeking in an atmosphere of distorted incentives or a copycat instinct, low earnings relative to replacement costs will naturally result. This is what happened with our sample of automatic mills. The competing techniques, especially small rice mills, are far more accessible. Besides, they manage their plants more intensively than do the proprietors of automatic mills.

(xxxxi) Of course, profitability being high in one year may be followed by another with dismal profits. Miscued public intervention in rice markets may foster profit volatility. Even so, some plausible reasons can be adduced for such healthy profits, These include (i) rice's national market; (ii) dense market contacts; (iii) well-functioning infrastructure and stable prices, by being public goods, redound to returns to private investment; (iv) rice market credit relations; and (v) greater capacity to manage risk.

(xxxxii) In sum, the rates of returns are high but not necessarily excessive, noting what was said about fluctuations. More to the point, if they are high, this is not because a small group of agents, each lavishly capitalized, earn high rates of profit and rents to the hurt of more numerous but less capitalized ones. They are high because the numerically

populous classes of agents, undercapitalized but sustained by egalitarian credit relations, manage their meager capital resources [illegible]enly on their way to high earnings. While returns rate favorably, margins on sales price remain very lean indeed. Relentless turnover of pipeline stocks at competitive margins virtually throughout the year is the best-kept secret of profit-making in this market. Mostly, in the study year, rice agents behave like competitive profit makers, not profiteers. This is the final straw in this expose of the growing maturity of Bangladesh's rice markets.

II INTRODUCTION

II.1 The Role of Rice in the Economy of Bangladesh

This report is about the structure, conduct and performance of the rice market of Bangladesh. The importance of rice as a commodity is a measure of the policy importance of this study. It is necessary to begin with a description of the role of rice sector in the economy of Bangladesh, in order to put this study in proper perspective. This discussion is structured around (a) the share of the rice sector in Bangladesh's gross domestic Product (GDP), (b) share in farm income, and employment and (c) the share of the expenditure on rice in the consumer basket, and its importance as a source of calorie for rural and urban households of Bangladesh.

II.2 Rice as a Productive Sector

Inspite of growing urbanization, Bangladesh remains a mainly agricultural country, with about 40% of the GDP still originating in agriculture (Table 1). It is the largest sectoral source of income, employment, saving and investment in the economy. About eight tenths of agricultural output originates in the crop sector of which rice accounts for a lion's share (Table 1). In the three years through FY90, rice production accounted for a little more than one half of agricultural GDP and one fifth of Bangladesh's GDP. Again, trade and transportation of rice are important income sources in the economy. Although reliable estimates are not available, there must be a presumption that about one-third of the combined product of trade and transport sectors is on rice account. This would raise rice relative share in GDP to 27% or so.

While the share of agriculture in the country's GDP has fallen the relative share of rice in the crop sector appears, by most accounts, to have slightly increased over time. This is primarily because the campaign to achieve "self-sufficiency" in foodgrains,

by directing massive public investment for development of irrigation-seed-fertilizer technology and subsidies, has caused a faster rate of growth in rice production than for most other crops. In fact, growth rates of some non-rice crops have declined over time while some minor crops have experienced much slower growth rates.

Table 1: Rice Sector in Bangladesh's National Accounts, 1985/86 - 1988/89 (Tk. billions)

Particulars	1985/86	1986/87	1987/88	1988/89
GDP at factor cost of which	425	442	455	467
Crop Agriculture	139.6	139.6	137.1	134.5
Rice sector value added	97	97	93.4	93.6
Non crop agriculture	36	36.7	37.7	38.5
Trade, etc.	39	40	42	44
Transport, etc.	47	52	54	57
Others	163	174	184	193
Agriculture as % of GDP	41	40	38	37
Rice as % of agriculture	55	55	53	54
Implicit deflator, crop agriculture (1984/85=100)	110	118	122	131

Source: Bangladesh Bureau of Statistics

Table 2: Employment Generation by Bangladesh's Rice Economy, 1989/90

Name of Crop Sector	Area (million ha)	Employment per ha	Total direct employment (million days)	Value added per ha (Tk.000s)	Sector value added (Tk. bn)	
					Current prices	at 1984/85 costs
Rice	10.3	158	1629	15.3	158	110
Local	6.2	139	860	11.95	74	52
MV	4.1	188	769	20.43	84	58
Wheat	.58	137	79	13.3	8	6
Jute	.67	207	139	12.7	8	6
Sugarcane	.17	270	270	22.8	4	3
Potato	.111	231	26	22.7	2	1
Oilseeds	.18	81	14	7.4	1	.6
Pulses	.26	81	21	7.1	4	1

Note: a) This table uses following sources. Area data are from BBS, 1990. Unit employment data are from Hossain et al. 1991, Table 3.4. col.4 is obtained multiplying col. 2 by col. 3. col. 5 is from Hossain et al. 1991, Table 3.2. Sector value added is obtained multiplying col. 5 by col. 2. All employment are in adult-equivalent persondays. Sectoral deflator for crop agriculture in 1989/90 with 1984/85 as the base is put at 1.43.

b) It would be of interest ot report total direct employment as a proportion of total employment in the economy. Unfortunately, requisite data are not available.

Table 3 reports on the place rice enjoys as an income source for a representative sample of 1264 rural households. The table suggests that 35% of household income arises from rice cultivation.[1] Rice production therefore is the single largest

[1]For one reason this appears to be an understatement of the true income significance of rice. As an wage good it is a medium of wage payment for hired workers. Rice cultivating households hold rice stocks both out of own-account security motive, and as also prospective working capital. Both ways, the presence of rice stocks on farm entails a convenience yield or added income. More

(Footnote contd. overpage)

income generating activity in the economy. As such, rice supply is also the single most important determinant of household's ability to consume cereals, one of the cheapest sources of calories for the poor.

On the demand side, rice absorbs the single largest share in household's expenditure in rural Bangladesh (Table 4). For the economy as a whole, 26% of household expenditure are spent on rice. This percentage is 31 for rural Bangladesh, and 19 for urban Bangladesh. The poorest 40% of households everywhere devote significantly greater share of expenditure to rice than the top 20%. The divide is particularly arresting for the urban areas. This law of declining staples' share in expenditure is due to the Engel's law in consumption. This law states that individuals diversify into nonfood consumption as their incomes increase: they do this by spending increasingly lower shares of their incremental incomes on food. especially staples. Declining marginal budget shares have the effect of lowering average budget shares, too. Real rice prices are a major determinant of the net incomes of poor and rice-deficit households in Bangladesh:[2] they are therefore a telling element in the amelioration of food poverty in much of Bangladesh.

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specifically, this yield arises from the expenditure saving made possible by the households obviating certain transaction costs in paying for input expenses directly.

[2]In the rice economy, households vary between surplus, self-sufficient, and deficit. Surplus households are those who have surpluses from production over and above their subsistence and labor-payments requirements: these do not enter the market as buyers. Self-sufficient farms can exactly balance their output, net of seed, feed and wastage deductions, and requirements. These households do not enter as buyer or sellers. Finally, deficit households do not grow enough rice to meet all they need. They have to make net purchases. Poorest among deficit households are landless laborers, urban industrial workers and urban slum-dwellers.

Rice accounts for even a larger proportion of the calorie intake of an average Bangladeshi household, than it is of total food expenditures. More than seven-tenths of the calories intake by an average household in rural Bangladesh in on account of rice. This merely reflects the fact that rice happens to be one of the cheapest available sources of calorie in the economy.

Table 3: Rural Household Income and Its Composition, 1989/90

(Thousands)

Source of Income	All households		Farm households		Nonfarm households	
	Tk./year	%	Tk./year	%	Tk./year	%
Agriculture	23.3	62	30.7	68	8.9	42
Crops	14.8	40	20.8	46	3.3	16
Rice	12.97	35	17.7	39	2.8	13
Kitchen garden	2.4	6	3.1	7	1.1	6
Noncrop agriculture	3.7	10	5.0	11	1.2	6
Agricultural wage	2.3	6	1.9	4	3.2	14
Nonagriculture	11.8	32	12.5	27	10.4	50
Industry	1.8	5	2.0	4	1.4	7
Trade	5.3	14	5.9	13	4.1	20
Services	2.6	7	2.8	6	2.3	11
Transportation	0.9	2	0.9	2	1.0	5
Nonagricultural wage	1.1	3	0.9	2	1.4	7
Remittances	2.2	6	2.5	5	1.7	8
Total income	37.2	100	45.7	100	20.9	100

Source: Rahman et al. 1992, Table 4.1

Table 4: Role of Rice as a Wage Good, 1988/89

(Tk./month)

	Expenditure	Expenditure on Food	Expenditure on cereals				Rice as % of total expenditure
			Rice	Wheat	Others	Total	
Rural	441	282	136	14	3.2	153	31
Lowest 20%	216	155	84	14.1	.7	99	39
Second 20%	305	219	116	14.6	1.2	132	38
Third 20%	380	265	138	15.4	2.1	156	36
Fourth 20%	479	321	156	12.8	3.6	172	32
Highest 20%	823	448	187	11.4	8.4	207	23
Urban	706	368	132	13.3	3.1	148	19
Lowest 20%	297	202	101	11.4	1.2	114	34
Second 20%	421	284	129	12.3	2.8	144	31
Third 20%	548	342	137	13.6	2.6	153	25
Fourth 20%	764	417	147	12.3	3.3	163	19
Highest 20%	1494	596	146	16.9	5.8	169	10
National	529	310	136	13.5	3.2	153	26
Lowest 20%	232	167	84	13.4	.8	98	36
Second 20%	334	234	118	14.6	1.5	134	35
Third 20%	422	288	138	13.6	2.6	154	33
Fourth 20%	557	354	156	12.3	4.0	172	28
Highest 20%	1098	509	166	13.6	6.9	186	15

Source: BBS Household Expenditure Survey, 1988/89.

Table 5: Rice as a Source of Calorie

	grams per day per capita		% of total calories	
	1985/86	1988/89	1985/86	1988/89
Rural				
Rice	453.7	454.8	80	78
Wheat	51.3	59.6	8.6	9.7
Vegetables	141.0	170.9	2.9	3.4
Pulses	18.3	21.6	3.0	3.5
Milk	24.3	19.7	.7	.6
Meat	7.0	5.5	.4	.3
Fish	34.7	32.9	2.8	2.6
Sugar	7.7	9.0	1.5	1.7
Urban				
Rice	376.3	400.4	73.9	73.1
Wheat	54.3	53.9	10.1	9.3
Vegetables	151.0	206.6	3.4	4.4
Pulses	20.7	25.9	3.8	4.4
Milk	32.3	29.3	1.2	1.0
Meat	15.6	12.5	1.0	.7
Fish	46.0	56.6	4.2	4.8
Sugar	11.1	11.1	2.4	2.2
National				
Rice	443.9	436.9	79.3	76.6
Wheat	51.7	57.7	8.8	9.6
Vegetables	142.3	182.8	2.9	3.7
Pulses	18.6	23.1	3.1	3.7
Milk	25.3	22.9	.8	.7
Meat	8.1	7.9	.4	.4
Fish	36.1	39.2	3.0	3.2
Sugar	8.1	9.7	1.6	1.9

Source: World Bank, 1992.

II.3 Definition of a Homogeneous Product

The working of a market of any given product is but a collection of myriad transactions. Such a collection is more proper when the commodity in question is a homogeneous one. A commodity is of value because it embodies utilities of time, form and place in consumption.[3] A commodity is homogeneous if each of its units is potentially capable of producing the same degree of functionality to every consumer who pays the "right" price, whenever, in whatever form and whenever it is consumed. A metallic pin, of Adam Smith fame (Smith, 1776) is a good example of a homogeneous product. A pin is a pin everywhere and always: it has a very specific purpose, and its ability to achieve it is not affected by storage (the treatment of time), transit (the treatment of place), and packaging (the treatment of form). Wax, or a generic chemical substance like DDT, are other examples of a homogeneous product. The more specific a commodity is in its end purpose and the less there are possibilities of substitution in production, the more homogeneous it is likely to be.

Only few commodities meet the textbook definition of homogeneity. A growing erosion of product homogeneity has always existed: if anything, advances of technology have aggravated the problem. By and large, durable goods are less homogeneous than perishable ones. Knowledge-intensive goods less homogeneous than are their natural cohorts. Before the advent of genetical research on rice in Bangladesh, there used to be of the order to 1000 varieties of rice grown. The key varietal difference was reducible to photoperiod sensitivity. Plant breeders have now standardized the modern varieties. Consequently, the number of varieties in the post-HYV phase can be counted in terms of tens or fifteen only. In

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[3] When it comes to food items, especially cereals, the utilities that consumers desire are a combination of energy, variety, and other micro-nutrients (Bouis, 1990).

manufacturing, in contrast, technology has spawned greater diversity, both in the perception of human wants and in how to meet them, with profound implications for separation of markets.[4]

Is rice a homogeneous commodity? The answer will, as usual, depend on whether the one asked is a plant breeder, a miller/trader, a rice grader, a marketing economist. To the plant-breeder, the measure of a rice plant is in terms of its physical characteristics. These abundantly differ between different varieties, of which there are many. The business regulator, the businessman and the business economist all tend to look at rice in utilitarian terms. The counts on which rice yields utility are vastly fewer than its physical characteristics. This makes for a case of relative homogeneity. But, still, rice is far from a homogeneous commodity, in the mind and mouth of the eater, and therefore in the method of producing it.

Visible differences in consumer preferences exist for different varieties in terms of cooking and eating quality. However, these differences are not marked. In Bangladesh, there are about one hundred varieties of paddy varieties mostly coarse and medium, recognized by the trade in Bangladesh.

II.4 What is meant by marketing

Marketing functions are rendered unnecessary only in the Robinson Crusoe world. The hallmark of such a world is that people can only consume what they can produce. To this day, a large part

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[4] Sometimes, a new technology creates an altogether new product as well as human wants to match. Telex machines were a homogeneous durable good meant to achieve longdistance communications. The arrival of telefax, which is telex and more, has rendered this class of commodity less homogeneous than before. To give another example, metallic buckles, once homogeneous, have become heterogeneous now that flap-adhesives have broadened the scope of buckle-type class of products.

of the production of staples everywhere tends to be motivated by this subsistence consideration. However, anything but subsistence commodities will necessitate some degree or form of marketing services to be performed.

The need for marketing arises if there is effective demand for the commodity over and above the subsistence requirement of the producers. This is for a market economy. But even socialist economies can not do without performing marketing services.

To market a commodity means to link up the myriad producers and equally numerous consumers such that the latter can get, at a "realistic" price, the desired quantities of it in the form and at the place and time of their choice. By its very nature, marketing involves the performance of two functions: one physical, and the other economic. The physical functions are those of transporting (the spatial aspect of the linkage between producers and consumer); storage (the temporal aspect); and processing and merchandizing. These functions correspond to the stages in the marketing of a commodity. The economic functions are those of forming an array of prices in the market: these are the data which signal the resource costs of consuming an unit of the commodity to the consumer, and the rewards of producing or supplying the same to the producer.

II.5 The stages in Marketing of a Farm Commodity: the case of rice in Bangladesh

The marketing of rice begins with handling of stalk paddy. Before marketing, the paddy is cleaned of foreign matter, soaked, dried and then bagged in gunnybags with an average capacity of 82 kg. The farmer has a choice between marketing most of his produce at the farmgate to itinerant traders or taking it to a village level market with the expectation of realizing a price which exceeds the farmgate price by more than what it costs him in terms of his time and energy and transportation to take produce to the

market. The farmer has also to choose between whether to sell all his surplus soon after the harvest or in phases. Economics is the driving force in all this decision making. If the farmer has obligations to repay debt contracted before the harvest, his liquidity needs will force upon him rather precipitate sales. Given greater freedom, a number of considerations weigh upon the timing of sales, including the farmer's expectations of future price in relation to the cost of storage, the timing of the farmer's liquidity needs in future associated with his demand for casual laborers, etc. The farmer's expectation of future price partly influences his current market supply. The aggregation of all farmer's price expectations thus helps determine current market price. If he chooses to phase sales, he has the option of either selling all his surpluses in phases to the traders or taking the grain to a rice miller where it will represent a kind of free loan-in-kind, with the condition that the miller will pay for the grain at the season's highest price. If and when the farmer chooses to store the grain, he becomes privy to the marketing act. The more informed these balancing acts are that millions of farmers perform at this stage, the more efficient their collective outcome for the economy at issue.

The farmer usually markets a relatively small number of varieties. Evidence, to be presented below, show that a typical farmer markets a relatively small quantity at a time. The *farias* or *beparies* will mix up various grades of paddy of the same variety.[5]

The surplus supplies are exchanged within confines of the primary market, when their titles are transferred to itinerant merchants visiting from major assembly markets, or to the miller's agents. If the primary market is connected to the national grid of highways by feeder roads, which is sometimes the case, millers or

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[5]These are itinerant merchants. They will be described below.

their purchase agents will move into it, with rented trucks, to purchase and ship paddy.[6] Similarly, paddy wholesalers-cum-aratdars, too, move into these markets with their trucks to buy paddy. Wherever waterways are available, millers or wholesalers will rent large mechanized boats to carry paddy out of assembly markets. Alongside largescale paddy purchasers, small-scale paddy traders, and homestead paddy processors (*Kutials*, etc), too, buy their paddy requirements in these primary markets.

Purchases in these markets are by personal inspection, and paddy prices are established through haggling. These prices are extremely important economic signals: longterm increases in these carry with them implications of rising welfare of farmers having surpluses to sell, but foreboding implications of rising costs of consumption. During the course of a season, these prices form the basis for the farmer's formulation of a price forecast for the next season, which determine his acreage plan. The formation of these prices thus goes straight to the heart of farmer's economic enterprise.

Consumers want to eat rice, not paddy. If the millers can purchase and process paddy into rice efficiently they can earn profits. This creates incentives for private investment in paddy processing. A large number of paddy processors with a variety of capacities, and scales of operation, have come into being in Bangladesh. In 1989/90, there were 88 automatic/semiautomatic rice mills with capacities ranging between 2 to 4 tones per hour, about 486 major rice mills with capacity of 1 ton per hour, and of the order of 19700 smaller rice mills with capacities ranging 15 mds to 27 mds. per hour. These paddy processors are distributed all over the country, although they are distributed somewhat

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[6]The number of licensed trucks plying Bangladesh's roads grew at a rate of 10% between 1976/77 through 1988/89, while that of smaller transport vehicles rose at the rate of 10% during the same period.

disproportionately in the North-West part of Bangladesh. There are more paddy processing facilities per thousand population in the agriculturally more advanced districts than in the others. The efficiency of these establishments achieved in milling has an important bearing upon the marketing margin and, *ipso facto*, upon what proportion of retail price is appropriated by the farmer (Lele, 1968). The latter is an important determinant of farmer's incentives.

Most millers have the option of marketing the milled rice using normal commercial channels. Occasionally, millers will have entered into a contract to mill rice for the Ministry of Food. When millers are selling through commercial channels, they either consign goods direct to wholesalers-cum-aratdars in terminal markets, or sell to visiting traders from outside the local market area. A small portion of the produce will doubtless also be marketed through aratdars in the local areas. Occasionally, terminal-market wholesalers will place indents by phone or telegraph, and back them up by bank transfers of the payment, in advance. (This is common for relatively large and well known mills, which produce rice of a consistent grade or quality). When the itinerant merchant purchases rice from the miller, he will transport the grain, by truck or rail, to the terminal market. Once the rice reaches terminal wholesaler market, like Dhaka (Babubazar), Chittagong (Pahartali), Khulna(Khalishpur), the terminal-market *aratdars* start matching arrivals with indents received from retailers or aratdars from other consumption areas. These matching acts also help set wholesale prices for the rice grades in question.[7]

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[7]There is no evidence to suggest that wholesalers are clustered together geographically. For 1986, when a census of all rice/paddy wholesalers was taken, the data suggest a fair degree of dcentralization (BBS).

II.6 Transmittal of Price Signals

The key economic significance of marketing services is that, when performed, they help form and transmit prices, across units of time, place and form. The formation and transmission of price is at the heart of how the market coordinates, as if through invisible hands, the private actions of innumerable agents, guided by their individual self interest but still potentially capable of delivering the common good. Prices are efficiently formed when atomistic participants freely interact with equality of access to capital and market information. Such a price regulates forces of demand because it is an information measuring the costs of supplying the consumers with the unit(s) of the good in question. It can simultaneously bear upon the producer, because it conveys to them the information that the consumer is willing to pay the resource costs of production.

This price formation has both static and dynamic features to itself. Each spot price quotation by an agent represents his best "estimate" or evaluation of the worth of the unit(s) of the commodity in question at the present moment. But the dynamic part lies in that expectations about future conditions are also likely to be important in the actual formation of prices. Each spot price quotation springs from an array of information, howsoever inaccurate, about future crops and alternative supplies, demand pressures, and storage costs to allocate the supplies in hand to future time periods. At the same time, the temporal pattern of prices established, or the price expectations formed, signal producers, consumers and the suppliers of storage as to the opportunity costs of their production, consumption and storage decisions. Failure to transmit realistic signals as to the opportunity costs can cause enormous misallocation of resources in food production and consumption, damaging disruptions to the smooth temporal flow of food supplies to the consumers. In market economies, price transmittal and expectations about the future are

simultaneously related. In a well-functioning market economy with vigorously competitive institutions, prices can not for long remain far out of alignment of the opportunity costs to the society of actual production and consumption decisions. This is because the desire for greater profit, or for greater utility, brings forth larger supplies or smaller demand and thus adjusts the prices quoted and eliminates the "distortion". Marketing functions provide the stage where the market agents play out their volitional economic role and create two sequences of fundamental importance to private-enterprise economies, viz. efficient price formation and efficient allocation of resources.

II.7 The Issues in Rice Marketing

If efficient conduct of the market is a prerequisite to efficient allocation of resources over place and time, a comprehensive understanding of the salient issues of marketing is a prerequisites to helping create an environment that fosters it. Marketing provides an illuminating vantagepoint for analysis of the role of prices as an allocator of resources, as also a major input into the distribution of incomes. The issues of cardinal importance in marketing do therefore lead straight to the problem of the efficient development of economies. In Bangladesh, rice has been a leading economic sector. This offers itself as a potentially valuable case study for looking at the issues of marketing.

The key issues are as follows: (a) what is structure of Bangladesh's rice market, and how do its component establishments in it conduct themselves in terms of pricing of their inputs and output; (b) what is the cost of marketing including a margin for normal profit, and what determines this cost? (c) what is the extent of the marketed surplus? (d) How efficient is the market in transforming the commodity in time, place and form while transmitting prices that accurately and continuously reflect its

scarcity or abundance to the producers and consumers? How high are the profit rates in trade and milling of rice?

Before launching into a full-blown analysis of each of these issues, it seems appropriate to dilate a little bit on why each matters to a study of rice markets.

II.8 The importance of Structure as a Determinant of Conduct

All postulations regarding the efficiency and welfare gains of private market coordination derive from economists' assumptions regarding perfect competition that drive the decision making models of both consumers and producers. A crucial aspect of these assumptions is that both consumers and producers are too numerous for any one participant to influence the price outcome of any given transaction. A usual starting point is by asking about the number and size distribution of establishments in the trade or industry. The argument usually is that a large number of participants is a proof, or makes it highly probable, that freedom of entry and exit exists in the market, and that thereby the conditions of perfect competition are approximated. Faced with the prospect of vigorous competition, firms' quoted price for performing marketing and distribution services will keenly reflect the real scarcities or abundance of the resources so employed. Structure and conduct are, in theory, thus closely connected.

With atomistic market structures, firms will have little or no incentive to invest resources in product differentiation, or in vertical integration: given the structure, such tactics will not pay because other competitors will follow up with product differentiation or vertical integration, thus dissipating excess profits.

II.9 The Cost of Performing Marketing Service

The cost of marketing can be excessively high because of (a) high resource cost of storage and transportation; (b) high minimum profit margin per unit of turnover due to small size of markets; (c) high profit margin due to trader's or miller's monopoly; and (d) excessive informational inefficiency by agents. Food policy analysts need to establish what the marketing costs in fact are, and, if possible, how important individual cost and profit component(s) are, and how to reduce these costs.

II.10 The Marketed Surplus Ratio, and the Size of the Market

Aggregate gross marketed surplus (GMS) during a period is equal to the difference between the production, and the farm retention.[8] The size of the rice market depends upon the GMS marketed surplus ratio, which is gross marketed surplus divided by the net production (production net of seed-feed-wastage fraction). The higher this ratio is, the larger the size of market.[9] When farm production and processing technologies are primitive and traditional, marketed surplus is small and commercial channels funnel fairly small volumes of paddy into a small number of largescale rice mills, which usually have to store significant quantities for sales later in the crop year at high prices (Barghouti et al., 1990, p. 30). A thin market translates into low unit capacity utilization and high average processing cost (Lele, 1971, p. 14). A thick market permits the adaptation of scale of plants so as to raise processing efficiency. With broad based

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[8]Following Krishna (1962), we used marketed surplus and market supply interchangeably in this report.

[9]Farms which are deficit in foodgrains may often have to alternate between selling some quantity after harvest, and buying back towards the end of the season. Net marketed surplus, for a given farm, is at best equal to gross, and can even be negative, when quantity bought back exceeds quantity sold after harvest.

adoption of high yielding varieties, a phase of an intricate seasonality with overlapping harvest seasons ensue, which result over time in growing size of the markets, a growing number of functionaries in the markets and growing mean turnover. The emerging empirical reality is that the rate of net increase in the number of functionaries in the market is below the rate of increase in the total size of the market, thus permitted a secular increase in average turnover for surviving establishment. (This is documented later). As such, the unit trading costs for rice rise at a lower rate than for nonrice options, where technological and marketing conditions are much less favorable (see a discussion in Barghouti et al., 1990, p. 31). The size of the market thus matters to the cost of marketing and distribution.

II.11 Efficiency in Markets Conduct

Markets are conducting their role efficiently when a large number of well-informed and uniformly leveraged buyers and sellers are competing to exchange goods and services that keenly reflect the scarcity or abundance of resources employed in them. In efficient markets price differences between places would be no more than the full cost of connecting them and a margin for profit and risk incurred. Similarly, prices differences between two points of time should be no more than the full cost of storing the good between them, and a profit margin for the effort. Price differences between two forms should be no more than the full cost of processing, and a margin for profit and risks. Further below, we examine specific hypotheses as to whether Bangladesh's rice markets exhibited any systematic tendency of lack of either temporal or spatial integration in this particular sense.

II.12 Objective of the Report

The major objectives of this report are the following

(a) to understand the present <u>structure</u> of the rice market in

terms of the number and size-distribution of the rice market

(b) to understand the conduct of the establishments in the rice market amid a two tier rice market (one public the other private), in terms of pricing of the output, the use of product differentiation and of advertizing, the utilization of any restrictive or collusive practices

(c) to understand the dense network of commercial contacts through which paddy and rice flows from upstream producers further downstream

(d) to understand the evolving size of rice markets, the size, seasonality and determinants of rice marketing and stocks

(e) to understand the evolving size of rice markets, the size, seasonality and determinants of private rice marketing and stocks

(f) to understand what the costs and returns are in the transformation of paddy in place, form and time, and whether they appear excessive per reasonable independent standards

(g) to evaluate the state of competitive health of the rice markets, and to identify the areas where public policy guidance may have some positive payoff

(h) to determine how well the market is integrated spatially and temporally, and to understand how wholesale and retail levels are connected with each other.

(i) to formulate a close understanding of the interactions between the private and public tiers of the market

III A REVIEW OF THE LITERATURE

Growth of the literature on Bangladesh's rice markets during the last three decades has been rather uneven. More has been written on the performance and constraints to Bangladesh's rice production system,[10] but much less has been done on marketing and distribution or the impact of public policies on the conduct of

[10]Following is an illustrative list of sources: Hossain (1980; 1984; 1986; 1987); IFDC, 1982; IFPRI/BIDS, 1985; Hossain, 1988.

markets.[11] The highlights of the first genre of studies has been, first, that foodgrain output has been the lead edge in a lopsided pattern of agricultural growth, but that the economy is far below its potential in terms of irrigation and fertilizer development. It is also pointed out that the gains from water resource investment have stimulated returns to farming of irrigated rice, crowding out noncereals from farmers' choice (Zohir, 1992; Hossain, 1991). Farmers appear to have devoted much of the resources released by gains in productivity in cereals production back into added cereal output, but not into cash crop production. The geographically wide basis of adoption of improved technology, couped with integration of agricultural input markets has helped a coupling of relatively high growth in output with stability: the 1980s have registered higher growth rates and greater stability of rice production, than have 1970s (Chowdhury 1992).[12]

In contrast, the basic studies of marketing and commercialization right upto the present times remain fragmentary. This is particularly true of the studies conducted in the 1950s and 1960s. The consensus seems to be that during the 1960s, rice markets were very thin, between 10 and 14% of the gross output being marketed.[13] About 55% of the province's rice output came from the rainfed aman, harvested in November-December. Boro, about 20%

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[11]Studies in this genre include Raquibuzzaman, 1968; various rounds of Master Surveys of Agriculture in East Pakistan under auspices of Bangladesh Bureau of Statistics (BBS); Farruk, 1972; Directorate of Agricultural Marketing, 1974; Ahmed, 1979; Ahmed 1981; Islam et al. 1985; Murshed and Rahman, 1988.

[12]On the question of greater stability, see Hossain, 1990.

[13]Raquibuzzaman (1968) put marketed surplus during 1964/65 at about 10% of gross output. Various Master Surveys of Agriculture conducted for early and mid-1960s broadly concur (Ahmed, 1981, p.38). Ahmed (1979) also points out that, during the period, 61% of gross rice output was consumed on farm, 9% were used for seed, feed or were wasted, and about 17% were used in nonmarket disposal, including rent payment.

of output, was harvested during March-April, especially in the North-Central and North-East pockets of the country. However, the *localized* specialization of boro meant that production risks correlated positively in space, thus creating larger fluctuations to total boro output. Next to nothing out of boro was marketed. Aus, contributing the rest, was harvested in July-August. Typical storage period for aman rice --- the major portion of private rice stocks --- was about eight months, following November-December (Farruk, 1972).

The first major preliberation account of which note must be taken was the description and analysis of the structure and conduct of the rice markets of East Pakistan during October 1967 through November 1968 (Farruk, 1972). Farruk examined in great detail the organization of rice marketing using a private and public divide, the levels, determinants and the effects of the costs of private processing and storage, the formation of spatial and temporal margins, spatial market integration using the method conventional at the time, viz. computing between-market correlation coefficients to reveal the degree of market connection.[14]

While we offer appropriate critique of Farruk *en passant* it is inescapable that on the most crucial question of competition in the rice market, he left his case unresolved. To quote: "Analysis of intermarket price differentials as well as intertemporal price increase shows that such variations during the year under consideration were higher than the cost of transfer and storage respectively. By the norms of a competitive market model, this suggests evidence of excess profit for the relevant market

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[14]Farruk's work was one of several that were moulded in the tradition of USAID-funded studies on agricultural prices in developing countries carried out at Cornell University in the late 1960s. One better-known among these cognate studies is by Lele (1971). These studies had a common set of research concerns and methods, which have been the object of a penetrating critique by Harriss (1979).

functionaries. However, in the absence of more detailed business and transaction data and, more importantly, a proper valuation of the skill and time of the trader, computation of profits in this manner may be a grossly imperfect method of measuring market imperfections. The real issue is not whether the trader earns any supernormal profits; rather the crux of the problem is whether the price differentials are large enough to weaken and distort the proper role of price as an allocator of resources and a distributor of income."

It is surprising that Farruk should have stated that the real issue was not whether the traders on his sample earned any supernormal profits but that the crux of the problem was whether the price differentials were large enough to create distortion. Farruk seems unaware that large price differentials *per se* may not be distortionary, as when they owe to high unit costs of transportation because of primitive infrastructure, or when great distances separate terminal from primary markets, or when storage cycles are long. Where efficient market conduct is at issue, the real issue is precisely whether the trader earns supernormal profits, because such profits introduce distortions. The fact that, on Farruk's own admission, whether wide positive margins adversely affected pricing efficiency was outside the scope of his study (Farruk, 1972, p. 75) must remain a handicap.[15]

After the liberation of Bangladesh, one early estimate had it about 19% of the output was marketed in 1973/74 (planning Commission, 1974). Marketing margins were estimated at about 31% in early 1970s: the farmer was estimated as receiving about 25% of the retail price. Meantime, Bangladesh was visited upon by the 1974 famine, which received a contemporary attention (Alamgir,

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[15]From this point, this survey of the literature at times becomes an interpretive chronology of rice market developments, too.

1980), and spawned a spate of subsequent scholarly research (Alamgir 1978; Sen, 1981; Ravallion, 1986). The famine casualties remained a tragic but object lesson as to the *conduct* of Bangladesh's rice market in the period shortly after liberation, effectively researched subsequently by Ravallion (1987). The *conduct* of the market was being unfolded with a destructive articulateness not captured by either contemporary writings or subsequent research. To recapitulate about the genesis, the flow and ebb and the effect of this famine in the present context does not seem to be amiss at all.

The production of rice in 1973 crop year upto the runup to the famine was not spectacularly below average. Nor was the public foodgrain stock at the beginning during FY 75 --- when the famine took place --- very much lower than the year before. As Sen first pointed out, there was no precipitous food availability decline in 1973/74 upon the year before. However, as Ravallion points out, there was crop losses to 1973 aman, and 1974 boro crops. In the second half of FY 1974, the government, strapped for cash in propping up the budget deficit of the massive state sector, began to brook even larger deficits (Osmani, 1985). A large part of this infusion of purchasing power were reaped by public-sector, mainly urban, consumers. This made demand bullish, especially given rampant economic uncertainty of the period. The socio political fabric of the economy was visibly fragile. A political credibility gap permeated popular perceptions and raised in the public consciousness a high probability of breakdown of the customary commercial rice market contacts. This added edge to uncertainty. At a time when the surpluses of aman output had to take the onus of feeding the deficit population through the rest of the year, the resultant uncertainty put a premium on strategic stocking on the part of a very small proportion of large farmers who controlled more than eight-tenths of the gross marketed surplus. These farmers had already been privy to a sweeping socialization of commercial and industrial assets, and then to the imposition of a

one-party device. Deeply suspicious about the intents of the ruling government, amid dwindling public stocks,[16] deteriorating law and order, rampant corruption, a infrastructure well below par due to the ravages of the war, and bullish expectations of future prices, the stockowners were rigidly clinging to a very liquid assest, viz. paddy stocks. Government capacity to deliver on its price-stabilizing mandates was transparently paralytic: the markets, correctly, second-guessed the Food Ministry. Bullish expectations were also partly the result of crop damages to aman crop of 1973, and the boro of 1974 (Ravallion, 1987, ch. 3).

Public attention was more sharply focussed on the grain markets in the tragic aftermath of the 1974 famine. To avoid a repeat of 1974 at all costs moved to the centre of the gevernment's policy agenda. The donor community, for its part, brought food policy upto a level of central policy importance, culminating in the production of the World Bank Food Policy Issues in 1979. Farmlevel adjustment amid gathering 1979 drought was expertly and minutely chronicled (Brammer, 1979). That article pointed at the need to render public assistance of a focussed kind to the generally shrewd Bangladeshi farmers as a basis for managing disasters. The scope, character and effects in Bangladesh of public efforts to underwrite food security amid weather-induced production fluctuations was the subject of much expert deliberations, internationally (Clay, 1981).

A second largescale study of rice markets was launched in 1982/83 (Islam et al. 1985). It was by far the most comprehensive study yet of this subject. Its research mandate was, among others, to document farmers' participation in rice markets and to evaluate the gains to different groups in the market chain. The sample frame was countrywide and representative, and 2000 farms --- quite

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[16]No doubt, this was aggravated by US embargo on food aid during the height of the famine (Sobhan, 1979).

a large sample --- from five regions of the country were interviewed.[17] The study's authors gave Bangladesh rice market a clean bill of competitive health. To quote: "One of the reasons for this study was the assumption that rice production in Bangladesh was being retarded because the middlemen in the marketing system were making exorbitant profits. This study has indicated that this is not true" (Islam et al. 1985, p. 137). The farmer receives between 71% and 80% of the retail price of his product, and this share is among the lowest in the major rice producing and consuming countries of the world. The authors attribute this, categorically, to the intense competition that exists in Bangladesh in all phases of the grain marketing system (Islam, 1985. p. 140).[18]

One result of this study was in compiling an exhaustive *description* of the working of the paddy and rice markets for 1982/83. The contents virtually exhaust all aspects of the marketing ranging from the delineation of buyers and sellers at each stage of marketing, the timing and the mode of transportation, the openness of market contacts, the choice of transportation media, the unit costs arising in marketing and gross margin at each stage. The major weakness of the report lies in its inability to generate virtually any data on the detailed income and expenditure statement of the commercial millers and traders on the sample. Consequently, the study evaluation of the appropriateness of profit earned by the millers and wholesalers in key stages of the market chain were tentative and unconvincing. Farmer's share in the retail price of rice begs key questions about (a) the rate of return in rice mailling or trading; (b) whether these rates were

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[17]A number of market agents from each of the other classes was interviewed, too.

[18]However, the authors might well have noted that, in Bangladesh, a small and densely populated country, distances transacted were relatively small, necessitating a small share of retail price in marketing costs.

significantly higher than the relevant opportunity costs. To give an example, we quote from a key part of the report: "The spread between the price received by the farmer in Bangladesh and the price paid by the consumer of from 71 to 80 percent is among the lowest in major world rice producing and consuming nations. The equivalent spread is about 60 percent in Thailand and less than 50 percent in the United States. There are several reasons for this situation."

The main reason the above assertions sound unconvincing is that data on the value of fixed assets were not collected: the authors cannot really be sure what the rates of return really are. And yet, using their numbers (in Table F-10, F-7, G-1 and F-13), and contemporary information about replacement costs of representative units with similar capacities (Harriss 1979, with proper adjustments), we calculate that the small mills registered a pretax rate of return of 92% and the large mills yielded a rate of return of 68%. These rates of return (before payment of any direct taxes) compare very favorably indeed with shadow interest rate for Bangladesh during the time, unlikely to much exceed 20-24%. The weighted average rate of return would be about 84%, which is not a great deal higher than an average of 70% reported by Harriss for a somewhat earlier period.[19] The average mill could pay for itself in just over one year, while in Harriss' case, the average custom mill could recreate itself in 1.5 years. Clearly, these rates of return are high. In contrast, Islam et al. thought the returns were reasonably modest, given the unknown capital requirements and risks (p. 139). Nothing was said elsewhere in the report on the nature of risks, on which, however, much of the

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[19]Here is how these computations were infact done. From Table F-10 in Islam et al. operating capital per unit was calculated at Tk. 74 and 267 thousands respectively during 1982/83. Using Harriss' estimates for an earlier period with appropriate adjustments, we estimate the replacement cost of a small and large mill at Tk. 240 thousand and Tk. 725 thousand.

explaining was being vested. There must be a presumption that risks can not be crippling when investments can pay for themselves in one or two years.

The farmer, to be sure, gets a quite high share of the retailer's taka of rice to be sure. But to compare economies as different from each other as Bangladesh, Thailand and United States in terms of this ratio is not tenable. Even for rice, the typical spatial units in marketing, the gradation, packaging, inspection and promotional costs are very radically different between Bangladesh and the U.S. A comparison with West Bengal, India, would have more merit. Finally, farmer share soon after the liberation of Bangladesh was reported at about 75% of retail price.[20] By the criterion of the farmer share in retail price, rice markets in 1973/74 would be made to appear as comperetive as in 1982/83. And yet this would not really follow. In 1973/74, typical distance (ton/mile) over which rice was transported was undoubtedly much smaller than in 1982/83, because much of the road system was not even in place. Real resource costs of marketing would have been smaller then. The upshot is that marketing margins may not unambiguously correspond to market competitiveness.

The final study selected here comprises a few articles authored by Crow and Murshid (Crow, 1989; Crow et al. 1991; Crow and Murshid, 1991). These papers have come out of data purposively collected by the authors from three regions in Bangladesh, namely Bogra, Tangail and Maizdehee. The first named is a surplus district, the second and third deficit areas. The focal consideration in the research design of Crow et al. work was the hypothesis that credit and foodgrain markets are interlocked in a way that facilitates exercise of monopoly powers by merchants, often at the expense of farmers. Using this body of data, Crow

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[20]This was reported by Islam, 1975, as quoted in Ahmed (1979, p. 22, ff.). The data for this study were collected in 1973/74.

argued that credit contracts, usually providing extremely poor debtors with liquidity during lean seasons of the year, stipulates an in-kind repayment, usually in paddy, which translate into a very high effective interest rate. He suggested that the current conventional wisdom about competitive health of rice markets in Bangladesh may not be one's last word.[21] (We revert again to Crow's work below.)

All of these studies rested often on weak analytical foundation especially as concerns the determination of whether price transmission was efficient or not. This one analytical strand is an influential one in the competitive context. The lacuna in the literature on this particular score, first pointed out by Harriss (1979), is critical. Because of its importance, the nature of Harriss' contribution, and the impact it has had on the reformulation in the literature deserves more elaborate discussion.

III.1 How to Study Spatial Market Integration

The evidence at the centre of Harriss' critique was about geographical integration of markets. This had usually been evaluated using pairwise correlation between price movements at various locations. High correlation coefficients (those above + 0.85) were seen as indicating high degree of spatial connection between markets (Farruk, 1972; Lele, 1971), and indicating efficient transformation of commodity in space. Blyn (1973) and, more authoritatively, Harriss (1979) pointed out that closely correlated movement of spatial price imply several other things, too: (a) common income or population growth trends or production seasonality; (b) equally binding implementation of government's pricing policy pursuing the same or dovetailed price targets in the

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[21]Crow and his co-researcher are still working on data generated during an eighteen month period through February 1990. All their results are therefore preliminary.

paired regions, with little actual market connection; (c) equally homogeneous monopoly; (d) high correlation of prices in both regions with that of a related good traded in a common third market. The point of the critique was that correlation and causality are not interchangeable (Papanek, 1972).

The popularity of the pairwise correlation has not survived Harriss' critique. The fact remains however that high pairwise correlation coefficients indicate high degree of spatial arbitrage so long as there are no extreme monopoly, or effective government control over all regional markets, or shared dynamic seasonal structure in market availability (Timmer et al., 1983).

The outgrowth of the literature on Bangladesh's rice markets since Harriss' critique has made thought provoking analytical contributions into their conduct. The high-water-mark of the growing analytical innovation is to be traced to Ravallion (1987). Ravallion's key insights are now summarized.

First, using an analysis of the determination of rice prices in Bangladesh during 1972-1975 including the famine months in the autumn of 1974, Ravallion shows that reports of future crop damage resulted in higher rice prices during the period, and that this existed independently of future prices. Price forecasting errors were positively correlated with readily available information on damage to the future harvest. Rice hoarding prior to anticipated production losses was excessive when compared to the likely outcome under competitive conditions with informationally efficient expectations. This implies that the traders believed that future prices adequately reflect the future scarcities on which their storage decisions depend. Storage decisions were fueled by overoptimistic price expectations, due to their belief that the government would be unable to implement a suitable stabilizing response to the reported damage to the future crop.

Second, Ravallion has formulated a dynamic model of spatial price differentials, which can test for market integration both in the short run and the long. By permitting each local price series to have its own dynamic structure (and allowing for any cognate local seasonality or other characteristics), as also an interlinkage with other local markets, both the degree of spatial market connections can be tested by nesting market integration and market segmentation within a more general model.

Ravallion applied this genera. framework to regional price data for the famine period (Ravallion, 1986). Using monthly rice price data for five markets Ravallion showed that of the five markets no one, even in 1974, showed complete segmentation from Dhaka prices. However, most markets on his sample were not highly integrated even in the long run. Subsequently, Ahmed and Bernard, using the same approach, showed that, of nineteen markets tested, not one was found to be segmented, 26% were well-integrated within the domain of monthly prices, and 64% were integrated in the short run in all except the four monsoon months (Ahmed and Bernard, 1989).

III.2 Price Expectation Results

Speculation in grains does not rule out the existence of competitive condition, given the presence of informational inefficiency. Intertemporal price spreads can be excessive if future price expectations are overstated that is, future scarcity is overstated --- which will cut back on the supply of storage. Montgomery (1983) has shown that the degree of anticipated shortfall in the size of prospective harvests explains the increases in lean season prices. Ravallion (1986) has argued that for a sample of wholesalers in Badamtoli --- Bangladesh's "reference" rice market --- that forecasting errors positively related with price forecasts. This result implies that above a certain critical level of expectations, future prices are

systematically overestimated, and below which they are underestimated. Correspondingly, bias in profit expectations will be such that private stocks will be insufficient (relative to those implied by rational expectations) when expectations are low, while storage will be excessive at times of high expectations. Supply of storage will be choked (relative to a rational expectations equilibrium) during lean periods of sufficiently high prices.

III.3 Results about competitiveness of markets

Most evidence on Bangladesh's rice market failed to establish visible signs of any serious imperfections. Margins were between 23 and 29% of retail price, and considered moderate; the number of both buyers and sellers were large; even though the market structure is pyramidical, so that the number of sellers at the apex of the pyramid, represented by the Badamtoli wholesalers, is small, entry requirements at the other levels of the trade are reasonably easy to meet; the Labor Force Survey data, for all its caveats, show that the number of persons engaged in various types of trade had experienced a rapid growth rate between 1974 and 1984. Given the very significant increase in the quantum of foodgrains to be marketed over this period (Crow, 1989), there must be a presumption that growth in the overall size of foodgrain marketing was one major beneficiary of this increase; even the number of wholesalers in Badamtoli rose from 17 in 1973 to 150 in early 1984, while over the same period, Dhaka's population doubled or so (Ravallion, 1987, p.149, ff.1). This suggests the fairly rapid growth even at this level of the trade. The balance of information --- which can selectively provide key leverage to participants --- had tended to become more equal over time as a result of the secular improvement of rural-to-urban and intra rural infrastructure.

Virtually all major studies have argued that foodgrain markets are competitive and not collusive, in which, especially in normal years, the sheer scarcity of capital resources at the disposal of the "average" trader makes for a compulsion towards rapid turnover of stock. This tendency has been accentuated by the growing importance of boro harvest juxtaposed between the aman and aus harvests, which, thus, implies a lowering of the mean interharvest storage duration.

Two bodies of evidence have attempted to controvert the conventional wisdom as to competition in foodgrain markets. Crow and Murshid without as yet contending that markets are not competitive, have pointed to some evidence that credit contracts on onerous terms amount to vertical integration set up so that control of markets really devolves to the relatively handful of wholesalers/aratdars in terminal markets. This, they argued, causes some tension to the concept of the equality of access to the market required by the normative competitive model. Second, this calls into question the realism of assessing the competitive health of markets on the basis of prices collected by public agencies in markets in or near to district headquarter towns. This is because these prices reflect conditions some way "up" the chain of market intermediaries, and because the effects of indebtedness is more in evidence amid producers' prices. Crow (1989) displays strong skepticism in both Farruk's and Islam et al. study's result, in part, because both reported, in the words of Farruk, that "there is virtually no integration between the marketing intermediaries and the rice producers, nor is there evidence to support that these two groups are linked by financing and credit arrangements" (Farruk, 1972, p. 34).

Several questions are worth asking about the robustness of both Farruk/Islam et al. and Crow/Murshid contentions. First, the contention as to the virtual absence of any integration between the market intermediaries and, specially, the small rice farmer must be

of dubious validity, given the utter inadequacy of formal credit structure, the tendency of rice cultivation becoming increasingly cash-cost-intensive with the diffusion of HYV-adoption, and the legalization of the issue of cash credit limits by scheduled banks favoring rice millers, which would create profitable opportunities for onlending to poor and vulnerable rice farmers. At least some of the informal credit being called to attention by Crow could be funneled to poor peasants by peasant-traders, mistaken for peasants during interviews. Hashemi has shown that in two sample areas such informal credit is only extended by either peasant-traders or by pure peasants but almost never by itinerant traders --- who would have high transactions or enforcement costs (Hashemi, 1989). Farruk/Islam et al. failed to correctly specify the source of credit in the context of an overlapping of economic roles. However, Crow's "Plain tales" are narrated in a deliberately anecdotal style. His data does not come from a statistical design which can support some probability statement of the proportion of farms taking such onerous credit. "Poor peasants" are a subset of small farmers who have been show to account for no more than 3-4% of marketed surplus of rice in Bangladesh (Ahmed and Bernard, 1989). Put differently, if the grains raised by the poor are for consumption alone and do not enter into the markets, then why should the provision of credit to them at high implicit rates, for all its <u>moral</u> or <u>ethical</u> opprobrium, be decisive to the underlying competitiveness of its conditions? Crow and Murshid have not as yet dealt with the <u>distribution</u> of the unit costs of credit across farm sizes which has a corresponding range in the proportion of output marketed. Unless that is done, what can one say as to impact of those credit transactions on the competitiveness of the overall <u>market</u> for foodgrains?

For many poor peasants the distinction between high-cost consumption credit and high -cost production credit that stabilizes consumption in the lean preharvest season in bound to be a thin one. Poor people are prepared to pay extremely prices to be able

to consume in order to live on. The high costs of production credit are an artifact of the high price of consumption resources, charged by the creditor. But the exploration of the costs of consumption credit in the grab of productive credit is hardly a substitute for understanding the role of credit as a force informing the competitiveness of foodgrain markets, simply because there is no one-to-one correspondence between the demand for high-cost credit, and the command over foodgrain marketed surplus.

Finally, is it axiomatic that prevalence of high cost credit must mean a greater departure from competition than in its absence? The alleviation of vulnerability of the poor peasants asks for augmentation of their capacity to generate income from farming. That requires utilization of farm inputs. But these are complementary in nature (the marginal product of one depends on the quantity used of others). Farming is also about timing of one's combination of such inputs. The decision to discard a highcost credit may entail the lowering of the marginal --- and average --- product of land and labor by a larger magnitude than might have happened due to the credit *per se*. If poor farmers are to be able to act so as to enhance their productivity and because Crow says that acceptance of such high-cost credit is fairly widespread, credit may well be deemed worthwhile despite its ostensibly high costs. If so, then the very availability of such timely credit in amounts that match the individual ownership of complementary production resources, like labor and land, must be deemed to raise the productivity of the poor relative to what would likely to have happened in its absence. Such a dynamic productivity behavior would impact upon poverty favorably, and thus another entail a closer approximation to competition in an abstract sense.

The second body of evidence is about informational inefficiency of the rice market. Such inefficiency can lead up to excessive hoarding. This happens when the demand for storage is based on price expectations that are greater than the mathematical

expectation, given all currently available information. The position that private traders ought to have the same "rights" to cheap bank finance as industrial processors, in some people's view, takes on an alarming dimension due to sheer increase of the speculative potential within the foodgrain chain. Our own position on the question is that, even when foodgrain merchants are barred from holding "large" stocks or borrowing bank for the purpose, they were doing both, with the qualification that they were to having to incur certain "transactions cost" in getting around the law. Where the laws do not take their cues from market incentives, this creates space for rent-seeking behavior. Hence, 'law-making" is not at issue. The real issue is, how to nudge the foodgrain information system to a position where informational inefficiency is lowered. Barring foodgrain wholesalers from bank credit would also militate against using private sector as a major buyer of paddy in good --- or bumper-crop-years. In other word, such a legislation would amount to forcing upon the private sector the invidious disadvantage or having informal markets as the only source of credit, while other commodities are allowed to be traded in a more laissez-faire tradition.

III.4 Summing the Literature Up

It is time now to summarize what we may have learnt from this review of evidence. We would like to enunciate the following propositions:

(a) The number of agents in Bangladesh's rice markets has risen very rapidly. By all accounts, the size of the rice market, as measured by the gross marketed surplus, has also risen fairly rapidly since the early 1970s.

(b) Foodgrain markets clear with competitively determined margins in seasons/years with normal production/trade performance. However, margins can be "excessive" in "below-normal" seasons/years. But this is more plausibly attributed to

informational inefficiency than to the sudden appearance of monopolistic or oligopolistic tendency in such years/season. Such inefficiency can lead to excessive stocks even though the underlying market structure is one where there exists a large number of similar traders (in each level of the market chain) with individually flexible prices that are responsive to market conditions and converge in equilibrium.

(c) The overall scarcity of capital, growing pressure on land and growing unemployment, secular improvement of the infrastructure that has reduced marketing costs carry with them the presumption that foodgrain trade is primarily carried on with labor intensive methods. Rapid growth in the overall size of trading sector is thus understandable. Barriers to entry are virtually nonexistent.

(d) To probe market integration using bivariate correlations methods is a useful descriptive procedure where strong presumptions do not exist for widespread monopolies or highly effective governmental policies, such as procurement or stabilization, to manage prices. By most accounts, public interventions in Bangladesh's rice markets have not been effective enough to synchronize spatial price movements. Also, obvious monopolies in rice market must be ruled out.

(e) Informational inefficiency has been shown to exist among Bangladeshi rice traders (Pavallion, 1987). This has potentially important implications for the behavior of private supply of storage and therefore the public capacity to stabilize prices. Formulation of buffer stock policies begs the question of the how marketing agents form their price expectations, and how the forecasting biases interact with forecast themselves as also with public storage levels themselves. Besides Ravallion's work, there is no other research effort worth the name in this connection. It may not be enough to simply study rice markets from this viewpoint: paddy markets also have to be studied in their own right.

(f) The debate about the extent and effects of preharvest credit contracts between traders and farmers is still wide open, as is the firmness of the new evidence purporting to show that preharvest credit transactions, which allegedly represents vertical integrations structures. It is plausible that major studies in the past ignored important aspects of the credit market relating to duality of roles of economic agents. There is a need to reexamine credit relations. However, it is also important to put the extension and acceptance of highcost credit by poor peasants in the context of the overall supply of the foodgrain marketed surplus. This is because there is no one-to-one correspondence between the characteristics of poverty and the determinants of the supply of storage. Also, it is warranted to probe the relationships between credit and the performing of marketing transformation in a manner that permits making probability statements at conventional levels of significance.

(g) One of the most striking omission of the available foodgrains market literature in Bangladesh relates to a total lack of information as to the magnitude of private grain storage at a point in time. Consequently, nothing is known about the price, production, income elasticities of private supply of grain storage, still less about how private and public storage interact. This gap in information is crippling. To estimate some plausible confidence intervals of traders' and farmers rice inventories over a crop-year (Nov-Oct) is likely to have high research pay off.

IV. STRUCTURE OF THE RICE MARKET

The purpose of this chapter is to provide a clear idea about the structure and organization of the rice market in Bangladesh. By organization we mean the physical collection of commodities and byproducts, the use of grades and standards, seasons, market agents and markets, means and media of storage, transportation, processing, and exchange that are prerequisites to the effective functioning of commodity markets. The emphasis presently is upon the physical aspects of market organization.

IV.1 The commodities

The principal commodities traded in the rice market are rice and paddy. Something of the order of 150-200 individual strains of paddy, and a similar number of strains of rice are marketed in Bangladesh. Out of this, about 52% are produced in the aman season (June-November), about 25% are produced in the boro season (January-May), while the rest are produced in the aus season (April-August). This might create the impression that the rice market is precariously heterogeneous --- to a degree that makes average prices, say, of coarse or noncoarse variety a not very meaningful number. Without brushing this wholly aside, the study of competitiveness of rice markets would still has a rightful place. Analysts have indeed studied market performance of even more heterogenous commodities, like cut flowers. Competitiveness of markets, like the purity of the air, is a matter of degree. The case for the assessment of market coordination is important and pervasive enough to rule out a puritanic attitude on product homogeneity.

During milling, paddy outputs a small number of byproducts. Because the nature of the byproducts differs somewhat depending upon the milling technology at use, it is imperative to first outline the milling technologies used in Bangladesh rice markets.

IV.2 Paddy processing technologies in Bangladesh[1]

Stripped down, milling is about dehusking the paddy. Other mechanized procedures in the mills are meant to polish the grain, whiten it, and to separate the bran from the husk etc. Dehusking is a kind of peeling action. Techniques range from those that separate the husk by impact (e.g. in a pestle-and-mortar) or by scraping action of hullers or metallic stones as they are passed, at high speed, through paddy. In Bangladesh, the pestle-and-mortar, introduced into the development literature earlier on by Ajit Bhalla (1964), goes by the name of dhenki, which used to account for a major share of paddy dehusking, has of late become virtually entirely *passe*. About 98% of Bangladesh's paddy is now milled by mills using the scraping devices, powered by either diesel engines or electric motors.

The mills themselves come in two broad classes. The first is the Engleberg type huller (also sometimes called the Louisiana State University huller), which works on abrasion principle. Paddy passes through an annular space between a rotating roller, attached with helical and straight ribs and a fixed hollow cylinder. The cylinder with metallic screen on the lower half forms a part of the housing. The roller rotates while its ribs abrade the grain against the cylinder, thus dehusking the paddy. Subsequently, the husk is crushed and the grain is polished, simultaneously. Crushed husk and bran pass through the screens at the bottom and these are sifted from the grain. The paddy is passed once, or twice. Quality of milling is controlled by adjusting the feed rate by a feed adjustment mechanism. A flat belt transmits power from primemover to the huller.

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[1]This section draws heavily upon Rahman (1988), and Mahiuddin Ahmed (1987). In this report, technologies and techniques of production are used interchangeably. In reality, a technology corresponds to an array or shelf of techniques embodying different degrees of mechanization.

Major quantity of crushed husk and bran is separated by screens inside the huller. Remaining husk and bran that remain mixed with finished rice is separated, either manually or using mechanical means. The manual method is winnowing, usually done by women. Mechanically, the separation is done when aspirators create induced or forced draft across which rice with bran and crushed husk is sprayed in thin layers. The draft carries away bran and husk, leaving behind heavier clean rice. These aspirators are driven by the same primeover as the huller.

The second class of technique is a modern rubber roll sheller. In it, one rubber-made roller has a fixed position, the other is adjustable to obtain the desired clearance between the two rolls. Driven mechanically, they rotate in opposite directions. Both of them are of the same diameter and width. The clearance between the rolls is kept smaller than the thickness of the paddy grains. The rollers, moved at different speed, generate different peripheral speed. When paddy is fed between the rolls, they are caught under pressure by the rubber rolls, and due to the difference in peripheral speed, the husk of the paddy is stripped.

By automatic in Bangladesh context is meant a paddy processing complex with (a) a parboiling unit, (b) a modified Louisiana State University type of drier, and a multistage milling unit of either (i) Satake (Japan) model or (ii) Shule (German) model, largely of 1960s vintage.

Mills employing rubber roll shellers have mostly been imported to Bangladesh from India, and are either of the automatic or semi-automatic variety. When these shellers are accompanied by (a) paddy precleaning unit, (b) conveying equipment like bucket elevators or screw conveyors; (c) aeration equipment like blowers, aspirators, and (d) various type and capacities of sieves and mechanical separators, they are fully automatic.

IV.3 The Production of byproducts

These different technical options are supposed to differ in their biproduct characteristic. First, the bran produced by the rubber roll machine are good enough in theory to sustain bran oil extraction. This bran is also marketable as poultry feed. The bran extracted by the traditional hullers is not potentially as well-endowed as from RR shellers.

Besides, the RR shellers are claimed result in a higher percentage of head rice and therefore in a smaller proportion of broken rice, than does the huller technology. They carry the potential of fetching higher average rice price, than the huller technology.

IV.4 Seasons and the Structure of Markets

Seasons matter to market performance. Seasons sharply differ in temperature, relative humidity, and therefore in hygroscopic equilibrium. During the boro season, monthly mean rainfall during May through July average 450 mm, as against only 80 mm during December through February. The heaviest mean rainfall takes place during June through August. Relative humidity averages at 83% during these months, as compared with 75% during the months of December through February (Table 8). This is the most wet and humid part of the year. Solar radiation, the staple of the drying of the paddy, is at the lowest ebb. Paddy postharvest losses multiply due to favorable vegetative processes. Losses during storage also increase in their incidence. Table 6 reports on the byproduct coefficients of three mill technologies, and Table 7 shows by product unit prices during study year. This information does not suggest the position that automatic mills are support the position that automatic mills are superior in byproduct yield to competing technologies.

Table 5: The production of by-products per md. of paddy by milling technologies, 1989/90
(aman season)

Type of mill	Progressive District			Non-progressive District		
	Husk	Bran	Brokens	Husk	Barn	Brokens
Automatic	9.8	1.9	.4	6.2	1.2	.17
Major rice mill	5.4	6.0	.2	3.4	7.4	.21
Small rice mill	3.9	7.1	.2	5.5	6.1	.09

Table 6: The production of by-products per md. of paddy by milling technologies, 1989/90
(boro season)

Type of mill	Progressive District			Non-progressive District		
	Husk	Bran	Brokens	Husk	Barn	Brokens
Automatic	8.0	3.2	.18	4.5	2.9	.16
Major rice mill	4.7	6.6	.21	4.5	6.3	.06
Small rice mill	4.7	6.0	.15	5.9	4.[illegible]	.17

Table 7: Unit price of byproducts, 1989/90
(seer)

Technology	Progressive				Nonprogressive			
	Husk	Barn	Brokens	Yield per md. of paddy (TK)	Husk	Barn	Brokens	Yield per md. of paddy (TK)
Automatic	.23 (.07)	.77 (.07)	4.7 (.3)	5.15	.28 (.08)	.65 (.20)	4.64 (.76)	3.89
Large	.38 (.13)	.63 (.12)	4.36 (.44)	6.86	.28 (.04)	.62 (.06)	4.74 (.37)	5.45
Small	.30 (.11)	.64 (.14)	4.74 (.36)	5.91	.29 (.05)	.68 (.18)	4.73 (.50)	5.58

Note: Parentheses report related standard deviations

Not only the averages of these variables increase during the boro season upon the aman season. But their variability, too, is larger. Optimization is additionally constrained by risk. The fact that farm storage has a component of carryout from the aman season does not help either.

While the costs of intertemporal storage increases during boro/aus season, the costs of transformation of commodity in place, however, tend to rise. This is because transportation and communications are below par. Price transmission works less well (Ahmed and Bernard, 1988, p. 55). This is despite the number of itinerant merchants increasing during the boro/aus season. This has a bearing upon the structure of competition and market coordination between seasons.

IV.5 Grades, Standards, Weights

In Bangladesh, grading and standardization are not scientific in rice markets. All grading of privately traded paddy and rice is done visually or by touch. Bagging is done separately by varietal strains. Traders are apt to mix lots of the same variety of paddy with varying degrees of dryness in order to offer keener prices in

private trade (Table 9).

Table 9 reports on two versions of average coarse paddy prices. One version corresponds to prices realized by farmers on the IFPRI Farm Survey. The other corresponds to ex-trader or -processor paddy prices, not counting collection costs. The second set of prices doubtless relate to a market stage further downstream. The point of the information is that traders pay lower prices than farmers fetch. The absence of mechanical aids, however, does not entail any significant market failure: the same batch of commodity is evaluate fairly uniformly between customers. Bred out of long and sustained familiarity, business flair and acumen guide the spot quotations, which does a reasonably efficient job of reflecting scarcities and opportunities --- the heart of the price system. The absence of moisture meters really represents a situation of capital scarcity, and is not the only result of that scarcity. The pervasiveness of the scarcity of capital induces labor-intensive techniques of trading, of which manual and approximate "standards" is a good specimen. Local variations in weight exist, to be sure. But knowledge of the differences is ubiquitous. Therefore, variations do not impede trade.

The Directorate of Food (DOF) is a purchaser of some importance. The DOF is mandated to buy paddy of fair average quality (FAQ), entailing a fourteen-percent moisture level. Each DOF procurement centre has a moisture meter. From among the several elements in this set, only the moisture content is known to be regularly watched by the public procurement officers.

Table 8: Seasonality and variations in humidity, temperature and rainfall

Month	Average Humidity (%)	Rainfall (mm)	Temperature (0°C)
January	74.8	0	18.4
February	70.7	34.2	22.1
March	67.1	58.1	24.6
April	69.0	134.3	28.3
May	78.0	335.7	27.9
June	82.8	517.6	29.0
July	78.6	438.7	28.1
August	87.7	482.2	28.6
September	85.5	281.1	29.0
October	82.0	138.6	27.7
November	78.2	102.5	24.4
December	80.0	7.2	21.4

Source: Bangladesh Bureau of Statistics, 1989.

Table 9: Farmers' realized prices as % of prices paid by traders/processors

District	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Agu.	Oct.
Thakurgaon	97	100	105	111	99	117	124	110	102	103
Dinajpur	108	109	109	104	102	127	107	106	116	102
Rangpur	97	106	104	105	109	127	101	101	102	112
Bogra	105	107	105	105	102	124	101	103	104	98
Joypurhat	109	109	104	101	107	116	108	108	102	110
Naogan	107	108	109	108	105	111	108	109	102	112
Rajshahi	112	110	112	111	113	122	112	110	105	110
Netrokona	109	108	111	112	117	133	110	107	98	112
Mymensingh	113	109	118	112	114	114	100	105	97	104
Sherpur	122	120	117	113	113	13[illegible]	115	114	107	108
Noakhali	112	116	116	116	123	139	124	108	89	95
Satkhira	106	108	112	112	116	104	111	118	106	101
Barisal	110	107	111	119	111	120	115	106	95	101

Source: IFPRI Farm Survey 1989/90; IFPRI Market Survey 1989/90

IV.6 Role of Traders and Processors in Rice Market: A Classification

The following classes of traders operate at the primary markets, namely

Itinerant traders (*Bepari, Faria, Paikers*)

In FY90, there were about 40000 license holders in this category, an average of about 50 for all primary and secondary markets. By all accounts, this number has increased by a factor of twelve to fifteen since 1973 --- if the growth in the number of market participants at more exclusive echelons of the market is any guide. This increase signifies the injection of new blood in the system, and is fundamentally due to much larger size of the marketable crop more recently. These traders purchase paddy at farm and primary market levels, regrade the paddy. They transport

their purchases to the next market level or a mill. Normally, they do not own their transports. They get along by renting transports, typically cycle-vans, bullock cart, boats. Bigger ones typically use rented trucks for transporting their purchases. A very small number own godowns, usually small multipurpose structures, at a primary market, or in their villages. They are responsible for 70 to 80% of purchases from farmers, and for a substantial proportion of the movement to mills.

Size of business varies considerably. Most common is the small family-run operation without separate business premises. At the other extreme is the trader with godown and possibly transport, employing one or two staff and handling 15000 mds of paddy per season. Some also have some land to till which are however tended by tenants. Each trader in IFPRI Market Survey sample was a full-time paddy trader: this one vocation generated a quite adequate income for most itinerant traders. Most itinerant traders can count upon trade credit besides their own resources for operating capital. Even so, given their crowded ranks, supply of trade credit is limited at some point. This along with limited godown capacities, limit how much business they can transact. Typically, a *bepari* will not hold any stocks at all, will purchase enough paddy to load a truck --- about 75 quintals with a value in FY90 of Tk. 45000 --- and will send it forthwith to the secondary market. *Farias* have regular suppliers among local farmers. It will be reported below that farmers sell nearly two-thirds of their surplus at the farmgate: the buyer is almost always the *faria*. Hands-on transactions with the farmers on the one hand and with paddy wholesalers and mills on the other translate into a durable relationship of trust and mutual economic dependence.

IV.7 Aratdars, wholesalers and dalals

There are currently 2200 licensed *aratdars*, or commission-agents and an unspecified number of dalals, of which a very few are licensed, operating at secondary markets. These market agents generally perform at larger intermediary markets, as also at terminal markets. Once paddy moves from the primary markets to a larger distribution market, the buying and selling methods evolves, thus thrusting into being new relationships not necessary in the primary market. The larger intermediary markets are "dominated" by *aratdars*. *Beparis* from spatially downstream market (i.e. consuming area markets) place an indent for paddy or rice they want to buy, through the *aratdars*. The *aratdars* from that point on act as their representative, locating, pricing and purchasing the indent. Meantime, the visiting *bepari* has free board and lodge paid for by the *aratdar*. If, as is usual, the *bepari* is carrying cash for the purchase, it will be put in safe custody at the *aratdars'* vault. Once purchases are made, the *bepari* makes arrangements for despatch.

The *aratdar* will keep the purchase in his stores for a reasonable duration if there is a transport bottleneck. For all these services, the *aratdars* usually change a fixed commission of between Tk. 8 and Tk. 10.75 per quintal from those who sell through them. If necessary, *aratdars* also provide shortterm credit when selling to *paikers* (more on credit later).

Aratdars have even a more commanding presence in the wholesale terminal markets. It is probable at times that a bepari visiting an intermediate distribution centre will effect his purchase directly from a large resident trader having a fixed premise there, and can count his savings at the cost of greater risk. However, in the terminal wholesale markets like Dhaka, Madanganj, Chittagong, Khulna, Narayanganj, *aratdari* system would be all-pervading. Here, the aratdars are the sales agents and stockmen of the beparis.

Rice *paikers*, or retailers effect their purchases through the *aratdars*, being charged a commission of Tk. 10.72 per quintal.

The demarcation between the functioning of a wholesaler and an *aratdar* (commission-agent) or (a broker) is blurred, certainly in practice. The former is an entrepreneur, who balances off cost of performing marketing functions against the returns and pockets the difference as profit or loss. The *aratdar* is not an entrepreneur in the accepted sense of the term need take no risk and carry no stocks. He only brings buyers and sellers on the same negotiating platform, both of whom deem it worth their while to deal through the *aratdar*. But he can properly be deemed to be an entrepreneur in that he personifies the provision of services that are highly germane to the efficient conduct of transactions by potentially unrelated traders, but for which no markets are available. For example, providing security of visiting *beparis* is an input to the marketing process but is itself not marketed: the *aratdars* provide this service. It has been argued that entrepreneurship is about dealing with the absence of markets (Leibenstein, 1968; Leff, 1984).

In reality, too the demarcation between the wholesaler and *aratdar* is none too watertight. It is inherent in the roles *aratdars* perform that strong internal pressures quickly mount towards their assumption of a wholesalers' roles. Strong complementarities exist between those two classes of role, creating an incentive towards horizontal integration of functions. All commission agents in the paddy and rice trades might easily double up as *aratdars* and wholesalers, although very few, for tax reasons, concede being a wholesaler. This is how the coupling is supposed to work. One of *aratdar's* functions is to find supplies to match the visiting *beparis'* indents. Now, his incomes could be higher if the stock were available in his ownership. This of course assumes that the *aratdar* has some sufficient resources to invest in stocks and that he can cover the wholesaling cost. Besides, inhouse

availability of stocks usually obviates the cost of search for the variety and the quantity depending on the various indents that may at a particular moment be pending. The smaller the indents placed, the more presumably would the *aratdar's* unit search costs be. The point is that some powerful business incentives exist why, after an initial period, many *aratdars* adapt to a combination role. But they are always coy about squealing.

The *dalals*, in theory, keep the *aratdars* posted about the changing sources of supply, or route new crops of itinerant beparis to particular *arats*. But it is unlikely that this function is distinctive enough to justify the existence of a whole class of intermediaries. This is because many *aratdars* have to maintain a constant liaison, though telephones, or written messages carried back and forth, with the paddy processors in the secondary markets. *Aratdars* and wholesalers have continually become more and more knowledgeable about the supply outlook and prices in secondary markets. If is unlikely therefore that they would pay all over for that particular service. The other service --- ie. that of routing *beparis* on their maiden visit --- may fundamentally be in greater demand. Beyond the first time, the visitor is unlikely to need this service, because by then he would have known his ways around. And even for the first time, new *beparies* are as likely to visit a big terminal market in the company of a "senior" *bepari* of previous acquaintance, as to resign himself to the initiation of an unknown *dalal*. Hence, even on this count, *dalals* are unlikely to be playing an overly remunerative avocation. It is likely therefore that they will phase this vocation <u>into</u> some more substantial role, like *bepari* or *paiker*. It is for this reason that we were not able to identify any full-time *dalals*. We shall therefore not entertain any discussion of this particular class of agents in this report.

IV.8 The Classification of Primary and Secondary Levels

Close to about 85,650 villages in Bangladesh are served by about 10,953 primary markets, normally called *hats* (World Bank, 1982, Table 11.3). These markets usually cater to the commerce of several villages, and comprise a market area ranging from 4 to 16 sq. miles. They usually transact business on specified days each week, usually twice. Most of the transactions in these markets involve small quantities: producers sell their surpluses and purchase supplies for their daily or biweekly requirements. The meeting days are fixed so that itinerant traders can visit the area. Over many years, the primary market network has grown, even spatially evolved, taking its cue from the changing infrastructural opportunities. Almost invariably, these markets are situated on public land, e.g. on river banks near launch-stops, or in the vacant playground before the village primary school, or occasionally straddle an all-weather roads at a convenient point. Virtually no toll or hat-taxes are due from the transactors. In the same hat, virtually all daily necessities for rural folks are traded. This plurality of trade character of these markets is one of their important economic exchange attractions. They constitute the locus of the economic life for Bangladesh's rural population.

Next are the secondary markets on the market hierarchy. This is where the surplus supplies from primary market move for assembly to concentration of mills. These also serve as the wholesale outlets for the supplying of grains back to primary markets in deficit areas, and forward to major urban consumption centers. There are about 450-500 of these secondary or assembly markets. Many of them operate 6 days a week.

The final group are the terminal markets, situated in or near the major urban population centers. In this report paddy traders or paddy processors are treated as operated at primary or secondary levels according as they are purchasing about 50% of their purchase

from farmers.

Accordingly, among the paddy traders, farias and beparis are treated as primary-level market participants, while paddy wholesalers and commission agents are treated to be secondary level operators.

Table 10: Number of establishments on the IFPRI Market Survey sample, 1990

	Progressive	Nonprogressive	All
Paddy Traders			
Primary-level			
Faria, etc.	29	39	68
Secondary-level			
Wholesalers/aratdars	12	35	47
Paddy Processors			
Primary-level			
Kutials	31	34	65
Secondary-level			
Automatic/major mills	19	35	54
Small mills	51	23	74
Crushers	47	63	110
Rice Traders			
Primary-level			
Itinerant rice traders	43	36	79
Secondary-level			
Wholesalers/aratdars	20	61	81
Rice retailers	23	35	58
Total	275	361	636

Source: IFPRI Market Survey, 1990.

Table 11 reports on some personal antecedents of 636 respondents. The following features of the information are worth nothing. Firstly, the average respondent is a man --- there being no woman on this sample --- just about forty years of age. This is a sample essentially comprising people in their middle ages.

Second, the average respondent had entered this trade about twelve years ago, or about the turn of the 1970s. From about 1975/76, Bangladesh initiated a changeover from regime of "socialist" policies to "privatizing" stances. This created a congenial environment for people to set out on careers of trade in mass consumption items, such as rice. This was also the period when the first spate of the increase of farm-to-market road mileage came about. Third, the average trader has had the benefit of somewhat higher formal education than is true of the average Bangladeshi in that particular age category.

IV.9 Storage and Transportation

The capacity and character of storage resources at the disposal of the farm and trade storers are clearly germane to the maintenance of competition. Virtually all of paddy and rice storage are for a duration of well less than one year: year-to-year storage would appear to be of extremely limited scope. In Bangladesh, the farmers are, collectively, responsible for most of relatively "longterm" storage. (By longterm we mean season-to-season). The traders have, in more recent times, exhibited a pervasive willingness to perform mainly as *arbitrageurs*, not as speculators. Most surveys in Bangladesh have reported that the traders and millers carry relatively little beyond working stocks --- that is, what inventories are essential to permit smooth operations of their plants or businesses (Islam et al. 1985; IFPRI Market Survey, 1989/90). To be sure, a small number of liquid traders do invest in stocks. But this still is within the realm of arbitrage --- connecting markets over short spans of time without

any noteable implications for market failure, as long as supernormal profits year after year, sharp price increases, and the associated human misery by poor consumers of grain do not appear to issue as a result.

Farmers mostly do their storage either using *golas*, typically bamboo structures, or gunny bags. The *gola* is considerably sparing of repair and maintenance, and has a life of about thirty years. Its raw materials are widely available, though not cheap. The gunny bags, too, are made from jute, one of Bangladesh's economic staples. The real constraints to the availability of storage resources on farm is land, especially amid growing size of households marketable surpluses.

Storage losses are typically high. For four back-to-back rice seasons in 1982/83 through aus of 1983, FAO reported an annual average storage loss of 1.58% --- equivalent to a loss of about 237 000 MT of milled rice (FAO 1984). Storage loss proportion for boro rice was 1.2 as against .3% for aman. Other estimates point up much higher storage losses during boro season, of 3.9% (Huq, 1980, quoted in Greeley, 1982, p. 134). During the generally dry and cool months comprising the aman market season, damage to storage due to rat and insects tends to be low. The former is because the rats stick to their burrows consuming out of their cache garnered during the long growing season. The insect damage is low because atmospheric dryness makes it possible to lower the moisture to 14% or below, before storage. The moisture content in stored paddy had a tendency to decrease further between January and March (BRRI, 1985). Bacterial or insect reproduction is at a low ebb. However, during the wet season, both tendencies are reversed. First, as the fields are flooded, the rodents move to highlands which is to say, to the homesteads, with a damage potential to match. Besides, between May through September is a period of high temperature and

Table 11: Profile of market agents in the paddy market, Bangladesh, 1989/90

Variables	Progressive districts				Nonprogressive districts				All districts				
	Faria	Bepa ri	Whole saler	Arat-dar	Faria	Bepa-ri	Whole saler	Arat-dar	Faria	Bepa-ri	Whole saler	Ara. -dar	all sample
1. Average age (yr)	31 (4.5)	37 (9.6)	43 (5.7)	41 (13.4)	41 (9.1)	37 (10.4)	44 (12.7)	50 (13.5)	35 (8.10)	37 (9.9)	44 (11.5)	48 (13. 8)	41 (11.9)
2. Average schooling	6 (3.7)	7 (4.5)	9 (4.4)	10 (5.1)	4 (3.4)	7 (4.3)	12 (1.9)	10 (3.4)	5 (3.7)	7 (4.3)	12 (2.7)	10 (3.9)	8 (4.4)
3. Family size (Nos)	8 (8.1)	8 (7.8)	15 (14.5)	9 (3.5)	8 (3.2)	10 (6.6)	9 (4.2)	12 (3.9)	8 (4.6)	9 (6.0)	10 (4.9)	11 (3.9)	9 (5.3)
4. Land ownership (acres)	3.3 (4.0)	5.6 (8.2)	8.2 (4.3)	6.5 (5.3)	2.1 (1.1)	3.7 (4.2)	3.3 (3.3)	3.7 (4.0)	2.9 (3.2)	4.4 (6.0)	4.2 (3.9)	4.6 (4.5)	4.3 (5.1)
5.Experi-ence in this business (yrs)	9 (6.8)	13 (9.3)	15 (6.8)	13 (7.9)	14 (8.8)	10 (7.1)	17 (12.8)	17 (13.1)	11 (7.7)	11 (8.2)	17 (11.7)	16 (11. 7)	13 (9.9)

Note: Figures in parentheses are standard deviations of variables at issue.

Source: IFPRI Market Survey, 1989/90

Table 12: Personal and economic antecedents of market agents in the rice market, Bangladesh, 1989/90

Variables	Progressive districts						Nonprogressive districts						All districts						
	Faria	Bepa-ri	Whole saler	Mill er	Reta-iler	Arat -dar	Faria	Bepa ri	Whole saler	Mill er	Reta-iler	Arat -dar	Fari a	Bepa ri	Whole saler	Mill er	Reta - iler	Arat -dar	all sam ple
1. Average age (yr)	31 (4.9)	42 (0.7)	45 (11.6)	40 (10. 1)	38 (11.1)	39 (8.5)	-	38 (8.7)	41 (12.5)	43 (10. 9)	39 (12.1)	30 (10. 9)	31 (4.9)	38 (8.2)	43 (11.9)	41 (10. 6)	38 (11. 6)	39 (10. 3)	40 (10 .8)
2. Average schooling	3 (2.9)	8 (2.1)	10 (4.8)	12 (3.3)	6 (4.8)	13 (3.0)	-	9 (3.3)	10 (2.0)	12 (3.7)	7 (3.7)	11 (3.2)	3 (2.9)	9 (3.2)	10 (3.7)	12 (3.5)	7 (4.1)	11 (3.2)	10 (4. 2)
3. Family size (Nos)	7 (4.1)	9 (3.5)	10 (4.9)	11 (5.8)	7 (2.9)	12 (15. 4)	-	13 (20. 6)	16 (18.7)	12 (8.1)	9 (8.9)	10 (4.9)	7 (4.1)	13 (19. 4)	13 (13.1)	12 (6.9)	8 (4.1)	11 (8.9)	11 (8. 9)
4. Land ownership (acres)	0.3 (0.4)	0.5 (0.7)	4.7 (4.6)	39.6 (115 .9)	1.1 (1.9)	5.9 (6.6)	-	0.6 (1.0)	2.3 (2.2)	22.7 (119 .3)	0.5 (.94)	4.1 (4.8)	0.3 (0.4)	0.6 (0.9)	3.6 (3.8)	31.9 (140 .4)	0.7 (1.4)	4.6 (5.7)	15. 4 (93 .8)
5.Experi-ence in this business (yrs)	10 (5.0)	21 (0.7)	13 (7.6)	12 (8.9)	12 (8.7)	12 (7.5)	-	12 (8.3)	16 (10.0)	11 (7.6)	14 (9.7)	13 (9.8)	10 (5.0)	13 (8.3)	14 (8.7)	12 (8.3)	13 (9.3)	13 (9.1)	13 (8. 7)

Note: Parenthetic numbers are standard deviation

Source: IFPRI Market Survey 1989/90

Table 13: The density of market contacts, by progressive and other districts, 1990

(No. of regular transactors/unit)

Type of business	Paikar	Bepari	Faria	Crusher	Kutial	Farmer	Consumer	Miller	Retailer	Aratdar
Progressive wholesalers Processors	Aman season									
Automatic	5	13	-	-	-	-	-	-	-	6
Large	4	4	1	1	-	4	-	.33	.26	2
Small	2	1	2	1	1	10	0.09	.47	.09	2
Traders	4	3	3	8	3	4	2	3	1	1
Retail processors										
Kutials	.42	1	3	-	-	5	4	.38	1	.42
Traders	-	-	-	-	5	1	25	.35	-	.17
Other traders	.14	.12	1	1	.24	8	.11	2	.12	1
Other processors	.70	.06	1	.09	.19	5	1	1	.94	3

Note: By transactors are meant both suppliers and those supplied to. Both rice and paddy are involved.

Source: IFPRI Market Survey, 1989/90.

(Table contd. overpage)

Type of business	Paikar	Bepari	Faria	Crusher	Kutial	Farmer	Consumer	Miller	Retailer	Aratdar
Non-progressive wholesalers Processors	Aman season									
Automatic	17	17	4	-	-	4	-	-	-	6
Large	5	5	5	1	1	148	-	.33	1	3
Small	9	1	4	1	4	206	0.39	.16	1	3
Traders	11	5	7	10	9	74	8	6	8	3
Retail processors										
Kutials	1	1	3	.09	-	143	14	-	4	1
Traders	.30	-	1	2	19	20	273	2	-	1
Other traders	1	.38	2	1	1	140	15	3	0.43	2
Other processors	2	.10	3	.17	5	165	1	0.36	3	3

(Table contd. overpage)

Type of business	Paikar	Bepari	Faria	Crusher	Kutial	Farmer	Consumer	Miller	Retailer	Aratdar
Progressive wholesalers Processors	Boro/aus season									
Automatic	12	20	-	-	-	3	-	1	-	4
Large	2	5	4	1	.33	5	-	.26	-	2
Small	2	1	3	1	1	12	-	.12	1	3
Traders	8	3	3	7	8	8	2	3	1	.47
Retail processors										
Kutials	-	-	.23	0.03	-	2	1	.26	3	1
Traders	-	-	-	1	5	-	26	1	-	.39
Other traders	.03	-	2	1	1	7	1	2	.45	1
Other processors	.41	1	1	-	1	10	-	1	1	2

(Table contd. overpage)

Type of business	Paikar	Bepari	Faria	Crusher	Kutial	Farmer	Consumer	Miller	Retailer	Aratdar
Non-progressive wholesalers Processors	Boro/aus season									
Automatic	23	33	-	-	-	7	-	-	-	3
Large	65	12	6	1	0.13	158	-	-	-	2
Small	386	2	6	.002	3	294	-	0.22	4	3
Traders	10	3	3	6	11	142	9	3	17	1
Retail processors										
Kutials	7	-	2	-	1	111	18	0.43	9	1
Traders	0.09	-	-	3	19	12	290	2	-	.13
Other traders	0.3	-	2	1	3	155	33	1	.35	1
Other processors	2	1	3	-	2	136	-	.15	5	2

Note: Each respontent was asked how many agents do with regularly transact business with ?

Source: IFPRI Market Survey, 1989/90.

humidity (Table 7). Stored paddy absorbs moisture even if stored at safe moisture content. High moisture content increases susceptibility to insect and mould infestation (ARDICOL, 1988). The cost of storage and the perceived price risk during poststorage future periods both tend to increase. This increases the propensity to market boro surpluses disproportionatly and constituted an important source of relative.

Marked seasonal differences exist between the aman and boro season in transportation charges. While truck tariffs on long distance haulage increase marginally upon the aman season, the mainly kutcha feeder road network performs very sloppily indeed.

Unit costs of haulage over short distances rise quite sharply. More to the point, availability of means of transportation become less predictable, as breakdown increases. This increases risk.

IV.10 Economic Structure of Rice Markets

Having thus far described the physical structure of the market at issue, we now turn to a treatment of the economic structure of this market. Key structural aspects of the market involve the following: (1) the number and the size distribution of establishments; (2) the ease of entry into this business; (3) the sources of recruitment and the achievement of economic mobility by relatively small establishments. But before presenting the structure --- which, to an important degree, is an outcome of exchange - we need to introduce the supply side of the market. This is now attempted.

IV.11 Supply of Paddy in Bangladesh

The objective of the following subsections is to provide an overview of paddy market. In the main, we rely on results from IFPRI Farm Survey. In an appendix to the chapter, we establish that results from IFPRI Farm Survey 1990 are broadly representative of Bangladesh's rice economy in terms of (a) the diffusion of modern rice technology; (b) adoption of modern irrigation; (c) yield rates (d) cropping intensity. This is in spite of the fact that the sample had overreprenented medium and large farms. In the following subsections in the text, we present some key results about farmers' extent of commercialization, the geographical diversity in it, and the choice by the farmer between selling at the farmgate, as opposed to in the primary markets.

First of all, we need to present this body of data in a setting of time. Especially, we need to locate the study year --- twelve months through November 1990 --- in a continuum of rice

output levels. Table 14 therefore reports rice output for the sixteen years through November 1991.

Table 14: Rice and wheat production, Bangladesh, 1975/76 - 1990/91 (Thousand MT)

YEAR	RICE	WHEAT	TOTAL
1975/76	12763	219	12982
1976/77	11753	259	12012
1977/78	12969	355	13324
1978/79	12849	494	13343
1979/80	12740	823	13563
1980/81	12883	1092	14975
1981/82	13631	967	14598
1982/83	14216	1095	15211
1983/84	14508	1211	15719
1984/85	14623	1464	16087
1985/86	15037	1042	16079
1986/87	15406	1091	16497
1987/88	15413	1048	16461
1988/89	15544	1022	16566
1989/90	17856	890	18746
1990/91	17703	900	18603

Source: BBS, Statistical Yearbook, various years.

It appears quite clearly from this body of data that rice production, after a quinquennium of stable levels, surged in 1989/90.[2] However, the important point is that rice output kept its momentum in 1990/91, gaining 1.4% above the historic levels of the

[2]The weather in 1989/90 was unremittingly favorable. Besides, the year before, i.e. in 1988/89, the phenomenal flood that afflicted the country may well have deposited much-needed fertility-raising sediments. Therefore, one should refrain from reading in the 1989/90 rice output more than a propitious turn of events.

year before. For the first time in more than a decade, two large positive rice output deviations from trend have succeeded each other (Table 15; Fig.1). One can still not say, in optimism, that Bangladesh's rice sector has arrived at self-sustaining growth. But one can definitely say that the rice output seems poised to make relatively faster growth than in the past.

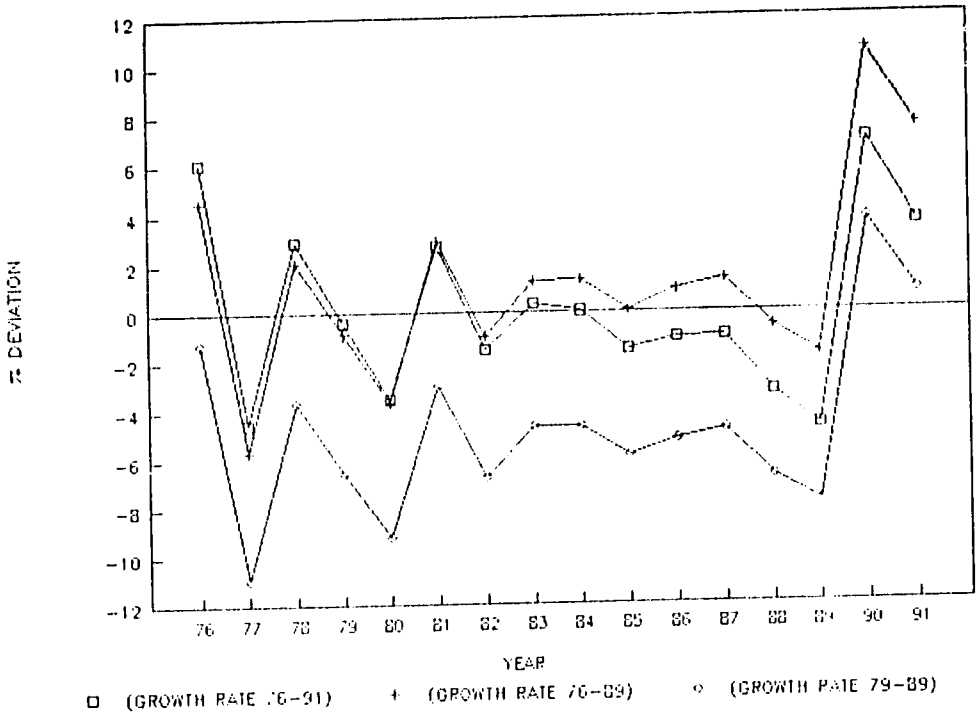
Table 15: Trend deviations for rice production, Bangladesh, 1975-1991 (Million MT)

Year (1)	Rice Production (2)	Trend Deviation (3)	Deviation as % of trend (4)	Total grains output (5)	Trend deviation (6)	Deviation as % of trend (7)
1975-76	12.8	0.74	6.1	13	.46	3.7
1976-77	11.8	-0.59	-4.5	12.01	-.84	-6.5
1977-78	13.0	0.36	2.8	13.32	.14	1.06
1978-79	12.8	-0.05	-.4	13.34	-.18	-1.4
1979-80	12.7	-0.49	-3.5	13.56	-.32	-2.3
1980-81	13.9	0.36	2.7	14.98	.73	5.1
1981-82	13.6	-0.21	-1.5	14.60	-.01	-.10
1982-83	14.2	0.04	.3	15.31	.32	2.10
1983-84	14.5	0	0	15.72	.33	2.16
1984-85	14.6	-0.22	-1.5	16.09	.30	1.89
1985-86	15.0	-0.16	-1.0	16.08	-.12	-.74
1986-87	15.4	-0.16	-1.0	16.50	-.12	-.75
1987-88	15.4	-0.52	-3.2	16.46	-.59	-3.49
1988-89	15.5	-0.76	-4.7	16.57	-.93	-.5.34
1989-90	17.8	1.16	6.9	18.75	0.79	4.39
1990-91	17.7	0.61	3.6	18.60	0.18	.96

Note: The proportionate deviations for rice use the trend growth rate of 2.37% per year estimated using data in col. (2). For all grains, they use growth rate of 2.61% estimated using data in col.(5).

Fig.1: % DEVIATION FROM RICE OUTPUT TREND

(1975/76 - 1990/91)



IV.12 The Extent of Commercialization

Table 5 and 6 in the Appendix to ch. IV report the proportion of marketing in output by the sample farms arrayed by operated farm size. The degree of commercialization is here found to increase with the size of the farm. In the progressive districts, the marketing proportion rises from 41% for small farm operators to 47% for medium farm operators and then to 58% for large farms. The corresponding proportions for nonprogressive districts are 39%, 40% and 49% during the aman season. These proportions rise marketedly during the boro season: 63%, 81% and 92% in the progressive districts, and 54%, 76% and 86% in the nonprogressive districts. Blowing up from these estimates to the rice economy in fifty-seven (out of sixty-four) new districts of Bangladesh, we get an overall economy-wide proportion of 34% during aman season and 64% during the boro season. For the study year overall, the proportion of output that is marketed in the rice economy is hereby estimated at about 49%.[3]

IV.13 The Marketing Effort in Bangladesh Rice Economy: A long View

Table 16 puts the year of our immediate interest, viz. 1989/90, in a historical context. It presents rice production, rice area planted with HYV strains and rice marketed surplus ratio for Bangladesh. The highlight of this information is in the gross MS ratio over time. This ratio has increased, over time, from 34% in the second half of the 1970s to 49% in 1989/90. The overall quantity marketed indicates the size of the private rice market. Total marketing rose from 4.25 to 8.7 MMT thousand MT in 1989/90 - a compound growth rate of 5.8 per annum. The size of private marketing of rice therefore rose by a rate that is close to more

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[3]The detailed methodology of the blow-up is presented later in the report. Suffice it to say for the moment that for seven new districts, information on the blow up factor was not available.

Table 16: Growing farm technological change and commercialization in Bangladesh's rice economy, 1979-1990

Year(s)	Rice Production (MMT)	Proportion of area planted with HYVs		Estimated marketed surplus ratio	Gross surplus (000MT)
		Aman	Total		
1960s	10.8	0	0	15.0	1620
1976/77-1978/79	12.5	6	13	34.0[a]	4250
1979/80-1981/82	13.4	16	21	36.0[a]	4824
1982/83-1984/85	14.4	18	26	38.7[a]	5573
1986-1987	15.4	21	30	42.0[a]	6468
1989-1990	17.8	28	38	49.0	8722

Notes: (a) These average are computer from Dr. Madan Dey Ph.D dissertation (Dey 1988). The estimate for 1986/87 is from Dr. Akther Ahmed Ph.D thesis (Ahmed 1900). For 1989/90, this is a direct estimate in which data from IFPRI Farm Survey were used.

than twice the growth rate of population during this period is notable, and echoes the favorable assessments of other observers (Crow, 1987). We note, too, that the proportion of HYV rice strains, in both aman as well as in total acreage, has been steadily increasing. The size of commodity markets reflects the degree of commercialization, and technological change is usually thought to foster it. The positive association between marketed surplus ratio and the HYV ratio is therefore suggestive.

Our estimates of marketing ratio are higher than most estimates reported by recent studies. For example, Murshed and Rahman, reporting the findings from a 1986/87 data set of 222 farms selected from eight districts --- Dinajpur, Pabna, Jessore, Satkhira, Mymenshing, Narsingdi, Sunamganj and Chittagong --- find that marketing ratio averaged at 37% (Murshed and Rahman, 1988). There are valid reasons why our estimates suggest a more vigorous marketing effort than is indicated bv available cross-section estimates. The first reason, undoubtedly, is a methodological one.

Our district coverage is larger and more representative than is Murshed and Rahman's: we have data sets from twenty-one new districts representing virtually all of the major cereal cropping patterns. Our sample size is much larger. Specially trained investigators, mostly graduates, were hired to generate the basic data, while Murshed and Rahman used undergraduate students in lieu of field investigators. Besides the methodological differences, it is clearly relevant that Bangladesh's rice production performance has been particularly buoyant since 1989/90 which, undoubtely, will affect the marketing performance of farmers. Using regression results, we show later that output level vigorously increases the level of marketing, other things being equal.

IV.14 The Geography of Paddy Marketing: a District-level View

Table 17 reports on the geography of the farm-level propensity to market paddy, among other things. It may be important to establish this relationship at two levels, one formal, the other descriptive, While we explore the locational relationships of marketing in a formal manner elsewhere in this report, presently we report, rather descriptively, on the intensity of rice marketing effort demonstrated by the smaple farms in order to highlight its geographical facts. Intansity is measured by the share of farm net production that is marketed. Before examining the results, it may be in order to enter a few observations about the concepts.

Output, farm consumption and marketings are all related according to the following identity

$$Q_t + (OS_t - CS_t) - C_t = M_t$$

where, Q_t = Net paddy output, that is gross output minus (a 10% provision on account of) seed, feed and wastage

OS_t = Opening stock of paddy

CS_t = Closing stock of paddy

C_t = Onfarm consumption

M_t = Quantity marketed

Table 17 reports on these variables. Quantities are expressed per capita, to achieve comparability.

A few broad results may now be noted. First, the average farm is found to begin the aman market season with a not uncomfortable cushion provided by the carryin from the previous boro/aus market season of FY89. The ratio of the carryin to the aman harvest stands at a 6%. Plausibly enough, the ratio of the carryin to production is about the same for both the progressive and the other districts. Second, onfarm consumption averages at 41% relative to availability (which is carryin plus net production minus carryout), while marketing averages at 47%. Carryout for the year is significantly higher than one year ago: 4 Kgs per capita as against 1.5 Kgs. This is plausible, as FY90 has, aggregatively, registered one of the highest rice harvests on record (as well as one of the highest positive output deviation from trend). A large positive transitory component to the FY90 rice carryout on farm is therefore itself a significant event in the storage life cycle of these units. The fact that we do not have any direct observation bearing upon these households for FY91 does not alter this. For we know that FY91 had experienced a positive output deviation from the trend in both aman and boro seasons (Table 15). And because we establish, using IFPRI Farm Survey data, that current output is a major determinant of the carryout stock in any given season (Chowdhury et al. 1992), it follows that transitory output components in FY91 are likely to translate into positive transitory components in stocks during the year. Third, the ratios between the quantity marketed and net output for the aman and boro market seasons as also for the year as a whole, are reported (Table 18). Several features of this material are worth underscoring. First, with the lone exceptions of Sathkhira, the matketing ratio reported for the boro season is significantly higher than during the aman season. Satkhira's marketing ratios during the boro season are only very slightly lower than during the aman season. While the marketing ratios of the nonprogressive districts frequently acquire

the magnitude demonstrated by the progressive ones, the ratios themselves are against a significantly lower production base. The upshot of this is that the size of the local component in the rice supply is much smaller in the nonprogressive districts. For the year as a whole, the marketing ratios of the eleven progressive districts fall in a none-too-wide range, namely from a low of 59.6% for Chittagong to a high of 77% for Rangpur. For the nonprogressive districts, the variability in the marketing ratio overall is larger, ranging from a low of 42% for Jessore to a high of 72% for Tangail. The districts registering the most intensive marketing effort among the progressive districts are Rangpur (77%), Bogra (75.5%), Dinajpur(74.7%), Sherpur(71.8%), Thakurgaon(70.3%) and Naugaon (67.4%). In so far as a portion of the paddy surplus marketed by the farmer ends up through a series of market exchanges as part of the public procurement, it may be interesting to know that these six top the league table on district-level procurement, too. The geography of the degree of commercialization revealed by the present sample closely matches the geography of the public-sector procurement operation.

Table 17: Geography of the rice economy in the sample households (Per capita; mds.)

Districts	Aman season					Boro season			
	Opening Stock	Production	Onfarm Consumption	Seasonal Marketing	Closing Stock	Production	Onfarm Consumption	Seasonal Marketing	Closing Stock
Progressive Dist.	.0778	1.46	.305	.717	.422	1.698	.473	1.325	.187
Thakurgaon	0.060	1.84	0.337	0.883	0.660	.75	0.526	0.757	0.154
Dinajpur	0.104	2.76	0.579	1.400	0.769	3.16	0.894	2.584	0.316
Rangpur	0.062	1.86	0.284	1.019	0.534	2.58	0.446	2.060	0.207
Bogra	0.258	2.53	0.531	1.260	0.713	3.37	0.810	2.749	0.407
Joypurhat	0.028	.95	0.215	0.352	0.348	.79	0.333	0.679	0.106
Noagaon	0.064	1.3	0.317	0.555	0.388	1.56	0.499	1.177	0.184
Rajshahi	0.047	1.13	0.227	0.439	0.445	1.01	0.362	0.802	0.129
Sherpur	0.043	1.22	0.265	0.666	0.283	1.53	0.391	1.112	0.162
Chittagong	0.013	.43	0.124	0.211	0.084	.44	0.202	0.254	0.042
Cox's Bazer	0.032	.45	0.146	0.170	0.136	.77	0.213	0.502	0.103
Satkhira	0.031	.85	0.166	0.474	0.194	1.01	0.252	0.570	0.108
Nonprogressive Dist.	.035	.598	.193	.224	.188	.729	.298	.521	.096
Tangail	0.089	.43	0.256	0.140	0.096	1.64	0.402	1.235	0.135
Mymensingh	0.035	.85	0.265	0.358	0.256	.89	0.384	0.639	0.084
Netrokona	0.049	.58	0.195	0.235	0.161	1.29	0.321	0.848	0.141
Sunamganj	0.021	.72	0.143	0.496	0.076	2.41	0.221	0.382	0.058
Sylhet	0.015	.56	0.151	0.153	0.241	.35	0.240	0.266	0.044
Comilla	0.043	.65	0.236	0.272	0.143	.91	0.382	0.558	0.091
Feni	0.012	.32	0.096	0.126	0.094	.49	0.158	0.361	0.041
Noakhali	0.017	.30	0.109	0.085	0.105	.25	0.149	0.170	0.029
Jessore	0.022	0.51	0.164	0.179	0.162	.18	0.232	0.084	0.038
Patuakhali	0.037	1.12	0.168	0.548	0.396	.42	0.255	0.351	0.169

Table 18: Production and marketing of paddy, a geographical Overview, 1989/90

DISTRICTS	Aman	Boro	Overall
	Marketing ratio (%)	Marketing ratio (%)	Marketing ratio (%)
PRGRESSIVE DISTRICTS:	50.5	83.0	69.4
Thakurgaon	53.21	112.45	70.30
Dinajpur	56.38	90.75	74.74
Rangpur	61.03	88.51	77.03
Bogra	55.31	90.65	75.49
Joypurhat	40.99	95.02	65.49
Naogaon	47.49	83.90	67.35
Rajshai	43.25	87.79	64.33
Sherpur	60.68	80.66	71.80
Chittagong	54.74	64.33	59.59
Cox Bazar	41.66	72.05	60.81
Satkhira	63.06	62.61	62.82
NONPRGRESSIVE DISTRICTS:	41.0	75.6	61.0
Tangail	35.86	81.57	72.17
Mymensingh	46.76	79.68	63.56
Netrokona	44.69	73.22	64.30
Sylhet	30.59	84.58	51.37
Comilla	46.28	68.11	58.98
Feni	43.24	81.61	66.40
Noakhali	31.24	74.46	51.00
Jessore	39.39	50.42	42.36
Patuakhali	54.53	92.45	64.93

Source: IFPRI Farm Survey, 1989/90

IV.15 Spatial Pattern of Farmer Paddy Marketing, 1989/90

Table 19 reports on the pattern of marketing of paddy at home and away from home for different types of economic environments, and across marketing seasons and across paddy varieties.

Knowledge of the spatial pattern of marketing assumes importance, because several authors, writing about conditions of product marketing in developing countries, have all too readily concluded that market-based exchanges are to the disadvantage of small farms only, while they are tipped to give visible advantages to the large farms. One way to probe this position is to estimate the proportion of home sales in the total marketings by all classes of farmers, and see where, and to what degree, they differ. Also, it would be informative to know at what prices do farmers sell at the farmgate, and at what prices, in the primary market. Here are the key results, begining with some overall results.

Table 19 below reports on the pattern of marketing behaviour of Bangladeshi rice producers. IFPRI Farm Survey disaggregated paddy quantity marketed by the farmers by destinations, viz. farmgate sales and those at nearly markets. This information is useful, as it is material to the extent to which the farmer exchanges his surplus at the most elementary stage of the market chain, ie the farmgate. If the farmer mostly trades at the farmgate, even as the Government "procures" a fairly large quantity of paddy, this raises troubling questions about the role of public procurement interventions versus farm level or producers' incentives. If the farmer mostly trades in some primary market, comparisons between prices they receive and average prices that faria had paid on similar quantities when buying at the primary market levels should be suggestive of prevailing practices regarding admixture etc. in what is typically bought.

Table 19 suggests several conclusions. Firstly, the average farmer sells at the farmgate 69% --- nearly seven-tenths --- of what he markets. The proportion of marketing at the farmgate remains pretty much the same, at about 69%, for both progressive and nonprogressive districts. For both types of locations, the proportion of farmgate sales is higher by 2-3 percentage points during the boro season than for the aman market season: this is intuitively plausible because unit transportation costs tend to increase in the wet boro season as compared with aman market season. Secondly, the proportion of farmgate marketing does not vary significantly at all across a coarse-noncoarse divide: the preference of the farmer to dispose off his surplus at the farmgate is equally strong for both major varieties. That variety is not material to the spatial structure of the marketing by the farmer is an important piece of evidence: this provides the justification for presenting our marketed surplus functions, reported elsewhere in this report, in an aggregative manner. The farmer markets a composite good called paddy. Hence, it is valid to estimate one price elasticity of marketing, as we have done. Thirdly, the price array composed by the prices for farmgate sales as compared with primary market prices is an interesting evidence. Everywhere, farmgate prices are lower per maund than primary market prices, whatever the paddy variety at issue and whatever the type of district. Thus for the aman market season a Tk. 2 difference exists between the farmgate price and primary market price for coarse paddy in progressive districts, while the corresponding figure for nonprogressive district is Tk. 3. For boro season, the matched figures are Tk. 4 and Tk. 5

How is one to explain why the farmer mostly sells at the farmgate, and not at the primary market ? What does it say for the degree of price transmission between the farmgate and the primary stage of the market chain ?

Against the background of the conventional wisdom that farmers are economically intelligent within their own price environments (Islam et al. 1984), the most convincing explanation of this is that it does not mostly pay the farmer to take the grain to the market given the way prices transmit themselves between the primary markets and the farmgate stages fo the market. The farmgate level and the primary stage of the market chain are well-integrated, in that price difference between them covers little more than the cost of connecting them plus a margin for profit and risk-taking. If the price differences had more than covered the cost plus normal profit during the year under observation, then at least the generally hardpressed small farmer would have marketed a major share of his surplus produce away from the farmgate, in order to pocket the difference. In reality, as seen already, all classes of farmers prefer the farmgate. Therefore, markets are well-integrated between the farmgate and the primary stage.

This effect is redoubled in that farms market their surplus in fairly small lot ranging from 5 to 20 mds. The most oft-cited transport medium is cycle-van ---- essentially a cycle attached with a flat-bed 3.5 ft by 5 ft wooden trailer---with a maximum capacity of 12-14 mds. Cost of transport per md per mile for this type of vehicle is Tk.5-6. The farmer dovetails his marketing schedule in order to match his liquidity requirement, for hiring casual farm labours for example. Therefore, his typical marketing batch is relatively small, and often he cannot rent all of a cycle van to transport his product. The farmers' prospective unit costs to carry the produce to the market are higher than are those of the traders who he may sell to. The traders will probably typically buy enough paddy from one village to fully load a smaller truck with a capacity of 54 mds. or so and thus outcompete the farmer. Thirdly, the farmer is likely to balance the cost of his time against the benefits of a higher price. Therefore, the net gains to him from marketing away from the farmgate remain small.

This evidence implies that the public procurement program in sofaras it buys paddy, can mainly involve traders even if it the program could be pitched at the primary markets. (In practice, before the Mill-gate Purchase became the major conduit of public purchase, the Temporary Purchasing Centres (TPCs) that were opened by the Directorate of Food would mainly involve secondary markets.) It seems, to reach the farmer by the procurement program would require a very major shift in both the geographical targetting of the program itself, but also require a scaling up of the farmers' own marketing schedules. Until that happens, a geographical targeting of public procurement program would appear to be of limited use, and so will be public procurement itself, if affecting the producers' incentives is a major goal. But it is well to remember at this stage that, since prices transmit well between the primary market and the farmgate, any positive effect on market price of procurement program will trickle down to the farmgate level.

The analysis of the spatial pattern of marketing so far has been aggregative, and does lot say much about inter-farm-class differences in marketing preferences, something that one wants to know. This requires the whole information to be presented by operated farm size classes. This we do in Table 20 and 21, below.

IV.16 A Disaggregate Look at Spatial Pattern of Marketing

First, the proportion of home marketing during the aman market season is usually somewhat <u>lower</u> for virtually every sizeclass-district type combination than during the boro market season. For the small farms in the nonprogressive districts, the decline is statistically significant, too. This means that, as between the two seasons, the farmer finds it to his advantage to exchange a greater proportion of his marketable surplus within the confines of a functioning market during the aman market season. In contrast, a larger share of the output marketed is at the farmgate during the

boro season. This is conspicuously so for small farms in the backgward districts. Why is this so?

Table 19: Home and primary market sales by farmers, Bangladesh, 1989/90

Variables	Progressive districts			Nonprogressive district			All districts and all seasons
	Aman season	Boro/aus season	All seasons	Aman season	Boro/aus season	All season	
Average qty. marketed (mds)	98	156	255	56	97	153	108.3
Coarse	60	110	171	29	70	99	72.5
Noncoarse	38	46	84	27	27	54	35.8
Average qty. sold at home, to faria (mds)	62	112	174	38	67	105	75.1
Coarse	42	78	120	24	47	71	52.5
Noncoarse	20	34	54	14	20	34	22.6
% marketed at home	63	72	68	68	69	69	69
Coarse	70	71	70	83	67	72	72
Noncoarse	53	74	64	52	74	63	63
Average price received per maund in market (Tk)							
Coarse	214	220	217	220	222	221	219
Noncoarse	229	252	239	234	253	243	241
Average price received per maund at home (Tk)							
Coarse	212	216	214	217	217	217	215
Noncoarse	221	236	229	230	232	231	230

Source: IFPRI Farm Survey 1989/90.

Two factors could be responsible here. First, this could either reflect the outcome of an unconstrained selection process by the farmer in which he weighs the benefits and costs of marketing at alternative venues. Or, the decision to sell at the farmgate could stem from posible credit-contract obligations. The cultivation of the high-yielding-variety (HYV) boro drives up the farmers need for capital, and the use of credit in production. To the extent that the farmer contracted credit on the basis of dadan that stipulates a payment of the principal in the form of produce, such a household is bound to sell a lot of his surplus produce at the farmgate. There is a warrant therefore to look closely at farm uses of production or consumption credit. While we do this later in this report by credit contracted by the sample farms, here we probe the answer to this question by looking at the average prices fetched. For there is a presumption that credit-constrained farmgate sales would involve variously discounted prices. If a relatively high proportion of home sales reflects credit-tied forced sale, such transactions would take place at significantly lower prices. Note that, in as much as the HYV output is almost entirely of coarse grain, their prices have to be watched more closely.

IV.17 Pattern of Spatial Marketing and Prices

There must be a presumption that credit-constrined sales, if any, would more likely be characteristic of smaller farms. We therefore have to examine the spatial pattern of *boro* out put marketing by disaggregate farm size classes. Table 20 below reports the evidence, and the evidence does not bear out the reasoning related to credit-tied selling. As against the average of Tk. 218 per md. fetched by the nonprogressive district farmer for the paddy sold in the primary market the corresponding price for farmgate sales is Tk. 209 --- a difference of less than 5%. Given the small number of transactions at issue, the difference is not statistically significant. The difference is therefore

unlikely to be due to price - unfavorable credit contracts. True, the small farms in nonprogressive districts are taking a larger discount on their home sales than either medium or large farms in the same districts. But this could be more convincingly treated as attributable to more crippling shortage of farm storage, poorer conditions of the paddy, want of drying facilities and greater remoteness of the dwellings of small farmers. (The thrust of this evidence is later corroborated with direct evidence on credit contracts on this sample.)

In fairness, therefore, the pattern of spatial marketing is largely explicable in terms of choice decisions of farm manager operating within markets which one knows from earlier research to be demonestrating a high degree of competitive price transmission. The price differences fetched by the various sizeclasses for their sales of coarse and noncoarse make a revealing study. Several findings are worth stressing here. First, the difference between average price fetched by farmgate sales and primary market sales of coarse paddy ranges between Tk. 2 and Tk. 3 for the progressive districts, whatever the season. The corresponding difference for the nonprogressive districts ranges between Tk. 2 and Tk. 8 with an average of Tk. 5. The greater price difference for noncoarse rice between home sales and primary market ones is not surprising: the noncoarse varieties are greatly more heteorogenous than are coarse varieties. It is estimated that there are of the order of 500 different strands of local paddy varieties in the greater Bengal, most of them noncoarse (Lele, 1966). These strands vary in terms of rice outturn potential taste, etc. Some varieties are specialities, and do not have a national market, as they are traded in small quantities. These are the relatively more expensive varieties, and are mostly taken to the markets for sale. Most of the itinerant paddy faries visiting farmgates are desirous of buying varieties enjoying marketability on the broadest basis. Noncoarse varieties which enjoy broader markets are those which it

is worth the while of itinerant merchants to come to the farmgate.[4]

Note that noncoarse paddy prices for the quantities sold in the primary market during the boro market season exceed average prices during the aman season. Significantly enough, virtually in all possible combinations the price differences range between Tk. 25 to Tk. 29 per maund. Most noncoarse varieties are harvested during the aman market season. The surpluses marketed during the boro season included in their prices a component corresponding to the cost of storage for an average period of five months or so. The interseasonal price differences are therefore quite plausible.

IV.18 The Structure of Rice Markets: the Number of Establishments

In 1986, the BBS enumerated the total number of units in the rice industry/trade at 107,657. Of this, 59,067 were commercial paddy processing establishments of a variety of capacities, technologies and organization. Of this, 46,191 were permanent establishments, 26 were temporary establishmtns and 12,850 were based in homesteads (BBS, 1989, Table 1).[5] The first category comprised the automatic rice mills, the major rice mills and the Engleberg huller mills including the husking mills. The third category comprised the kutials, the cycle *beparis*, the *varkiwalas* etc. The *crushers*, who appear to be a large category of footloose enterpreneurs who only invest in working capital, do not appear in

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[4]Enquiries among farias reveal that the one thing most would like to avoid is buy very small quantities of a relatively large number of rice grades, each with significantly diferent price. This creates difficulties in terms of their knowing where the bottomline is. When a large number of farmers have each brought a small quantity of even a special variety to the market, total quantity on offer would still likely offer convenience in handling and therefore economy of costs. For these varieties, buying from farmers' home is unlikely to offer these advantages.

[5]Bangladesh Standard Industrial Classification (BSIC) 3119 relates to rice milling.

BBS' census enumeration. We estimate that these numbered at about 15000 in 1990.

Table 20: Spatial pattern of paddy marketing by grain varieties, types of districts, and by farm sizeclasses, 1989/90

Farm Classes	Variables	Progressive Districts			Nonprogressive Districts			All Districts All seasons
		Aman Season	Boro/Aus Season	All Season	Aman Season	Boro/Aus Season	All Season	
Small	Avg. qty. marketed (md)	76	117	193	43	57	100	88
	Noncoarse	29	32	61	28	22	50	27
	Coarse	47	85	132	15	35	50	56
	Avg. qty. at home to faria (md)	52	80	132	16	30	46	57
	Noncoarse	15	21	36	11	19	30	17
	Coarse	37	59	96	5	11	16	40
	Avg. price recived per md (Tk)							
	Noncoarse	241	256	249	242	257	250	252
	Coarse	214	221	222	231	218	225	219
	Avg. price recived per md at home (Tk)							
	Noncoarse	227	243	235	240	192	216	233
	Coarse	211	218	215	228	209	219	215

Note: Small includes landless farm households

(Table contd. overpage)

Farm Classes	Variables	Progressive Districts			Nonprogressive Districts			All District s All seasons
		Aman Season	Boro/Aus Season	All Season	Aman Season	Boro/Aus Season	All Season	
Medium	Avg. qty. marketed (md)	50.5	65	115.5	31	63	94	30
	Noncoarse	20	17	37	13	18	31	18
	Coarse	30.5	48	78.5	18.0	45	63	37
	Avg. qty. at home to faria (md)	33	46	79	17	40	57	21
	Noncoarse	11	15	26	12	12	24	12
	Coarse	22	31	53	5	28	33	25
	Avg. price recived per md (Tk)							
	Noncoarse	226	252	239	236	251	244	237
	Coarse	211	221	216	215	220	218	217
	Avg. price recived per md at home (Tk)							
	Noncoarse	218	240	229	226	245	236	229
	Coarse	209	219	214	209	217	213	215

(Table contd. overpage)

Farm Classes	Variables	Progressive Districts			Nonprogressive Districts			All Districts All seasons
		Aman Season	Boro/Aus Season	All Season	Aman Season	Boro/Aus Season	All Season	
Large	Avg. qty. marketed (md)	119	194	313	70	119	189	73
	Noncoarse	45	57	102	35	33	68	47
	Coarse	74	137	211	35	86	121	92
	Avg. qty. at home to faria (md)	71	130	201	39	75	114	53
	Noncoarse	24	36	60	12	25	37	27
	Coarse	47	94	141	27	50	77	64
	Avg. price recived per md (Tk)							
	Noncoarse	231	253	242	230	251	241	241
	Coarse	216	220	218	223	223	223	220
	Avg. price recived per md at home (Tk)							
	Noncoarse	[illegible]	237	232	226	217	222	229
	Coarse	213	217	215	221	215	218	216

Table 21: Percentage of sales at home by season by districts and by farm size classes in Bangladesh, 1989/90.

Farm size classes	Variables	Progressive Districts			Nonprogressive Districts			All Districts and all Seasons
		Aman season	Boro/aus season	All season	Aman season	Boro/aus season	All seasons	
Small farms	Percentage of sales at home	68	68	68	37	53	46	51
	Noncoarse	52	66	59	39	86	60	60
	Coarse	79	69	73	33	31	32	41
Medium farms	Percentage of sales at home	65	71	68	55	63	61	62
	Noncoarse	55	88	70	92	67	77	76
	Coarse	72	65	68	28	62	52	55
Large farms	Percentage of sales at home	60	67	64	56	63	60	61
	Noncoarse	53	63	59	34	76	54	55
	Coarse	64	69	69	77	58	64	65

There were 11948 rice or paddy wholesalers-cum-aratders and 36642 retailers.[6] Table 22 below puts fragamentary evidence on the growing size over time of Bangladesh's paddy processing sector in a perspective of time. Before taking up the numbers, a few caveats about the data are worth entering. First, except for 1986 when there was a census of all nonfarm establishments, the figures for other years are based on assorted sources, including World Bank, 1983; Harriss, 1979; Rahman, 1988; Ahmed, 1988; Farruk, 1972;

[6]BBS produced a combined estimate of grain and pulse wholesalers of 67610 in 1986. This was pro rated between rice and nonrice wholesalers using proportions of rice mills and nonrice mills. Retailers are a pure category. Nonrice grains are never retailed all by themselves, but as one of many individual grocery items.

Abdullah, 1988. The scattershot data make it imperative that their approximate character be emphasized. It would appear plausible, however, that the approximation to a complete count would be closer for the automatic and major rice mills. These mills have standerdized boilers (for their driers). They have to be registered with the office of the Chief Inspector of Boilers. Their complete coverage by the BBS would appear to be highly probable. The other huller mills are most unregistered, unstandardized, and geographically scattered at that. They are apt to be counted out from sample surveys. Second, the census of 1986 for the first time claimed to report on the totality of the milling industry. Its numbers provide one with a benchmark. Third, our estimates of the total rice outturn by different categories are based on operating results reported from IFPRI Market Survey. Because of the greater standardization of the core processes employed by automatic mills, and by the major rice mills, these results are probably more representative of these subsectors. The resulting data as to combined outturn of these two classes of mills in 1986 therefore warrant greater confidence. It turns out that these relatively modern mills account for only about one-tenth of the total rice produced in the country. This serves to highlight the preponderant significance of the huller-type mills.

The following norms were assumed while computing combined outturn. Automatic mills are rated to mill 2 tons per hour (TPH). Their rated capacity per year is assumed to be 9,720 MT of paddy per year.[7] Virtually all major rice mills MRMs operate either a 25

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[7]Number of days of milling per year is 270, and number of hours milled is 18 hours. The number in the text is arrived at as follows: 2 x 18 x 270 = 9,720 MT or 260,447 mds. of paddy per year. Several seasoned entrepreneurs have opined to us that an average automatic mill will, in the conditions of paddy market of 1989/90, have milled about 150,000 mds of paddy, or 5,600 MT. However, most of our respondents reported that average millage of automatics is about 125,000 mds. of 4,666 MT per year. This we have used in our computations reported here. Capacity utilization is 48%.

HP or a 30 HP electric motor. Farruk estimated that, in 1968, these hullers rated a capacity of 1 TPH (1972, p. 49). Our own survey enquiries returned quite similar operating realities. Major rice mills have rated capacities one half that of automatic mills. We assume a capacity utilization of 50% for the major rice mills or 2430 MT of paddy per year. In the calculations, milling ratios for the automatics and the MRMs are assumed to be .674 and .657, on the basis of data returned from the IFPRI Market Survey.

Several features of the information in Table 22 are noteable. First, in 1988 automatic mills and MRMs were turning out just about 1 MMT of rice, against a net production of 15.4 MMT (that gross output minus seed, feed and wastage deductions). The rest of the output was milled either at small rice mills, or at custom-milling facilities. In 1987/88, gross marketed surplus of rice out of a (net) production of 15.4 MMT was probably about 6.62 MMT. The automatic and the MRMs in that year thus accounted for only 15% or so of the marketed surplus. Note further that out of the 0.96 MMT of total outturn, as much as 0.3 MMT represented millage against Directorate of Food operations. The relative share of the automatics and the MRM in the surplus privately marketed is just about 10%. This comes reassuringly close to the estimate made independently by one of Bangladesh's leading rice entrepreneurs, who wrote in 1988: "About 95% of the rice milled for consumer (commercial) market is milled by this simple but primitive (Engleberg huller) machine" (Rahman, 1988, p.4). The closeness of these two independent estimates of the relative share of the smallest and labor-intensive paddy processors in the private componont of the rice market has two favorable implications for our results. First, we can look back at our capacity and millage assumption about the automatics and the MRMs with some vindication. Second, and more to the point, the greatest bulk of the rice supply and of the derived demand for paddy is found to originate from an extremely large number of geographically scattered small rice mills. Also note that the small rice mills are without any clear

corner on the balance of market power or monopolistic proclivites (like favored access to bank credit, or overly favorable credit rating by trade sources.) They are likely to register a greater degree of price competitiveness in their conduct. The implications of this for a vigorous health of market adjustments by price competition are transparent.

IV.19 Size Distribution of Establishment

The distribution of establishments in any trade with respect of size is an cft-quoted feature of market structure. The examination of this structural facet of the rice market is imperative. Some discussion of the reasons for use of the particular size measure may be useful. Of course, after-tax net profit is perhaps the most firm measure of the establishment performance. Bigness in terms of sales or employment may mean little if the associated profits are small.[8] Unfortunately, the data presently used are from the Economic Cansus, which measured size in terms of employment. Reported in Table 23 are the size distribution of rice milling (BSIC 3119) and the matched distribution of all other categories under the 2-digit BSIC group 31 (i.e. all food, beverage and tobacco). The data relate to 1986.

Two results now follow. As compared with other subsectors, rice milling has highly similar mean establishment sizes for all but the largest size class. But, whereas the other industries brook a conspicuous degree of concentration merely due to establishments in the largest sizecalss, the rice milling suggests no signs of establishment concentration. Because the capital-labour ratio of establishments in the larger employment classes are apt to be larger than for smaller ones, the table understates the

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[8] Such lopsided sales-profit combination is becomming more common in turbulent corporate waters of developed mrket economies. See The Economist, April 10, p. 15.

potential for industrial concentration in the rice market. But, even so, the industry gives off no sign of excessive concentration.

Table 22: Number of rice mills and rice output, Bangladesh, 1968-1988

(Rice output is in MMT)

Year	Automatic /semi-automatic (No)	Major rice mills (No)	Other huller mills (No)	Other mills producing reic derivative (chira, etc) (No)	Rice Outturn				Dhenki rice outturn
					Auto	Major rice	Auto and major rice mills combined	Other huller mills	
1968	-	106	6049	345	-	.17	.17	?	?
1978	3	152	11437	653	-	.24	.24	?	?
1982	36	182	16171	932	.11	.29	.40	2	2
1986	66	251	43374	2500	.21	.40	.61	12.42	2.19
1988	88	426	?	?	.28	.68	.98	?	?

Notes: The first automatic rice mill was established in Bangladesh in 1977. Because automatic and major rice mills are registered with the Chief Inspector of Boilers, the data on their number are more firm throughout the period. This table

Source: For 1968, Farruk (1972, Table 17) and Mahiuddin Ahmed (1988, Table 1-1).
For 1978, BSB/BSRS (unpublished data), BBS (Statistical Yearbook, 1979), BSCIC (1982)
For 1982, BSB/BSRS (unpublished data), BBS (Statistical Yearbook, 1983/84) BSCIC (1983).

Table 24 reports on the size distribution of grain wholesalers (BSIC 6111) and retailers (BSIC 6211). The basic idea is to first compare the structures of the millers and traders in an effort to understand where, if in fact, there is excessive concentration. Such a tendency, if present, may be betrayed by a small number of very large establishments. The diea is to compare the size structures for millers and wholesalers.

Table 24 suggests two findings. First of all, the wholesalers do not exhibit any significantly higher degrees of concentration than do the rice mills. Second, this correspondence in the structure between two of the potentially most important class of market participants is no doubt suggestive of a certain stability of the structure.

Table 25 reports on similar information from the IFPRI Market Survey. Important additional information reports on capital-labor ratios, and relative profit and employment shares of various sizeclasses are also presented.

The information suggests that a broad correspondence indeed exists between the relative sharers of employment and net profits across the size classes. Eighty one per cent of the establishments, which account for 88% of the sample establishments account fpr 91% of the sample net profits. The correspondence claimed is keen enough. No single group has a corner on net profits.

A question springs to the mind. In evaluating whether the sample has exhibited an excessive concentration of profits, should one compare relative profit shares and establishment share of various classes in an *overall* way or relative profit shares of the one or two sizeclasses with above average degree of mechanization should really be the focus? If the latter, it is conspicuous that the 20-49 sizeclass, having the greatest degree of mechanization,

accounts for only 37% of the units but 56% of the operating net profits. That would give away the impression of a sharp degree of market concentration, indeed. However, firms are of varying levels of employment, and prudent firm-managers in the end want to mobilize their workforce to earn profits. Therefore, relative profit shares should perhaps be compared with relative shares of employment, and not with capital-labor ratios.

Table 23: Size distribution of establishments, 1986, BSIC code 3119 and all other BSIC categories under 31

Size classes (employ-ment)	Rice milling				All other groups in BSIC 31			
	No. of units	Emp't	Employ-ment per unit	% share, total emp't	No. of units	Emp't	Emp't per unit	% share, total emp't
1	7822	7822	1	4.8	1308	1308	1	0.5
2	15419	30838	2	18.9	2181	4362	2	1.8
3	9225	27675	3	16.9	1946	5838	3	2.4
4	5129	20516	4	12.6	1696	6784	4	2.8
5-9	6726	42191	6.27	25.8	4065	26480	6.51	11.0
10-19	1341	17623	13.14	10.8	1129	14765	13.08	6.1
20-49	491	13421	27.33	8.2	519	15179	29.24	6.3
50-99	28	1836	65.57	1.1	187	12768	68.28	5.3
100 +	8	1294	161.75	0.8	289	153827	532.3	63.8
All classes	46190	163216	3,53	100	13242	241284	18.22	
Gini coefficient				0.38				0.73

Note: Figures include homebased processors, too.

Source: BBS 1989, Table 2, pp. 185

Table 24: Size distribution of grain traders, Bangladesh, 1986.

	Grains Wholesaling				Grain Retailing			
	No. of units	Employment	Employment per unit	% of total Employment	No. of units	Employment	Employ-ment per unit	% of total Employ-ment
1	3199	3199	1	10.25	81642	81642	1	20.13
2	2760	5520	2	17.68	80501	161002	2	39.73
3	1869	5607	3	17.96	26671	80013	3	19.73
4	1108	4432	4	14.20	11111	44444	4	10.96
5-9	1526	9531	6.25	30.53	6409	36816	5.74	9.08
10-19	198	2393	12.09	7.66	119	1390	11.68	.34
20-49	18	467	25.94	1.50	8	196	24.5	.05
50-99	1	71	71	.23	-	-	-	-
100+	-	-	-	-	-	-	-	-
All	10679	31220	-	100	206461	405503	-	100
Gini coeffi-cient				0.30				0.20

Source: BBS, 1989, Table 2, pp. 185-6.

Table 25: Size distribution of rice mills on IFPRI sample of establishments

Employment size class	Rice Mills							
	No. of units	% of total	Employment (L) (Nos)	% of total	Fixed capital (K) (Tk.000)	K/L (Tk.000)	Net profit Tk.000	% of total profit
1	1	1	1	-	280	280	61	-
2	1	1	2	-	189	94	57	-
3	2	2	6	.2	2028	338	396	.4
4	1	1	4	.1	84	84	531	.6
5-9	15	12	108	4.3	2427	22	5476	6.3
10-19	58	44	832	33.6	89716	108	30909	35.0
20-49	48	37	1362	54.9	127838	94	48752	55.8
50-99	1	1	50	2.0	1970	39	479	.5
100+	1	1	114	4.6	9255	81	1229	1.4
All	128	100	2479	-	255734	103	87413	100

Source: IFPRI Market Survey 1989/90

IV.20 Competition, Ease of entry and the Achievement of Mobility

Market coordination is likely be thoroghly competive when, a large number of buyers and sellers of a commodity exist, but also when there is considerable ease of entry and exit. To quote: "Ease of entry into the marketing system (as a petty trader or operator of small-scale rice mill, for example), in combination with reasonably accessible market information, carries a strong presumption of a competitively efficient marketing system" (Timmer et al. 1983, p. 166). If freedom of market access is accompanied by a broadbased vertical mobility through market participation, the presumption for competitiveness can be accepted with greater conviction. Reported below are some information related to the conditions of entry, and the prospects of upward mobility in Bangladesh's rice markets.

Before presenting the empirical evidence, a few procedural preliminaries are in order. Up until 1991, entry into the rice market in theory waited upon the issue of a foodgrain dealership license. At last count, a lumpsum license fee was Tk. 250, which remained the same for all classes of traders or millers. Irregular payments and other lobbying costs would routinely add Tk. 150-200 to this sum. For myriad petty traders, this sum of Tk. 450 or so was a high price to pay, and was routinely avoided. Most establishments operating from permanent premises paid up. The license was to be renewed for Tk. 50 every year. The license fee, or the cost of its renewal, did not imply an entry barrier of any consequence. The smallest trader, who could not afford to trade without it, or, as in Crow's "plain tales" (Crow, 1989, p. 207-8), bought the right to use a license for a fee. Other than a license, establishment's fitted out with boilers need to have a fitness certificate issued and renewed by the Chief Inspector of Boilers of the Government of Bangladesh. In FY90, the boiler fitness renewal fee was Tk.500. Most mills are fitted out with crude steaming devices, and can deflect the liability to pay. Although the use of unstandardized steaming device is illegal, the district administrations do not enforce the ban. Hence, the de jure ban does not amount to an entry barrier.

The import content of the investment in plant and machinery, fixtures and structures of a typical rice business is small, except for the automatic mill. The hullers are vairtually all domestically assembled. Electric motors are the only sizeable equipment that have to be imported, although domestic assembly on one or two well-known brands (e.g. GEC) exists. This implies that statutory requirements for import licenses do not exist. Therefore, the cultural and social endowment, that translate into the flair to cut through a lot of redtape are not additional entry barriers.

Product advertizing does not exist in this industry. Nor does R & D in product or process development. Consequently, these traditional sources of market power do not breed any significant entry barriers.

The real barrier to entry in this market, for most people anyway, is liquidity, for even the smallest *faria* would need seed money to Taka several thousands, which he does not have. His options are three: to be a tenant farmer, to be a casual leborer, or to be a *faria*. The average *faria* on the IFPRI Market Survey sample only has 0.9 acres of cultivable land and could prospectively tend to operated farm of not exceeding 2 acres. The annual income of a typical paddy *bepari* on IFPRI Market Survey in 1989/90 is significantly higher than for a farmer tilling a 2-acre farm. Career as an itinerant trader is decidedly more rewarding, but it is also more hazardous, as it involves frequent and risky travels on night-coaches, and a very difficult life-style. Considering the average age of these agents, they are strongly motivated by tangible cash returns. Faced with a choice, most people are predisposed toward a career in rice trade.[9] The question is: how do they surmount the barrier of being broke beyond fixing. The answer that we may pick from Crow's "plain tales" is: from "dadan loans" (Crow, 1989). Most small traders thus can only surmount the barrier at the cost of financial subservience to a better-off trader. Crow argues as though this amounts to interlinkage between credit and grains market. This analysis shows the creditor's action as the complementary side of a volitional

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[9]By travelling in a night coach, the bepari can reach the assembly market the following morning. He catches on his sleep by the day in a rest room attached to the noisey aratder's godi. Then, after the dusk, he has loaded a truck with paddy or rice, and is on his way back to the terminal market. If the Jamuna does not have to be crossed, the bepari would dearly like to reach his destination well before traffic thicken up. This is because the wholesaler markets are always located in the inner cities, whose streets bans truck from negotiating when traffic builds up. The point is that the beparis life has lot of hazards.

deal much to the advantage of a small trader. Thousands have accepted this state of subservience (Crow, 1989). Therefore, even the seed capital does not harbor an entry barrier of any consequence.

Table 26 below reports on the conditions of access to rice market. The material strongly support a thesis of considerable market access. First of all, we witness that the average entrant is well under thirty years of age at business start-up. Sixtyeight percent of the entrants were aged between twenty-four and thirty six years. Second, the sample exhibits rather low formal-education achievement, the average businessmen with only about nine years of schooling, even though granted, such average achievement is significantly higher than for an average Bangladeshi. Education is often the lubricant in the social institutions of economic patronage and rent-seeking in South Asian cultures (Papanek, 1964; White, 1974). But the average educational endowment on the present sample is sufficiently low for the exercise of supramarket patronage to be rejected as an important potential trait of these entrepreneurs.

A large proportion of the sample started up in the modest capacities of itinerant merchants or the owners of small rice mills, or "crushers". A relatively handful of the sample started off in one the roles of either a mediumscale establishment, e.g. a major rice mill, or anautomatic miller, or the rice wholesaler in the terminal market.

Table 26: Conditions of access to rice markets, 1989/90

Type of market agents	Fixed asset per agents, 1989/90 (Tk.000) (resale value)	% of business statrups in the sample	Current average age of enter-preneur	Average age at startup of establishment	Average years of schooling of entre-preneur	Proportion reporting			% having achieved upward mibility	% of sample in 1989/90
						Increase in annual turnover	Decline	Status quo		
1. Paddy paiker, Faria	51	-	37	27	7	73.5	8.8	17.6	12.4	10.7
2.Paddy whole-saler,	173	1.6	46	34	10	53.9	20.3	24.3	0.5	6.2
3.Automatic mills	6000	0.9	43	31	14	50.0	30.0	20.0	0	3.1
4.Major mills	1992	2.7	44	33	12	79.4	-	20.6	.3	5.3
5.Small mills	912	8.2	40	31	11	72.0	8.0	16.0	.9	11.8
6.Kutial	3.6	14.0	36	23	3	61.5	7.7	30.8	5.0	10.2
7.Crusher	19	12.6	36	27	7	66.4	14.5	18.2	2.5	17.3
8.Rice whole-saler,	30	19.2	.36	25	9	68.6	58	23.6	1.7	4.0
9.Rice aratder	125	11.1	39	25	11	53.2	19.4	25.8	1.5	9.7
10.Rice retailer	170	9.1	38	26	7	44.8	20.7	34.5	1.1	9.1
11.Others	163	5.3	44	33	10	70.0	5.0	25.0	2.5	3.1
12.All	456	100	39	28	9	63.1	13.0	22.9	4.7	100

The number of market agents is very large, market ascess is fairly open and upward mobility, even by relatively vulnerable agents, has been strongly in evidence. The structure of rice markets, that is to say, is open and broad. From the Structure, it is the natural next slep to take toward marketing channels. To this we now turn.

IV.21 Market Channels for Rice

Market access is not only about the conditions of entry: it is also about the agents, range of selling options at each tier of the marketing chain. The nature, scope and diversity of such sell options determine the quality of the price information available to the farmer: they also matter significantly to the farmers' and other stoxers' balance of information and market power.

The paddy in circulation that are delivered from the farmgate is rather like the flow of a river from upstream through rivulets. We first depict this complex structure. We report on the quantitative importance of the componential flow at every critical stage of the journey downstream, as also to estimate the number of market agents at each of the stages.

The farmer, selling his surplus, represents the first tier of the market perticipation. Of the 10 million or so of Bangladesh's farm households, we estimate that about 7 million marketed any quantity of surplus paddy. Together, they marketed about 8.7 MMT of milled rice equivalent in FY90. Of that quantity, about 63%, or 5.48 MMT, were sold at the farmgate, mainly to *farias*. The rest was taken to the primary market, and sold to either *farias*, or millers or paddy wholesalers. Of the quantity taken to the market, about 3% was sold to the purchasing centre of the Directorate of Food.

Table 27: Proportions of sales of paddy by paddy traders, 1989/90 (%)

	Public sector	Private Sector			
		Bepari	Aratdars/wholesalers	Mills	Others
Faria	-	15	47	33	5
Bepari	-	-	28	70	2
Aratdars/wholesalers	-	-	5	84	11

Source: IFPRI Market Survey 1989/90

Table 27 above shows how the titles to the surplus paddy marketed by the farmer changes ownership. *Farias*, who handle an average quantity of about 150 to 325 mds. of paddy a month sell 47% of their throughput to wholesalers and another 33% to the millers. *Beparies* , who transact about a thousand mds a month,, sell seven-tenths of their volume to the mills, and the rest to the wholesalers.

The wholesalers/*aratdars* sell, and indeed must sell, virtually all of their volume to millers, and to "crushers" (shown in the table by others).

A few findings of Table 28 are worth more discussion. The table reports on the relative role of each of classes of market agents as direct purchasers of paddy from the farmer. The point of this information is to show how the farmers' selling options are broadened by the fact that a wide cross-section of agents do purchase paddy from the farmer. Estimated number of participants in 1989/90 are also reported in order to betray the density of market contacts. Table 20 shows, first of all, that. First, the

Table 28: Disposal of paddy surplus marketed by the farmers

Type of Market agents	Quantity of paddy surplus handled (MMT), 1989/90	Estimated number of market participants in each category (000s), 1989/90
Paddy *faira*	2.04	40.3
Paddy *bepari*	2.72	7.3
Wholesalers, paddy	1.1	9.5
Kutials	.54	15.6
Crusher	2.49	15.3
Small rice mills	3.25	50.3
Major rice mills	.74	0.48
Automatic mills	.16	.088
Total gross marketed surplus	13.05	
Home Retention	13.5	
Milling by husking mills	11.5	
Milled by dhenkis	2.0	
Total	26.55	

Notes: The number of marketing agents in various categories for the rice economy as a whole for 1986 was available from BBS. For a number of markets, we estimated the growth rate in the number of participants between 1986 and 1990. Our estimates of the number of participants in 1989/90 are based on the growth rates computed from our admittedly fragmentary data. Small rice mills include husking mills. IFPRI Market Survey generated data on the quantity of paddy bought directly from the farmers at each stage of market chain. By multiplying estimates on the number of market agents by the estimate of average marketed surplus transacted within each category, we get the breakdown.

Source: Author's computation based on BBS, 1986 and IFPRI Market Survey, 1990.

five categories of the paddy processors (i.e. the rice millers) directly account for 7.6 MMT of the gross marketed surplus of (about 58%) 13.0 MMT of paddy. Of this quantity, 42% are mediated by the home-based processors and by the "crushers". Of the total marketed surplus, about 42% are directly accounted for paddy traders and wholesalers. Second, the largest single source of the farmers' paddy surplus is the numerically very large class of important paddy demand category comprises the crusher, who rake in another 20% small huller mills. These account for about 25% of the marketed surplus. The next most important categories, *beparis* and *farias* together take up about 37% the marketed surplus. Paddy wholesalers provide the rest of the demand. The most important point of note is that both classes of agents --- millers and traders have to compete for the farmers' grain, and the related fact that the result is a large number of alternative price quotations before the farmer, representing a wide variety of costs, opportunities skills and compulsions. This sways the balance of information in the farmers' favor.[10]

Virtually, all of this body of paddy surplus is milled in either of the three categories of rice mills. It is estimated that the resultant rice volume was 8.7 MMT in the study year. Five categories of paddy processors (i.e. the *kutials*, crushers, the small rice mills, the major rice mills and the automatic mills) market this amount of rice. Barring a very small proportion of their rice output that is marketed directly to the consumer, the rest is marketed through usual commercial channels. Table 29 and 30 reports on the marketing chain for rice in Bangladesh in 1989/90.

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[10]And we want to assert that credit-tying does not adversely affect the prices realized by the farmer. This will be shown below, when credit relations in rice markets are discussed.

The main finding of this table is that small scale processors of paddy predominate in the performance of the rice marketing function. Especially, huller mills and footloose crushers account for about 83% of the quantity of rice that is privately marketed. This is no doubt a very significant structural feature of Bangladesh's rice market. In 1989/90, there were about 35000 entrepreneurs in these two categories. There is no strong collateral evidence (e.g. vertical integration, access to preferred bank credit or favored status versus the Directorate of Food Millgate Contract) to associate these numerous firms with restrictive or collusive practices. The automatic mills, and the major rice mills account for a minority of the rice privately marketed in Bangladesh.

Also reported are the proportions of the quantity marketed by three or four broad market-channel types. The proportions are based on the privately-marketed quantity alone, and side-track the quantity procured by the Government. The reason for this is that public procurement represents title transfers accounted for by extramarket procedures. A few words may be appropriately said now on each of these market channels.

First, quantitatively the most significant channel suggests that the SRMs sell milled rice through paikers, usually from out-of-town destinations and operating with some degree of commercial "attachment" to wholesalers/*aratdars*. These *paikers* supply virtually the whole of their purchase to *aratdars*. These *aratdars* sell about 98% of their turnover through retailers, and the rest directly to the consumers.

The second most significant route originates from the crushers and through the mediation of paikers and aratdars directs the flow of rice to the consumers.

The third route has it that the rice produced by the automatic and major rice mills are sold to paikers, representing *aratdars*, or to *aratdars* themselves.

The least important of the rice market channels has rice produced by *kutials* being purchased by *aratdars* directly, or by retailers, or by *paikers*. Also, a small percentage is marketed directly to the consumers.

One thing emerges surely from the data. The *aratdars*/wholesalers maintain a commanding presence in the rice market. About 80-90% of all rice that reaches the consumer passes through the premises of one or the other *aratdars*. Since conspicuously high level of concentration may harbor strong competition-undermilling potential, this reform was echoed by Farruk, who wrote: "The intermediate and terminal markets for rice distribution are dominated by small groups of *aratdars* who handle from 75-80% of the supplies. By contemporary theories on market structure analysis, this high level of concentration should be conducive to the forces that undercut the elements of competion. Yet it is observed that there is no solid evidence that supports collusive behavior among the few aratdars operating in the intermediate and terminal markets" (Farruk, 1972, p. 33). For the moment, suffice it to say that the rate of entry into the rice trade, even at the fairly exclusive *aratdari* tier, has been considerable (Ravallion, 1987, p.149). This buoyant growth in the number of market participants even at an elitist tier amounts to a rejection of some of Farruk's gloomier presaging.

Table 29: Distribution of the rice output, privately-marketed and in the aggregate, Bangladesh Rice Industry, 1989/90 (Quantities are quintal, unless stated otherwise)

From \ To	Bepa-ri/pai ker	Fa-ria	Rice mill-er	Arat-dar	Retai-ler	Con-sumer	Other	Total	Estimat e No. of paddy proce-ssors (000s)	Rice output from paddy proce-ssing MMT	Millin g for the gover-nment (MMT)	% of output	
												for private market	for the DOF
Kutials	67.5	3.8	-	156.6	69.4	89.9	10.0	397.2	15.6	0.62	-		
Crusher	705.0	1.7	63.5	676.1	169.4	5.6	117.3	1738.6	15.3	2.66	-		
Small	1040.4	-	33.7	847.1	100.2	5.7	67.4	2094.5	19.67	4.12	.10	97.5	2.4
Major	1740.7	-	-	1473.7	42.1	0	1.7	3258.4	0.48	.16	0.37	27.4	71.2
Auto	14417.5	-	-	8708.6	203.9	0	101.98	23432	0.098	0.21	0.45	31.8	67.2
Total	-	-	-	-	-	-	-	-	50.24	7.77	0.92	78.2	10.7

Note: (a) This table presents our estimate of distribution of quantity privately marketed per establishment in each of the class of paddy processors in the rice economy of Bangladesh. Multiplying total marketing per unit by the total quantity of rice privately marketed.

(b) The flows of rice from crusher to rice miller, or from small rice mill to rice miller, are quantities in situations where a "millgate Contract" miller has subcontracted a part of his own fortnightly allotment favoring smaller mills, or crushers.

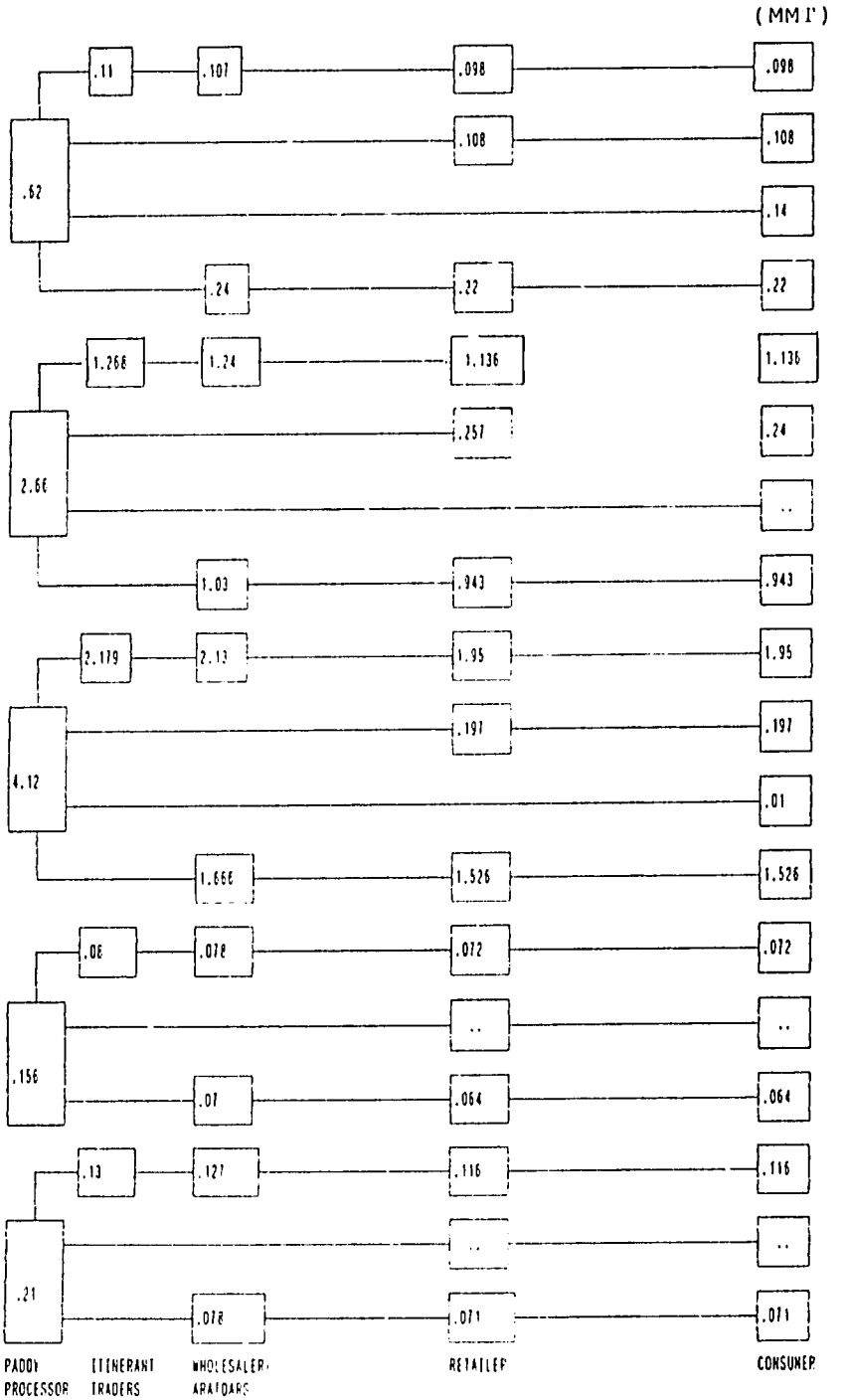
Table 30: Market channels of rice, Bangladesh, 1989/90
(Percentages)

Categories of market agents	% of turnover sold to					Rice outturn (MMT)
	Itinerant traders	Aratdars/wholesalers	Retailers	Consummers	Others	
Paddy processors						
Kutials	17.96	39.42	17.48	22.62	2.52	.62
Crasher	47.69	38.66	9.69	0.32	3.63	2.66
Small mill	52.9	40.44	4.79	0.26	1.61	4.12
Majors	53.47	45.23	1.29	0	0	.16
Autos	61.97	37.17	0.86	0	0	0.21
Traders						
Itinerants	-	97.8	2.2	-	-	3.53
Wholesalers	-	-	91.6	7.1	1.3	6.34
Retailers	-	-	-	100.0	-	8.20

Note: All proportions are based upon privately marketed quantum of rice by categories of processors and traders in 1989/90. Total quantity thus marketed in about 7.77 MMT of milled rice. In the study year, about 8.7 MMT of milled rice was marked. However, about .92 MMT was procured by the Government of Bangladesh.

Fig.2: Market Channels of Bangladeshi Rice, 1989/90

(The different boxes represent total millage of five classes of processors)



Note: .. denotes insignificant

IV.22 Salient Features of the IFPRI Farm Survey Sample

Major features of the sample are related to (a) its distribution with respect to owned land; (b) its distribution with respect to operated land; (c) the typical level of its adoption of modern rice farming technology (e.g. the proportion of area under high yielding varities (HYVs), the proportion of the area under modern irrigation, yield rate, labor coefficient in paddy cultivation etc.), and (d) the typical degree of commercialization demonstrated in the disposal of paddy (ie , the proportion of net output marketed).

Table A1.1 reports on the means of a number of variables, mainly economic, of the sample households arrayed with respect to land ownership. Small farm households are those with upto 2.49 acres of land owned; medium owners own between 2.50 acres and 4.99 acres; and the rest are large owners. As already noted, the estimation of farm level rice marketing and stocks was the pivotal guiding consideration in the design of the IFPRI Farm Survey. It is common knowledge that medium and large farmers are disproportionally represented among the germinators of farm marketable surpluses (meaning stocks) (Ahmed, 1979). The probability for a farm household to generate marketable surplus was deemed, while designing the survey design, to be distributed as a non-random variable. The selection of a criterion variable for the design of the sampling itself is therefore different than if some more universal phenomenon, e.g. the intake of food by a representative population, were to form the focus of an analysis. Indeed, when the latter is the distinctive concern, the distribution of ownership of land on the sample, which is universally accepted as the most major determinant of the poverty status of a household in an agricultural country, will be of critical importance. This is not to be so in this study. We have

therefore oversampled medium and large farms, and undersampled small landholders, as compared with the population of the cultivators in Bangladesh.

A few features of Table A1.1 are worth elaborating on. First, mean landholding sizes by small and medium-sized owners in the progressive and nonprogressive districts are not significantly different from each other. But large landholders in the progressive districts average significantly higher mean holding than for nonprogressive districts. Like for land owned, mean size of operated holdings by all classes of owners are statistically insignificantly different between the progressive and nonprogressive districts. This holds for both aman and boro/aus seasons. This is an important result: this implies that if there are significant mean differences between progressive and nonprogressive districts on the sample in any facet of agricultural performance (say farm rice stock per capita), this could be attributed to factors other than the size of farm. Some of these causal factors may in fact be closely related to technology or infrastructure.

Table A1.1: Production and Marketing Regimes in Progressive and Nonprogressive Districts, 1989/90, Aman season (All quantities are per farm)

Farm type by ownership	No. of farms in sample	Own land	Operated land during aman	Family size	Net Output	Marke-ting	HYV ratio (%)	Marke-ting/ Net output (%)	Average Price
Progressive Districts									
Small	94	1.3	1.70	6.3	45.9	19.4	38.6	42	218.38
Medium	162	3.7	3.1	8.0	94.3	43.7	40.72	46	218.36
Large	186	9.9	5.3	10.9	196.3	113.4	36.79	57	222.20
All	442	5.8	3.7	8.8	127	67.9	39.47	53	219.33
Nonprogressive Districts									
Small	71	1.4	1.6	7.8	36.3	14.2	46.94	39	221.47
Medium	94	3.7	2.9	9.0	72.7	28.8	46.58	40	226.43
Large	72	8.9	4.7	10.8	142.9	69.6	35.24	49	225.25
All	237	4.6	3.0	9.2	83.2	39.9	44.88	42	225.18
Overall	679	5.4	3.47	9.0	111.7	58.1	41	49	221.22

Table A1.2: Production and Marketing Regiems in Progressive and Nonprogressive Districts, 1989/90, Boro season.

Farm type by ownership	Closing stock of Aman season	Operated land	Net output	Marketing	MYV ratio (%)	Marketing/ Netoutput (%)	Average Price
Progressive District							
Small	16.41	1.3	47.4	28.5	81	60	221.66
Medium	41.04	2.1	94.9	76.0	91	80	223.46
Large	85.08	3.96	198.2	181.6	98	92	222.72
All	48.75	2.7	128.2	110.3	85	86	223.03
Nonprogressive District							
Small	10.95	1.3	45.9	24.4	55	53	227.46
Medium	26.46	2.4	80.0	59.9	69	75	225.4
Large	62.5	4.1	154.0	129.7	53	84	222.21
All		2.6	92.0	70.5		76	
Overall	41.87	2.68	116.0	90.4	77	82	223.8

Thirdly, tenancy markets are found to be a profound eqalizer of acess to land and more so in the boro market season than in the aman season. In the aman season small-owners operated area average at 1.8 and 1.7 acres in progressive and nonprogressive districts; medium-owners return 3.3 and 3.2 acres; and large landholders average 5.4 and 5.0 acres. In the boro season, small-owners average 1.4 acres and 1.4 acres; medium-owners average 2.2 and 2.6 acres; and large owners average 4.1 acres and 4.4 acres. Sample-Wide average operated farm size is 2.7 acres and 2.7 acres in the boro season. In the aman season, in contrast, operated land average 3.7 acres and 3.0 acres in progressive and nonprogressive districts, respectively. Mean farm size is lower in boro season than in the aman season. The inequality of the distribution of operated land is much lower (Gini coefficient being 0.49) than for the land ownership distribution (Gini coefficient being 0.54).

The land tenancy market brings the smallholders' relative share of operated land closer to their population share than would otherwise be possible. This is shown by Table A1.3 and A1.4. The tables present relative shares of ownership classes of farms with respect to a number of key variables in progressive and nonprogressive districts. The tenor of the tables is to show that, especially for the small-holders in the progressive districts, the tenancy market redistributes access to land enough to restore the equivalent of parity with their population shares. Several features of the material are noteable. First, while smallholders in the nonprogressive districts account for 6.7% of the persons on the sample but only 2.4% of the land owned, their share of the operated land is 6.8%, about their share of the sample population. In the progressive districts, smallholders account for 6.3% of the population and only 2.82% of the land owned: they account for 8.05% of the operated land on the sample. In the aman season, the medium sized owners in both progressive and nonprogressive districts as a group rent in land on a net basis. Thus, in the progressive districts, while they account for 31% and 38% of the land and population on the sample, they account for 44% of the operated holding. In the nonprogressive districts, the corresponding proportions are 16%, 21% and 18%. The large land owners rent out land on net basis, especially in the nonprogressive districts. For example, large landowners account for 11% of the land, 6% of the population but only 3% of the operated land.

The boro season provides an interesting variation on the theme. Again, the nonprogressive districts differ in some crucial respects. For instance, the large landowners themselves operate most of their land, which is why they account for 9.76% of the operated land on the sample while owing 9.9 % of the land on the sample. Because the supply of land to the rental market during the boro market season as compared with the aman market season must shrink in the nonprogressive districts --- the large owners are not renting land out --- small owners must find their access to land

restricted. Their shares of the owned land and operated land are very nearly the same, while their population share is much higher.

In the progressive districts, in contrast, the larger landowners are found to rent out land. While, they account for 37% of the land owned, they account for only 21% and 22% of the sample population and operated land. Small holders are the principal gainers of this: while they account for 2.9% of the land owned on the sample, they account for 6.5% of the sample population and 6.1% of its operated land. One final thing is worth reiterating. Especially as concerns the small owners, in the progressive districts in both seasons, the land tenancy market brings about, essentially, a parity between population shares' and operated land shares.

Table A1.3: Percentage Share of Different Farm Size Classes in Progressive and Nonprogressive Districts in the Market, 1989/90, Aman season.

Type of farms by ownership	Population	Operated land	Own land	Production
Nonprogressive dist.	34.3	28.5	29.5	23.5
Small	6.7	6.8	2.4	2.7
Medium	21.2	18.5	15.6	13.4
Large	6.3	3.1	11.4	7.4
Progressive dist.	65.7	71.5	70.7	76.5
Small	6.3	8.0	2.8	4.2
Medium	38.4	43.9	31.1	38.7
Large	21.1	19.5	39.7	33.6

Source: IFPRI Farm Survey 1989/90

The implication here is that operated land is more inclusive an indicator of economic status of cultivator households, especially smaller farm, than is the amount of land owned. It is noteable that mean operated land for the sample as awhole is 2.8 acres, which is not a great deal larger than mean size of the operated land according to the 1983/84 Agricultural Census by the Bangladesh Bureau of Statistics (BBS). It is therefore imperative that one looks at the sample households with respect to the distribution of operated farm sizeclasses.

Table A1.4: Percentage Share of Different farm size classes in Progressive and Nonprogressive Districts in the Paddy market, 1989/90. Boro Season.

Farm type by ownership	Population	Operated land	Own land	Production	Marketing
Progressive dist.	65.7	66.2	70.9	67	75
Small farms	6.5	6.1	2.9	4.0	3.4
Medium farms	38.0	38.5	31.2	34.7	37.6
Large farms	21.3	21.6	36.8	28.3	34.0
Nonprogressive districts	34.3	33.8	29.1	33.0	25.0
Small farms	6.3	2.2	2.2	3.0	2.1
Medium farms	22.8	21.8	17.0	22.3	15.1
Large farms	5.2	9.8	10.0	5.2	6.8

Source: IFPRI Farm Survey 1989/90

Table A1.5: Production and Marketing Regime in Progressive and Nonprogressive Districts on the Sample, 1989/90, Aman Season

Operated farm size classes	Number of farm house-hold	Land owned	Opera-ted land during aman season	Family size	Proportion of seasonal operated land under high-yield variety (HYV) (%)	Net Paddy produc-tion (mds)	Produc-tion per acre operated (mds)	Quant ity of paddy mark-eted (mds)	Propor-tion of output marketed	Average price received for sale (Tk./md)
Progressive districts										
Small	115	1.67	1.8	6.4	56	50.6	28.1	20.7	40.9	229
Medium	160	4.01	3.3	8.2	47	101.4	30.7	47.9	47.2	216
Large	168	10.4	5.4	11.1	38	203.4	37.7	118.8	58.4	223
All	443	5.6	3.7	8.8	46	126.9	34.3	67.5	53.2	222
Nonprogressive districts										
Small	90	1.7	1.7	7.9	47	42.0	16.3	24.5	38.8	221
Medium	88	4.3	3.2	9.5	39	78.4	24.5	31.6	40.3	224
Large	58	9.5	5.0	10.8	29	154.1	30.8	76.3	49.5	231
All	236	4.6	3.0	9.2	40	83	27.6	39.9	48.1	225
All sample	679	5.4	3.4	8.9	44	111.7	32.8	58.5	52.7	223

Note: All production figures in this table are net of provision of seed, feed and wastage

Source: IFPRI Farm Survey, 1989/90

Table A1.6: Production and markeitng regime in progressive and nonprogressive districts on the sample, 1989/90 Boro/Aus season.

Operated farm size classes	Land owned	Operated land during boro/aus season	Family size	Proportion of seasonal operatted land under high-yield variety (%)	Net paddy production (mds)	Production per acre operated (mds)	Quantity of paddy marketed (mds)	Proportion of output marketed	Average price received for paddy (Tk./md)
Progressive districts									
Small	1.67	1.4	6.4	92	50.7	36.2	32	63	218
Medium	4.01	2.2	8.2	86	101	45.9	82	81	222
Large	10.4	4.1	11.1	81.5	207.5	50.6	191	92	226
All	5.6	2.7	8.8	85.4	128.3	47.5	110	86	223
Nonprogressive districts									
Small	1.7	1.4	7.7	74.7	47.8	34.1	26	54	222
Medium	4.3	2.6	9.3	64.5	88.2	33.9	67	76	226
Large	9.5	4.4	10.9	55.2	167.5	38.1	144	86	226
All	4.6	2.6	9.1	64.7	92.3	35.5	70	76	224
All sample	5.4	2.7	8.9	78.2	115.8	42.9	96	83	223

Source: IFPRI Farm Survey, 1989/90

IV.23 Representativeness of the Sample in Farm-technology terms

In the face of the diffucion of modern farm technology for rice production, the adoption of the HYV technology offers yet another basis for evaluating this particular sample. The adoption of HYV technology is in itself scale neutral. The intensity of the adoption of HYV strains, the proportion of area under modern irrigation, the proportion of farmers using fertilizer, fertilizer used per acre and paddy yield rate are the five principal technology-related variables under study here. If the adoption of modern rice technology by the average farm on the present sample is fairly similar to nationally representative data, the data should

brook some confidence. We revert for nationally representative data to either the BBS, or two largescale surveys of Bangladesh's rice economy completed more recently at BIDS (Hossain, et al. 1991; Rahman et al. 1992).

Tables A1.7 and A1.8 report on the technological attributes of the sample. Overall, the sample is adequately representative of the technology of the rice sector as a whole. Several features of the information presented prompt this conclusion. First, the proportion of area under HYV strains during both aman and boro growing seasons, at 38% and 85% compare quite favorably with other estimates, related to the recent past. For example, Hossain et al (1991) estimated aman and boro HYV shares for 1987/88 from a much larger and nationally (land-ownership wise) more representative sample at 31% and 81% respectively. The proportion of land under irrigation is found to be 63% on average on this sample, as against 52% according to Hossain et al. There are plausible relationships between the proportion of farmers applying fertilizer as between our sample and that reported by a large survey of fertilizer practices carried out in Bangladesh in the early 1980s (IFDC, 1983). The same can be said for the level of fertilizer used per acre on the present sample, and other national estimates. Finally, Table 8 report on comparative yield rates and labour used per acre between the IFPRI Farm Survey, and two recent largescale surveys carried out by researchers in BIDS.

It is quite clear that the IFPRI sample is representative of the state of the development of technology of Bangladesh's rice economy as a whole. Inasmuch as commercialization traits of farms are closely related to technological levels, the degree of commercialization of the farms may also be deemed as of representative character. An evaluation of this conclusion can not however proceed directly from a comparision with other contemporary estimates, because comparable estimates are not available in the literature. However, the reassuring similarity in several key

respects between our sample results and those from BIDS exercises of a nationally representative character must underline the relevance of our observations regarding the state of commercialization demonstrated by the sample farms, to which we now turn.

Table A1.7: Representativeness of IFPRI sample using technological indexes.

Variables	IFPRI sample 1989/90	BIDS sample, 1988 (N=1264)	IFDC sample 1980-1982	BIDS sample 1981-1982
% of rice area under HYV	43	40		
% of farms using irrigation	63	52		
% of farms in the land rental market	71	n.a	43	n.a
% of rice plots fertilized Traditional variety Modern variety	100	n.a	91	n.c
Fertilizer used per acre (kg) Traditional Aus(b)	33	n.a	19	19
HYV Aus (b)	101	n.a	n.a	n.a
HYV Aus (t)	107	n.a	114	96
Traditional Aman (b)	12	n.a	7	5
Traditional aman (t)	43		22	18
Modern aman	112		68	84
Modern boro	150		117	130
Cropping intensity	171	175	n.a	n.a

Table A1.8: Salient results compring IFPRI and BIDS surveys

	IFPRI sample	BIDS sample (N=1264)
Output (in paddy) per ha, broadcast aman (md)	38	35
Output/ha, HYV aman (md)	94	94
Output/ha, local transplant aman (md)	67	66
Labor/ha, HYV aman (person-days)	166	161
Labor/ha, Local transplant aman	133	130
Labor/ha, local boro	156	132
Output/ha, HYV boro	130	140
Labor/ha, HYV boro	181	207
Output/ha, HYV aus	101	121
Labor/ha, HYV aus	164	189
Output/ha, local aus	54	42
Labor/ha, local aus	137	152

Note: IFPRI Farm Survey refers to 1989/90 and BIDS data relate to 1987/88.

Source: BIDS results are from Hossain et al. 1991.

IV.24 Salient Features of IFPRI Market Survey, 1989/90

IV.25 Structure of Paddy Purchase Operation

In Table A2.1 we report on the paddy purchasing activities of establishments in the paddy market. Why are we concerned with paddy perches at all ? We are, because the establishments are later found to be highly motivated by the imperative of a quick turnover for profits. They avoid building up heavy stocks of grain even in the immediate postharvest period, either for speculative purposes or for as working stocks. In such an environment, paddy purchases become closely related to the measures of trading or milling incomes, as "stock appreciation" is not an important source of income. Therefore, the quantity of paddy purchase is a valid measure of the scale of the business of an establishment.[1]

Table A2.1 breaks up the sample into districts that are called "progressive" and nonprogressive. "Progressive" districts are those which either registered a "surplus" in per capita cereal production over and above normative requirement in 1988/89 or those which demonstrate a market degree of farmlevel modernization in the matter of input (mainly) fertilizer use. On this definition, nine new districts are here grouped in the progressive class, viz. Thakurgaon, Dinajpur, Rangpur, Bogra, Joypurhat, Naogaon, Rajshahi, Sherpur and Sathkhira. The "other" districts are Pabna, Mymenshing, Netrokona, Kishorganj, Brahmanbaria, Chandpur, Feni, Munshiganj, Dhaka and Barisal and Sylhet. Also market agents are

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[1]A second reason is that the paddy market weighs more heavily upon the price formation than does the rice market (Lele, 1970). The farmer markets all of his marketed surplus qua paddy; rural electrification has, via its outreach, fostered a dynamization of heretofore slack rural paddy markets. Therefore, the structure, the conduct and the performance of the paddy will be treated in this report as of major import.

Table A2.1: Structure of paddy purchase at primary and secondary levels of the paddy months (Qty. in mds)

	Qty. of Paddy purchased			Proportions bought from					
	Aman	Boro	All seasons	Farmer	Faria	Bepari	Whole-saler	Aratder	Others
Progressive Districts									
Primary level									
Paddy Farias	1627	1550	3177	100					
Paddy Beparis	7279	5670	12949	76	20			4	
Paddy Kutials	1082	753	1835	69	24	1		5	1
Secondary levels									
Crushers	4433	5037	9470	38	8	5		49	
Paddy Aratders	17557	28921	46478	63	14	17		6	
Paddy Wholesaler	9900	10550	20450	71	29	0	0	0	0
S.R.Mill	12492	14777	27269	40	9	13		36	2
M.R.Mill	29668	19008	48676	20	3	19		49	9
A.R.Mill	134421	95787	232708	4	3	60		33	0
Other District									
Primary level									
Paddy farias	1547	1148	2695	100	0	0	0	0	0
Paddy Bepari	6288	6709	12997	70	20			10	
Paddy Kutials	942	1249	2191	46	12	24		18	
Secondary level									
Crusher	8724	9575	18299	24	3	26		46	1
Paddy aratder	16964	24949	41913	5	1	89		5	0
Paddy Wholesaler	19014	21956	40970	9	13	75		4	0
S.R.Mill	10715	10731	21446	13	11	34		25	17
M.R.Mill	15202	12805	28007	6	2	24		43	25
A.R.Mill	41652	43974	85626	4	0	49		17	30

Source: IFPRI Market Survey 1989/90

separated as between the primary and secondary level of the market. This separation is mainly in terms of their relative proximity to the farmer, or the primary level of the market.

The following findings from Table A2.1 are worth highlighting. First, the average scale on which the smallest of the paddy-traders (ie. farias and beparis) purchase paddy in the whole FY90 are very similar indeed: for example, farias average 976 quintals in the progressive districts, as against 1004 quintals in the "less progressive" districts. Paddy beparis also return closely similar paddy acquisition levels between those two categories of markets. Among processors operating at the primary level, home-based ones return similar average purchases in progressive and nonprogressive districts. The big difference at the primary level between the "progressive" and other districts lies with the "crusher" (ie. custom-millers) --- a difference of about 90%. This is mainly owing to the fact that the environment of greater paddy availability along with the geographically more distributed milling capacity in the progressive districts combine to bring down the minimum scale on which a custom-miller can still survive in the business. In the progressive districts overall, many relatively smaller-scale crushers have entered the trade, while in the more deficit-prone districts, who have to depend upon paddy surpluses generated by the progressive districts, only those entrepreneurs have entered and survived who can muster enough working capital to sustain a higher scale of acquisition. While stating this, we are satisfied that the number of chalans (ie. transaction) per market season in the progressive district on average remains about the same as for nonprogressive districts.

At the secondary level, among traders, we note one major difference. Paddy aratdars register about the same volume of brokerage performed per year in both classes of regions, 46 and 42 thousand mds, respectively in the progressinve and other districts. However, paddy wholsalers in the nonprogressive region register

significantly higher average magnitude of acquisition (41 thousand mds) than in the progressive districts (20 thousand mds). Here is why. Aratdars in paddy are merely brokers who may not need to invest any substantial sum of money even in pipeline stock. They may earn their keep merely by linking paddy paikers or beparies with the buyers of paddy while drawing upon his reputation as an honest and locally influential broker. This may not require a large amount of liquid resources. However, wholesalers will require to invest some money in business. This is also because wholesalers have to provide short-term credit to the processors who buy from them. Therefore, the capital requirement in as a paddy wholesaling is higher in the nonprogressive markets. This is reflected in the significantly higher average scale of paddy acquisition of the paddy wholesalers in these districts.

Among processors at the secondary level, the small rice mills in the two classes of regions register approximately the same scale of acquisition (of 27 thousand mds in the progressive districts as against 22 thousand mds in the others). At this stage, it is well to remember how predominant an output these small mills as a group have within the rice economy. The absence of a sharp disparity in scale of operations within this class of mills is suggestive of a certain equality in "market access" across the progressive-nonprogressive divide. The largest of the paddy processors viz. the major rice mills and the automatic mills in the progressive districts register very significantly greater scales of paddy acquisition than do those in the nonprogressive districts. In particular, the automatic mills acquire more than twice as much paddy on average in the progressive districts. This result will be explained in greater detail subsequently. For the moment suffice it to say that the average automatic mill in the progressive district register significantly higher rates of capacity utilization than those elsewhere.

In sum, small establishments survive some significant differences in their production and commercial environments, and achieve a broad parity in their scale of operations. But in the upper end of the scale distribution, location is destiny. This is because the entrepreneurs associated with these establishments have apparently not chosen scales of plants commensurately with the dictates of locational disadvantages.

Further in Table A2.1, we report the pattern of sourcing of the paddy requirements by the establishments on the sample. The presentation is done separately for the progressive and nnprogressive districts, and for both primary as well as secondary levels of the market. We basically present how the quantity of paddy purchased by market agents in a given category breaks itself up into various categories of sellers. The information shows the proximity of each specific slass of paddy user from the farmers, or the primary market transactors.

The following findings of Table A2.1 may be highlighted here. Certain clear difference now emerge between the progressive and nonprogressive districts. Firstly, among the processors in progressive districts, those in the primary level of the market purchase two fourths or more of their purchase from the farmers directly. Thus, the home-based processors report an average proportion of about seven-tenths of their purchase from the farmers. The "crushers" in the progressive districts report an average proportion of 43% from the farmers. By contrast, small rice mills and major rice mills both report lower average proportions of purchases from the farmers. The automatic mills procure the smallest share of their purchases from the farmers. In the nonprogressive districts, processors have to depend much more on intermediaries both from the primary and secondary levels of the market. Essentially, this stems from reduced availibility of farm surpluses of paddy in the nonprogressive districts, which appears to reduce the degree of commercialization.

IV.26 Seasonality of Paddy Purchase

One important trait of the functioning of a market of a commodity with a strongly seasonal production environment is seasonality. Therefore, seasonality of the paddy acquisition can be an important description of paddy market.

If the seasonal ebb and flow of the paddy acquisition by establishments operating at primary and secondary levels of the market are found to be substantively the same, this will then no boubt lend greater credence about the integration of those separate market tiers. On the other hand, discrepant seasonality would signify poor quality of the data. In Table A2.2 we report seasonality of paddy purchased per establishment in FY90 at various levels of the market. Several findings of this table are worth pointing out.

First, the higest paddy turnover per unit is registered overall for the month through January 14 --- which is the nodal month of the aman market season. It has been shown that the total quantity of paddy marketed throughout the economy in FY90 is about 2.8 million metric tons (MMT) for the aman season, as against 4.9 MMT for the boro season (ch. V). But this aggregate picture does not reflect the greater importance of the individual months of the aman season in the paddy turnover: combined turnover per establishment per month is <u>higher</u> for the aman season than for the boro market season. This is also shown by the last row of Table A2.2.[2] Second, the months through April 14 and November 14 ---

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[2]This is probably due to a decentralization of the paddy market during the boro/aus season despite the relatively difficult communications, as compared with the aman season. The number of traders reporting some purchase of paddy for commercial purposes on this sample is higher for each of the months during the boro season than for the first. A plausible speculation why this may happen is that abounding surpluses to be marketed quickly given the moist

(Footnote contd. overpage)

which signify the end of the aman and boro/aus market seasons respectively --- witness the slackest activity in the paddy market, with paddy prices at their sasonal (average) peaks (see below), and with rice wholsale prices at their own seasonal peaks, too (Chowdhury, 1992a). The timing of a seasonal dip in turnover survives a primary - secondary market divide. On the whole, the seasonality pattern suggested by these numbers is quite plausible.

IV.27 Seasonality of Paddy Prices on the Sample

Table A2.3 reports on the seasonality of paddy purchase price on this sample. The prices shown below are averages weighted over coarse and noncoarse varieties, and are exclusive of handling and other costs. The following findings may be noted with some interest. First, prices on average are at a seasonal low during November - December period, representing the onset of the aman harvest. Prices then begin to rise representing the cost of storage. This seasonal increase continues through March-April. Prices fall in the month through May under the impact of the onset of the boro harvest amid moist conditions, with growing communicational difficulties. They go on increasing seasonally through October - November. The rates of seasonal increase per month are found to be those of Tk. 10/md and Tk. 13/md, during aman and boro market seasons, respectively.[3]

Bangladesh has evolved an intricate pattern of seasonality in its rice production. *Aman* crop, which accounts for just over 50% of the rice output of the country, is harvested between November -

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conditions increase the degree of price risks in an environment of seasonal price declines during the months of May through July (Chowdhury, 1992a). Risk-averse agents may then react by lowering quantity indents.

[3]This seasonal increase is closely related to, but not synonymous with, temporal margin on paddy. The latter is discussed later in this report.

December. The irrigated boro, which now has emerged as the second largest cereal crop, and accounts for about one-third of the output, is planted in January-February, and is harvested in May-June. This is harvested on a very broad geographical basis. The aus crop, which accounts for the rest of the rice output, is harvested in July-August. The production of aus in contrast, is more localized than for irrigated boro. HYV-boro is heabily marketed: hence its arrival in the market in the month through the middle of May lowers paddy prices. However, aus is less heabily marketed. This, plus the localized production, is why its arrival does not have any depressing effect on prices.[4] Bangladesh's price seasonality has thus become bimodal, with two seasonal dips and this has affected, arguably for the better, the performance of paddy markets. Temporal margins have fallen over time. Farm technological change and, perhaps more to the point, growing commercialization have been at the centre of all this. Suffice for the moment to say that temporal margins have fallen for other reasons, too, as marketing seasons have shortened. But margins have fallen, as shortening seasons have translated into greater informational efficiency by the agents: Ravallion has shown how margins can be excessive due to informational inefficiency by the market agents (Ravallion, 1987, p. 123). A thesis of greater informational efficiency in the 1980s versus the 1970s is consistent with the evidence of a greater predictability of monthly public grain stocks: the variablity of government foodgrain stocks reduced significantly during the 1980s upon the 1970s (Chowdhury, 1990). There is now some strong evidence that public foodgrain stock level exercized a significantly inverse effect upon market

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[4]This seasonal pattern of harvest is quite removed from before the onset of irrigated dry-season rice cultivation, viz. before the late-1970s. Then, the aman crop was about three-fifths of the rice output, while aus accounted for about 25%. Boro output was mainly a low-yield traditional variety: marketing ratio of the boro paddy was in the 10-12% range. Hence, the market arrivals of boro paddy during May through July did not register any downward impact on market prices.

prices (Goletti et al. 1990; Chowdhury 1990). Greater predictability of public stock amounted to lowered market price risk. It has been succintly shown that informational efficiency in a more stable price environment is greater. Informational component in market margin has consequently grown smaller in the 1980s.

IV.28 The Degree of Competition in the Paddy Market

Table A2.4 reports on the degree of concentration revealed by paddy acquisitions. One is interested in this because "excessive" concentration could carry with it the potential of monopoly behavior (Utton, 1970). What is to comprise "excessive" concentration does not admit of a single answer. We simply compute the degree of concentration in terms of the familiar Gini coefficient.

Two findings emerge from Table A2.4. First there is virtually no difference in the degree of concentration in the structure of control over paddy acquisition at the secondary and the primary level. The Gini coefficient of the establishments at the secondary level is 0.53 as against 0.54 for those at the primary level. Second, the processors display greater concentration than do the traders. One final result is worth pointing up. The paddy market does appear to display a perceptible degree of concentration.

Table A2.2: Seasonality of paddy purchase at various levels of the paddy market, Bangladesh (Quintal)

	Aman marketing season						Boro marketing season					
	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
Primary Markets	388	470	430	326	277	386	494	428	350	310	418	242
Traders	436	593	509	373	248	351	510	506	370	306	863	262
Processors Kutials	75	76	73	80	67	82	111	79	65	67	58	52
Secondary Markets	1842	2142	1811	1380	772	1199	1905	1580	1331	1128	1218	822
Wholesalers	1338	1550	1407	1114	714	1199	1747	1628	1356	1056	2081	1853
Processors Crushers	544	628	593	443	420	590	713	[illegible]	508	458	487	379
Smallmills	958	1093	1001	708	419	910	1489	1039	918	868	962	417
Largemills	2073	2017	1659	1338	948	772	1624	1416	1021	857	548	524
Automatics	4722	6441	5210	4032	1800	3263	4294	4181	3693	2806	2447	2195
All establishments	696	816	697	509	328	584	763	663	557	486	541	376

Source: IFPRI Market Survey 1989/90

Table A2.3: Seasonality of paddy price at various levels of the paddy market, Bangladesh, 1989/90 (Taka/quintal)

	Aman						Boro					
	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
Farmers, selling at farmgate												
Primary Markets	506	535	573	601	638	514	527	553	585	606	653	673
Trader	499	514	551	554	610	488	504	522	553	575	626	661
Processors Kutials	496	546	572	614	639	529	533	563	595	615	654	666
Secondary Markets	505	545	594	612	644	517	529	559	573	607	652	676
Wholesalers	490	525	568	601	656	479	499	525	563	589	647	670
Processors Crushers	517	542	588	622	655	520	538	565	598	619	665	685
Small mills	496	541	576	610	636	524	533	564	573	611	651	678
Large mills	515	547	577	606	636	505	525	552	562	589	636	642
Automatics	533	570	611	640	681	529	536	575	613	633	668	706
All establishments	504	539	574	607	640	514	527	556	585	607	653	765

Table A2.4: The degree of concentration in the quantity of paddy purchase

Proportion of Purchase	Primary Level			Secondary Level			All Traders	All Processors
	Traders	Processors	All	Traders	Processors	All		
Bottom 10%	0.85	0.53	0.63	0	.01	.01	0.35	.01
next higher 10%	1.77	1.01	1.25	0	.02	.02	0.73	.23
next higher 10%	3.3	1.83	2.30	0	0.70	0.51	1.36	0.98
next higher 10%	3.66	3.11	3.28	2.41	2.68	2.63	2.93	2.78
next higher 10%	5.85	4.66	5.04	4.81	4.23	4.33	5.24	4.36
next higher 10%	8.26	6.33	6.95	7.25	6.34	6.50	7.67	6.34
next higher 10%	10.18	9.82	9.94	10.46	7.91	8.34	10.34	8.36
next higher 10%	12.88	13.46	13.27	16.38	10.92	11.85	14.94	11.51
next higher 10%	16.94	21.39	19.97	19.71	13.87	14.87	18.57	15.63
next higher 10%	36.32	37.35	37.36	33.21	53.77	15.25	37.88	50.06
Total	100	100	100	100	100	100	100	100
Gini Coefficient	0.50	0,56	0.54	0.50	0.55	0.53	0.55	0.63

Table A2.7 reports on the structure of rice sales by establishments on the sample. Two broad differecces between the progressive and other districts can be noted. First, as regards primary-level traders, the average scale of operation in the rice market in the progressive districts is significantly lower than in the nonprogressive districts: 116 MT as against 221 MT. In contrast, the mean scale of operation of the secondary level paddy processors in the progressive districts is significantly larger for all classes of plants than for corresponding establishments in nonprogressive districts. Small mills and major rice mills in the progressive district register 515 and 1013 MT for the whole year, as against 360 and 633 MT in the nonprogressive districts. Because mean milling installed capacities for these classes of establishments do not differ significantly across progressive-nonprogressive district divides, the forgoing significant

Table A2.5: Structure of rice sale at various levels in the rice market, 1989/90 (Quintals)

Types of Market Agents	Quantity of Rice Sold		
	Aman	Boro	All seasons
Prograssive Districts	9046	8886	**17932**
Primary Level	863	967	**1830**
Rice Retailer	1116	1269	2385
Faria	889	2408	3297
Bepari	2925	-	2925
Kutials etc.	539	495	1034
Secondary Level	12683	12239	**24922**
Crushers	2988	3205	6193
Aratdars	27685	33590	36358
Wholesalers	-	-	-
Small Rice Mills	8644	9346	17990
Major Rice Mills	19696	11840	31536
Automatic Mills	89064	61515	150579
Nonprogressive Districts	7129	7914	**15043**
Primary Level	1543	1461	**3004**
Rice Retailers	1266	1178	2444
Farias	-	-	-
Beparis	4081	3997	8078
Kutials etc.	635	602	1237
Secondary Level	9906	11217	**21123**
Crushers	5841	6198	12039
Aratdars	13278	14487	27765
Wholesalers	7039	20111	**27150**
Small Rice Mill	6885	7127	14012
Major Rice Mill	8149	8387	16536
Automatic Mill	23753	29265	53018

Source: IFPRI Market Survey, 1989/90

differences signify corresponding significant differences in capacity utilization and scales of business. The automatic mills show an even larger difference: 4306 MT as against 1080 MT. This all suggests that the mean rice mill in the progrssive districts is of a large scale, and is operated to higher degree of capacity utilization. Why this is so will be explained later. In contrast, the mean scale of business of home-based processors, i.e. the *kutials* etc. is significantly smaller in the progressive districts than elswhere. Why is this so? Fixed capital needs for a *kutial* are the same in both types of districts. The difference in the scale of operation is therefore due to a decentralization of capacity which, in turn, is due to the greater per capita paddy marketed surpluses at shorter distances from the *kutials'* home coupled with more convenient location of the husking mills (where the paddy is custom milled). In other words, a conjuncture of commercial and agro-processing-cum-infrastructural advantages in the progressive districts have lowered the capitalization requirements of primary-level paddy processing, relative to nonprogressive districts.

For the traders, mean scale of operation of secondary-level traders is significantly higher for the progressive districts than for nonprogressive districts. In contrast, the mean scale of operation of primary-level traders in the nonprogressive districts is significantly higher than for the progressive districts. The underlying pattern closely reflects the one established for the paddy processors. The underlying causes are the same.

IV.29 Marketing Channels for Rice Salers

Table A2.6 reports on how rice millers and traders merchandize their rice. The information illustrates the marketing chain of rice, and promotes an understanding of the network of sales relationship between various stages of the rice market. Several major features of Table A2.6 may be noted briefly. First, the

mills, which in any case predominate the production of rice, have utilized three main sales conduits, viz. the *paikers/beparies,* the *aratders* and the Food Directorate. For the sample as a whole, the proportions were 36%, 18% and 42%. While these millers disposed of major share (54% or more) through private market channels, the Directoriate of Food has been the single largest customer for the rice milled by the mills on the present sample. The fact that private market channels together predominate all others suggest that, even in a year of record public procurement, catering to the demand of the market is a slaple for paddy processors. These establishments are well-integrated in the national market. Significant differences emerge between progressive and nonprogressive districts, however: private market transactions predominate in the latter, while in the progressive districts, the Food Directorate accounts for 49% of the rice sold by the millers. This simply reflects the fact that the outreach of public procurement is much greater in the progressive districts. Second, the crushers, who are the most market-sensitive among the rice millers, market most of their millage using private commercial channels in both groups of districts. Third, *kutials* and other home-based processors use the *paikers/beparis* and the *aratders* for the majority of their sales. Significantly enough, these small scale processors also markets a sizeable proportion --- about 39% to be exact --- of their output to the retailers or the consumers directly. This implies that besides being integrated in the national market, there processors have also carved out a localized niche for themselves where they serve particular types of final demand for specific varieties in small [5]quantities.

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[5]This may prompt an ancillary observation. Undercapitalized small processors will often deem it expedient to parcel out the market in order to exploit the advantages of their keen knowledge of the magnitude and character of local demand. This type of conscious "segmentation" is a part of their survival options amid fiercely competitive market practice. This seems to be endemic in the markets of both developed and developing economics (Robinson, 1938, p. 6).

The *aratders,* who frequently double up as wholsalers, sell mostly to *paikers/beparies*. These *paikers/beparis* are of two kinds. One comprises *paikers* who have come into town from elsewhere. The second comprises paikers who connect retailers and wholesalers within the same (large) market. Retailers do not as a rule buy any large quantities from *arataders*. In the nonprogressive district, wholesalers sell 44% of their product to retailers.

We note with some curiosity that *aratdars* on the sample despatch an estimated 11% of their business to other *aratdars*, perhaps in other locations. This could well happen when the purchasers could in fact be wholesalers-cum-*aratdars*, although they might present themselves as *aratdars*. Again, for nonprogressive districts, we note that rice wholesalers have despatched rice to other *aratdars*. This also is plausible: the wholesaler is located closer to paddy processors, while the *aratdars* are located more downstream (ie. closer to consumption points).

IV.30 Seasonality in the Mean Scale of Rice Turnover, 1989/90

Table A2.7 reports on the seasonality in the rice sales volume by establishments at primary and secondary levels of the market, as also among various classes of market participants. The table, basically, presents monthly average sales for homogenously grouped market participants: averages are therefore more meaningful. Three features of this material deserve closer observation. First, in overall terms, the establishments do show some variability in turnover, as would be expected due to seasonality. Average sales volumes are the largest during the months of January and February:

Table A2.6: Pattern of rice sales by paddy processors, 1989/90

(Per cent)

	Paiker	Faria	Rice Miller	Aratdar	Consumer	L.S.D.	Retailer	Other
Progressive District Primary level								
Rice retailer	0	0	0	0	100	0	0	0
Rice Farias	0	0	0	12	18	0	61	0
Rice Beparis/paiker	0	0	0	100	0	0	0	0
Rice Kutials	13	2	0	35	29	4	14	3
Secondary levels								
Crushers	19	0.3	11	49	0.2	3	6	22
Rice Aratders	71	0	2	11	10	0	5	3
Rice Wholesaler	0	0	0	0	0	0	0	0
S.R.Mill	27	0	2	25	0.1	42	2	4
M.R.Mill	20	0	0	7	0	73	0.2	0.03
A.R.Mill	24	0	0	31	0	45	0	0
Nonprogressive District Primary level								
Rice retailer	0	0	0	0	100	0	0	0
Rice Farias	0	0	0	0	0	0	0	0
Rice Beparis/paiker	0	0	0	97	0	0	3	0
Rice Kutials	20	0	0	42	16	0	20	2
Secondary level								
Crusher	53	0	0	35	0.4	0	12	0.2
Rice aratder	81	0	1	1	2	0.2	13	3
Rice Wholesaler	7	0	0	43	6	0	44	0
S.R.Mill	44	0	0	32	0.3	18	5	0
M.R.Mill	19	0	0	35	0	45	1	0
A.R.Mill	83	0	0	10	0	4	2	1

Note: Row percentages may not add up to 100 due to rounding errors.

Table A2.7: Seasonality of rice sale at various levels of the rice market, Bangladesh

(Quintal)

	AMAN					BORO					AUS	
	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.
Primary Market	230.3	253.6	281.8	280.7	299.8	227.7	298.1	277.4	258	273.8	226.9	218.7
Traders	407	409	395	345	269	264	379	386	326	269	258	231
Processors Kutials	41	42	48	57	46	41	47	43	42	44	44	45
Secondary Market	953.4	1229.7	1344.0	338.9	1098.6	813.3	1178.0	1142.9	816.7	1038.6	1003.8	967.4
Crushers	293	333	386	396	377	355	424	385	367	412	364	361
Aratders/W.Salers	592	712	737	643	600	1300	1542	1601	1577	1484	1106	753
Processors	966.6	1247	1364.5	1362.7	1117.5	792.2	1165.5	1127.2	791.0	1022.2	998.5	982.0
Small Mills	537	622	757	791	639	576	858	726	684	734	665	612
Major Mills	920	1146	1233	1280	1069	441	871	887	836	835	629	634
Automatic Mills	2988	4229	4294	3994	3030	2493	3794	4162	3605	3093	2844	2577
Retailers	83	88	92	93	94	87	91	93	92	91	87	87
AllEstablishments	435	542	592	591	491	377	548	525	487	483	432	382

Source: IFPRI Market Survey, 1989/90

the next highest average is registered for the month of May, during the boro season. However, there is not a great deal of variability in the monthly turnover volumes on this sample. The coefficient of varition of monthly turnovers overall is found to be 33%, deemed presently to be unexcessive. Second, much of the variability originates due to actions taken by traders/millers at the secondary level. The relatively small and presumably more numerous traders at the primary level, and the home-based paddy processors demonstrate much greater degree of turnover stability. Turnover by kutial and other homebased processors average at about 4 MT per month. This compares with a sales volume per month per *kutial* of 1.53 MT, returned by a large-scale marketing study conducted in 1982/83 (Islam et al., 1985). Between 1982/83 and 1989/90, the average scale of operation of homebased paddy processors appears to

have registered an impressive rate of increase. That a noteable degree of seasonal stability in monthly sales survivers a quite vigorous growth in annual sales is a significant feature of the economics of homebased paddy processing. The market agents at the secondary level of the market experience much greater variability in their turnover volumes. Much of the variability at the secondary level originates from the class of major rice mills, and the automatic rice mills. These are, of course, among the largest of all the establishments sampled. Their variability ramify into the whole of the secondary market level. The variability is mainly due partly to seasonal output peaks motivated to take advantage of harvest season soft paddy prices and partly to seasonal variability in rice prices, to which we now turn.

IV.31 Seasonal Variability in Rice Prices

Table A2.8 reports on the seasonality of rice prices realized by various categories of rice sellers. Like for paddy, rice sales price rice from a seasonal low in November-December to a high in April, when under the impact of boro market arrivals prices slip. From then on, prices go on gaining right through the onset of aman harvest. September and October represent the highest seasonal level of prices, persumably adjusting final demand downward. Small wonder, rice supply is at its lowesr seasonal level during these two particular months.

This evidence regarding rice price seasonality strongly corroborates observations made earlier, to the effect that price seasonality has become bimodal in Banlgadesh, with peaks in April-May and September-October (Ahmed and Bernard, 1988; Chowdhury, 1987). We shall see later than both public and private foodgrain stocks are at their seasonal lowest during these two periods of the year. Besides, these two periods also signify the run-up to the period of the pair of Bangladesh's most important cereal harvests, viz. the boro and aman. In the run-up, prevailing prices can be

influenced upward by the expectations about the size of the forthcoming harvests, as Montgomery has shown (1983).

Table A2.8: Seasonality of rice price at various levels of the rice market, Bangladesh (Tk./ Quintal)

	AMAN					BORO					AUS	
	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.
Primary Market	943.4	967.7	1002.2	1032.1	1061.0	951.0	955.0	975.2	1000.6	1023.3	1079.2	1089.3
Traders	976	1009	1029	1054	1084	1014	1022	1031	1049	1059	1132	1164
Processors												
Kutials	934	961	993	1025	1054	945	943	964	988	1013	1076	1104
Secondary Market	932.9	957.7	890.7	1005.9	1053.0	937.8	953.0	970.0	987.7	1006.9	1056.8	1101.8
Crushers	940	960	1000	1030	1059	938	946	968	996	1021	1075	1067
Wholsalers	964	995	1016	1143	1071	910	923	959	990	1027	1049	1080
Processors	931.9	956.6	979.6	1001.3	1052.4	939.1	954.1	970.4	987.7	1006.2	1057.3	1103.4
Small Mills	934	955	979	999	1059	952	962	978	996	1014	1070	1125
Major Mills	933	961	977	998	1035	933	959	970	981	996	1023	1048
Automatic Mills	921	954	988	1018	1059	890	895	927	857	986	1039	1077
Retailers	1031	1061	1091	1124	1163	1063	1072	1095	1116	1143	1184	1222
All Establishments	953	979	1009	1037	1076	966	972	992	1014	1037	1094	1122

Source: IFPRI Market Survey 1989/90

V. CAPITAL AND INFORMATION IN RICE MARKETS

V.1 Access to Capital, and role of Capital at Various Levels of Trade

In any given market, at any particular time, production, ownership, enterprise and exchange arrangements each exhibits structural features. Thus ownership may be structured through patterns of equity and debt claims of varying degrees of complexity. Enterprise may be structured through various enterprise-sharing arrangements. Exchange arrangements may be structured through a body of custom regulation, law and facilitating services. Market structure, then, is the totality of such separate structures (Paul, 1964, p. 40).

One of the most telling specimens of the ownership arrangements in a structural context revolves around the role of capital---the capitalization required for minimum efficient scale (MES) --- and the cost conditions of raising the capital required. Two issues arise: one is the size of capitalization requirements. The second involves two elements: the relationship between the size of firm and risk-diversification; and the resource cost of raising capital. Together, this pair may amount to entry barriers. This makes it imperative to look at issues of capitalization and access to capital. Before proceeding any further however, a few conceptual issues need to be briefly touched upon.

V.2 The bases of establishment size-correlated capital cost differences

These differences owe to three factors. First, start up costs are nearly fixed whether the volume of equity or debt claims sold to raise capital is large or small (Archere and Faerber, 1966, pp. 69-83). Cost as a percentage of total equity finance raised is usually inversely correlated with both size of issue and size of

the issuing firm. Second, larger establishments may be perceived capable of earning more stable profits, or warding off defaults or bankruptcies. In theory, greater stability in earnings of large firms is supposed, among other reasons, to spring from a greater ability to spread risk. For example, a large multiplant enterprise is likely to serve more geographic markets or to offer more distinct product-packages. This makes it better able to weather a demand contraction in any single market or product segment (Scherer, 1980, p. 105). Third, the unit cost of borrowing is everywhere likely to rise disproportionately to the amount to be borrowed, given the size of the borrower's assets. This has been named the principle of increasing risk (Kalecki, 1937, pp. 440-447). The fourth basis springs from entrepreneurs associated with small and large sized ventures belonging to very different situations of supplies of savings, with different costs of funds. Where land ownership profoundly affects germination of economic surpluses seeking remobilization in nonfarming, a marked degree of inequality of land ownership necessarily translates into marked differences in the subjective costs of funds. Many poor potential entrepreneurs are simply priced out of any startup because their time preference, reflecting conditions of dire poverty, is excessively high. The amount of capital they can put up front as *venture* capital is too small relative to prevailing capitalization norms. Other entrepreneurs, coming from more favorable conditions of surplus creation, may apply a significantly lower rate of time preference and thus come forth with larger venture capital.

V.3 Capitalization Levels in Rice Trade

Capitalization requirements are of two kinds: fixed and working. Traders have modest fixed capital needs: a lump sum "possession money" for a premise including perhaps a godown space, some furniture and fittings, an iron safe etc. In 1989/90, a typical space for an *arat* at Dhaka's historic Badamtoli wholesale market, located on prime land adjacent to Dhaka's most important

communication artery --- the Old Ganges --- cost an average of Tk. 300,000 or so by way of possession-money. This is the average returned from a survey of wholesalers carried out by IFPRI in six of the major terminal and assembly markets. Collateral fixed capital cost come to another Tk. 50,000. For traders, especially wholesalers, the principal component of capital requirements is in the form of working capital. Following Sen (1964), the need for working capital is defined in terms of input and output inventories, and of the value of work-in-process.[1]

For mills, capital requirements spring from the need to pay for plant and machinery and to meet their purchase and installation charges, and pay for other fixed assets (land, building and physical structures, vehicles, furniture and fixtures, etc.). If plant and machinery are imported, the resulting need to buy foreign exchange and to negotiate a deal with external companies will doubtless run up larger initial fixed costs. For processors, the need for working capital arises for the same reason as for traders.

There are basically four ways an entrepreneur can raise money for fixed capital, viz. by investing own venture capital or by issue of common stock, by borrowing for the long term, by suppliers' credit and by profit-sharing arrangements with the suppliers, especially foreign suppliers, of plant and equipment. The last-noted is a variation on raising capital by floating stock, but with a critical difference. In this case, profit sharing arrangements may permit savings by allowing <u>shorter</u> plant run-in times, as foreign collaborators have greater inducements to rapidly

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[1]Virtually all production processes involve a lag between the commission of inputs and the appearance of output ready for sale. The value of the inputs representing different degrees of processing is doubtless a part of the plant's capitalization. Input stocks may include but not be limited to routine advance payments for input purchases, as well as suppliers' credit that are routinely issued while selling. Both features are present among the ownership arrangements in Bangladesh's rice markets.

commence commercial, as distinct from, trial production.[2] The equity floatation route is resorted to when stock markets are well-developed, which has not been the case in Bangladesh. Not one of the 88 automatic and semi-automatic mills operating in 1988/89 was a public limited companies listed on a stock exchange.[3] In Bangladesh, longterm debt for financing fixed assets in the rice processing industry has mainly been a preserve of the handful of specialized banks e.g. the Bangladesh Shilpa Bank (BSB), Bangladesh Shilpa Rin Sangstha (BSRS) and Bandladesh Krishi Bank (BKB). Between them, these three have helped finance establishment of about 65 automatic and semi-automatic rice mills between 1976/77 and 1989/90. Six scheduled banks have helped finance ten of the other mills. Mostly, these banks have required, that at least 30% of the total worth of the project be funded by the sponsors' own equity. Most sponsors have put up land, frequently highly overvalued, as their stake in equity. A typical automatic mill stands on a plot about 2.5 acre of prime and convenient land. The ownership of such a parcel of land is the exclusive privilege of only a handful of Bangladesh's entrepreneurs. The implication is that the longterm debt finance route is not overly accessible in the realities of Bangladesh's money market.

Suppliers' credit or profit-sharing arrangements have not been resorted to by the entrepreneurs in the milling industry. India remained by far the largest source of milling machinery and equipments during the 1970s and 1980s. Bangladeshi sponsors would no doubt have welcomed the benefits of suppliers' credit on affordable terms. However, the Indian exporters, almost invariably private concerns, were weak at mobilizing export finance. Also, their product quality turned out to be below par --- providing

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[2]This assumes that there is sufficient competition in the industry producing the plant and equipment at issue.

[3]Only about 25% of these establishments are private limited companies.

ample justifications for *not* entertaining *deferred* payments. The realities of both capital and money market were such that, except for about 60-70 automatic and semi-automatic mills, virtually all other of the thousands of entrepreneurs in this industry were largely internally financed. A large majority of the equipment in use by the major rice mills and the huller mills used electric motors made either in China, or Pakistan, or assembled in Bangladesh. The huller themselves could be put together by local foundries using crude methods. There is no evidence of any presence of vertical integration between rice milling and rice-mill machinery making. All in all, the entrepreneurs in the rice milling and trade were pretty much left to their own devices. They all began small, with the exception of the automatic mills.

V.4 Fixed Capital Requirements of Paddy Processors

We attempt to formulate some stylized fixed capital requirements, on replacement cost basis, of four classes of paddy processors, viz. the *kutials*, the small huller mill, the major rice mills and automatic rice mills. Before presenting the estimates themselves, it may be apt to dilate upon underlying assumptions. The automatic mill is assumed to have a capacity of roughly 1000 mds per day operating on 270 days. It is supposed to have a mechanized drying unit, but is also fitted with a drying yard with a capacity of 186 quintals (500 mds) per day capacity. Employment in a mill of this capacity ranges from 35 to 40, with an average of 38, of which 14 are white-collared and the rest blue-collared. About 16% of the workforce are women, mostly in the latter category.

Most mills of this type have been built on land ranging from 2.5 acres to as much as 5 acres, with an average of 3 acres. One basic difficulty in evaluation of their fixed capital lies with land. Operating mills have acquired land variously. Some have opted for leasing plots with 99-year-long maturity from semi-

government bodies, like the Bangladesh Small and Cottage Industries Cooperation (BSCIC). Some have privately purchased land. The unit cost of acquiring these various land resources in 1989/90 vary considerably, from Tk. 11 lac per acre in Birganj in Dinajpur in FY90 prices ot Tk. 125 lac in Shaikhghat in the heart of Sylhet, which is included in our sample. Unit price of land depends on many factors, including proximity to markets, access to infrastructure, and the prospects of appreciation of value etc. For our purposes, we take three acres to be the standard, and land values in 1989/90 prices, before development, to be Tk. 1 million per acre.

Table 31 elaborates upon the breakdown of the land of 3 acres.[4]

Table 31: Standard Layout of a 2 THP automatic rice mill in North-west of Bangladesh

(Area in 000 sq.ft)

Category of asset	Area	
	sq. ft	decimel
Drying yard	28.8	66
Godown	17.9	41
Mill premises	17.9	41
Other areas	66.1	152
Total mill area	130.7	300

Source: IFPRI Market Survey 1989/90

[4]It will be wrong to think that this represents the industry standard. The institutional structure for standardization is fairly weak in Bangladesh: any consensus would be hard to build on what the industry standard is. However, a majority of the automatic mills in Bamgladesh do broadly conform to these estimates.

The major rice mills use up land ranging between 1 acre to 3 acre depending on the region. The cost of land averages at about Tk. 1 million per acre. Daily milling capacities range between 1 MT per hour to 1½ MT per hour, depending on soaking, parboiling

Table 32: Replacement cost of fixed capital, and the degree of mechanization

(Tk.000s)

	1989/90			
	Automatic mill	Major mill	Small mill	Kutial
Land	3000	2000	660	
Building/structures	4500	850	140	
Plant/equipment	7500	550	150	
Others	1000	100	50	
Total	16000	.3500	1000	60
Workforce	38	25	19	3
Capital-labor ratio	421	140	53	20

Notes: These figures are rough averages reflecting cost conditions in four major surplus districts of Dinajpur, Rangpur, Bogra and Rajshahi.

and drying capacity. On our sample, milling capacities averaged about 540 mds. per day. Replacement cost of the motor(s), boilers, accessories and the hullers themselves averaged Tk. 550 thousand. A *chatal* with drying capacity of 400 mds (149 quintals) would require about 14420 sq.ft of land and, in FY90 prices, would cost about Tk. 450000. The machinery are all largely housed in structures using CI sheets and metalled floors. The real limit to

a plant's capacity is set by those of soaking reserviors and/or the drying yard. During the aman season when temperatures are low, ideal results could take about two successive days of drying. The intervening night is of use in tempering the grain: sustained but long exposure to sunshine creates cracks in grain endosperm and increases the percentage of brokens. Milling of own-account grains in usually done after dusk, through the night. Entrepreneurs balance their manufacturing facilities by building a *chatal* roughly about the capacity of their soaking tanks. A typical major rice mill will likely be fitted out with storage capacity for about 1200 mds of paddy and 500 mds. of rice --- in all, about 2000 mds of paddy. Storage space typically is about 400 sq. ft, and cost about Tk. 80,000 to build in FY90 prices. The typical mill, housing a 30 HP motor, will occupy about 1700 sft of space, and cost Tk. 320 thousand to build. Such a mill cost Tk. 3.5 million to build, in toto, in 1989/90. Such a mill typically employed about 25 workers, one-fifth of them while-collared.

The small mills avoid investing in standard boilers: in other respects, are scaled down versions of a major rice mill. These have two-thirds or so of the capacity of a major rice mill. However, their capital costs are yet cheaper, mainly because of use of more rudimentary auxiliary devices (like steamer made of oil-drums, etc.) and frequently less accessible locations. Also, the structures tend to be below par. Their employments is three-fourths or so of that for major rice mills.

Table 32 below demonstrates glaring differences in the degree of mechanization between the automatic, the major rice mills and the small rice mills. Thus, capital-labor ratio for the automatic mills is found to be Tk. 0.42 million, as compared with Tk. 140,000 for major rice mills and Tk. 53000 for the small rice mills. For the *kutials*, mechanization is much smaller.

The high degree of mechanization of the automatic mill has a high average depreciation to match. Capacity utilization and the level of capitalization per unit of output are inversely related. Thus capital requirements are vastly different among the four classes of paddy processors. This is the most inportant reason why automatic mills or the MRMs are so unimportant as components of rice milling industry, and also why the small rice mills are its veritable staple.

Working capital requirements will add to the overall capital requirements. Smooth operations require that, while at least one day's requirements of paddy is stored *qua* working stock, one day's supplies will be in the soaking reservoirs, while another day's requirement is being dried, another day's requirement is being milled. This means that input stock and work-in-process between them add up to four days' of value of output. Output inventories will doubtless add another two days' output. This implies that working capital requirements average the value of 6000 mds. of paddy for an automatic mill or Tk. 1.5 million; of 2000 mds. of paddy or Tk. 0.5 million for a major rice mill and Tk. 0.32 million for a small rice mill.

The days of setting up automatic mills using foreign aid have become *passe*. And to rise privately enough money to build one is pretty much beyond the capacity of any one industrialist. Most new entrants into rice milling during the past quinquennium or so had rejected the automatic mill. This does not pay. The technology has too long a pay-back period (about 6-7 years in 1989/90 prices) as against 4-5 years in the case of a major rice mill. Most of the new entrants to rice milling during the five years through 1989/90 are the huller mills. Undoubtly the great majority of these new entrants are fitted out with unstandardized steaming devices located within small rice mills. This has been a response to the paucity of capital available to prospective enterpreneurs.

V.5 Access to Capital

Access to capital raises such issues as (1) The likelihood that a given entrepreneur will be able to raise any amount of money at any realistic rate of interest, and (2) how rapidly liable rates of interest increase when the amount to be borrowed increases. Amid well-functioning contingency and risk markets, with a variety of debt instruments representing various degrees of defult risk, maturities, cost of collection etc., the probability will be small that an entrepreneur will be unable to raise money at any rate of interest. Where exchgange arrangements called for by orderly development of risk and contingency markets are not created by public policies, credit participants will of their own accord fill the void, if the private pay-off is sufficiently large. Even when these arrangements are at the behest of unregulated oligolists, they will provide positive access, admittedly expensive, of capital to a class of potential debtors who would otherwise remain totally drained of capital resources, beyond what little they themselves can garner. The other aspect of access has to do with rates of interest charged.

V.6 Realities of the Access to Operating Capital in Rice Markets in Bangladesh.

In theory, there are four major sources of capital for entrepreneurs in Bangladesh's rice market: banks, moneylenders (lending on interest) or traders lending to earn interest equivalents; friends/relative; own finance. Banks signify institutional credits. All other forms of credit, whether interest-seeking or not, are termed noninstitutional credit in the literature. The conventional wisdom is that an overwhelmingly large majority of deficit units are "refused" access to institutional credit by statutory requirements of collateral (frequently demanded in form of land, jewelry, and the like). The ensuing demand is diverted to the noninstitutional segment of the

market. However, the demand for funds swamps available supply. Conditions of lenders' market emerge. It is alleged that interest rates are likely enough to perpetuate usury, and gross economic and social inequities (Crow et al. 1990). Indeed, some authors have gone to the extent of saying that surplus units, especially large traders, have capitalized upon the powerlessness of deficit units and interlocked their domination of capital and grain markets to extract large surpluses on the cheap (Crow and Murshid, 1989; Crow, 1989).

Crow and Murshid work has pointed up several type of credit contracts in the rice markets in their study areas. These include (1) *dhaner upore* (DU) contract, (2) *dadan*, and usual (3) trade credit. DU contracts require that the debtor repays the loan in a stated quantity of paddy: this quantity is so determined that it amounts to exceedingly high interest rates. *Dadan* contracts involve wholesalers advancing operating capital to itinerant merchants, on condition that the latter will supply paddy or rice to the former at a preferential price. Trade credits are bridge loan contracts, where sellers' cash receipt is smaller than the value of the deal. The underlying price may or may not be higher than for cash sales. Mostly, though, it is 1 per cent higher.

We now proceed to expose the weakness in the line of reasoning just cited, before we report on the credit relations prevailing in Bangladesh's rice economy on the basis of results from the IFPRI Market and Farm Surveys.

The Crow and associates' argument is wanting in that it preoccupied itself with the cost of the *dadan* or *dhaner upore* credit for the debtor: its benefit for the debtor is quite inadequately recognized. It can be argued that the use of credit, however expensive, enlarges the feasible resource set for a previously tightly-strapped deficit unit and changes its factor price ratio during all-too-critical parts of income-generating

seasons by enough to translate into a more *productive* use of the abundant input, namely labor. By releasing or relaxing a binding capital constraint during the most critical part of the economic seasonality, the use of credit effectively *lowers* the price of the input in short supply in terms of output to be produced, thus enabling the producer to move up the production function. The marginal product of capital, arguably is high at relatively low levels of capital absorption for peasant farming if the production function is concave.[5] Second, the Crow argument virtually assumes away the cost of administering the credit, especially the cost of making amends for the absence of functioning risk and contingency markets. Because the issues here are somewhat subtle, a fuller discussion seems in order.

One class of creditors' cost involves that of enforcing contract clauses. The failure by the debtor to comply may stem from two factors, viz. (i) environmental risk (crop loss) which may disble the debtor to generate planned surplus; (ii) the potential gains of violating the repayment-in-kind clause of the contract.

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[5] This need not be surprising. Where crop yields are precariously dependent upon timely mobililization of labor, and where morbidity or sickness rules family labors out of action, the capacity to hire labor and/or to apply a certain quantity of fertilizer can potentially spell the difference between a lost crop and a harvest at average yield. A *dhaner upore* credit contract could frequently be such a catalyst. By allowing the farmer to raise 20 mds. to an acre, instead of 5 mds, the farmer would have it in his advantage to borrow at *DU* rates of 10 mds of paddy per Tk. 1000 to mature after four months: the farmer is better off by 5 mds. of paddy. This example, no doubt oversimplified, drives home the point that whether a credit contract is usurious also depends upon the incremental capital output ratio. None of the studies by Crow and Murshid have been careful enough to stress this point. But they have overlooked the fact that an assertion that credit and grain markets are interlocked is an empirical proposition, which cannot really be resolved without an account of the cost as well as the productivity of credit. Such an analysis calls for estimation of production functions that allow computation of benifit-cost ratio of noninstitutional credit which no author has as yet attempted to do.

Risks of crop-losses sapping, totally or partially, the capacity to repay have to be borne, at least partly, by the creditors: there is no risk market to speak of. Risk of default on the loan due, say, to the death of the debtor has also to be covered: there is no contingency markets to speak of. Risk and contingency are critical inputs amid production environments characterized by covariate preduction risk, extremely small financial resiliency by dobtor and single-crop production system. As for the second factor, enforcing the repayment-in-kind clause of the contract involves information cost, too. These costs are mainly in order to ensure that the debtor does not sell the produce someplace else. It is easier to ensure at little or marginal cost when the creditors happen to be rich and influential peasants in the area of debtors' residence, because then local kinship ties and hierarchical status could function as nonmarket sanctions against such breach of contract. Itinerant paddy traders hailing from outside the area at hand may here have a cost disadvantage. This is one important reason why pure paddy traders were found not to provide *dadan* based credit in Nalitabari and Ajmiriganj areas in Bangladesh in sample surveys (Hashemi, 1989, p. 13). The creditor has to pay for spreading information regarding the indebtedness of his clients in the market area, in an effort to handicap the latter. Second, his agents have to shadow the creditors closely. Besides, the DU contracts seem to be concentrated in remote and flood-prone areas where, by implication, the public provision of financial and physical security is in short supply (Crow and Murshid, 1989). When the provision of security, a public good, is supplanted by local-level economic hierarchy of trader-financiers and abentee landlords, this transtates into a selective provision of such security--- freedom from robbery and default --- that is denied to external traders (Crow et al. 1991, pp. 116-7). These trader-financiers are also the sources of much of the DU credit funneled in one of three study areas of Crow and Murshid.

V.7 The extent of Dhaner Upore Credit Contracts[6]

Table 33 reports on the frequency of DU credit contracts. We report on the proportion of farmers on IFPRI Farm Survey with such debt obligations, the average duration of such credits, and the creditor traits, the (weighted) average interest rate charged. In general, these results do not lend much support to those of Crow et al.

Only 4% of the sample respondents had entered into at least one DU contract (Table 33), as against 14% for bank credits (Table 34), and 18% for other noninstitutional credits (Table 34).

Table 33: The extent and character of *dhaner upore* contracts, 1989/90

	Ownership size class					Type of districts	
	Marginal	Small	Medium	Large	All	Progressive	Nonprogressive
No.of farms taking DU	2	13	10	5	30	13	17
Total no. of farms	30	137	254	258	679	443	236
% of farm taking DU	7	9	4	2	4	3	7
Average amount taken in DU (Tk. 000)	22.0	5.4	9.5	5.96	8.0	5.05	9.0
Average duration of DU credit (weeks)	6.5	6.8	7.3	5.4	6.7	4.9	8.1
Average interest rate per month	33.3	19.8	28.1	45.9	31.8	29	33

Source: IFPRI Farm Survey, 1989/90

[6]All results about credit relations using IFPRI Farm Survey 1989/90 reported in this section relate to contracts made during the five months through the middle of April, 1990. The data for the second round will be reported in the final version of this report. Arguably, these five months represent a period of above-average credit demand stress: HYV boro, the most cash-intensive crop, has to be cultivated in this season. This limitation on data availability does not materially affect the conclusions.

Second, the proportion of marginal or small farms who contract any DU credit is significantly higher (at 9%) than for the medium and large farms (at 3%). However, amount of credit contracted per farm is found to be Tk. 7.6 thousand for the two smallest sizeclasses as a whole, as against Tk. 8.32 thousand for the medium and large farm as a whole --- not a significant difference. Therefore, even the medium or large farms are in the act of contracting DU credit on similar orders of magnitude as small ones. Just about *anyone* may be forced to raise money this, admittedly expensive, way.

The average DU credit was contracted about 7 weeks prior to the boro harvest, or, in other words, in the last week of March, 1990. The average interest rate per month is 32% for the sample of DU debtors: the average interest rates do *not* appear to be excessively high, given the short maturity of these unsecured loans. They are certainly much higher than those on institutional loans. But the latter invariably are collaterized by immoveable assets, like land or real estate. Pledge of land, naturally, lowers interest rates of collaterized loans. But the rates are no doubt high as seasonal averages.[7]

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[7] It is well to stress at this point that the demand for DU credit is highly seasonal. Specialized creditors face lean demand during about half of the year.

Table 34: Access to Institutional and Other Noninstitutional Credit

	Ownership size class					District type	
	Marginal	Small	Medium	Large	All	Progressive	Nonpro-gressive
Institutional							
No. of farms taking bank credit	1	21	30	44	96	45	51
% of farms taking bank credit	3	15	12	17	14	10	22
Average amounta taken in bank credit (Tk. 000)	2.2	3.8	4.8	10.0	6.9	5.0	8.6
Average duration of bank credit (months)	4.0	4.0	4.0	5.0	4.3	4.0	5.0
Average interest per year (%)	16.0	15.7	18.0	16.4	16.6	17.6	15.7
Noninstitutional Credit							
No. of farms taking noninstitutional credit	2	25	53	44	124	70	54
% of farms taking such credit	7	18	21	17	18	16	23
Average amount taken in informal credit	3.0	4.4	3.5	8.3	5.4	6.0	4.5
Average rate of interest per year (%)	120	19.3	15.2	18.8	19.0	11.0	29.4

Note: Interest rates are weighted averages, weights being sizeclass specific total credit contracted.

V.8 Access to Bank and other Informal Credit

Table 34, featuring two panels, reports on the relative role of formal-sector and informal credit on the study sample farms. Knowledge of the formal sector credit access illuminates the capitalization backdrop of the farms whose marketing and storage behavior are here under study. Several features of the information in this table are worth nothing. First, 14% and 18% respectively of farm contracted any amount of institutional and noninstitutional credit. Second, interest rates on noninstitutional loans averaged at 19%, as against 16.6% for bank credits. Third, it should come

as a modest, albeit mostly pleasant, surprise that such a small proportion even of small and medium farms are contracting noninstitutional credit even though it is not costly. This is because the literature on credit is full of unsubstantiated assertions as to wide farm incidence of high-cost informal credit. Our contention is that such stereotypes must be discarded. The evidence from IFPRI Farm Survey 1989/90 strongly shows that even small and medium-sized farms, who are the staple of the eligible peasantry to be trusted able to service an informal loan, do not overwhelmingly *need* to contract such credit. Why? At this stage of this research, we do not claim to know the whole answer. But, partly, the answer is that, at least as far as rice cultivating households are concerned, the onfarm availability of rice surpluses according to an intricate seasonality has considerably increased both the quantity and predictability of farm working capital. Put differently, there is greater credit-related "self-sufficiency" even for small and medium farms. Conditions of lenders' market, which in the past might have characterized the rural credit scene, are no longer valid as current description.

In sum, the following conclusions may be reached. First, the incidence of the farmer being haplessly tied via usurious credit contracts like *dhaner upore is quantitatively insignificant*. Second, less than twenty percent of farmers contracted any noninstitutional credit: fourteen percent contracted institutional credit. Overall, the sample strongly suggested the incidence of *internal* finance. Arguably, this was, to an important degree, due to the greater availability on rice surpluses, even on the populous category of small farms. Third, the cost of informal credit is only marginally higher than that for institutional credit.

Having examined farmlevel credit relations, it is now imperative to report on the character and consequences of credit networks in rice milling and trade. The following account draws upon the results from IFPRI Market Survey 1989/90.

V.9 Some Insights into the Rice Traders' Access to Operating Capital

The following material is structured as follows. First, we examine the structure of the recipt of trade credit or dadan by source on study sample. Next, we examine the structure of disbursement of trade cerdit by source and by destination.

Table 35 reports on the volume of trade credit or *dadan* received per establishment during the study year.

Table 35 also reports on the proportionate share of various sources in the capital receipt of the various categories of establishments on the sample. The following findings may be highlighted. First, the wholesalers/*aratders*, are among the largest *individual* types of debtors of trade credit. Although they are only 20% of the sample, they account for 58% of the trade or *dadan* credit received on the sample. Automatic mills, too are slightly overrepresented. Besides these two categories, every other is underrepresented as beneficiaries of credit/*dadan*. This findings should be a solid rejection of a patron-client relationship where the supposed patron --- the *aratdar* --- never borrows. Significantly, nine tenths of paddy *arats*' trade credit are disbursed by the paddy beparies; the rest are financed by farmers and farias (Table 36). Significantly, paddy itinerant merchants receive the greatest bulk of their trade credit from the farmers and the next largest relative share from other *aratdars*. The largest benefactor of this trade credit are the *aratdars*/wholesalers, located further downstream. The fact that the farmer should be a prominent source of credit for the paddy

Table 35: Receipt of credit or *dadan* per establishment by source, 1989/90

(Tk.000s)

Types of agents receiving	No. of units	Sources												
		Pai-ker	Bepa-ri	Farin	Cru-sher	Kuti-al	Far-mer	Arat-dar	Mill-er	Reta-iler	Othe-rs	Total	% of Sam-ple	% of credit/ dadan receipt
Paddy trader	68	.6	1.9	1.6	.15	0	8.2	5.5	.3	0	0	18.2	10.7	2.2
Paddy wholesalers	47	0	222.6	10.4	1.6	1.0	13.2	2.2	1.9	0	0	252.9	7.4	21.4
Automatics	20	0	60.3	0	0	0	9.8	45.7	1.3	0	0	117.1	3.1	4.2
Major rice mills	34	0	14.8	4.1	.10	0	4.3	56.5	0	0	0	79.8	5.3	4.9
Small rice mills	74	1.6	13.3	4.3	2.2	0	8.4	44.4	.1	0	.2	74.6	11.6	10.0
Kutials	65	0	.3	2.4	0	0	1.5	1.0	.8	0	0.7	6.7	10.2	0.8
Crushers	110	.5	12.4	1.6	0	.03	2.8	41.5	34.8	0	.4	59.2	17.3	11.8
Rice wholesalers	19	0	22.2	2.6	.9	6.4	.3	15.5	2.3	.3	2.6	53.2	3.0	1.8
Rice aratders	62	0	174.5	3.9	51.7	5.0	12.5	1.0	66.6	0	0	315.2	9.7	35.3
Rice retailers	58	.6	.01	.004	.5	.9	.04	1.8	.7	0	.11	4.7	9.2	0.5
Others	79	0	13.4	1.3	9.3	1.7	.6	9.3	14.1	0	.25	49.9	12.4	7.1

Source: IFPRI Market Survey 1989/90

itinerant merchants, and, at a further remove, for wholesalers is intuitively suggestive of growing solvency of the farmers in Bangladesh. The automatic mills are more amply in the debt of trade transactors, but their aggregate importance in trade credit is small. Small rice mills, however, are an important category of credit receivers. All in all, *aratdars* and beparis are the trade-creditors of some significance in this economy.

Table 36: Structure of credit or dadan receipt by source, 1989/90 (%)

To \ From	Piker	Bepari	Faria	Crusher	Kutial	Farmer	Aratdar	Miller	Retailer	Others	Total
Itinerant paddy traders	3.4	10.8	8.5	0.8	0	44.9	30.2	1.5	0	0	100
Paddy wholesalers	0	88.0	4.1	0.6	0.4	5.3	0.9	0.7	0	0	100
Automatic mills	0	51.5	0	0	0	8.4	39.0	1.1	0	0	100
Major rice mills	0	18.5	5.1	0.1	0	5.4	70.8	0	0	0	100
Small rice mills	2.1	17.8	5.8	3.0	0	11.3	59.5	0.2	0	0.3	100
Kutial	0	4.1	35.7	0	0	22.1	15.3	12.1	0	10.7	100
Crusher	0.8	21.0	2.8	0	0.05	4.7	70.1	0.5	0	0	100
Rice wholesalers	0	41.7	4.9	1.6	12.1	0.5	29.2	4.4	0.6	4.9	100
Rice aratdar	0	55.3	1.2	16.4	1.6	3.9	0.3	21.1	0	0	100
Rice retailers	11.5	0.2	0.1	10.1	20.8	0.8	38.5	15.6	0	2.3	100
Others	0	26.7	2.7	18.6	3.4	1.1	18.7	28.2	0	0.5	100

Source: IFPRI Market Survey 1989/90

V.10 The Pattern of Disbursements of Trade Credit in the Rice Market

In order to round off our understanding of the demand as well as supply of trade credit, it is imperative to now look at the magnitude and pattern the disbursement of of trade credit in the rice distribution economy. Table 37 reports on the structure of disbursements by sources on the study sample. Table 38 reports on disbursement per establishment by receivers.

The principal findings of Table 37 are as follows. First, paddy and rice *aratdars*/wholesalers, who account for 20% of the sample, account for fully 60% of the disbursement of informal credit. We are, no doubt, to recall that these agents also accounted for 58% of the *receipt* of trade credit, too. This suggests a strong circularity in the credit flow: a Taka of credit resource that is received is also likely to be disbursed in credit. This derives, basically, from the circulation of trade credit being a very important determinant of the turnover of business. In other words, credit relations are based upon a *convergence* of business interests cutting across primary and secondary levels of the market. And convergence is the opposite of *collusion within* a particular section of market agents. Second, the next most important set of disbursers embrace the automatic mills, the large rice mills and the small rice mills, in that order. Third, *dadan* credit accounts for only about 24% of total firm-to-firm credit: the rest is bridging credit. Fourth, *dadan* distributions are only 16% of the total disbursements on the study sample.[8] This data does not support the position that *dadan* is a preeminent source of credit in this market. This finding about the *dadan* is corroborated by the relative insignificance of DU or other forms of *dadan* credit contracts among farmers, as already reported. We presently note that *beparis* account for seven-tenths fo all *dadan* credit disbursements on the sample (Table A5.2). Nearly three-fourths of the disbursements to the *beparis* originate from paddy wholesalers, and from rice *aratdar*/wholesaler. In both case, disbursement of *dadan* credit is in order to ensure periodic paddy and rice collection as the case may be.

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[8]Total disbursement means bank credit disbursement plus informal credit disbursement.

Table 37: The Structure of the Disbursements of Trade Credit by Source and by Recipients, Bangladesh Rice Market, 1989/90

(%)

From \ To	Paiker	Bepari	Faria	Crusher	Kutial	Farmer	Aratder	Miller	Retailer	Consumer	Total
Paddy itinerant traders	1.7	-	28.2	15.1	3.5	11.7	26.0	12.9	.2	.7	100
Paddy wholesalers	12.9	43.0	.7	26.9	.6	1.4	4.0	10.0	-	.5	100
Automatic mills	38.3	27.5	-	1.2	-	-	32.3	-	.7	-	100
Major rice mills	49.3	3.7	.4	.9	-	-	45.5	.2	-	-	100
Small rice mills	16.4	10.8	.1	3.7	.05	2.8	65.2	.3	.6	.05	100
Kutial	9.9	6.1	21.5	-	-	8.3	42.6	2.2	6.1	3.3	100
Crusher	17.9	24.4	.4	1.3	-	3.4	43.8	1.6	7.0	.2	100
Rice wholesalers	12.8	12.8	-	69.1	-	-	2.7	2.3	.2	.1	100
Rice aratders	66.0	16.6	.3	9.5	.5	-	1.4	4.1	1.0	.6	100
Rice retailers	-	-	-	-	-	2.5	-	-	2.0	95.5	100
Others	22.6	15.6	.3	8.0	4.4	1.3	34.2	11.7	1.6	.3	100

Source: IFPRI Market Survey 1989/90

Table 38: Disbursements of Trade Credit by Source and by Recipients, Bangladesh Rice Market, 1989/90 (TK 000)

From \ To	Paiker	Bepari	Faria	Crusher	Kutial	Farmer	Aratder	Miller	Retailer	Consumer	Total
Paddy itinerant traders	.3	-	6.0	3.2	.7	2.5	5.5	2.7	.04	.2	21.3
Paddy wholesalers	28.4	94.9	1.5	59.5	1.4	3.2	8.7	22.1	-	1.1	220.9
Automatic mills	112.7	81.1	-	3.5	-	-	95.1	-	2.2	-	294.6
Major rice mills	59.1	4.4	.5	1.1	.03	-	54.6	.3	-	-	120.0
Small rice mills	18.4	12.0	.2	4.2	.03	3.1	73.0	.4	.7	.03	112.1
Kutial	.3	.2	.6	-	-	.2	1.2	.1	.2	.1	2.8
Crusher	7.7	10.5	.2	.6	-	1.4	18.9	.7	3.0	.1	43.1
Rice wholesalers	87	87	-	468	-	-	18	16	1	-	677
Rice aratders	351.5	88.3	1.5	50.6	2.5	-	7.3	21.7	5.5	3.6	532.6
Rice retailers	-	-	-	-	-	.09	-	-	.1	3.4	3.5
Others	37.2	25.6	.5	13 1	7.2	2.2	56.2	19.2	2.7	.2	164.2

Source: IFPRI Market Survey 1989/90

The structure of the disbursement is intuitive. A few descriptive observations are in order. First, paddy wholesalers route most of their disbursements to paddy beparis (43%), paddy paikers and crushers (27%). The rice mills do not appear to be an overly important customer of wholesalers' credit. Second, rice wholesalers funnel their trade credit to the crushers (69%) --- and most of the remainder to rice itinerant merchants (26%). Rice *aratdars* channelize 83% of their disbursement favoring two classes of itinerant rice merchants.

Trade credit is of wide prevalence on this sample, the average

establishment disbursing Tk. 78 thousand in a single aman season alone. The market-wide estimate of trade credit disbursed is one of Tk. 14.7 billion during the aman season.[9] Virtually, every tier of the market chain --- even the lowly *kutials* etc., and retailers --- reports some degree, however small, of disbursement. Trade credit thus appears to be the grist of the rice-market mill, the durable lubricant. Just as about every class of agents are represented among the sources of credit, every class is also represented among the its beneficiaries. Rice has a national market, and is is no surprise to see that trade credit is a thoroughgoing facilitator in all this.

Table 39 reports on the pattern of net disbursement by categories of marketing agents. The overall result which emerges from this table is that rice wholesalers/*aratdars*, and the rice mills are the two most important collective sources of net disbursement in this market. Because of their overwhelmingly large number, the small rice mills are particularly important source of finance.[10] In the same breath, it stands to reason that *kutials* and crushers should be important net absorbers of credit.[11] Paddy wholesalers/*aratdars* absorb total net credit on the order of Tk. 304 million.[12]

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[9]This is obtained by multiplying Tk. 77.8 thousand by 188.9 thousand, which is our estimate of the total number of market agents in the rice market.

[10]An estimated 18.4 thousand small rice mills account for Tk. 691 million worth of net disbursement, while the automatic mills generate only Tk. 16 million worth. The corresponding figure for the major rice mills is Tk. 17 million.

[11]These two categories together absorb net credit on the order of Tk. 286 million during the aman season.

[12]This is arrived at by multiplying 32 thousand by 9.5 thousand which is our estimated the number of paddy wholesalers in the country. Of this amount, paddy itinerant merchants pay up on the order of Tk. 143 million, and a part of the rest is put up by farmers.

Table 39: Disbursements and Receipt of Trade Credit, by Categories of market Agents, 1989/90

(Tk.000/unit)

	Dadon	Paikari Baki	Disbursement	Receipt	Net disbursement
Paddy itinerant traders	8.5	12.8	21.3	18.3	+ 3.0
Paddy wholesalers	97.4	123.5	220.9	252.9	- 32
Automatic mills	62.5	232.1	294.6	117.1	177.5
Major rice mills	4.9	115.1	120.0	79.8	40.2
Small rice mills	12.7	99.4	112.1	74.6	37.5
Kutial	.46	2.32	2.8	6.7	-3.9
Crusher	10.1	33.0	43.2	59.2	-16.0
Rice wholesalers	67.9	608.7	676.6	53.2	361.4
Rice aratders	136.8	395.8	532.6	315.2	217.4
Rice retailers	.	3.5	3.5	4.7	-1.2
Others	.	164.2	164.2	49.9	114.3
All			77.9	48.3	29.6

Source: IFPRI Market Survey 1989/90

V.11 Mechanism of Market Information

The object of this section is to evaluate the informational performance at various levels of the rice market. Market agents essentially combine capital (fixed and working), market power (information) and proprietary traits (e.g. greater skill and savyy bred from long experience, and the like) in an effort to generate income. We have already looked at access to capital in the preceding section of this chapter. Market power is closely related to market information. Ill-or inadequately-informed agents may often underachieve their profit potential. They may do so either because they pay input prices above their true opportunity costs, or because they end up receiving output prices below resource costs that consumers are willing to pay to be supplied with that quantity. Examination of the sources, costs and channels of market information is therefore imperative. Market information is demonstrated through the prices --- for the output and the key inputs --- that agents pay, as also through how well farmers forecast future prices (which influences the division of current availability into current disposal and storage).

Four vantagepoints for probing into the source of market information are (a) whether preemption of the right of free negotiation is binding because of restrictive credit contracts, like DU; (b) the range of buy and sell options of average marketing agents; (c) the realism of one's information as to the size of the actual and/or anticipated harvest, demand pressures, future scarcity and current cost conditions, especially storage and spatial handling costs; (d) the quality and relevance of one's information regarding the production and prices of substitutes or complements. Rice really has no close substitute in Bangladesh: the fourth will therefore be discounted in this work. The first has already been covered upto a point: that, too, will not be covered any further in this report. In the main therefore, we shall isolate (b) and (c).

Prices betray a joint outcome of information, technology, utility and the power to execute. This amorphousness of prices will be conceded. But, even so, it will be argued that informational endowment is really at the heart of prices. Therefore, we initially treat informational performance in terms of prices agents pay or fetch. More specifically, we have to look at the pattern revealed by average paddy prices for a large cross-section of market agents ranging from the lowly *kutials*, to the sophisticated owners of automatic rice mills. Prices established reflect information ready to be transmitted. Similarity in prices is in part bred from similarity of information. (Similarity in prices established would also of course stem from similarity in executive power or in technological details, or in "staying powers".) If a large cross-section of market agents evoke roughly comparable dispersion (a measure of dissimilarity) in seasonal coarse paddy prices they paid, this should prompt rejection of a lopsided balance of information. For this exercise are selected five classes of agents, paddy itinerant merchants, paddy wholesalers, *kutials*/crushers, small and major rice mills, and the automatic rice mills, to place them in a upstream-to-downstream sequence. This information is reported in Table 40.

Several results are noteable. First, unit paddy purchase prices are always the lowest furthest upstream, i.e. where paddy *farias/beparis* buy; paddy wholesalers pay somewhat higher prices. Small rice mills and MRMs always buy their paddy requirements at lower average prices, than do automatic mills.[1] Second, the

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[1]Why this should be is very from the data. Small and major rice mills especially in progressive districts buy much larger proportions of their paddy purchases from farmers directly. Automatics purchase their paddy much further downstream: hence the higher price. Because their scale of unit purchase is relatively large, and because small bulk-discounts are prevalent, it would seem that than neutralizes the savings from the latter. The alternative explanation, savings from the latter. The alternative explanation, that automatics mill a higher proportion of noncoarse

(Footnote contd. overpage)

Table 40: Mean Variability of Prices by Season in 1989/90 in Rice Market, Bangladesh

(Tk./quintal)

Type of Catagories	Aman Season			Boro Season			Aus Season		
	Purchase Price of Paddy	Sales Price of rice	Sale price of paddy	Purchase Price of Paddy	Sales Price of rice	Sale price of paddy	Purchase Price of Paddy	Sales Price of rice	Sale price of paddy
Paddy traders Paddy paiker, Faria, Bepari	539 (3.9)	-	587 (4.4)	525 (5.6)	-	563 (5.6)	641 (6.2)	-	665 (6.8)
Paddy wholesalers,	555 (3.7)	-	616 (5.6)	528 (2.8)	-	565 (6.3)	657 (3.4)	-	681 (2.9)
Paddy processors Automatic mills	592 (6.7)	989 (3.6)	-	574 (4.5)	933 (4.3)	-	681 (8.0)	1045 (5.5)	-
Major rice mills	563 (4.4)	981 (3.9)	-	547 (5.5)	970 (3.4)	-	635 (6.8)	1034 (5.0)	-
Small rice mills	560 (5.7)	984 (3.9)	-	560 (5.4)	984 (5.6)	-	662 (7.8)	1088 (8.2)	-
"Crushers"	576 (6.8)	1002 (7.1)	-	565 (7.7)	973 (8.1)	-	670 (6.7)	1077 (8.9)	-
Kutials	576 (4.9)	994 (6.2)	-	568 (6.1)	970 (7.3)	-	662 (7.5)	1091 (9.1)	-
All paddy processors	57 (6.1)	992 (5.8)	-	568 (6.5)	947 (6.8)	-	672 (7.3)	1052 (8.5)	-

Notes: Figures within the parentheses report coefficients of variation corresponding to the means.

Source: IFPRI Market Survey 1989/90

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paddy, does not appear to be true, because the average rice sales prices would then have been higher, which is not the case.

variability of prices *within* a particular class of establishments is not arresting high: coefficient of variation ranges from a low of 4% to a high of 7%. Significantly, variability of prices *among* all five class of paddy processors is of the order of magnitude as that of the individual class. Overall, the data strongly suggest a tightly-stacked array of prices paid/fetched by establishments, even though they markedly differ in technology, and their command over resources.

There is quite a visible degree of consonance in the prices paid/fetched by these rather different categories of market agents, whatever the season. The banal explanation of this is that market agents within a particular category tend to consult the same sources and "frequent the same watering holes". Hence they tend to bid in unison. But such an explanation begs one question: these "watering holes" are located far between from each other, as the sample comprises a small number of respondents from each of as many as twenty one new districts. And these establishments were randomly selected, and, outside their own districts, were unlikely to be even known to each other. The conclusion arises inescapably that the mechanism and sources of information contained in the prices established are sufficiently similar.

We decomposed the price variance on the sample into within-class and between-class variances. Inasmuch as the small rice mills and the crushers are by far the most influential among the classes of paddy processors, class A comprises of them. The other class B features the major rice mills and the automatic mills, which accounts for the lion's share of the public procurement program. It is known that where P_1 and P_2 represent prices paid by establishments in these two classes, then the variance of prices in the overall sample, A and B, is equal to

$$Var_{A,B} = Var(A) + Var(B) + 2r^2 \, cov(A) . cov(B)$$

where r^2 is the coefficient of determination between sample A and B. Using this formulation, we find that by far the greater proportion of the variation of the price variable is attributable to between-class variance. The within-class variance is a fairly small proportion of the total variance. This is to be expected. The sources and mechanisms of the information within classes are more similar. The reason why the between-class variance is greater is intuitively explained using the fact the automatic mills and major rice mills purchase larger proportions of their paddy requirements from paddy *beparis* and paddy *aratdars*. Their prices contain to a much larger degree marketing margins incurred by the agents that sell them paddy. The relative share of market margins in price the automatics pay, however, is apt to vary. And this, to an extent, explains the greater between-class variance.

Table 41 reports on the mean and the coefficient of variation of coarse paddy for twenty three markets. Table 42 does the same for noncoarse paddy. The point of this information is to compare price variability across varietal divides. Overall, the data strongly suggest that price variability is fairly small regardless of variety, and regardless of season. Against the background of the fundamental differences between coarse and noncoarse varieties (e.g. storage period, size of market, seasonality of production) one might have expected rather greater variability for coarse paddy. This expectations is not borne out in fact.

V.12 The Informational Context of Input Purchase and Output Sale

Market exchanges embody informational performance of agents. The question arises: do all sample establishments participate in

Table 41: Mean and Coefficient of Variation of Coarse Paddy Prices by Markets and Seasons, 1989/90

Markets	Nov-Dec		Dec-Jan		Jan-Feb		Feb-Mar		Mar-Apr		Apr-May	
	Avg. price	Coeff. Var.	Avg. price	Coeff. Var.	Avg. price	Coeff. Var.	Avg. price	Coeff. Var.	Avg. price	Coeff. Var.	Avg. price	Coeff. Var.
B.Baria	189.37	2.16	196.33	3.82	208.67	3.87	217.67	2.92	227.00	0.00	169.29	6.33
Chandpur	190.29	1.00	201.77	0.71	213.52	0.90	226.72	1.76	239.90	2.13	191.30	1.52
Feni	178.50	2.14	200.20	0.78	219.20	0.39	237.20	0.95	247.25	0.37	194.12	9.12
Noakhali	176.83	4.69	191.63	4.46	208.74	3.48	229.52	3.27	246.71	2.72	191.15	10.25
Hobiganj	181.28	7.54	190.76	3.75	205.11	5.64	22[illegible].86	2.82	232.88	2.48	172.06	3.68
Sylhet	193.50	6.14	203.95	7.92	219.81	6.93	235.09	5.25	243.41	5.77	183.65	5.11
Dhaka	193.70	7.07	210.38	8.39	221.58	7.90	231.88	8.19	257.13	9.80	191.62	1.18
Munshiganj	194.29	5.16	210.93	3.83	229.79	6.23	238.70	1.55	252.11	1.68	186.35	5.39
N.Ganj	203.67	8.91	214.79	7.83	223.79	6.28	236.06	5.58	248.25	4.71	191.43	5.70
Sherpur	178.19	4.37	191.22	4.69	205.86	4.15	221.64	4.20	232.44	3.78	179.61	3.30
Kishorganj	186.70	5.53	195.30	6.91	207.03	6.30	215.30	5.83	215.00	0.00	170.40	4.51
Mymensingh	187.63	3.15	197.61	2.35	210.41	3.73	221.24	5.72	236.83	3.04	189.01	4.89
Netrokona	184.54	3.10	195.04	3.2[illegible]	205.83	3.06	214.96	2.66	221.73	1.23	185.18	7.33
Barisal	185.18	7.59	195.74	7.82	206.14	6.71	214.45	11.87	233.16	6.20	187.37	3.06
Satkhira	184.44	5.38	192.06	4.09	202.74	3.53	213.86	2.81	223.12	3.01	192.20	0.15
Bogra	190.31	4.50	199.40	4.99	208.97	5.10	215.36	9.72	228.03	3.48	188.78	9.82
Joypurhat	179.79	3.33	190.84	3.00	204.83	2.20	217.47	3.10	220.85	2.9[illegible]	188.06	11.24
Dinajpur	182.85	2.89	193.82	3.01	205.14	3.08	214.49	2.18	224.19	2.15	191.33	10.17
Thakurgaon	190.30	0.67	195.05	0.62	203.25	1.29	206.60	0.00	233.00	6.14	211.27	10.03
Pabna	185.69	11.48	195.56	8.28	203.47	13.52	221.72	2.00	N.A	N.A	184.73	2.44
Naogan	181.49	1.65	191.70	5.92	202.18	3.34	209.57	9.81	224.05	2.83	194.27	10.07
Rajshahi	185.05	2.05	194.17	3.10	203.28	2.57	213.57	2.62	222.64	2.46	191.87	6.30
Rangpur	198.82	23.07	195.72	9.24	207.30	5.51	214.44	5.23	219.28	4.53	196.33	5.77

Note: NA denotes that transaction did not occure

(Table contd. overpage)

	May-June		June-July		July-Aug		Aug-Sept		Sept-Oct		Oct-Nov	
Markets	Avg. price	Coef. Var.	Avg. price	Coeff. Var.	Avg. price	Coef. Var.	Avg. price	Coeff. Var	Avg. price	Coeff. Var	Avg. price	Coef. Var
B.Baria	180.73	6.35	200.44	5.10	216.43	1.90	225.57	1.72	247.47	5.45	260.26	5.81
Chandpur	214.01	7.26	224.44	6.61	231.84	4.59	241.77	4.06	246.80	1.28	256.05	1.33
Feni	197.85	6.38	214.34	5.97	223.37	5.94	231.77	5.71	255.95	2.78	264.34	0.67
Noakhali	197.50	8.23	216.00	11.13	223.70	10.30	233.00	8.50	0.00	-	-	-
Hobiganj	176.05	3.59	190.70	3.40	209.25	4.12	221.62	3.74	240.02	3.97	247.97	4.09
Sylhet	186.85	6.22	204.37	4.53	222.34	5.08	235.03	4.65	50.8	4.03	261.5	3.51
Dhaka	201.24	1.57	211.20	1.72	226.04	2.24	234.62	1.04	258.85	5.64	268.12	5.05
Munshiganj	196.41	4.89	209.56	4.11	225.42	3.4[illegible]	237.29	4.03	257.45	2.85	266	2.92
N.Ganj	200.75	5.35	211.83	4.65	229.92	5.60	237.67	5.55	251.70	5.9	263.78	5.57
Sherpur	190.85	4.66	205.72	3.89	214.49	4.19	221.02	3.30	238.98	7.53	253.37	5.82
Kishorganj	179.44	3.82	190.88	4.05	201.25	4.00	211.53	4.42	217.50	5.96	228.13	6.60
Mymensingh	201.20	3.79	209.54	2.34	217.49	2.28	227.19	2.45	242.07	6.46	249.17	7.93
Netrokona	195.38	3.03	204.60	2.14	210.76	2.05	222.25	1.03	226.71	4.64	235.97	7.97
Barisal	197.53	3.11	210.98	3.17	228.20	4.21	237.69	3.60	252.44	7.35	255.06	8.46
Satkhira	188.00	0.75	191.70	0.37	212.20	0.13	223.05	0.03	240.57	10.76	251.92	1.34
Bogra	192.23	4.40	203.52	3.69	211.84	3.94	219.77	4.18	242.67	3.10	252.62	2.71
Joypurhat	186.89	3.93	200.16	3.26	215.80	2.57	221.89	0.98	232	3.08	227.68	8.77
Dinajpur	185.17	8.45	189.82	4.34	198.01	3.61	191.41	11.32	226.20	4.12	244.87	3.05
Thakurgaon	183.81	11.52	198.81	6.16	200.53	4.98	207.20	4.63	217.91	5.42	228.71	3.22
Pabna	194.07	2.04	209.31	2.20	220.61	2.61	224.11	1.51	241.26	3.60	250.10	2.74
Naogan	195.27	3.37	206.49	2.32	215.83	1.89	222.64	2.02	232.01	3.93	226.46	10.88
Rajshahi	196.64	5.69	211.43	3.80	214.27	9.48	218.83	8.67	219.47	10.75	226.81	5.82
Rangpur	194.61	3.61	207.67	4.89	218.26	4.01	221.70	2.73	232.93	2.80	222.47	13.21

Table 42: Mean and Coefficient of Variation of Noncoarse Paddy Prices by Markets and Seasons, 1989/90

Dist.	Nov-Dec		Dec-Jan		Jan-Feb		Feb-Mar		Mar-Apr		Apr-May	
	Avg. price	Coeff. Var.	Avg. price	Coeff. Var.	Avg. price	Coeff. Var.	Avg. price	Coeff. Var.	Avg. price	Coeff. Var.	Avg. price	Coef Var.
B.Baria	198.17	6.01	205.98	7.03	215.00	7.19	225.66	8.35	229.53	4.99	195.00	2.54
Chandpur	202.10	2.56	214.38	1.42	228.23	1.94	234.50	6.87	253.03	2.35	N.A	N.A
Feni	207.40	8.46	213.27	8.82	233.17	6.92	246.57	5.84	245.05	2.91	N.A	N.A
Noakhali	181.87	7.84	201.14	6.96	217.53	4.81	236.47	3.71	246.70	4.40	N.A	N.A
Hobiganj	189.22	4.86	200.80	8.44	220.53	4.12	231.79	4.73	244.84	4.44	187.75	4.55
Sylhet	208.51	5.17	219.28	6.08	237.20	5.08	252.89	4.59	266.83	4.56	210.01	6.79
Dhaka	210.57	4.67	223.96	5.20	237.18	6.51	248.53	7.76	261.68	4.74	222.20	2.85
Munshiganj	207.29	6.56	220.40	6.63	233.98	5.40	251.30	5.48	265.50	5.44	203.00	5.12
N.Ganj	211.34	9.78	225.08	7.50	236.47	7.49	248.19	7.01	259.43	6.77	184.20	0.00
Sherpur	197.74	5.97	210.13	7.21	225.15	5.15	240.18	5.80	252.85	5.22	205.68	2.85
Kishorganj	191.35	5.88	201.10	5.39	215.98	5.27	223.33	5.59	233.50	6.97	186.10	2.87
Mymensingh	201.59	3.29	211.96	3.57	222.80	4.21	235.45	3.98	249.05	3.82	212.56	3.25
Netrokona	195.06	3.03	207.82	3.49	220.18	4.26	230.73	5.01	244.16	4.73	N.A	N.A
Barisal	190.85	8.46	200.50	7.30	215.81	6.64	228.73	10.04	240.15	8.13	192.00	0.00
Satkhira	196.91	3.67	206.75	3.81	218.82	4.48	229.59	3.93	239.75	3.32	190.90	3.26
Bogra	195.51	4.78	206.05	4.31	217.90	3.47	226.32	3.58	225.92	11.78	197.90	2.12
Joypurhat	182.20	1.27	189.00	0.75	204.50	0.35	210.00	0.00	N.A	N.A	187.28	4.07
Dinajpur	189.80	7.78	203.05	5.05	215.55	6.63	225.22	6.96	237.59	7.91	224.99	17.99
Thakurgaon	184.56	1.29	193.97	2.80	205.67	3.71	216.85	4.71	225.28	3.98	237.10	0.00
Pabna	200.72	8.74	209.29	6.66	223.42	9.63	229.06	2.59	238.09	2.82	201.00	5.01
Naogan	192.56	11.56	196.10	3.66	207.31	8.87	218.63	7.55	224.52	14.47	206.15	7.75
Rajshahi	193.56	4.63	203.81	5.31	223.89	10.77	226.79	3.71	235.29	2.58	239.72	8.16
Rangpur	180.63	6.07	189.41	6.06	199.57	5.15	208.03	3.35	219.27	2.66	203.26	10.21

(Table contd. over page)

	May-Jun		Jun-July		July-Aug		Aug-Sept		Sept-Oct		Oct-Nov	
Dist.	Avg. price	Coeff. Var.	Avg. price	Coeff. Var.	Avg. price	Coeff. Var.	Avg. price	Coeff .Var	Avg. price	Coeff. Var	Avg. price	Coeff . Var
B.Baria	211.00	1.46	226.20	1.57	235.00	3.07	246.00	4.85	266.00	2.80	276.72	5.28
Chandpur	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
Feni	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
Noakhali	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
Hobiganj	188.86	3.51	206.23	3.76	219.74	2.65	235.00	5.21	257.67	2.35	266.00	3.28
Sylhet	208.67	8.47	224.88	6.51	242.81	6.41	252.15	6.88	272.17	3.31	282.77	2.60
Dhaka	234.60	3.20	246.20	3.67	255.80	2.81	264.60	3.09	275.00	2.47	283.50	2.49
Munshiganj	215.17	6.00	231.00	5.55	249.00	6.76	260.67	6.96	278.33	1.04	285.67	1.41
N.Ganj	194.00	0.00	208.00	0.00	218.00	0.00	223.00	0.00	233.00	0.00	238.00	0.00
Sherpur	214.71	2.71	226.83	3.09	237.90	2.47	246.26	2.96	256.65	2.77	270.93	2.83
Kishoriganj	192.33	1.31	204.00	4.68	212.73	3.81	224.33	2.97	232.20	4.84	240.47	5.26
Mymensingh	222.06	1.80	234.68	2.48	245.13	2.39	254.35	2.77	N.A	N.A	N.A	N.A
Netrokona	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	246.40	0.00	256.40	0.00
Barisal	202.00	0.00	271.00	0.00	233.00	0.00	244.00	0.00	N.A	N.A	N.A	N.A
Satkhira	188.53	2.62	193.04	3.33	211.34	2.45	218.73	3.25	N.A	N.A	N.A	N.A
Bogra	203.98	3.27	214.68	3.20	223.34	2.03	233.20	2.83	257.32	1.73	264.20	2.07
Joypurhat	192.77	3.92	212.68	4.45	222.77	4.99	226.87	4.53	245.00	0.00	232.50	13.69
Dinajpur	211.51	19.05	203.19	7.21	213.90	7.89	209.06	8.64	238.65	1.52	256.57	2.55
Thakurgaon	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	ERR	220.00	0.00
Pabna	208.33	4.35	220.00	1.97	228.57	1.73	237.10	2.34	254.20	1.30	267.50	1.32
Naogan	215.56	1.46	225.16	1.07	229.61	5.13	236.73	5.31	246.72	3.88	250.22	7.89
Rajshahi	234.68	6.81	238.78	5.82	249.78	4.48	250.15	6.32	252.43	8.52	264.30	6.61
Rangpur	198.40	6.13	214.52	4.73	228.70	2.85	235.08	4.16	248.20	1.83	252.90	8.68

the same manner in market exchanges? Who in fact executes purchase actions on behalf of the establishment? Is there is a division of responsibility between the enterpreneur, who decides how much input(s) of various broad categories have to be purchased, but leaves the actual act of buying to representatives or employees? A similar functional hiatus may also be a feature of selling. Establishments have to have entrepreneurs and staff. If the establishments' incentive system is not consensual, possibilities will doubtless exist for unethical action by subordinates in inflating prices for accounting purposes. The difference will routinely be pocketed as rent. If an establishment internally transmits information poorly but has a large proportionate reliance on employees in matters' of purchase, then again delegation may translate into larger marketing inefficiency, that is higher prices. These considerations make it imperative to examine the managerial practices as regard buying and selling practices. Table 43 reports on the proportions of purchase and sales that are executed either by the entrepreneurs themselves through personal inspection or by his agents' visit, or from a distance (e.g. on the telephones), for the aman season.

As before, the five categories of paddy processors, viz. the *kutials*, the crushers, the small rice mills, the major rice mills and the automatic mills are separated. Two findings emerge. About three-fourths of the paddy quantities purchased by processors are by personal inspection. This merely serves to show how deeply immersed the entrepreneurs are in the day-to-day running of their enterprises. They are therefore highly informed, and apt to update their informational endowment firsthand through private visit. This could hardly be otherwise: the grading and standardization realities of the paddy markets leave the savyy entrepreneurs little alternative choice. Besides, paddy has such an overwhelming weight in processing costs that disregard of buying at keenly competitive prices can spell the difference between making or losing money.

Table 43: Methods of Purchase and Sales, Rice Market, 1989/90

Name of Business	% of purchase			% of sale		
	By own visit	By Representative	Telephone	By own visit	By Representative	Telephone
1.Automatics	43	50	7	36	55	10
2.Major rice mills	73	26	2	72	28	0
3.Small rice mills	75	23	2	83	16	1
4.Kutials	98	2	0	99	1	0
5.Crusher	88	12	.3	84	16	0
6.All paddy processors	88	9	3	91	9	0
7.Itinerant traders	97	3	0	100	0	0
8.Paddy wholesaler	76	23	.3	82	17	0
9.Rice itinerant traders	77	12	10	75	25	0
10.Rice wholesaler + rice aratder	69	28	4	69	26	5
11.Rice retailers	98	2	0	100	0	0
12.Others	78	22	0	92	7	0

Source: IFPRI Market Survey 1989/90

Second, automatic mills are really set off from the other agents, in that personal inspection is their least impcrtant mode of purchase and sale. Fully a half of their purchase is doen by representatives, as against typically one-fourth or less for other rice mills (Table 43). This could partly explain why automatic mills end up paying higher unit paddy prices.

V.13 The Range of Option during Buying and Selling

The greater the range of buyer alternatives is the keener will prices be. Similarly, the greater is the range ofseller alternatives the better is the information available to them. If market contacts are dense at every level of the market, and if balance of market power is about right the likelihood is strong that the price offers before each type of traders will accommodate all the information that is easily available about resource

scarcities and the like. And the more likely is the pricing mechanism to be translated into competitive bidding, with desirable implications for efficient resource allocation.

Table 44: Incidence of marketing among farmers, 1990

Farm size classes by land ownership	Percentage of farms selling any surplus		Total no. of farms (million)
	Aman season	Boro/aus season	
Marginal	73.33	70.00	2.8
Small	88.32	94.16	4.3
Medium	94.49	93.31	1.5
Large	98.06	98.06	1.1
All farms	86	88	9.8

Notes: Estimate in the last rows is an weighted proportion, where the weights are ownership size class specific relative share in the population as a whole

Source: IFPRI Farm Survey 1989/90

Rice markets of cource register dense contacts at all levels of the trade. Millions of farmers, many of whom are small, have surpluses to dispose. They can in turn, count upon dense market contacts, again composed of myriad small traders, to visit them both at the farmgate as well as in the primary market. IFPRI Farm Survey has shown that 87% of Bangladesh's farmers marketed some quantity of grain in 1989/90 (Table 44). That is to say, about 8.5 million farmers had marketed some surpluses. The greatest bulk of this number comprised small farms. From Table (28) we know that something on the order of 0.14 million paddy processors have to buy paddy. The overall number of paddy purchasers would therefore

appear to be large.[2] The weight of small traders and paddy processors in this trade in preponderant. And it has no significant presence of vertical integration, proprietary information, and the like. All this attests to the essential equality of informational balance in the rice markets.

V.14 Vertical Mobility in Rice Market

Information is about market access. In the end, entrepreneures seek to achieve upward economic mobility through market access. The achievement of fairly broad-based vertical mobility especially by relatively vulnerable producers is a proof that the channels of gainful information flow freely and in an egalitarian manner.

We examine below the pattern of vertical mobility demonstrated by the establishments on IFPRI Market Survey sample.

The questionnaire we used had probed respondents' occupational status both when they first set out in rice trade, as well as in the reference year of the survey, 1989/90. Occupational status data collected was therefore cross-time. Gradation in occupational status was quantified for 1989/90 in terms of net profit earned from rice trade per consumption unit in respondents' family.[3] Net

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[2]This translates into 61 farmers per trader. Of the 0.14 million, as much as 0.12 million are either small scale traders or small rice mills. The relatively high density of farmer per trader merely reflects the small quantity marketed by a representative farmer.

[3] The definition of what constitutes mobility merits some discussion. Normally, one's movement to a "higher" echelon in the trade circuit should count as mobility. But what is higher echelon? Is highness to be measured in terms of fixed capital requirements, or net profit, or some technical capacity measure? The last is ruled out because technical differences rule out a

(Footnote contd. overpage)

profits were equated to net value added net of paid-out primary factor returns and debt-service payment. Table 45 presents average income earned from rice trade by twelve categories of market agents. Several findings are worth noting. First, the combined category of the *kutials*, and beparis are the poorest of the lot, followed by rice retailers. The class of itinerant merchants, whether of rice or paddy, are better off, than these categories.

In Table 46 we summarise the evidence about the extent of vertical mobility on the IFPRI sample. The table shows the output from a CROSSTABS procedure performed by SPSSPC+ on a computer. Each value is a total percentage, yield by dividing the total sample size into the cell counts. As such, the proportions can be freely added or subtracted. The array formed by the cells forms a square matrix with diagonal and off-diagonal elements. Because the respondents are graded in order of average incomes, upward vertical mobility will be revealed for participants in a particular category, if the off-diagonal relative shares to the right sum to a value that is higher than the sum of the off diagonals to the left.

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common denominator. Use of fixed capital may be bugged by highly variable capital-return ratios. We settled for net profit per consumption unit from rice trade/milling. But we had data on this variable for 1989/90 only, and not for years of establishments' start up. Of necessity, we make the assumption that inter-echelon relativity in terms of income per capita is time-invariant, although the precise levels may vary between years.

Table 46 (a) clearly shows a significant degree of vertical mobility on the sample, by this criterion. Nine out of the 14 market-agency categories, accounting for 79% of the start ups, record the achievement some vertical mobility. For four out of these nine the recorded sums of the right off diagonals (RODs) are significantly higher than the sum of the (LODs) (Table 47 b). Chi-square tests convincingly reject the hypothesis of linear association between occupational status at inception, and in 1989/90. The case that rice trade/milling has returned some significant vertical mobility overall during the 1970s and 1980s is strongly established in this data.

Table 45: Per capita Income from Rice Trading/Milling, 1989/90

Types of market agents	Per-capita income(Tk.)	Sample size
Kutial/varkiwalas/cycle beparis	5356	65
Rice retailers	5547	57
Husking miller	6092	27
Rice faria, paddy faria, paddy paiker	10852	36
Rice paiker, paddy beparis	8139	64
Rice wholesaler	21558	18
Paddy wholesaler, paddy aratdars	24508	47
Crusher, crusher and rice wholesalers	25648	122
Rice aratdars	30481	61
Small rice mill owners	38866	74
Major rice milll owners	49274	34
Automatic mill owners	217553	20
All sample	27474	636

Note: Overall average income is inclusive of 11 establishments each with a miscellaneous attribution, which were not therefore categorically shown in the table.

Source: IFPRI Market Survey,1989/90.

Significantly enough, a very large proportion of the mobility achieved is accounted for by the relatively power market participants, namely *kutials*, rice retailers, the itinerant merchants, crushers. Thus, as col.(5) of Table 47 (b) shows, the net proportion of mobility-achievers is positive for each of the eight "low-income" agency types. In contrast, most of the mobility-losing market categories come from a background of higher current incomes. In simple terms, relative poverty is a strong correlate of economic mobility, while comfortable incomes are a correlate of relegation.

Table 46: Vertical economic mobility among rice market agents, Bangladesh, 1989/90

(Percent)

Status at startup \ Current status		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Kutial, varkiwala cycle bepari	9.1	.3	0	.6	.2	0	.2	3.3	0	.2	0	0	.2	0
2	Rice retailer	0	8.2	0	.2	0	0	0	.2	.5	0	0	.2	0	0
3	Husking miller	0	0	2.2	.2	0	0	0	0	0	.9	0	0	.2	0
4	Paddy faria, rice fria, paddy paiker	1.1	.5	1.3	12.1	.9	.8	1.9	3.3	2.2	2.0	.2	0	1.1	0
5	Rice paiker	0	0	0	.2	.3	0	0	.2	0	.2	0	0	0	0
6	Rice sholesaler	0	0	0	0	0	.2	.9	.2	.2	.2	.2	0	0	0
7	Paddy wholesaler	0	0	0	0	0	0	0	.2	0	0	0	0	0	.3
8	"Crusher"	0	0	.3	0	0	.2	.5	9.4	.5	.9	.2	0	.6	.3
9	Rice aratdars	0	0	.2	.2	0	.9	2.7	.8	4.9	.9	.2	.2	.2	0
10	Small rice mills	0	0	.3	.2	0	0	.2	0	.5	5.2	0	0	.0	.9
11	Paddy: others	0	.2	0	.5	0	.6	0	1.3	.8	.3	0	0	.2	.2
12	Rice: others	0	0	0	0	.2	.2	1.1	.5	.3	.3	0	.5	0	.2
13	Major rice mills	0	0	0	0	0	0	0	0	0	.3	0	0	.2	.3
14	Automatic rice mills	0	0	0	0	0	0	0	0	0	.2	0	0	0	.8

Source: IFPRI Market Survey, 1989/90

Table 47: Vertical economic mobility among rice market agents, Bangladesh, 1989/90

	Off Diagonal percentage of the left	Diagonal percentage	Off Diagonal percentage of the right	Net proportions of mobility achievers	Proportions of startups
1	0	9.1	5	5.0	14.1
2	0	8.2	1.1	1.1	9.3
3	0	2.2	1.3	1.3	3.5
4	2.9	12.1	12.4	9.5	27.4
5	.2	.3	.4	.2	.9
6	0	.2	1.7	1.7	1.9
7	0	0	.5	.5	.5
8	1.0	9.4	2.5	1.5	12.9
9	4.8	4.9	1.5	-3.3	11.2
10	1.2	5.2	1.8	.6	8.2
11	3.7	0	.4	-3.3	4.1
12	2.6	.5	.2	-2.4	3.3
13	.3	2	.3	0	2.6
14	.2	.8	0	-.2	1.0

Source: Table VI (a)

VI MARKETING COST OF RICE

Marketing is the business of connecting consumers with farmers. This involves transporting a commodity between places, storing it between periods and changing its form to make it fit for human consumption. In all economies, this is a vital function to perform efficiently, ie. at least possible resource costs. Economies, and markets, differ in terms of how well the marketing function is performed. Marketing is efficiently performed when the marketing agents charge keen rates for the use of their resources --- time, money, skills, vehicles or fixtures, assets, godown and risk-bearing --- and earn competitive profits. The consumer pays a price that is deemed closely related to the resource costs of supplying to him the commodity in the quantity and at the place and time desired. The farmer receives a price that keenly compensates him for the use of resources upto that stage of production. Understanding of how competitively a market performs involves looking at the costs of and normal returns to marketing. On the cost side, we look at (a) cost of collection (b) cost of processing, and (c) cost of transportation.

VI.1 Cost of Collection

Table 48 below reports on the cost of collection of paddy on the IFPRI Matket Survey sample. Unit collection costs are, supposedly, a function of the radius of the collection area, the quantity collected, the transportation medium chosen, whether the services of paddy *aratdars* are utilized or not. For the moment, we describe the pattern of the average cost of collections, leaving for later causal analyses.

Generally, the paddy processors return higher unit paddy collection costs than do the paddy traders: the mean differences, however, are not significant. The millers buy a significantly large proportion of their purchase from paddy *aratdars*, who charge

a fixed commission, usually between 1-2% of purchase price. The paddy wholesalers and the paddy *beparis* in contrast buy a larger proportion of their purchase from other itinerant merchants, and avoid paying the brokerage. This explains the above difference.

VI.2 Cost of Collection Differentials among District Types

Table 49 reports on unit cost of paddy collection for progressive and nonprogressive districts on IFPRI Market Survey sample. For the country as a whole population weighted average cost of collection per quintal is Tk. 15.8 during the aman season, and Tk. 13.9 for the boro/aus season. Unit collection costs fall during the boro season, although the difference is not significant, statistically.[1] Countrywide average purchase price of paddy during FY 1990 was at Tk. 565. Collection cost works out at 2.6% of the cost of purchase of paddy. This compares with the matched estimate of Tk. 12.0 per quintal or 3.1% average paddy price in 1982/83.[2]

VI.3 Structure of Collection Cost

Table 48 reports on the structure of collection cost, too. Its largest single component is transportation costs, racking up fully 58% of unit collection costs. At one-fifth, brokerage, is

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[1]As already noted, market arrivals relative to output are significantly larger during the boro season. Many rural people take to trading paddy during the boro season. The radius of the paddy catchment area for the millers shrinks during the boro season. Again, the automatic and the major rice mills increase the quantities of paddy they purchase through beparis, at their factory gates. However, for the itinerant merchants collection costs increase somewhat during boro season, even as their catchment radius decreases. The increase in this is mainly due to increases in transport cost per maund mile. Overall, though, collection costs fall during the boro season.

[2]This estimate is from Islam et al., 1985, Table C-16, p.254 and Table B-7, p.192. Average paddy price was Tk. 394 on Islam et al. survey.

the second largest cost share. Weighment/loadind which are labor charges, take about 15%. The rest are miscellaneous in nature. Table 50 reports on the structure of paddy collection costs in 1982/83. Then, brokerage and transportation cost shares nearly tied at about 31% each. Weighment/loading used to rack up another 14%. The miscellaneous category then accounts for 24%.

The biggest change between 1983 and 1990 has been about the share of transportation cost, and about big declines in *aratdari* and miscellaneous charges. These charges reflect the way in which paddy is itself marketed. They need a little more discussion.

Transportation cost share has sharply risen because the mean radius of the paddy catchment area is probably much higher in 1989/90. This will be the likely impact of the gradual appearance of a national market for paddy. The share of brokerage has fallen because the proportion directly purchased from the farmer has risen over time (Ch. IV). The proportion of miscellaneous charges has very significantly fallen, because market tolls --- are only .13/md. in FY90 as against 0.60/md in 1982/83. In real terms, the market toll has fallen very significantly indeed. This is because the number of participants per market has risen while the nominal toll per agent has remained relatively stable. But quantity of paddy purchased per agents has risen: we have shown that even an average *kutial* has raised mean turnover from 1.6 MT per month to 4 MT in 1989/90. In real terms, unit costs of collection have fallen for the transactors in both primary and secondary markets.

Table 48: Structure of collection cost of paddy (Tk./quintal)

Type of agents	Transportation cost	Weighment	Loading unloading	Brokerage	Others	Total
Paddy itinerant traders	9.05	.99	1.23	1.55	1.0	13.7
Paddy wholesaler	6.1	.64	1.15	.24	.38	8.6
Automatic mills	22.4	.56	3.40	8.31	.51	35.1
Major rice mills	6.9	1.5	1.26	3.59	1.23	14.5
Small rice mills	9.6	1.04	1.90	4.2	1.12	17.8
Kutials	13.2	1.10	1.12	4.26	1.3	21.0
Crushers	7.4	.88	1.47	5.98	.67	16.4
All paddy agents	8.78	.77	1.36	3.30	.73	14.9
Percentages						
Paddy itinerant traders	66.1	7.2	9.0	11.3	7.3	
Paddy wholesaler	70.9	7.4	13.4	2.8	4.4	
Automatic mills	63.8	1.6	9.7	23.7	1.4	
Major rice mills	47.6	10.3	8.7	24.8	8.5	
Small rice mills	53.9	5.8	10.7	23.6	6.3	
Kutials	61.9	5.2	5.3	20.3	6.2	
Crushers	45.1	5.4	9.0	36.5	4.1	
All paddy agents	58.6	5.1	9.3	22.1	4.9	

Note: Overall percentages are potulation-Weighted

Source: IFPRI Market Survey 1989/90

Table 49: Unit cost of collecting paddy by season, 1989/90

(Tk./md)

	Cost of collection of Paddy				
	Aman season	Boro season	Aus season	Boro/aus	All
Progressive districts	4.6	4.7	4.4	4.6	4.6
Thakurgaon	2.7	2.5	2.6	2.5	2.6
Dinajpur	2.8	3.3	2.6	3.1	3.0
Rangpur	5.2	6.3	5.2	6.0	5.7
Bogra	3.7	3.3	2.0	2.9	3.3
Joypurhat	4.6	5.4	5.8	5.5	5.1
Naogaon	6.4	6.7	6.1	6.5	6.5
Rajshahi	7.3	7.1	6.6	7.0	7.1
Sherpur	4.9	4.7	5.0	4.8	4.8
Satkhira	4.1	3.1	3.8	3.3	3.6
Nonprogressive districts	5.9	5.4	5.2	5.3	5.6
Pabna	6.9	7.5	6.2	7.1	7.0
Mymensingh	4.4	2.5	4.9	3.2	3.7
Kishorganj	4.8	7.7	7.8	7.7	6.5
Netrokona	3.3	4.2	3.8	4.1	3.7
Brahmanbaria	6.8	4.9	4.8	4.9	5.7
Sunamganj	2.7	3.5	4.6	3.8	3.3
Sylhet	6.1	4.3	0.8	3.3	4.5
Chandpur	6.6	4.3	3.5	4.1	5.1
Noakhali	7.8	3.1	3.3	3.2	5.1
Feni	5.6	7.8	7.2	7.6	6.8
Dhaka	14.6	13.0	13.5	13.1	13.7
Munshiganj	6.7	6.3	5.9	6.2	6.4
Narayanganj	4.8	5.2	4.9	5.1	5.0
Barisal	2.2	1.4	1.8	1.5	1.8

Source; IFPRI Market Survey, 1989/90

Table 50: Level and structure of paddy collection cost, Bangladesh rice market, 1982/83

Item	Paddy collection cost/quintal	% of total
Transportation	3.70	30.7
Weighment	0.79	6.6
Loading/unloading	0.92	7.6
Brokerage	3.76	31.4
Others	2.86	23.7
Total	12.03	100.0

Source: (Islam et. al. 1985, Table C-16, p.254)

Table 51: Mean radius of market area for paddy collection, 1989/90

Distance (miles)	Quantity purchased (000 quintal)	% of total
0-2.5	272	25.6
2.51-7.5	156	14.7
7.51-15	186	17.6
15.01-22.5	48	4.5
22.51-30	92	8.7
30.01-37.5	176	16.6
37.51-45	24	2.2
45.01-75	3.6	2.8
75+	75.2	7.1
Mean (miles)	23.1	

Source: IFPRI Market Survey 1989/90

VI.4 Mean Radius of Paddy Market Area

Table 51 computes mean radius of paddy market area in 1989/90, at 23 miles. Thirty percent of the paddy purchased is transported 30 miles or more. Seven tenths of the paddy is transported on trucks, 14% on boats and 10% on cycle vans (Table 52).

Table 52: Choice of paddy transport medium, 1989/90

Transport medium	Quantity (000 mds)	% of total
Truck	738	69.68
Cycle van	110	10.40
Headload	13.4	1.29
Boat	144	13.56
Bullock-cart	33	3.11
Other	21	2.0

Source: IFPRI Market Survey 1989/90

VI.5 Explaining Average Collection Cost

Understanding the causation of unit transportation cost must be a moot issue. None of the studies surveyed earlier treated this issue econometrically, and this lacuna is overdue for a redressal.

Two dependent variables are adopted, and both are relevant for our purposes. The first is transport cost per maund.[3] Insofar as

[3] A recent IFPRI study tried this version of transport cost in an evaluation of Rural Rationing in Bangladesh (Ahmed, 1992). This was justified in that the government is apt to pay transport bonus (TB) at a flat "per-maund" basis.

the government is wont to give those traders who sell paddy to it in the public procurement program a TB denominated per maund, it is imperative to understand what influences the transport cost per maund of grain shipped. A second unit cost measure used is transport cost per maund per mile. Undoubtedly, this is the most irreducible measure of unit transport costs.[4] Businessmen are apt to define their transport cost bottomline in term of cost per md. per mile covered.

The models, including a constant term, are of the following

$$TC = a_0 + a_1 D + a_2 D^2 + a_3 D^3 + a_4 Q + a_5 Q^2 + a_6 D_1 + a_7 D_2 + a_8 D_3 + a_9 D_4 + U \quad (1)$$

$$tc = b_0 + b_1 d + b_2 d^2 + b_3 d^3 + b_4 q + b_5 q^2 + b_6 D_1 + b_7 D_2 + b_8 D_3 + b_9 D_4 + u \quad (2)$$

$$TCM = C_0 + C_1 D + C_2 D^2 + C_3 D^3 + C_4 Q + C_5 Q^2 + C_6 D_1 + C_7 D_2 + C_8 D_3 + C_9 D_4 + U_1 \quad (3)$$

$$tcm = e_0 + e_1 d + e_2 d^2 + c_3 d^3 + C_4 q + C_5 q^2 + C_6 D_1 + C_7 D_2 + C_8 D_3 + C_9 D_4 + u_1 \quad (4)$$

where upper-case notations refer to variables having scaler values, and lower case notations refer to logarithmic transforms, and where distance and quantity purchased enter quadratrically and cubically. The acronyms are as follows:

TC = Transport cost per maund

TCM = Transport cost per maund per mile

D = Distance

Q = Quantity purchased

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[4]It is possible that measuring transport costs per maund in regressions on distance will suffer from heteroscedasticity: error variances correlated with distance itself. This alternative version avoids this possible pitfall.

D_1 = A dummy variable taking value of 1 if the buyer is of an automatic mill, or major rice mill or a small rice mill and zero otherwise;

D_2 = A dummy variable taking value of 1 if the paddy in question was moved by truck, and zero otherwise

D_3 = A dummy variable taking value of 1 of the district in question is a progressive one, and zero otherwise

D_4 = A dummy variable with value of 1 if transportation is by boats, and 0 otherwise.

U_1, U_2 = error terms.

For the theoretical underpinning of the log-quadratic terms, recall the specification of the Translog production function, a la (Jogenson et al. 1974). The idea behind the inclusion of log-cubic extensions in the above equation derives also from the same analytical construct. It may be asked why we expect the coefficients on the linear, quadratic and cubic terms to be different? The point is the nexus between distance, and transport cost per md.-mile may depend on (a) the feasibility of extra trip per vehicle; (b) the availability of return loads. It is possible that typical distances may divide themselves up into three categories: short, medium and long. Over the short haul, the trucker could return quickly enough to be in contention for a second trip. Over the medium haul, the trucker would have to stay overnight, while the probability of a return load could be the same as over a short haul. Under these circumstances, TCM will fall with distance over shorthaul range. Over the long haul, TCM is likely to go on increasing, unless the probability of return load is sufficiently large to outweigh the effect of longer travel time. In the analysis to follow, linear, quadratic and cubic versions of distance variable (D) are assumed to correspond to short, medium and long haulage. It turns out that, in preferred versions of the equation, all three coefficients are intuitively signed and highly significant.

Table 53 produces the OLS regression results.[5] The highlights of the results are produced below.

Table 53: Explaining Unit Cost in Transporting paddy, Bangladesh Rice Market, 1989/90

(n=1138)

Explanatory variables	Regressand					
	TC		tc		TCM	tcm
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	2.5*	2.96*	0.61*	0.51*	2.5*	0.[illegible]*
D	0.087*	0.057*	0.246*	0.259*	-.066*	-0.75*
D^2	-.0001		0.029*	0.030*	.0007*	0.031*
D^3	-2.88D-7		0.00047		-1.77D-6*	
Q	-.00012*	-.00013*	.013			-0.051*
Q^2	5.12D-9*	5.52D-9*	-.0046			
D1	-.195		-.066*	-0.123*	-.373*	-0.067*
D2	.061		-0.115*	-.163*	-.892*	-.115*
D3	-1.2*	-1.64*	-0.472*	-0.51*	-1.163*	-.465*
D4	-.193	-.327*	0.014	0.003	-0.27	0.017
R^2	0.58	0.52	.64	.64	0.12	0.85
F-stat	170	240	224	329	7.5	909

Notes: TC = Transport cost per maund; TCM = Transport cost per maund per mile; tc = natural log of TC; tcm = natural log of TCM;
* denotes that the coefficient is significant at 5% error probability level.

Source: Author's computation using IFPRI Market Survey data, 1989/90.

[5]It is assumed that no reverse causality flows from unit transportation costs to the distance variable or the weight of cargo. Assumption of independence of distance or quantity variable is highly tenable. Hence OLS is the valid estimator.

First, it is of some real consequence how the costs are defined: while cost per maund (CM) increases significantly with distance whatever the model, cost per maund per mile (CPM) first decreases significantly with distance, then increases with it. Quadratic and cubic terms defined on distance both return intuitively signed and highly significant coefficients. This supports the ideas set out earlier about the role of trip-time and return load on unit costs. This result implies that the idea of an optimal spatial radius for paddy collection is empirically tractable. As against the CPM function, the CM function in its linear version has distance only to be a significantly direct influence: the quadratic term is not significant.[6] Whatever its intuition, it is clear that the paddy processores want to minimize the per maund per mile, and not simply cost per maund. In the present case, the two are not equivalent. Hence, in our subsequent discussion, we confine to the CPM results, especially in its log-quadratic versions, which extract more information from the data than simply the quadratic version.

Controlling for distance, CPM appears to decline significantly with the quantity to be transported: according to the log-quardratic version, ten percent increase in quantity earns a 0.5% discount in CPM. The millers appear to receive a transport discount from the market as compared with the paddy traders and the crushers/*kutials*. Boats and trucks on this sample are found to offer significant transport costs savings as compared with the alternatives, like cycle-van, headload, ox-cart etc. Unit transport costs are lower in the progressive districts.

One implication of the CPM results may be clarified. The fact that beyond acertain distance, costs per md.-mile increase

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[6]Even this result is not without its intuition. Suppose that routes are such that the probability of return loads for truckers is close to zero. Then, the fuel cost per maund would tend to increase linearly with distance, because the emply return journey chalks up fuel costs.

disproportionately implies a powerful impediment in the path of the appearance of a centralized national paddy market. In such a market, rice mills would tend to be fairly centralized, buying paddy from surplus districts at low prices and shipping them over great distance amid conditions of decreasing costs. In reality, paddy processing capacities are of course distributed very widely in Bangladesh. Paddy tends to be sold and processed within relatively narrow spatial circles. It is rice which in contrast has a national market.

VI.6 Cost of Processing

Processing costs form a part of the cost of marketing. Processing sometimes yields byproducts with the effect of improving market margins. Processing brings to the fore issues related to the efficient operation of mills of various scales of operation. Some of these are technology, rate of capacity utilization, degree of competition or monopoly, size of the milling plants, geographical concentration, and vertical integration.

VI.7 Processing cost

Costs of milling paddy consist of the direct costs that vary with the quantities of paddy milled, and the fixed costs. Mill techniques differ in terms of both direct variable costs and fixed costs. Fixed costs may vary among plants using same technology.

In the huller mills, variable costs, not counting paddy itself, comprise mostly of labor required in parboiling, drying and moving paddy and for bagging. Labor intensities vary significantly between automatic mills, and the hullers. The other variable costs, such as fuel and electricity, are more substantial in automatic mills, due to greater machine-paced work.

Fixed costs consist of depreciation and maintenance, salaries of permanent employees, taxes, license fees and other fixed establishment costs. Depreciation may vary considerably depending on the age of the milling machinery even between two mills using the same technology.

Greater automation by raising depreciation implies significant differences in unit fixed costs for different levels of capacity utilization in the modern mills. The absolute level of fixed cost and hence the variation according to capacity utilization are much less significant for traditional hullers.

VI.8 Relative Milling Outturn by Milling Technologies

Table 54 reports seasonal averages of milling outturn ratios during 1989/90. The following findings are worth nothing. First, the automatic mills on this sample do not register the putative milling advantages over traditional huller mills. The reasons for this are as follows. The presumed advantages of modern mills are predicated on drying unit operating at optimal efficiency. The

Table 54: Weighted average mill outturn ratios by technologies, 1989/90

Type of milling technology	Aman season	Boro season	Aus season	Overall
Automatic	.673	.657	.712	.672
Major rice mill	.666	.642	.712	.663
Small rice mill	.678	.659	.702	.674
Overall	.676	.657	.705	.673

Note: Each value in the table shows the quantity of rice output, in quintals by 1 quintals of paddy
Source: IFPRI Market Survey 1989/90

automatic mills in Bangladesh have mostly not installed fully-fledged dryers. The dryers installed are more makeshift. That detracts from milling efficiency. Second, the huller mills register better-than-expected efficiency. These mills have their own drying yards, and they intensively use relatively cheap labor to thoroughly dry paddy. A combination of parboiling and tempered drying coupled with double passes while milling ensure that milling losses of the huller mills are lower than ordinarily supposed.

VI.9 Fixed and Variable Costs in Processing

Table 55 reports on fixed and variable costs of rice milling. All costs are Taka per quintal of rice. Several findings of this table may be noted. First, lowest unit process costs are posted by the automatic mills. Considering the vastly greater mechanization embodied by automatic units, this can hardly be otherwise. For these mills, milling costs in the study year came to Tk. 8.62 per md. of paddy. As against this, the Directorate of Food pays Tk. 10.50 per md. The statutory milling rates for the automatic mills are not as keen as they should be. Second, unit process costs for the major and small rice mills are higher than for automatic mills. Third, the highest processing costs are returned for *kutials*. Significantly, unit milling costs constitute a neat spectrum, with the automatics --- the most machine-paced --- at the low end, and the *kutials* --- the completely unmechanized --- at the high end. Fourth, unit costs for crushers are the same as those for small rice mills.[7] Fifth, except for the *kutials*, unit process costs do not change significantly between aman and boro season.

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[7]Crushers hire soaking, parboiling, drying and milling services at small rice mill facilities. The small mills charge for customized services on *marginal cost pricing* basis. It is shown in Tables A6.1 that, for small rice mills, unit costs for own-account milling is about 28% higher. Crushers' demand for custom-process services push unit costs down. The crushers are charged at this lower rate. Their financial strength lies in that their fixed investment can be next to n.

The reasons why automatic mills outsave other technologies may be as follows. First, they run up significantly less variable cost (Tk. 27/quintal of rice) than do the others (Tk. 44 and 47).

Table 55: Fixed, variable and total cost per unit of output, by season, 1989/90

Type of paddy processors	Fixed cost/quintal			Variable cost/quintal			Total cost/quintal		
	Aman	Boro	All	Aman	Boro	All	Aman	Boro	All
Automatic	8	9	9	30	24	26	38	33	35
Major rice mill	7	9	8	47	42	44	54	51	52
Small rice mill	7.5	7.0	7.0	46	49	48	53	56	55
Kutial	5	3	4	57	74	67	62	77	71
Crusher	4	3	3	51	52	52	55	55	55

Note: Weighted averages, where weights are quantities of rice outturn.

Source: IFPRI Market Survey 1989/90.

The lower variable costs of the automatic mills is due to (i) a higher rice-paddy ratio, (ii) greater output per unit of labor employed. Paddy processing remains a labor-intensive activity. Saving on labor costs translates into cost advantages. Besides, automatic mills probably use less energy per unit of output due to greater energy-efficiency built into its machinery: the automatics use latter-day technology as compared with traditional huller technologies. Finally, the automatic mills could potentially reap economies of large-scale marketing of production inputs other than paddy, like spares, gunny bags, twines, etc.

Significantly enough, the Directorate of Food pays two milling charges to its Mill-gate contractors. Automatic mills are paid Tk. 42.25/quintal of milled rice, while huller mills are paid at the

rate of Tk. 37.2/quintal of rice. Particularly, the small huller mills are put at a cost disadvantage as a result of this statutory mill charge.

Table 56: Comparative labor productivity by mill technologies, 1989/90

Type of technology	Output per worker per season (MT)		Index with automatic as base	
			Output/worker	
	Aman	Boro	Aman	Boro
Automatic	1178	844	100	100
Major rice mill	231	190	20	22
Small rice mill	263	240	22	28

Source: IFPRI Market Survey 1989/90

VI.10 Determinants of Average Processing Costs

The location and shape of the processing cost curves are important information for evaluation of alternative technologies and locations. Because much of the public procurement of rice in Bangladesh is through contracted mills, which may perform differently in terms of average processing costs than non-contract mills, such knowledge may help evaluate the procurement program. Processing costs provide a succint basis for evaluating *technologies* that process: such costs, for the most part, are not tampered with by *marketing* economies, for instance. Dependent variables were variable processing costs per unit of rice milled, and combined processing costs (fixed plus variable) per unit of rice milled. The preferred model was as follows:

$$c = a_0 + a_1 q + a_2 q^2 + a_3 D_1 + a_4 D_2 + a_5 D_5 + a_6\, educ + a_7 \exp + u \qquad (5)$$

where all variables, except the dummies, were log tranforms, and where

c = Log of process cost per md. of rice milled
q = Log of quantity of rice milled
q^2 = q times q
D_1 = A dummy variable with value of 1 for establishments located in progressive districts, and zero otherwise
D_2 = A dummy variable with value of 1 for automatic mills, and zero otherwise
D_3 = A dummy variable with value of 1 for establishments with a millgate contract with the DOF, zero otherwise
educ = Log of number of years of schooling
exp = Log of number of years since which the entrepreneur has been in the rice trade
u = error term

Table 57 reports the regression coefficients. Several results are worth reporting from this table.

Unit variable costs decline significantly with the scale of units' operation as the coefficnt on q shows: for every 1 percent increase in the latter, unit processing costs on average decline by 3%. However, the proportionate scale economies progressively decline with scale, as the significantly positive coefficient on q^2 shows. It does not pay to go on adding to scale, uninhibited: after a while, scale diseconomies set in. Cost functions are nonlinear. Automatic mills significantly outperform traditional hullers in processing cost, as the significantly negative coefficient on D2 shows. Modernization thus has a cost-reducing effect independently of the scale of operation. This confirms the descriptive material introduced earlier on. Finally, location in

Table 57: Explaining log of average process cost of paddy, Bangladesh rice markets, 1989/90

(n=125)

Variables	Average variable process cost		Combined process cost per unit	
(1)	(2)	(3)	(4)	(5)
Constant	18.2* (10.1)	17.7* (9.9)	17.5* (8.0)	17.8* (8.3)
q	-3.2* (-7.4)	-3.01* (-7.1)	-3.15* (-6.0)	-3.26* (-6.3)
q^2	.159* (6.3)	.149* (6.0)	0.157* (5.2)	.16 (5.3)
Educ	.202 (1.9)		.239 (1.8)	.269 (2.1)
Exp	-.002 (-.03)		-.017 (.22)	-.013 (-.70)
D1	-0.149 (-1.3)	-0.146 (-1.3)	-0.048 (-.35)	-.092 (-.70)
D2	-.68* (3.2)	-0.608* (-2.9)	-0.83* (-3.15)	-.73 (-2.9)
D3	0.38* (3.2)	0.402* (3.4)	.34* (2.4)	.33 (2.3)
R^2	0.58	0.57	0.52	.52
F-statistics	23.8	32.1	16	18

Note: * denotes coefficient significant at 5% error probability level.
Source: IFPRI Market Survey 1989/90

progressive districts does not confer a significant processing cost edge, even though the sign of the coefficient is right. Finally, mill-gate contract dummy is everywhere significantly positive: This implies that mill-gate contract establishments register significantly higher unit costs than "non contract" mills. The intuition is either that establishments which have processing-cost handicaps is more likely on average to enter into millgate contract arrangements with the government. Or, having entered such a contract and made complacent by the knowledge that it is heavily profit-padded, the establishments fall prey simply to greater x-

inefficiency relative to others exposed to the chill of the competition of the market. The finding is probably consistent with the prevailing structure of incentives within the milling industry. Millgate Contract scheme is known to be a cornucopia of multiple hidden profits for those who can secure admittance. The more inefficient establishments have strong incentives to join the enclave of the favored few. Why are unit process costs so responsive to scale? The reply is in two parts. First, combined unit process costs should indeed decline with scale of operation because fixed costs are spread more thinly. Second, batch size involves a certain indivisibility in the sense of a fixed start-up cost (e.g. igniting the boiler, switching on the motors etc). It is probable that at lower scales of output, unit start up costs are significantly high: they taper off as volume picks up. Third, labor costs per unit of output falls with the scale of output. Workers bid lower wage rates from a proprietor who is perceived able to keep them employed in order to produce larger volumes of output. This is intuitive because of the intense competition for jobs in Bangladesh's countryside: people trade off wages rates for job "security".

VI.11 Spatial Distribution Costs

These costs arise because consumers are separated by considerable distances from producers, and because they have to be transported to allow marketing to run its course. Shipment of goods over long distances may also involve transfer of title, handling, brokerage and payment of other charges representing services like market levies and the like. Spatial distribution costs contribute between 15 to 18% of the overall cost of marketing of rice in Bangladesh. To understand the level and determinants of these costs is important. This task will be divided up into (a) a discussion of the transportation options; (b) of the changes in the title to goods that are entwined with transportation and handling

and; (c) the level of certain proprietary costs. This discussion will be confined to costs of spatial distribution of rice only.

VI.12 The Choice of the Transport Medium

Millers sell rice in one of three main ways. Most often, out-of-town rice *beparis* purchase rice at factory premises, load it onto trucks and haul it over long distances to major terminal markets. Alternatively, mills will sell through the local *arats*, in which case they will run up small transportation charges but a large fixed commission. Finally, they could consign truckloads of rice to distant terminal markets on their own accounts. The following table shows that, overall, the largest single mode of disposal involves selling rice through local *arats*, followed

Table 58: Pattern of disposal of rice output by rice millers

Type of districts	%		
	Sold to out-of-town beparis	Sold to local arats	Sold direct to terminal market arats
Progressive districts	36	38	26
Nonprogressive districts	29	64	7
All	34	47	19

Source: IFPRI Market Survey 1989/90

by selling to visiting *beparis*. Direct sales to terminal markets are in a minority. Why is this? The reply has to do with the imperative of cash flows. Sales to terminal market *arats* can sometimes fetch better prices, but those gains have to be traded against payments lagging behind consignments: this raises working capital needs. Selling to out-of-town traders or to local *arats* reduce strains on liquidity, and is usually within under more assured seller control.

This finding has implications for the degree of specialization as between processing, and transportation. While millers mainly process paddy, rice *beparis* mainly transport. This rules out vertical integration of the processing and transporting function. While milling involves thousands of players, the task of transporting rice between places and thus forging connection between markets is assigned to numerous and often small-scale beparis each dealing with a relatively small quantity. The smallness of their indent and the general paucity of the resources at their disposal together make the stage ideal for vigorous price competition to prevail.

Table 59 reports on the average cost of transporting and selling rice on the sample. Weighted average cost of selling rice is found to be Tk. 22/quintal. Set against unit selling price of rice of Tk. 999 per quintal, this work out at 2.2% --- a little higher than for paddy. Of this, transport cost accounts for Tk. 13 or for about 59% of the total. The next most significant selling cost component is brokerage, which accounts for about 24% of all rice marketing cost.

As compared with 1982/83, two important changes in the structure of rice marketing costs may be underscored. First, the percentage share of the transport cost has increased from three tenths to about three-fifths. This is mainly because the typical consignment of rice sales is transported over longer distance in 1989/90 in 1982/83. In 1989/90 the average shipment of rice sold traveled a mean distance of 82.5 miles (Table 60) while in 1982/83 this distance was about 50 odd miles. The significant increase mean haulage distance is further reflected in trucks being the medium of choice for 75% of the sale shipments (Table 61). The corresponding proportion for 1982/83 was 54%. Second, the share of *aratdari* fell from 34% in 1982/83 to about 24% in 1989/90. *Aratdari* is a fixed charge, while has remained unchanged over the years under review. However, average transport costs have risen sizeably with the mean haulage distance, thus lowering the proportionate share of *aratdari*. Partly, of course, the decline is due to a greater component of rice sales to terminal markets through visiting *beparis*, whichavoid paying *aratdari*. The relative share of labor charges has remained virtually constant. Overall, changing cost structure highlights a process where flexible-price components have become more important than in the past.

Table 59: Level and structure of selling cost of rice, 1989/90

(Tk./quintal)

B.C.	Trans	Weigh	Load	Arat	Other	Total
Rice itinerant trader	15.6	.7	2.7	4.8	.9	24.7
Rice wholesalers	19.9	.7	2.3	7.4	.2	30.5
Automatic mills	17.3	1.1	1.0	8.7	0.8	28.9
Major rice mill	8.1	0.7	1.3	2.9	4.1	17.1
Small rice mill	11.8	.8	1.5	4.2	0.3	18.6
Kutial	6.4	0.4	1.8	3.9	0.5	13.0
Crusher	11.9	1.2	1.8	6.3	0.9	22.1
All	13	0.8	1.8	5.4	1.1	22.1
Percentages						
Rice itinerant trader	63.2	2.8	10.9	19.4	3.6	100
Rice wholesalers	65.2	2.3	7.5	24.3	0.6	100
Automatic mills	59.8	3.8	3.5	30.1	2.8	100
Major rice mill	47.4	4.1	7.6	16.9	24.0	100
Small rice mill	63.4	4.3	8.0	22.6	1.6	100
Kutial	49.2	3.1	13.8	30	3.8	100
Crusher	53.8	4.3	8.1	28.5	4.1	100
All	58.8	3.6	8.1	24.4	5.0	100

Source: IFPRI Market Survey 1989/90

Table 60: Mean rice shipment distance, 1989/90

(Quantity in quintals)

Distance (miles)	Quantity (000 mds)	% of total
0-10	198	38.3
10.01-20	51	9.9
20.01-50	29	5.6
50.01-100	56	10.9
100.01-200	131	25.3
200.01-300	35	6.8
300.01-400	7.1	1.3
400.01-H1	9.7	1.9

Note: Average distance covered per quintal is 82.5 miles
Source: IFPRI Market Survey 1989/90

Table 61: Choice of transport medium by rice traders/millers, 1989/90

(Quantity in quintals)

Transport mode	Quantity (000 mds)	% of total
Truck	1045	75.31
Cycle-van	112	8.04
Boat	156	11.35
Ox-cart	44	3.16
Others	30	2.14

Source: IFPRI Market Survey 1989/90

VI.13 Explaining Unit Transport Costs in Rice Marketing

Regression models are used to explain sample variations in unit transport cost inr ice marketing. Two versions of dependent variable were used, viz. cost per md. (TC), and cost per md. per mile (TCM). The models were of the following for

$$TC_I = A(K, \sum_{i=1}^{3} D^i, \sum_{j=1}^{2} Q^j, \sum_{k=1}^{4} D_k, U)$$

$$tcm_I = b(\log K, \sum_{i=1}^{3} d^i, \sum_{j=1}^{2} q^j, \sum_{k=1}^{4} D_k, u)$$

where upper-case and lower-case notations denotes variables measured in scaler terms, and in log transforms, respectively, and where

TC	=	Transport cost of rice per md
K	=	constant term
D	=	Distance term
Q	=	Quantity transported, in mds
D_1	=	A dummy variable taking the value 1 if the transportation is being done by an automatic mill, or a major rice mill or a small rice mill, and zero otherwise
D_2	=	A dummy variable, taking the value of 1 when a truck is used to haul the rice, and zero otherwise
D_3	=	A dummy variable, taking the value of 1 when a boat is used to ship the rice, and zero otherwise
D_4	=	A dummy variable taking the value of 1 when the transaction takes place in a progressive district, and zero otherwise

Table 62 reports the OLS results. a few salients features of the results are worth highlighting. First, it makes a difference how we measure unit costs: generally, TCM function is explained more fully than TC versions. Second, while cost per md. first rises with distance before declining, cost per md. per mile first decrease significantly before increasing. Third, TCM decreases by 7 per cent on average for every 10% increase in distance covered. Fourth, both the truck and boat dummies are highly significant in

our preferred versions. This implies that relative to cycle-vans, bullock-carts and headloads, trucks and boats are cheaper transport alternatives. Fifth, the automatic, major and small mill as a group chalk up higher average transport costs than do *kutials*, crushers and itinerant rice traders, because they consign rice further afield. Sixth, transport freight rate seems to be lower in the progressive districts than in nonprogressive ones, as is shown by the significant district dummy.

Table 62: Explaining unit transport costs in marketing rice, 1989/90 (n=704)

Explanatory variables	TC	tmc
Constant	1.64*	0.803*
D	0.11*	-0.705*
D^2	-0.0003*	0.061*
D^3	4.9E-06*	-0.004*
Q	-0.00013	-0.099
Q^2	4.0E-08	0.005
D1	-0.500	0.246*
D2	-0.072	-0.429*
D3	-0.104	-0.517*
District dummy	0.041	-0.135*
R^2	0.80	0.90

Note: TC = tramsport cost/md.; tc = log of TC; tcm = log of transport cost per md. per mile
* denotes that coefficient is significant at 5% error probability level

VI.14 Directionality of Rice Movement

Spatial distribution costs depend, in large part, upon georgaphical speciaiization in production and consumption. In general, spatial distribution costs are higher, (a) the wider apart the specialist production regions from major consumption regions;

(b) the smaller is the economy's endowment of railway and metalled road; (c) the more frequent are inter-gauge rail transshipment; (d) the general infrastructural preparation of the major routes. In addition, nominal spatial distribution costs will also depend upon how heavily the transport sector is taxed or subsidized, as also on how competitive is the market for transport services. Proper understanding of the cost of spatial distribution waits upon a grasp of three things: the geographical pattern of specialization of production and consumption; the road and rail system; the modes of transport; the degree and character of the competition between rail and road transport systems.

VI.15 Pattern of Specialization

A handful of Bangladesh's 64 new districts garner a lion's share of her rice surpluses. Most of these districts are situated in the north-western part of Bangladesh, and utilize the plains hemmed in on two sided by the Jamuna and the Padma river system in the east and south. The principal reason why these districts generate large market surpluses is their relatively large average farm size, and their low population density. On the other hand, a large part of net demand for rice (which counts upon out-of-district arrivals) originates in the three metropolitan areas viz. Dhaka/Narayanganj, Chittagong and Khulna,[8] in the industrial concentrations of Narsinghdi, Ghorasal, Jessore/Noapara, and by part of densely populated district headquarters like Sylhet, Comilla, Noakhali, Mymensingh and the like. The specialization in production of surplus relative to the distribution of the demand for marketed arrivals is such that the directionality of market connection is from rice-surplus north-west to the rest of the country, especially to the major cities and industrial areas

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[8]Rajshahi, the fourth metropolitan area, substantively does not import any grain from other old districts. Occasionally, some imports are effected from Naogaon, a neighboring new district.

adjoining them. We estimate that of the total quantity of rice marketed in Bangladesh in 1989/90, the three metropolitan areas accounted for some 20% (Table 63). The literature does not point to a similar estimate for any past period, ruling out even a very rough comparison. But experienced traders and millers seem to concur that this showed a decline in the combined relative share

Table 63: Net "Exports" of rice into major deficit regions, 1989/90 (000 MT)

Terminal markets in rice consumption areas	Aman season	Boro season	Total
Dhaka	493	565	1058
Chittagong	232	311	543
Khulna	93	82	175
Sylhet	53	76	129
Feni/Choumuhani/Noakhali	58	74	132
Narsingdi/Madhabdi	24	28	52
Chandpur	37	37	74
Others	56	70	126
Total	1046	1243	2289

Notes: In this table, Dhaka stands for only the major wholesale markets of Badamtoli, Mohammadpur within the city of Dhaka, but does not include the fledgling arats in populous city-edges like Tongi, Demra, Savar, Zinjira, Ghazipur, and Narayanganj. The Chittagong estimates relate to Pahartali and Chuktai wholesale markets. Quantities are those in private trade.

Source: IFPRI Market Survey 1989/90; trade estimates.

of these major terminal markets in the gross marketed surplus. In the early 1970s, when urbanization was about 20%, this combined share might have been as high as 40% or so. Growing number of market towns, the increasing population densities of the new district headquarters, the growing densities of the upazila

headquarters as a result of upazilaization, the rapid growth of the nonfarm sector (Osmani, 1990) all point toward a gradual but significant decentralization of Bangladesh's rice market. As well as a secularly growing aggregate size of the rice market, Bangladesh has had a geographically decentralized rice market. Rice economy has transitted from the days when a literal handful of rice wholesalers operating out of these three terminal markets would control a much larger share of the marketed supply: the actions and resources of a more spatially diversified class of traders would now seem to determine the price and therefore the distributional outcome of rice exchanges in Bangladesh. As this means that producers face a *more diversified demand in terms of composition of markets*, this feature fosters *price stability*.

In an appendix table to this chapter, we report our estimates for route-specific rice haulage by season in 1989/90, for a number of major routes. Quantities here refer to haulage by both road and rail. On the basis of aggregate rail haulage data for the rice, we assume that road and rail split on a 80:20 ratio. The route-wise division of the traffic by these two modes is nowhere available. We carry out our computations of average spatial costs as through all haulage were carried out by road. The implications of this procedure for the level of spatial costs are traced later on.

VI.16 The Rail and Road System of Transporting Rice in Bangladesh

Bangladesh has 2746 km of route tracks, of which 1822 km involving meter gauge (MG), and 924 km broad gauge (BG). Broad and meter gauge coexist in the North-West, while in the rest of the country only meter gauge is found. The chief distinction between MG and BG for the purposes of the present discussion is with the 50% greater permitted axle load for the BG tracks. The BG tracks were all laid out in per-1947 British India, when carrying surplus aman grain from the north west of Bangladesh to Calcutta on the

cheap was the basic imperative of track choice. All grains heading East across the Jamuna from the North-East involve time-consuming transshipment (at places like Saidpur, Santahar and the like), as well as rivercrossing on ferries which chalks up handling losses. Forty three of the countrys' 64 new districts are on railroad; of this, only 18 are situated to the west of the Jamuna, served only by the MG. The gratest bulk of BG meterage are in the rice surplus districts. About 50% of the headquarters of the new districts in the rice-deficit Eastern Bangladesh are situated on railroads. Bangladesh has only 12000 active rail wagons in 1989/90, while the country needs something like 30000.

Bangladesh had about 47,008 trucks in 1986/87, virtually all with 2 axles. The truck fleet is dominated by 2-axle 6-wheel vehicles with a typical load capacity of 6 or 7 tones. Observed average cargo per loaded truck amounts to about 6.5 MT. Of late, the (Japanese) Hino F173 has become more popular, with a nominal load capacity of 7.5 MT. The predominance of low axle load is mainly due to limitations posed by narrow roads, inadequate bridges and ferries/ferry ghats. Bangladesh's road system has many bridges of low weight limits, and about one-third are in bad need of repair. About one half have a width of less than 5.5 meter. Many roads have low strength pavements, and subgrades with CBR of around 3%. These are obviously affected by the low-lying nature of the country with its many rivers and heavy seasonal rainfall, making drainage more crucial than normal. Road network also has 65 ferries, many of whom accessed by structures founded on shifting or unstable bank seating. Under these circumstances, low permitted axle roads appear mandatory, even if expensive.

VI.17 State of Competition between Rail, Road and Water Transport

Mileage of all-weather road (high type) rose from 3,851 km to 5,657 km between 1976/77 through 1986/87 --- a compound growth rate of 6%. Number of registered trucks rose from 18,303 to 47,008 during the same period. Total length of feeder roads --- which contributes to serviceability of the all-weather types --- rose from 2340 km to 5680 km. Road transport sector has sustained the most sustained increase in carrying capacity, followed by water transport sector.

Commercial trucking in Bangladesh is highly competitive. Most truck owners have only one or two vehicles: the number of owners with more than five trucks is small. Carriers' permits are freely issued. Vehicles are not restricted to particular areas, routes or goods carried. Rates are thus set competitively and no evidence of any cartelized price fixing is witnessed (Kampsax for ADB, 1986). Truckers are fundamentally influenced by seasonal demand, commodity, availability of backhauls, etc.

Riverine mechanized transport fleet has made relatively rapid growth from 1976/77. The number of cargo boats rose from 12800 in 1976/77 to 29850 in 1989/90. This sector, too, operates in a competitive price environment.

Table 64 below reports the comparative growth rates of the tonnage transported by various media of transportation. Several comments follow. First, the railway has alone experienced a decline in tonnage carried. Second, organized road transport has recorded much higher growth rate, of 4.2% annually. Organized water transport sector, too, has highest growth rate of all classes of hauliers.

Table 64 reports on volume of cargo of all commodities, including rice. Table 66 shows the decline in the freight of paddy and rice shipped on rail in 1969/70, and in tow recent years. Clearly, the quantity has fallen by half over the two decades, even though the overall quantity marketed has risen by fourfolds. The decline of the railways is therefore simply staggering. As already seen, three-fourths of the rice are shipped on trucks. What explains this pricipitous decline of the railways and the attendent rise of the roads. Is this because rail freight rates are much higher?

Table 64: Movement of goods by means of transportation

(Million Ton)

Year	Bangladesh Railway	Road Transport			Water Transport			Air	Grand Total
		Organised	Un-organised	Total	Organised	Un-organised	Total		
1981/82	3.28	25.16	43.28	63.44	4.70	27.45	29.28	2	100.95
1982/83	3.00	25.86	48.30	74.16	4.87	25.42	30.29	2	107.44
1983/84	2.99	26.72	46.85	73.57	4.72	26.33	31.05	2	107.61
1984/85	3.06	27.51	47.56	75.08	5.05	27.32	32.38	2	110.51
1985/86	2.34	28.31	46.27	74.58	5.52	28.38	33.90	2	110.82
1986/87	1.98	29.02	46.71	75.74	5.63	29.49	35.13	2	112.85
1987/88	2.52	29.84	45.42	75.36	6.22	30.74	36.96	2	114.74
1988/89	2.49	33.50	45.86	79.36	7.39	32.05	39.44	2	120.13
1989/90	2.41	34.46	46.45	80.91	8.92	32.91	41.83	2	125.16
Growth rate	-4.8 (-3.0)	4.2 (6.9)	0.11 (.23)	2.3 (3.7)	8.3 (4.9)	3.4 (5.6)	5.0 (10.6)		2.8 (2.3)

Note: Parentheses show the T-statistics attaching to the time trend coefficient

Sources: Bangladesh Railway, BIWTA & BBS.

Table 65: Tonnage of rice and paddy carried by Bangladesh Railway, 1969/70, 1988/89, 1989/90 (000 tonnes)

	1969/70		1988/89		1989/90	
	Tonage	% of total	Tonage	% of total	Tonage	% of total
Paddy	72	1.5	34	1.4	20	.84
Rice	459	9.4	192	7.7	186	7.7
All goods	4878		2493		2410	

Note: Average rail haulage in FY90 is estimated at 181 km for paddy, and 342 km for rice. The corresponding estimates are 176 and 332 for 1969/70.

Source: Bangladesh Railway

Table 66 reports on comparative freight rates charged by the Bangladesh Railway in three time periods, and the corresponding road freight rates. For the rails, effective rates are higher than the statutory rates: the shippers have to incur certain "invisible" costs. The material suggests that the rails, which are heavily subsidized, are cheaper in nominal terms. However, in reality, the *haulage time* on a typical route in two and half times or more for the rails than for the trucks. This means that a shipper can execute two deals or more by road during the time that deals or more by road during the time that one rail-deal takes: the lost profit from the second (and possibly a third) deal adds to the opportunity costs of using the rail. To use the rail thus becomes relatively more expensive. Second, trucks freely ply to new towns or nonfarm regions, not touched by the rails. Third, the above rail rates do not include handling losses at transshpment points. And, fourth, the number of freight-worthy rail wagons have *fallen* over time, which the number of registered trucks has risen substantially. In the light of all these arguments, the fact that the road transports have become the carriers of choice for private shippers of rice should come as no surprise.

Table 66: Comparative structure of rail freight, base rate, 1985-1992 (Tk./kg.)

Km	Road		Rail					
			1984/85		1985-1989		1989/90-1990/91	
	1985/86	1989/90	Statutory	Effective	Statutorry	Effective	Statutory	Effective
Upto 60	.45	.60	.15	.23	.17	.26	.22	.34
61-120	.50	0.65	.16	.25	.18	.29	.23	.37
121-180	.55	0.69	.18	.29	.20	.32	.25	.39
181-240	.61	0.77	.20	.31	.22	.35	.28	.44
241-300	.66	0.83	.22	.35	.24	.38	.30	.47
301-360	.71	0.98	.24	.38	.26	.41	.35	.53
361-420	.78	1.06	.26	.41	.29	.49	.38	.60
421-480	.84	1.15	.28	.43	.31	.48	.41	.64
481-540	.91	1.21	.30	.46	.33	.51	.42	.67
541-600	.97	1.22	.32	.49	.34	.54	.43	.68

Note: For rail rates, effective rates are unit user costs obtained from trader interviews.

Source: Bangladesh Railway publications; trader

VI.18 Level and Determinants of Private Rice Stocks

The subjective of this subsection is understand (a) how large private rice stocks currently are; (b) how rapidly they have grown; (c) how govornment policy affects them and especially what role public stock operations play in determining private storage behavior. There has always been a pervasive ignorance about the size, seasonality and causalities about private rice stock. This seriously limited the value of the quantitative models of Bangladesh's rice economy in particular which were built by economists during the 1970s and 1980s. It is necessary therefore to put the information in this subsection in the context of the ongoing work involving rice price modeling.

VI.19 A Survey of the literature on the role of rice stocks

There have been several analyses, at both aggregate and disaggregate levels, of the determination of rice price in Bangladesh (Ahmed, 1979; Ahmed and Bernard 1988; Chowdhury, 1990; Shahabuddin, 1990). These models were concerned to capture the interaction between demand for and supply of rice in the context of a two-tier price system reflecting wide-ranging quantity interventions with administered prices in the midst of a large and dense private rice market. One distinctive feature of all these models was an effort to evaluate market rice supply and price in view of the scope and nature of public interventions in the foodgrains market. Howevers, the point that market supply is also about private storage decisions was not, until very recently, embedded in the analysis.

Goletti, Ahmed and Chowdhury (1991) have estimated a seasonally disaggregate dynamic model of Bangladesh's rice economy that incorporates the demand both for consumption and storage. Direct measures for consumption and private stocks were, to be sure, not on hand. The presumed effect on rice prices of changes in the consumption demand is in that model captured by income and the current price of a substitute cereal (ie wheat). The presumed effect on current rice price of changes in the underlying storage demand is captured by lagged and expected future prices. (Expected prices were generated by regressing present price on a set of instruments, viz. lagged public stock, current imports, current income and current rice losses associated with flood, droughts or cyclones.) Some of the highlights of the results are as follows: (a) opening stocks have an important negative effect on future prices; (b) losses in rice production, associated with droughts etc, affect future price by aggravating future scarcity; (c) Income positively affects future prices by raising current consumption and lowering available future supplies; (d) the speculative effect of future prices on current price is quite important; (e) expected

future price has roughly the same degree of influence on current price as have lagged prices, indicating a support for the hypothesis of profit maximizing demand for storage (Goletti, Ahmed and Chowdhury, 1991, p. 32)

One important question still remained unanswered: what is the order of magnitude of private rice stocks, both onfarm and trade? Is the evidence of the effect on prices of market-wide directly measured private stocks consistent with the evidence from the Goletti et al. model? Do changes in private and public stocks separately have symmetrical but opposite effects on prices? If changes in private stocks impact upon market prices, what factors in turn influence the former?

This is what this subsection is motivated to provide. In this subsection, we first estimate of Bangladesh-wide rice production, market supply (ex-domestic production) and private stocks for the twelve months through November 14, 1990. A division of private rice stock into farm and trade components is attempted. Then we examine the market wide repercussions of private stocks using a district level model.

VI.20 The Data and Methodology

Virtually all data used in this subsection were generated by IFPRI Farm-and Market Survey 1989/90. One of the main objectives of this combination survey was to estimate private farm and trade rice stocks in Bangladesh. This required estimation, for a representative sample of rice farms, production, consumption, marketing, other uses, losses, purchases, beginning-of and end-of-period rice stocks. For a household, the following identity should hold (where all quantities derive from production alone):

$$I_t - I_{t+1} + Q_t = X_t + M_t \qquad (1)$$

where Q is quantity harvested, M is quantity marketed, X is quantity consumed, I, is carryin stock, I_{t+1} carryout stock and t

is a seasonal subscript. What is neither consumed nor sold has to be stored across seasons or market periods. This accounting identity was implemented in quantity terms, which established an warrant for treating all rice/paddy receipts (whether purchases or received in public rationing or other food distribution schemes or in lieu of work performed) as additive. All estimates of farm stocks should be seen as relative to farm production, and net of purchases or transfers or kind-receipts.

A brief outline of the blow-up of sample estimates into population aggregates is in order. IFPRI Farm Survey had oversampled medium and large owners of farms. There was an warrant to adjust sample quantities for four ownership size-classes, on the basis of their weight in the "population". However, the weights of these four sizeclasses vary significantly in space. In the surplus North-West of Bangladesh, the proportion of large farms is larger than in the South-East. Therefore, the above "correction" was effected for the various strata on the sample using the proportionate weights of farm ownership sizeclasses in the relevant geographical region (district)[9] and not by some aggregate set of weights. From survey data, population-weighted stocks *relative* to harvest quantities were thus computed. These ratios were applied to district-level official rice output to arrive at farm stocks. Ensuing district stocks were aggregated to yield stocks in fifty-seven new districts.

Before we highlight our results, a few salient statistical points are of interest. First, the sample was capable of generating population-level estimates for *cultivator farms* of the

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[9]For this purpose, the number of farms in these four sizeclasses for each of Bangladesh's fifty seven new districts were accessed from the Agricultural Census of 1983/84. These were used as weights or blow-up factors. The country does not have an agricultural census after the one in 1983/84. Hence its use in this paper.

proportion of rice production consumed on farm, marketed and stored. However, it may not adequately represent rice consumption and storage of *landless households* in agriculture of which there are many millions and which live off supplying labor and the like. In so far as these rice-deficit households purchase all or most of their consumption from the market, much of their rice storage will be sustained by the marketed supply in prior time periods by the kinds of farms (i.e. mainly surplus farms) that our survey has been concerned with. It is therefore quite proper that this survey does not attempt to exhaustively represent rice storage by the landless farmers.[10] This is just as well, for the gross marketed surplus (GMS) is the major determinant of the overall size of the market, while net marketed surplus (NMS) is germane to the extent of the intra-agricultural trade in the commodity at issue, and was not of high priority in this study.

Second, in blowing up sample estimates we have used regional land ownership distributions in preference to operated land distribution. This is appropriate, for the following reason. First, the last time for which these regional farm level weights are available is 1983/84. Operated land differs from owned land due to the land rental market. Owned land is the most irreducible measure of a household's production wealth. Rice stocks are a form of liquid wealth, too. Operated land on the other hand is a derivative of the land rental market. The underlying conditions in that market may have changed in unknown ways between 1983/84 and 1989/90. And available resources did not permit a census of all farm households in each of the thirty four villages on the sample. Neither we, nor anyone else, had an idea about the population of operated farms in these villages, not least in the economy at large. To have used 1983/84 operated land distribution in conjunction with sample results for operated land classes would

[10]This means that, if anything, the estimates of farm stocks in this paper are underestimates.

have amounted to the assumption that land rental market behavior had been timeless. We did not want to make such a controversial assumption. We believe that use of owned land distribution was the proper decision.

Third, we make no effort to blow up to arrive at regional (district level) rice production, for such crop estimates have already been made by the Bangladesh Bureau of Statistics (BBS). More to the point, currently the BBS and the Ministry of Agriculture are embroiled in technical controversies about the size of the rice crop during the period of our interest, with the two sides being as much as 10% apart. We accept the lower, BBS, estimate of new district level rice output. We used the survey data to estimate, by crop season, carryin, marketing, onfarm consumption, losses, transfers and carryout all relative to seasonal output. By applying these *proportions* to BBS output by new districts we arrive at economy's farm stocks.[11]

Fourth, margins of errors to the estimates from IFPRI survey are of the same order of magnitude as those for a much larger sample survey recently by a team led by Mahabub Hossain, currently at the IRRI, Manila. The standard errors of the estimates of the yield rates of aman and HYV boro, to pick an important pair of ratios, are not very dissimilar according to IFPRI Farm Survey, and the BIDS Survey. The BIDS survey in turn had reported averages on a number of variables which were strikingly close to BBS' nationally representative estimates.

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[11]We exclude seven new districts of Bangladesh, viz. Rangamati, Bandarban, Khagrachari, Sylhet, Sunamganj, Habiganj and Moulavibazar. The first three had to be omitted because these were not included in IFPRI Farm Survey sample, due to security reasons. The last four, because 1983/84 Agricultural Census failed to report the number of farms at the desired level of disaggregation for these districts.

Fifth, IFPRI Farm Survey had oversampled farms owning 2.50 acres and more of land. However, we did accommodate the functionally landless with upto 0.49 acres of land (30 observations) and the marginal and small farmers with between 0.50 and 2.49 acres (20% of observations). One of our key findings --- which may defy early conviction --- is about the dramatic escalation in the extent of marketing during the boro/aus season (see below). But there is nothing illusory about this. Even the small farmer on average markets 51% of his output during boro/aus season and 29% during the aman season (Table 3). Even the functionally landless on average market 24% of his output during the aman season, and 26% during the boro. And why not when the functionally landless average 36% mds of paddy per acre during 1989 aman season and 57 mds per acre during 1990 boro --- as against an average of 29 mds and 52 mds. for the large farms on the sample. Finally, the average family size of the smallest farm on this sample is about the same as for the nation as a whole, so that their surprisingly "strong" marketed surplus is not an artifact of unreliably small families.

In view of these prefatory remarks, we may now turn to our main results.

VI.21 Private Rice Stocks: Level and Composition Size Rice Market and Farm Stocks

The findings are structured as follow. First, we report countrywide production, gross marketed surplus, carryin and carryout stocks by aman season (the five months through middle of April) and the subsequent boro/aus season (the seven months through the middle of the following November). We then look at seasonality and composition of private rice stocks in 1990, and how the ratio of these to putative rice consumption requirements fare about two decades apart. After that, we look at farm rice balances by sizeclasses using sample data, before presenting

economy-wide distribution of the ownership of rice stocks across farm classes. Subsequently, we look at stock-to-consumption ratios across farm sizeclasses for 1990 for the economy.

Table 67 shows first of all that in the crop year through November 1990, rice output in these districts was 15.9 million MT (MMT). The country had a private onfarm rice carryin of 0.66 MMT. During the aman season, output was 8.3 MMT. (Net aman output was 7.5 MMT.) Of that quantity, 2.85 MMT or about 34% was marketed. During following seven months, output was 7.7 MMT. Of that quantity, 4.9 MMT were marketed. Proportion of GMS in output during the boro/aus season was 64%. We estimate that farm sector marketed 0.8 MMT of aman rice, raised as part of 1989/90 aman season, during the boro/aus season in 1990. This came out of the aman season carryout of 2.6 MMT. Of this quantity, about .24 MMT is accounted for marginal or small farmers. This confirms what was already casually known, viz. that a significantly larger share of the rice output is marketed during the wet season than during the dry season. Inasmuch as there is a significant between-season carryover of marketable surplus, ratios of marketings relative to beginning of season availability should be of greater interest. These are 32% and 48% respectively. For the year as a whole, this works out at 47%. Carryout stock at end of aman season is 32% of harvest, and at end of boro/aus season is 15% of harvest. During the year under study, the farm sector made net additions of 0.58 MMT to production-induced rice stocks. Because the combined production of boro and aus rice during 1989 (the year before the one under study) was down by only 10% upon during 1989/90, but because the end-of-boro farm sector carryout made gains of 166% (990/417), the farm sector in the rice economy raised the stock-to-output ratio during the year under review. It is necessary to interject at this point that rice output has risen in 1990/91 upon the year before by about 1.1%. Rice output in 1989/90 had already risen by a healthy 16% upon the three or so preceding years. Rice output has, essentially, plateaued at its new higher level. This

hold-up of the momentum of rice production, coupled with the extra cushion of private farm stocks gains means that the cushion had not been frittered away.

Table 67: Rice Production, Marketing, and Private Rice Stocks during Year through November 1990

(000 MT)

	Aman season	Boro/aus season	All seasons
Opening stock	660	2660	-
Rice production	8274	7667	15941
Gross marketed surplus(GMS)	2853	4935	7788
GMS as % of output	34	64	49
GMS as % of availability	32	48	47
Closing stock	2660	1140	-

Source: IFPRI Farm Survey 1989/90; BBS, unpublished data.

Note: Availability here is equal to carryin from past production plus net size of the harvest at the onset of current market season.
Ratios of GMS to net output would, naturally, be higher.

Fig.3: Allocation of Private Domestic Rice Availability
Year through Nov. 1990

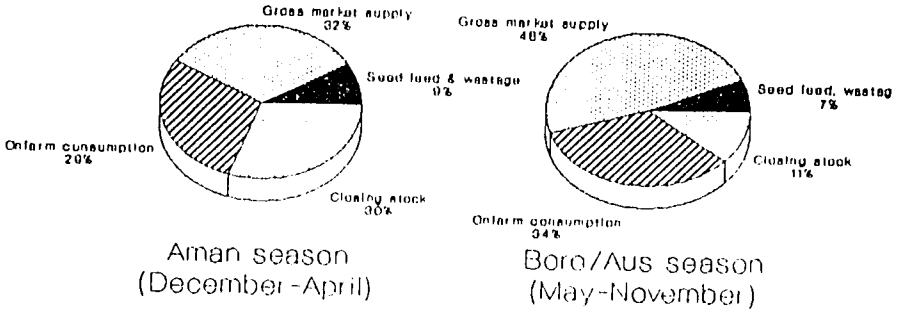
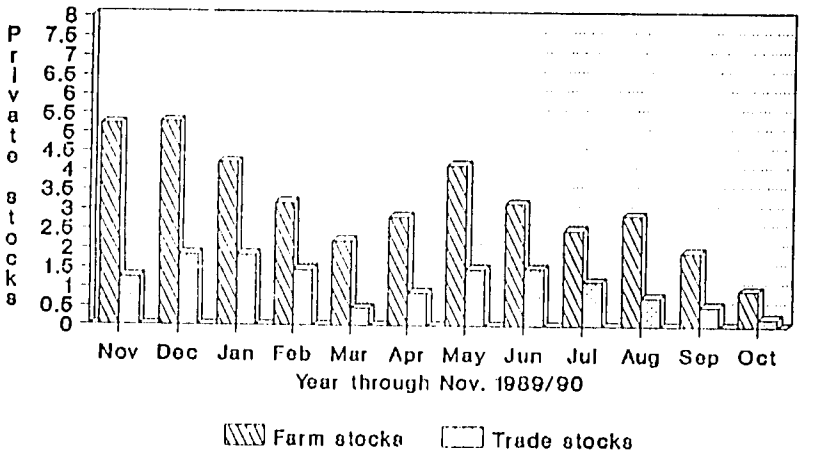


Fig.4: Level and Seasonality of Private Rice Stocks, the Year through November 1990



VI.22 Seasonality and Composition of Private Rice Stocks, and Public Stocks

Table 68 below reports private and public foodgrain stocks in Bangladesh economy by months. Several findings deserve fuller discussion. First, during the year through the middle of

Table 68: End-of-Period Rice Stocks in Bangladesh Economy, the year through Nov. 1989/90

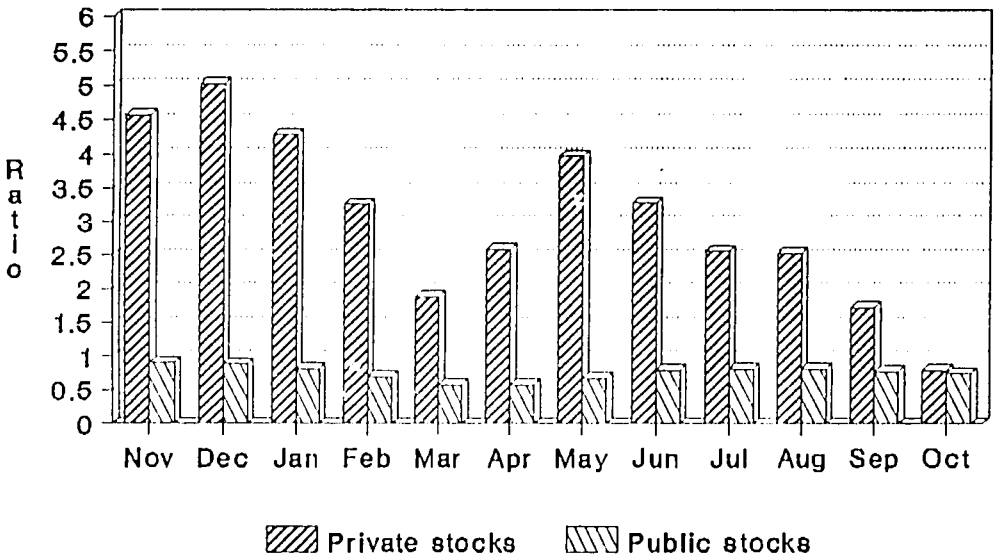
(Quantities are MMT)

Months	Private stocks			Total private rice stocks as multiples of consumption per month	Total private rice stocks as multiples of consumption per month, 1967/68	Public foodgrain stocks			Total public rice stocks as multiples of monthly consumption
	Farm stock	Trade stock	Total			Rice	Wheat	Total	
October	0.35	0.31	0.66	0.47	-.128	0.59	0.84	1.43	0.92
November	5.22	1.25	6.47	4.57	0.80	0.66	0.75	1.41	0.91
December	5.28	1.83	7.11	5.02	3.55	0.77	0.61	1.38	0.89
January	4.22	1.84	6.06	4.28	3.26	0.83	0.43	1.26	0.82
February	3.17	1.45	4.62	3.26	2.35	0.79	0.26	1.02	0.70
March	2.20	0.46	2.66	1.88	1.53	0.70	0.19	0.89	0.58
April	2.81	0.86	3.67	2.59	1.23	0.65	0.25	0.90	0.58
May	4.15	1.47	5.62	3.97	0.50	0.74	0.31	1.05	0.68
June	3.16	1.48	4.64	3.28	-.12	0.84	0.39	1.23	0.80
July	2.48	1.15	3.63	2.56	-.42	0.81	0.46	1.27	0.82
August	2.85	0.74	3.59	2.53	0.86	0.72	0.55	1.27	0.82
September	1.92	0.52	2.44	1.72	-.07	0.59	0.61	1.20	0.78
October	0.93	0.21	1.14	0.80	-1.0	0.54	0.62	1.16	0.75

Note: Each month begins from 15th instant.
If anything, these estimates of private rice stocks for 1989/90, both absolute and relative, are underestimates, as seven of Bangladesh's 64 new districts are unavoidably omitted in this table.

Source: Private stock figures for 1989/90 from IFPRI Market and Farm Survey, 1989/90; public stock figures are from the Directorate of Food;

Fig.5: Private and Public Stocks Relative to corresponding Consumption Needs



November 1990, private rice stocks amounted to 3 months' rice consumption of the country as a whole.[12] However, stocks-consumption ratio during the aman season is 3.8, which is significantly higher than during the boro/aus season, at 2.49 (Fig. 4). Farm stocks account for 79% of private stocks during the aman season, and some 78% during the boro season. Second, the country took advantage of the bumper rice crop of 1989/90 to build up a contingency stock of about 0.5 MMT --- the difference between 1.14 and .66 MMT. Note that this is the difference between the carryin and carryout for the period under study. The farmers built up additional reserves of 0.58 MMT during the year under review. While the carryin at the beginning of the period translated to roughly fourteen days' consumption requirements only, the carryout amounted to more than twenty four days'. Third, public foodgrain stocks hovered around 1.2 MMT. For the year as a whole, private stocks amounted to 79% of the total stocks. Public stocks represented .78 month's equivalent of combined foodgrains requirements during the aman season, and .75 month's equivalent during the boro/aus season (Fig. 5).

VI.23 Rice Market Performance in 1968 and 1990: a Rough Comparison

Even in a paper mainly about 1989/90, it seems natural to want to compare the Bangladesh's private rice stocks relative to putative consumption requirements, say two decades apart. Comparable estimates of private stocks for the pre-liberation period, to be sure, are not available and a rough comparison only can be attempted. Farruk had guesstimated that in 1968/69, private rice stocks averaged at 1.0 month's consumption requirement (Farruk, 1971). Two aspects of rice market performance in 1968 deserve an elaboration.

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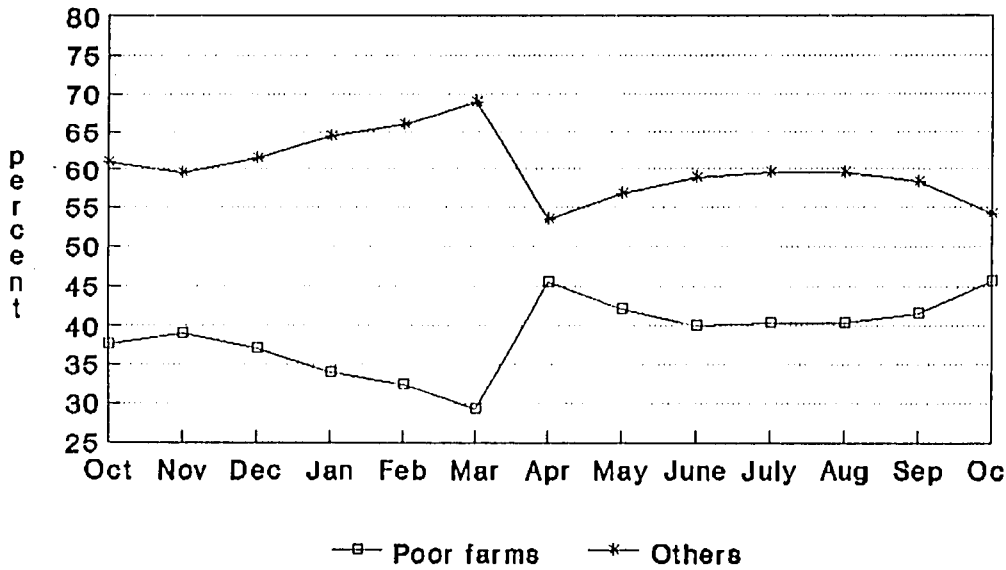
[12]In 1989/90, aggregate rice consumption is put at about 17 MMT or 1.416 MMT per month (World Bank, 1992).

First, while the six months through October generally ran low on farmlevel rice stocks, the worst deprivations were reserved for the months of September and October. During these months, aggregate farm stocks turned negative: farm sector experienced a net addition in consumption credit owed to the trading system. In late 1960s, as well as today, these months register seasonally peak prices (Ahmed and Bernard, 1983; Chowdhury, 1992). The degree of seasonal price increase depends on prevailing expectations during the lean season regarding future grain availability. We shall argue that the level of private stocks during October will powerfully influence traders' assessment of future scarcities. Already in October 1989, rice stocks are positive (and not, like twenty years ago, negative). Even without taking account of the record harvest of 1990, the market's capacity to ward off overly optimistic forecasts of future scarcities by traders was greater in October 1989, relative to the preliberation period. The record harvest of 1990 further underlined this inner strength, by allowing a higher stock-to-requirement ratio in October 1990 relative to a year before. Second, rice market in 1968 was quite thin. The proportion of gross marketed surplus in output was between 10 and 15%. The market was heavily influenced by a rainfed (and fluctuating) aman crop --- the only rice crop with a sizeable marketing. Thin markets are wont to be relatively volatile, as a given magnitude of production shortfall translates into a large contraction in marketed supply. In combination with inelastic consumption demand, this sets the stage for greater volatility in prices. While the 1960s generally were price wise stable, the volatility of prices of the late 1960s and early 1970s (Ahmed and Bernard, 1988) had much to do with thin rice markets and small-volume farm stocks. Both essentially derived from a single-harvest production system.

By comparison, two decades later, marketings have amounted to about half of output, and private stocks at any given time amount

Fig.6: Composition of Farm Rice Stocks between Poor & Other Farmers, 1990



to one-fourth of requirements. This implies an enhancement in the resourcefulness of the rice economy at least in terms of managing the aftershocks of even a dramatic production shortfall, as was convincingly demonstrated in the wake of some recent calamities. Rice markets have thus fairly come of age. Farm stocks are one of the leading edges of this incipient market maturity. Given the importance of farm stocks, it is imperative to understand the structure of the ownership of farm rice stocks with respect to land ownership classes, to which we now turn. However, in this effort, we must begin with rice balance sheets by farm size classes.

VI.24 Rice Balance among Farm Sizeclasses

We report in Table 69 below on rice balances of rice farms among various classes of farmers in Bangladesh during the year through November 1990. The information is arrayed separately for progressive and nonprogressive districts. The idea is to project the extent, sources and uses of rice resources available to rice farms. The omission of wheat --- the other important cereal --- is not a crippling handicap, as a lot can still be learnt from the picture about rice, the preferred cereal. All quantities are per capita in kgs. The following results deserve some fuller discussion.

First, there is an inevitable divergence in the rice production levels as between the functionally landless, and the landed farms in both progressive and nonprogressive districts. This divergence is essentially due to access to land. Thus, for example, while the large farms in the progressive districts register production of 1.48 MT of rice per capita per year, the landless register o.41 MT. The corresponding numbers for the nonprogressive districts are 1.11 and 0.29 MT, respectively. If the inequality is glaring, it was even more so a decade or so ago. Second, the seasonal distribution of rice output is markedly different as between the landless and other classes of farms.

While the landless in progressive districts raise only 41% of output in aman season, large farms raise 50%. Medium farms raise 52%. The relativity carries over to the boro season. The boro/aus output is a more significant component of rice availability of the poorest farms than for the better-off.

Third, consumption per year per capita from own-account production in progressive districts is 140 kgs. for the landless, 176 kgs. for the small farms, 205 kgs. for the medium farms and 212 kgs. for large farms. Overall, annual consumption per capita exproduction is 201 kgs. in progressive districts, as against 185 kgs. in nonprogressive districts. In the latter, the landless consume 133 kgs. per capita, while the consumption for small, medium and large farms are 161, 190 and 207 kgs., respectively. Own production not only appears to suffice for rice consumption requirements for all except the functionally landless but generates sizeable marketable surpluses.

While it was all along well-known that medium and large farms heavily market, present results serve to bring the far more numerous landless and small farmers closer to the analyst spotlight, for several reasons. First, the fact the functionally landless market 25% of their output in the year under study, and that their net marketed surplus is a 9% of output are both suggestive that even poorest of farmers have not been untouched by commercialization (Table 69). Second, for the small farms, gross marketed surplus is 41% of output and net surplus is 36%. The functionally landless and the small farms are the most populous of farm categories. Medium farms register gross marketed surplus of 52% of output, and net marketed surplus of 50% of output. The rice market is therefore thick and broad, and the marginal and small farms, if somewhat under-represented, still are players of some consequence in it. Earlier on, IFPRI research had strongly argued that technological change in rice cultivation had profoundly embraced the marginal and small farms (Hossain, 1988). And now

here is firm evidence that commercialization of rice markets --- spawned by the spread of the HYVs, infrastructural outreach, rural electrification --- has again substantially embraced the marginal and small farms.

Table 69: Per capita rice balance of Farm Economy, Bangladesh, 1989/90

(kgs; per capita)

Type of dist.	Farm size classes	Family size (Nos)	Carry in stock	Production, aman	On-farm consumption, (OFC) aman	buy from market aman	Marketing aman	Net marketed surplus aman	Carry-out, aman season	Production boro	OFC, boro	buy from market, boro	Marketing, boro	Net marketed surplus	Carry out stock, boro
P	Marginal	6.1	6.2	170	65	11	63	53	14	247	75	27	88.5	62	16
	Small	6.5	9	331	74	7	140	133	70	338	102	9	205	197	37
	Medium	7.9	18.4	496	87	3	207	204	172	466	118	6.5	361	355	59
	Large	10.9	41	745	89	2.7	387	384	227	738	123	2	620	618	87
	Overall	8.8	25	558	85	4	265	261	171	549	116	6	432	426	65
NP	Marginal	5.9	2	123	53	24	28	4	10	167	80	28	41	13	18
	Small	8.0	13	193	71	10	51	41	43	256	90	16	125	109	28
	Medium	8.9	20	339	81	6	120	115	99	381	109	11	250	240	44
	Large	10.9	33	544	87	..	238	238	103	585	120	4.5	445	440	71
	Overall	9.3	21	355	79	6	135	126	106	402.5	106.5	11	269	258	47.5

Notes: P stands for progressive, and NP for nonprogressive

Source: IFPRI Farm Survey, 1989/90; BBS, Agricultural Census, 1983/84

VI.25 Ownership of Rice Stocks by Farm Size Classes

Table 70 reports on the proportionate distribution of rice stocks by seasons on the part of various size classes of farms. These are economy-wide estimates. It used to be the conventional wisdom in this field that the medium and large farms account for a preponderant share of the country's private rice stocks at any

given time. To confirm whether or how much that wisdom is valid for 1989/90 is a moot issue.

Several findings from this material are worthy of further discussion here. First, seventy three percent of the farms in the country as a whole in 1983/84 were with upto 2.49 acres of land, the remaining being medium and large farms. Marginal and small farms numerically prodominate. Second, for the year under study, marginal and small farmowners accounted for 39% of farm rice stocks, while the medium and large farms accounted for 61%. Third, the functionally landless are the most heavily impoverished of stocks; while they account for 29% of the farms, they account for only 2% of the aman-season carryout and 7% of the boro carryout. Fourth, and more to the point, the functionally landless and small farms together improve their combined share in rice stocks by eight percentage points --- from 38% to 46% --- during the year under study. Of this increase, small farms accounted for a five-percentage-point increase, and landless ones the rest. Significantly enough, the large and medium farms have registered a matched decline. What is more, virtually all of this decline has impacted upon large landowners whose share has fallen from 40% to 32%. In sum, if the ownership of ex-output carryout stocks at any point in time is a major determinant of stability of future consumption of rice --- a subsistence staple --- the small farms and, to a smaller degree, the functionally landless farms have over the period under study improved their relative endogenous capacity to underwrite future food security (Fig. 6). Three explanations for this results will be proffered here. First, especially the

Table 70: Distribution of private farm stocks by farm size classes, 1989/90 (per cent)

Farm size classes	% of farms	Op. stock	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Closing stock
Landless/ marginal	28.9	4.3	4.7	5.0	3.9	2.9	2.0	6.7	8.9	8.6	8.0	7.4	7.2	6.8
Small	44.0	33.4	34.3	32.1	30.1	29.4	27.3	38.8	33.2	31.4	32.4	33.1	34.5	38.9
Marginal & small	72.9	37.7	39.0	37.1	34.0	32.4	29.3	45.5	42.1	40.0	40.4	40.5	41.7	45.7
Medium	15.6	21.6	23.2	21.9	22.2	22.9	23.4	19.1	22.7	22.9	23.7	24.1	23.7	22.1
Large	11.4	39.3	36.4	39.6	42.3	43.2	45.6	34.3	34.0	35.8	35.9	35.1	34.6	32
Medium & large	27.0	60.9	59.6	61.5	64.5	66.0	69.0	53.4	56.7	58.8	59.6	59.5	58.3	54.2

Source: IFPRI Farm Survey, 1989/90

functionally landless return higher yields than do large landowners in production of aman and boro rice. (This is because their greater availability of family labor relative to operated farm size translates into a more intensive cultivation of rice land). Second, landless and small farms can sustain themselves at lower consumption of rice from production: our estimates are those of production stocks. Third, possible acceleration in the spread of irrigation infrastructure throughout 1989 and 1990 had made traders, output forecasts relatively optimistic and price forecasts bearish. This would dampen the speculative motive in rice storage during the year under study. Presumably, large farms, the most well-endowed among all farm classes with institutional credit, are the most significant investors in speculative storage.

VI.26 Agricultural Policy Reforms and Rice Stocks

It is now possible to relate this set of results to a wider policy context. Major agricultural sector policy reforms since 1988 have eased on supplies of fertilizer, and of shallow tubewell (STW) irrigation. During the 1990 boro season, STW fieldings were

a healthy 20% up on 1988, the last year before the reform. Fertilizer supplies have risen at a significantly high rate during FY 1990. Real fertilizer price during FY 1990 (fertilizer price deflated by paddy price) was lower during 1989/90 than at any time during the quinquennium through June 1990 (Table 72). Overall, the rice input cost environment was favorable during the year under study as not in a long while. Marginal and small farms who are used to being at a price disadvantage relative to other sizeclasses would, in the first instance, have some of it neutralized by the price breaks, while they would redound to the better off farmers' advantage. However, it is quite probable that large farms are at or a lot closer to their technical ceiling of production than are marginal and small farms. If so, then for a given degree of price break --- which creates incentives for farmers to move closer to their technical ceiling --- small farms would outyield large farms after the price break. (This is because some of the price breaks are not realized by medium and large farms, for the technical reason cited.) Even before these reforms, an inverse relationship between farm size and land productivity (yields) had been a part of conventional wisdom in the literature on resource allocation by agricultural households in Bangladesh (Hossain, 1977). Small wonder, therefore, that these farms have only maintained, their productivity advantage over the large farms, especially in the production of aman rice. Such improved production performance had led to a corresponding food security gains.

To be sure, there is a great deal of inequality of access across sizeclasses to farm rice stocks relative to consumption requirements. Table 71 below shows that, as multiples of monthly cereal consumption requirement of 0.16 MT per person per year, while marginal farms achieve an average of 3.3 months' equivalent of consumption needs in ex-output stocks, the matched number for

Table 71: Farm stocks as multiples of monthly rice consumption, 1989/90

Farm size classes	Carry -in	Nov.	Dec.	Jan.	Feb.	Mar	Apr	May	June	July	Aug.	Sep.	Car-ry out	Average for year through Novem -ber, 1990
Marginal	0.23	4.32	4.76	2.9	1.6	0.8	3.2	6.5	4.8	4.2	3.7	2.4	1.1	3.3
Small	0.81	12.6	11.9	8.9	6.6	4.2	7.3	9.7	7.0	6.8	6.6	4.5	2.5	7.4
Medium	1.3	20.5	19.5	15.8	12.2	8.7	8.6	15.8	12.2	11.8	11.5	7.4	3.4	12.3
Large	2.6	33.1	36.5	31.2	23.8	17.5	16.0	24.6	19.8	18.6	17.4	11.3	5.2	21.3
Overall	1.3	20.2	20.1	16.1	12.1	8.4	10.2	15.9	12.1	11.5	10.9	7.2	3.6	12.3

Source: IFPRI Farm Survey, 1989/90; BBS Agricultural census, 1983/84

Table 72: Fertilizer-Rice Price Ratios in Bangladesh, 1982/83 - 1989/90 (%)

Year	Price of Urea/Price of Rice	Price of TSP/Price of Rice	Price of MOP/Price of Rice
1982/83	62	58	47
1983/84	55	53	43
1984/85	65	66	52
1985/86	63	63	52
1986/87	52	54	47
1987/88	53	56	47
1988/89	50	53	45
1989/90	48	53	44

Note: Every year denotes the period of twelve months through Nov. 14. Both fertilizer prices and rice price are at wholesale stage of respective markets.

Source: All fertilizer prices are from IFDC, and rice prices are from the Directorate of Agricultural Marketing.

the small farms is 7.4, for medium farms 12.3 and for large farms is 21.3.[13] Despite the egregious inequality, all farm classes have one thing in common: every class achieves an increase in the stock-consumption ratio during the year under study, as the carryout stocks are everywhere significantly larger than the matched carryin ratios. Significantly enough, the disparity in stocks-consumption ratio between the landless and the large farms has narrowed over the period under review (compare them for carryout and carryin stocks for the two classes) (Fig. 7).

It is of some considerable interest that stocks gain relative to consumption requirement of the poor farm households even amid vigorous commercialization, as measured by the ratio of gross marketed surplus to output (Table 69).

VI.27 The Determinants of Private Rice Stocks

A simultaneous-equation model of the determination of private stock is estimated. Interactions between private stocks on the one hand, and market supply and government stocks on the other determine market price, too. The model also determines the supply of rice procurement to the government. Model estimation used 3SLS. In model validation, Theil Inequality Coefficient (TIC) was relied on. Because the prediction of rice price is the principal objective of the econometric model, its validation singles out

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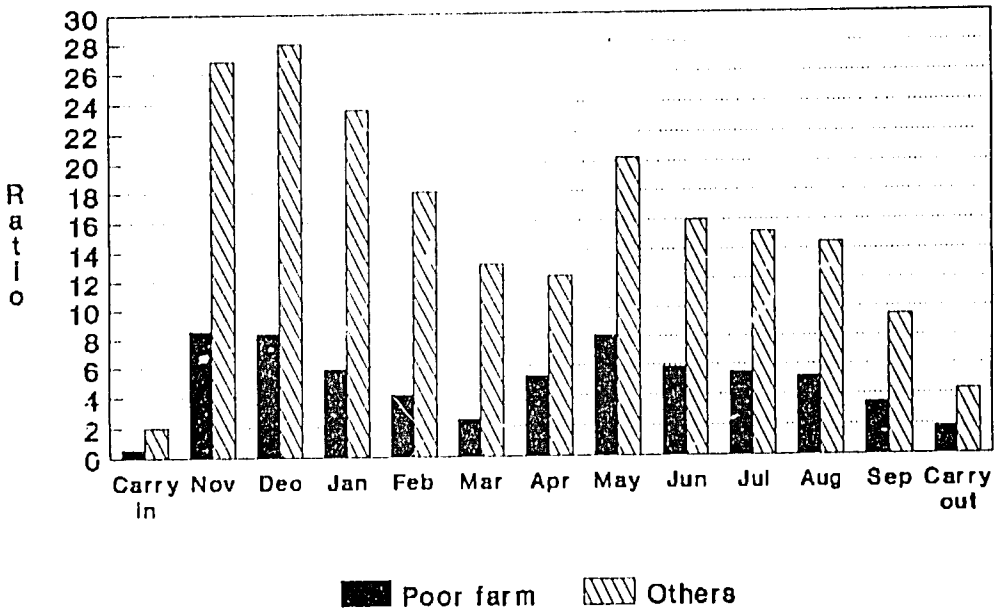
[13]These ratios are not comparable to the stocks-to-consumption ratios for the country as a whole, in Table 68 above. There, consumption requirement related to total population. Here, consumption relates to estimated farm population by four ownership size classes. Number of farms by sizeclasses are from BBS Agricultural Census 1983/84. Population per farm is from IFPRI Farm Survey 1989/90. Therefore, the present estimates are germane to an understanding of food security of people on rice farms. The idea, presently, is to exhibit the stock inequalities in the ownership of rice stocks --- an important measure of wealth --- across farm size classes.

Fig.7: Farm Stocks as Multiple of Farm level Consumption Needs, 1990



price as the crucial variable. That is to say, a model registering the lowest TIC on the price variable is regarded the most valid one. While the details of the model formulation and estimation are presented in Appendix-1 to this chapter, the following are the salient results about how private rice stocks are determined.

Size of harvest directly influences private stocks. For farmers, rice is both a consumption good and a medium of storing working capital. Its stocks thus depend on the seasonality of output. Second, private stocks adjust with a lag: partial adjustment hypothesis is apt in explaining them. Third, lagged rice prices impact negatively on current stocks. This merits some elaborate defense. There seems to be a strong (and direct) wealth effect running from prices to onfarm consumption: the latter appears to be (significantly) upwardly sloped in price.[14] This brings down stocks, with a lag. Public offtake brings private stocks down: this crowding-out effect is quantitatively significant. Controlling for public rice offtake, government rice stocks do not appear to have any perceptible effect on private stocks.[15] Finally, private stocks are significantly lower during the wet (boro/aus) season. This is because the cost of storage

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[14]Rather than being perverse, this finding has an intuitive theoretical foundation. Renkow (1990) has empirically established the existence of wealth effect in onfarm consumption due to price changes in South India. Using data from IFPRI Farm Survey, Chowdhury et al. (1992) have shown that onfarm retention demand for rice is significantly upwardly sloped in price, but that the demand for market purchases of rice is significantly negatively sloped in price. (Both estimates used SURE as the estimator.) Home consumption of own-produced 'surplus" rice, and consumption from market purchases seem to evoke different price responses. As already shown, about three fifths of farm rice stocks originate on medium or large farms, which buy virtually no rice from market. Hence a positive price response dominates.

[15]The main influence of government stocks is on market prices: it lowers them. As seen already, lagged prices impact upon private stocks.

tends to be higher during this season, while the convenience yield from stocks is lower.

The preferred version of the model (Table A6.2), when historically simulated, output TIC values of about 4% for price --- which is rated as good --- and of about 16% for private stocks.[16] Even this is considered good relative to other seasonal models with quantity endogenous variables to predict (see Shahabuddin, 1990). We regard this model valid for purposes of simulations in price policy analyses.

[16]On this, see Chowdhury et al (1992).

VI.28 A Model of Determination of Private Farm Stocks in Bangladesh

In the short run, rice prices have to be seen in Bangladesh as largely determined through a process of interaction between the private exchange system, and the public foodgrain distribution system (PFDS). Rice remains a subsistence crop, with strong interdependence between consumption and production. The private exchange involves a complex interaction between farm-level consumption, storage and marketing decisions, given production. (In a more elaborate model, production would better be considered endogenous.) The PFDS is the locus of a variety of public interventions in the grain markets by way of procurement, offtake, imports and stock decisions.

The need to understand how rice prices form in a framework of a transparent role of public interventions is self-evident, as the resulting public "control" over a major determinant of food security is widely deemed as of considerable importance.

In most recent analytical pricing-policy work one point of departure has been the recognition that public foodgrain stocks are a nodal point of the private-public interactions in the rice market.[17] In particular, Goletti et al. show that for both rice and wheat opening public stocks have an important negative effect on future prices. More to the point, Goletti et al show that current prices of rice increase with future prices. This pair of evidence was posited at the heart of IFPRI's optimal stock model: the intuition was that public stocks could be optimally varied to achieve plausible range of price stability objectives of the

[17]Virtually all of this work has been done at the IFPRI, most recently at the Bangladesh Food Policy Project. See Goletti et al (1991) and Chowdhury (1990).

government. One notable aspect of this IFPRI work was that the determination of rice prices was derived from a foundation of providing for the demand for both final consumption and private storage on the demand side (Goletti et al, 1991, appendix 3). The influence of storage demand on prices was indirectly captured by lagged and future prices, as direct measurements were not available.

There are two main reasons why we must not be content with only having a transparent understanding of how to stabilize market prices through public stock action. We need also to have an understanding, however elementary, of how private foodgrain stocks affects market prices. The first reason is that, by all accounts, the private traders can move their stocks about more cheaply than can the government. If, as would be expected, private storage demand can significantly change prices, at least a tradeoff (option) between using public stock quantity targets and inducing private adjustments to achieve a well-defined price stability objective will have been demonstrated. (Presently, there is no hard knowledge about the private stock - price causality). The second reason is that virtually any worthwhile discourse on price policy begs the question of the <u>level</u> of private stocks.

VI.29 Objectives of this Exercise

The objective presently is to create an understanding of how market prices and private stock interact, amid quantitative public interactions in rice markets.

VI.30 The Analytical Framework

In equilibrium, we posit that demand for rice equates supply for each market,

$$D_t = S_t \qquad (1)$$

In a district level model, market supply derives from net production plus net distribution from the PFDS plus net "imports" from other districts. Or,

$$S_{i,t} = q_{i,t} + O_{i,t} - G_{i,t} + X_{i,t} \qquad (2)$$

where $q_{i,t}$ = rice production at time t
$O_{i,t}$ = rice offtake, monetized plus others
$G_{i,t}$ = procurement
$X_{i,t}$ = net imports from other districts

As pointed out by Goletti et al., the total rice demand equals a consumption demand and storage demand. Or,

$$D_t = C_t + \Delta I_t \qquad (3)$$

Equation 1 implies that supply of rice during any time interval will either go into consumption or be part of demand for stocks

$$S_t = C_t + \Delta I_t \qquad (4)$$

where S = rice supply during period t
C = rice consumption
$\Delta I = I_{t+1} - I_t$ = changes in private stock of rice.[18]

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[18] $\Delta I = \Delta FI + \Delta TI$, where ΔFI = onfarm stock (from production) and ΔTI = trade stocks. For the moment, we assume that farmers and traders display the same causal behavior in matters of rice stock. This may not be a valid assumption, as we shall see later. To anticipate that discussion, traders have a different model of stock behavior from farmers. An aggregate stock model, econometrically, is less tractable. Besides lower accuracy in prediction, farm stocks are the primary, motherlode, version of a country's stock. In Bangladesh, where very little rice is imported, farm stocks evolve into trade stocks over time. These reasons suggest that we estimate the model in three versions: a full model where private rice stocks sum over farm and trade stock, and where market supply

(Footnote contd. overpage)

While we have firsthand estimates of private stocks by districts, consumption is not similarly available. Consumption has to be treated relative to underlying variables, like rice price and district income.[19] That is,

$$C_{i,t} = f_1 \ (P_{i,t}, \ Y_{i,t}, \ P^W_{i,t}) \qquad (5)$$

where $P^W_{i,t}$ = price of wheat

The demand for additions to storage will be sensitive to the difference between expected future prices and current prices (Goletti et al, 1991, p. 31, eq. (8)). Insofar as current-period farm rice consumption is amenable to significant wealth effect, farm stocks may be negatively sloped in lagged prices.[20] Then again, rice stock may widely be perceived as working capital (stock). The availability of such capital resources may be influenced by the seasonal appearance of rice output. Thus, inventories will respond to some version of output, whether lagged or current output. The presence of some processing gestation

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relates to total supply; and a truncated model where only farm stocks are considered, and where market supply is quantity minus public procurement; and a model explaining trade stocks only as part of a economic system. The truncated version returns greater price predictive efficiency.) In this last version, offtake is omitted from market supply, on the ground that the great bulk of rice offtake sidesteps the class of rice cultivators who matter as regards farm stocks for arbitrage purposes. This is admittedly an adhoc procedure. But it is less arbitrary than assuming that supply and demand balance, where changes in stock relates to farm stocks alone.

[19]Presently, we had to omit wheat prices as another underlying variable.

[20]See Renkow (1990) on this point. IFPRI Farm Survey has returned evidence confirming a positive wealth effect on onfarm consumption associated with price changes. Onfarm consumption demand is (significantly) upwardly sloped in market price. In contrast, rice purchases from the market are negatively sloped in prices. Both effects are found to be robust. See Chowdhury et al. 1992.

suggests that it ought to be lagged output. But because this gestation is not well-known, we choose current output. Further, current stocks will also be influenced by public interventions, e.g. offtake and procurement. Finally, private stocks will also be influenced by government stocks.[21] Thus we write

$$I_t = I(Q_t, P_{t-1}, E_tP_{t+1}, O_t, G_t, GI_t) \quad (6)$$

Similarly, $I_{t+1} = g(P_t, E_{t+1}P_{t+2}, Q_t, O_{t+1}, G_{t+1}, GI_{t+1})$ (7)

$$\therefore \quad \Delta I_t = f_1(P_t, P_{t-1}, E_tP_{t+1}, \Delta Q_t, \Delta O_t, \Delta G_t, \Delta GI_t) \quad (8)$$

where E_t is an expectational operator.

The last equation states that changes in stock will depend on current and lagged prices, present expectation of future prices, changes in rate of output, in offtake, procurement, and in public stock. Ideally, we ought to work in terms of changes in stocks. But, unfortunately, the data better sustain a model with stocks measured as levels, rather than changes.[22]

Because public procurement of rice is the major instrument for the mobilization of public stocks, the structure of the model has to have public procurement as an endogenous variable. The

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[21]True, offtake and procurement are closely related with public stocks, as they are connected by the following identity:

$$GI_t = GI_{t-1} - O_t + G_t - L_t$$

where L_t equals losses in storage. Why then are we positing them all in the same equation? The point is that while offtake and procurement are in concept clearly relevant to private storage decisions, given offtake and procurement, closing stock will equal opening stock (net of losses which may be ignored in this discussion). Retaining closing stock is really like retaining opening stocks in this model. It would be odd for the model to not include the public sector initial stock resources. As it happens, the inclusion of procurement in the private stock equation lowers model performance, but that is besides the present point.

[22]Renkow (1990) too had worked with stocks measured as level rather than changes.

analytical foundation of this has been aptly outlined in Goletti (1991). In brief, while the demand for rice in public procurement will be administratively determined as a quantity target, the quantity actually procured by the government depends on the capacity and willingness of the farmer to sell. The capacity to sell is a function of gross marketed surplus. Willingness to sell to government depends on difference between procurement price and open market price. It has been shown that an equation for public procurement which is faithful to profit-maximizing market supply by farmers can be written as follows (Goletti, 1991, pp. 58-59):

$$G_t = g(PP_t, P_t, Q_t, G_{t-1}) \quad (9)$$

where PP_t = Procurement price of rice

Because cross-section data are at use, procurement price will remain unchanged spatially and therefore will have to be omitted.

The term on interdistrict commerce may be expressed as follows:

$$X_{it} = x(P_{j,t}/P_{i,t}, m_{i,j}, \forall_j) \quad (10)$$

This states that shipments of rice from i^{th} region to the jth regions depends on price ratios and the spatial arbitrage costs from i to j. This suggests that, in a cross-section, price determination within regional markets is jointly determined together with between-region market flows. The chief handicap here is data availability. Interdistrict shipments on monthly basis are unavailable.[23] Having failed to deal directly with this problem, a dummy variable approach has been utilized instead.

In a full system, output should itself be deemed endogenous, as it would depend upon current and lagged prices, technology,

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[23]Because a handful of Bangladesh's surplus districts regularly account for a very large production of her interdistrict rice trade, it is not possible to prorate the quantities thus traded on the basis of district level output.

endowment, seasons/weather, price of substitute commodity. That is,

$$Q_t = Q(P_t, P_{t-1}, \Psi, W, E, P^w_t) \quad (11)$$

where Ψ = a technology variable
W = weather
E = Endowment

To keep the analysis relatively simple, we here treat output to be exogenous. We use a district dummy to proxy the influence of technology, endowments and substitute prices, and a seasonal dummy to proxy that of weather and cropping pattern.

With supply and demand balancing, and with supply being exogenous in this monthly analysis, the task reduces into one of tracing how the demand for final consumption and for private stocks interact with government rice procurement to determine price. In effect, we shall estimate a three-equation system dropping regional subscripts:

$$P_t = P(S_t, GI_t, P_{t-1}, I_t, Y_t, D1, D2) \quad (12)$$
$$I_t = I(Q, GI_t, I_{t-1}, P_{t-1}, O_t, G_t, D1, D2) \quad (13)$$
$$G_t = g(P_t, Q_t, G_{t-1}, D1, D2) \quad (14)$$

where, the commodity being rice,
P = rice price
S = market supply
GI = Public stock
I = Private stock
Y = income
G = public procurement
Q = Rice output
O = Rice offtake

D1 = A dummy variable taking the value of 1 for progressive districts, and 0 otherwise

D2 = A dummy variable taking the value of 1 for boro season, and zero otherwise.

Equation (12) tries to explain market price in terms of market supply, public stock, private stock, income, lagged prices, and two dummy variables. Equation (13) tries to explain private stock in terms of seasonal harvest, public stock, lagged private stocks, lagged prices, public offtake and procurement, and the two dummies. Equation (14) explains public procurement in term of seasonal harvest, market price and lagged procurement. The dummies isolates the purely spatial and seasonal influences from the observed causalities.

The data

This is a cross-district, cross-season model, using per capita observations for all quantities. Twenty districts and twelve months through November 1990 are invaded, yielding a total of 240 observations. Endogenous-variables lags caused loss of twenty degrees of freedom. Sample results from IFPRI Farm and Market Survey have been blown up to new district levels. Public rice stocks, offtake, procurement were obtained from the Ministry of Food data.[24] District level income was generated through blowing up sample averages (of farmlevel disposable income) to new-district levels.[25] Data are of monthly intervals. Population data have been

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[24]We are grateful to Naser Fareed of IFPRI/FPMU team for assistance in this regard.

[25]District level incomes thus estimated may not correspond to the matched data from the national accounts for the corresponding period, when they are eventually processed. At the time of writing, district-level product data are not available from the BBS. Use of blown-up income data was due to the want of official output data. We suspect that income data available to us are very

(Footnote contd. overpage)

based on preliminary results form the 1991 census, after some downward adjustment. (The census took place after the year under study). Nine of the twenty districts are dubbed as progressive: they are Thakurgaon, Dinajpur, Rangpur, Joypurhat, Bogra, Naugaon, Rajshahi, Sherpur and Satkhira. Prices used are nominal: this is a cross-section study.

VI.31 Estimation and results

While we report the results of the models of all version, the full as well as the truncated, we will leave it for the reader to glean some key distinctions between the alternatives sets of results. But we anticipate the discussion somewhat by saying our preferred model is reported in Table A6.3. The criteria bearing on this preference will be highlighted below.

The system has been estimated by three-stage least squares. In Table A6.3 in the first equation, we note the following results. All the variables have the expected sign, and most of them are significant. For example, market rice supply and public rice stocks lower prices, while private farm stock build-up raises them. These results are plausible, and corroborate analytically cognate results using more aggregative national data (Goletti et al. 1991, p. 33). The fact that public stocks lower prices while controlling for market rice supply regardless of the aggregation of the data suggest that the interactions between public policy and private response in rice markets survive spatial disaggregation. An aggregate model, like in Goletti et al (1991), is quite legitimate to use. Partial adjustment effect is strongly in evidence for prices, and this is to be expected in a seasonal model like this.

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inadequate. Not unsurprisingly, the coefficient on income was "wrongly" signed. In our preferred version, income was eventually dropped.

Farm stocks move directly with harvest size and with lagged stock. The first reflects the demand for liquidity; the latter is due to partial adjustment. Stocks are inversely related to lagged prices, as was reasoned earlier.[26] It is argued here that this is due to the wealth effect triggered by price changes which positively impacts upon onfarm retention of rice. Stocks are equal to what is not consumed or marketed. Therefore farm stocks are negatively sloped in lagged prices. Farm stocks are negatively related to public rice offtake. (Farm stocks are, rather perversely, negatively related with public procurement, in one version of the model.) Finally, the demand for farm stocks is found to be significantly lower during the boro season than during the aman season. Costs of storage tend to increase markedly during the boro season, while the convenience yield is lower. This explains the purely seasonal difference.

Rice procurement is directly responsive to harvest size and lagged procurement, but it is negatively responsive to market prices.

Chief differences between the model versions are as follows: where as in the farm-stock-only version of the model, all variables in <u>all</u> equations have the intuitive sign (with most significant, too), in the other two versions, several key variables are not (e.g. private stock in price equation, output in the stock equation and procurement equation); the predictive accuracy for the price variable of the models reported in Tables A6.4 and A6.5 are markedly lower than for that in Table A6.3. Prices are more important than either stocks or procurement as model-validation variable.

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[26]This effect is robust with respect to sample size changes (see Table A6.7).

During historical simulations, the preffered version of the model performed fairly well (Table A6.6). For the price equation, the Theil Inequality Coefficient (TIC) was under 4%, while for private stocks, TIC was 16%. The model's reproduction of the stock variable during the historical simulation, in spite of a 16% TIC, is here argued to be satisfactory. Compare the TIC for quantity variables in other monthly models (cf. Shahabuddin, 1990). TIC for procurement is reported at 29%.

The performance of all other versions of the model in terms of the TIC for the price variable was worse. (These models are reported in Tables A6.4 and A6.5 below.)

Table A6.1: Fixed and variable costs by seasons, 1989/90

(Tk.)

Aman season									
	Fixed cost/unit (000s)	Variable cost/unit (000s)	Total cost/unit (000s)	Fixed cost/quintal		Variable cost/quintal		Total cost/quintal	
				own-account milling	all milling	own-account milling	all milling	own-account milling	all milling
Automatic	186	645	831	13.4	8.5	46.7	29.5	60.1	38
Major rice	40	274	314	8.3	6.9	56.4	47.2	64.7	54.1
Small	26	172	198	9.3	7.0	60.6	46.1	69.9	53.1
Kutial	1	12.5	13.5	4.6	4.6	56.6	56.6	61.0	61.2
Crusher	7.6	90	98	4.4	4.2	52.6	50.6	56.9	54.8

Boro season									
	Fixed cost/unit	Variable cost/unit	Total cost/unit	Fixed cost/quintal		Variable cost/quintal		Total cost/quintal	
Automatic	186	494	680	14.1	8.6	39.1	24.1	53.2	32.7
Major rice	40	191	231	10.4	8.6	51.4	42.5	61.8	57.1
Small	26	188	214	7.9	7.0	59.4	48.8	67.3	55.8
Kutial	1	15.3	16.3	3.1	3.1	73.9	73.9	77	77
Crusher	7.6	101.4	109	3.0	2.9	53.4	51.8	56.4	54.7

Source: IFPRI Market Survey 1989/90

Table A6.2: Routewise private movement of rice by season, 1989/90
(000 Metric Tons)

Origin	Destination	Aman	Boro
Thakurgaon	Dhaka	19	13.8
	Chittagong	7	5
	Sylhet	3.5	2.5
	Khulna	1.75	1.2
	Noakhali	1.7	1.2
	Others	1.75	1.2
Total Thakurgaon		35	25
Dinajpur	Dhaka	66	50
	Chittagong	24	18
	Sylhet	12	9
	Khulna	6	4.5
	Noakhali/Chandpur	6	4.5
	Others	6	4
Total Dinajpur		120	90
Rangpur	Dhaka	30	20
	Chittagong	6	4
	Khulna	2	1.6
	Sylhet	6	4
	Chandpur	7	4.8
	Feni	6	4
	Others	3	1.6
Total Rangpur		60	40
Bogra	Dhaka	92	120
	Chittagong	69	90
	Khulna	23	30
	Narsingdi	12.5	15
	Noakhali/Chandpur	23	30
	Sylhet	6	7.5
	Others	6.5	7.5
Total Bogra		230	300
Nougaon	Dhaka	56	60
	Chittagong	35	38
	Khulna	14	15
	Sylhet	7	7.5
	Narsingdi	7	7.5
	Noakhali/Chandpur	14	15
	Others	7	7.5
Total Nougaon		140	150

			Boro
Jaipurhat	Dhaka	24	27
	Chittagong	4	4.5
	Khulna	4	4.5
	Narsingdi	1	1.4
	Noakhali/Chandpur	1.6	1.8
	Others	5	6
Total Jaipurhat		40	45
Rajshahi/C.Nawabganj	Dhaka	30	38
	Chittagong	9	11
	Khulna	12	15
	Narsingdi	3	3.7
	Sylhet	3	3.7
	Noakhali/Chandpur	3	-
	Other	-	3.775
Total Rajshahi/C.Nawabganj		60	75
Sherpur/Jamalpur	Dhaka	81	81
	Noakhali/Chandpur	12.5	12.5
	Comilla	6.2	6.2
	Chittagong	18.7	18.7
	Others	6.2	6.2
Total Sherpur/Jamalpur		125	125
Mymensingh/Tangail	Dhaka	54	72
	Chowmuhani	9	12
	Comilla	4.5	6
	Chittagong	13.5	18
	Others	9	12
Total Mymensingh/Tangail		90	120
Netrokona/Kishorganj	Dhaka	16	60
	Sylhet	11	42
	Chittagong	2	8
	Choumuhani	2	8
	Bhairab/Ashuganj	11	42
	Others	3	10
Total Netrokona/Kishorganj		45	170
Sunamganj/Sylhet	Dhaka	7	17
	Chittagong	38	94
	Chowmuhani/Feni	7	17
	Bhairab/Ashuganj	14	34
	Others	4	8
Total Sunamganj/Sylhet		70	170

			Boro
Barisal/Patuakhali	Dhaka Chittagong Khulna Others	18 6 30 6	6 2 10 2
Total Barisal/Patuakhali		60	20
Grand Total		**1155**	**1445**

Source: IFPRI Market Survey 1989/90

Table A6.3: Determination of Market Price, Farm Rice Stock and Public Rice Procurement, 1990

Variable	Coefficent	T-Statistic
Price Equation		
Constant	5.14	9.59
S	-.11E-01	-8.86
GI	-.20E-01	-2.82
I	.45E-02	3.60
P_{-1}	.47	8.54
SD	.35E-01	.32
DD	-.12	-1.08
Private Rice Stock Equation		
Constant	54.61	3.42
Q	.44	7.58
I_{-1}	.72	16.70
P_{-1}	-13.91	-2.76
GI	1.71	1.46
O	-10.37	-2.76
G	-4.32	-1.37
SD	-17.66	-4.28
DD	2.82	.44
Rice Procurement Equation		
Constant	17.96	2.68
P	-1.88	-2.78
G_{-1}	.80	10.68
Q	.65E-02	.63

Table A6.4: Determination of Market Price, Trade Stock and Public Rice Procurement, 1990

Variable	Coefficent	T-Statistic
Price Equation		
Constant	-7.81	-3.04
S	-.57E-02	-1.98
GI	.75E-02	.48
I	.60E-02	.78
P_{-1}	1.92	6.99
SD	-.95	-3.20
DD	.16	.61
Private Rice Stock Equation		
Constant	-229.30	-3.00
Q	-.46E-01	-.96
I_{-1}	.50	5.73
P_{-1}	26.70	3.16
GI	-2.76	-5.38
O	2.70	1.07
G	9.04	6.13
SD	-14.60	-2.87
DD	-4.23	-1.09
Rice Procurement Equation		
Constant	11.81	3.05
P	-1.25	-3.23
G_{-1}	.80	11.77
Q	.18E-01	2.11

Table A6.5: Determination of Market Price, Combined Private Stock and Public Rice Procurement, 1990

Variable	Coefficent	T-Statistic
Price Equation		
Constant	-7.57	-3.05
S	-.59E-02	-2.00
GI	.10E-01	.66
I	.76E-03	.27
P_{-1}	1.90	7.13
SD	-.97	-3.11
DD	.21	.81
Private Rice Stock Equation		
Constant	131.64	.91
Q	.37	6.00
I_{-1}	.71	14.91
P_{-1}	-9.64	-.59
GI	-.90	-.72
O	-9.19	-2.05
G	2.78	.75
SD	-21.73	-2.58
DD	-6.95	-1.19
Rice Procurement Equation		
Constant	12.01	3.09
P	-1.28	-3.29
G_{-1}	.81	11.89
Q	.18E-01	2.04

Table A6.6: Theil Inequality Coefficients for Endogenous Variables from Historical Simulations Using preferred Model Versions.

Endogenous Variable	When model uses only Farm Stock	When model uses Combined Stock	When only Trade Stocks are used
P	3.9	7.7	7.9
I	16.0	14.0	37.2
G	29	28.8	28.0

Note: Theil Inequality Coefficient is estimated using the formula:

$$T.I.C = \frac{\sqrt{\frac{1}{n}\sum_{i=1}^{n}(PV - AV)^2}}{\sqrt{\frac{1}{n}\sum_{i=1}^{n}(PV)^2} + \sqrt{\frac{1}{n}\sum_{i=1}^{n}(AV)^2}}$$

PV = Predictid value
AV = Actual value

Table A6.7: Robustness of the Regression Coefficients of the Model

Variable	Sample = 200		Sample = 180	
	Coefficient	T-Ratio	Coefficient	T-Ratio
Price Equation				
Constant	205.308	9.858	209.989	9.046
S	-.39506	-7.944	-.3896	-7.312
GI	-.72398	-2.460	-.8447	-2.519
I	.16622	3.362	.1959	3.627
P_{-1}	.4303	7.444	.41164	6.361
SD	-1.2898	-.302	-1.8460	-.405
DD	-5.5389	-1.191	-6.3085	-1.239
Stock Equation				
Constant	96.3283	5.044	105.504	4.929
Q	.39656	8.448	.40715	8.053
I_{-1}	.7407	17.111	.73099	15.410
P_{-1}	-.19811	-3.569	-.22414	-3.598
GI	.2175	.781	.25955	.814
O	-8.002	-2.713	-8.0225	-2.613
G	-2.2	-.99	-2.3	-1.01
SD	-16.513	-4.123	-17.6582	-4.095
DD	-4.6909	-1.031	-5.2304	-1.037
Procurement Equation				
Constant	16.704	2.261	18.483	2.273
P	-.04787	-2.361	-.05338	-2.372
G_{-1}	.8567	11.402	.8650	11.052
Q	.01047	.972	.010192	.897

A Model of Joint Determination of Private Stocks

The objective of this appendix is to estime a household-economic model of the joint determination of *onfarm consumption*, *marketed surplus*, stock of rice, and of the casually-hired labor input in farming. The basic theory is spelt out in Singh, Squire and Strauss, 1986. Other contributions in this genus are Renkow (1990) and Strauss, 1986. These results extend an earlier paper recently completed at Bangladesh Food Policy Project by Chowdhury, Ahmed and Goletti (1992). Suffice it for the present that the estimating equations come out of a model where, over two periods and given two commodities, viz. rice and a composite one, households maximize expected utility subject to a budget constraint specified in terms of full income and expenditure.

In all, four equations were jointly estimated using generalized least squares:

$$C = f_1 (P, Q, I, OY, FMEM, AFLDEM, D_1) \quad (15)$$

$$M = f_2 (P, Q, Q^2, C, CRDT, RIRAT, NGOD) \quad (16)$$

$$I5 = I + Q - M - C \quad (17)$$

$$CLDEM = f_3 (I5, P, AFLDEM, IRGN, D1) \quad (18)$$

where

FMEM	=	Number of members of the farm family
Q	=	Rice harvest (mds) in Paddy equivalent
INCNE	=	Non-rice income (Tk.)
P	=	Paddy price (Tk.) per md
I	=	Opening stock, mds, of paddy
AFLDEM	=	Number of days of labor input by attached farm labourers
DD	=	A district dummy taking value of 1 for progressive districts, and zero otherwise

Q^2	=	Q x Q
C	=	Rice consumption, mds, in paddy equivalent
RIRAT	=	Ratio of rented-in land (%)
TCRDT	=	Total credit absorbed, Tk.
NGOD	=	A dummy variable taking the value of 1 in region with credit-giving non-governmental organization (NGOs), and zero otherwise
I5	=	Closing stocks, mds., of paddy
IRGN	=	% of irrigated area
M	=	Marketed surplus
CLDEM	=	Number of days of casual-laborer input

A few theoretical comments below attempt to rationalize the specification of this system. Rice features strong interdependence of consumption and labor: it is a wage good but is also a medium of payment for production input in farming. The demand for own-account production depends on both the level of income, as well as how such income is earned, in particular, how labor allocation decisions are made in farming. To employ casual workers entails making kind payments, which implicate retention of onfarm rice stocks. The maximization of utility (through consumption) is entwined with the allocation of all household resources (labor, commodity stock liquidity, credit and infrastructural services). Hence the case for a joint determination of consumption, market supply, closing stocks and labor demand amid a battery of price, production, household, infrastructural and locational variables. Rice consumption is introduced in two versions, viz. consumption from own-account production, and consumption from market purchase. For each season, therefore, the system is estimated twice over.

The first equation states that onfarm consumption from production depends upon initial stocks, rice income (proxied by harvest size), prices, household size,nonrice income, labor input in farming, and a district-level dummy variable. The second equation states that market supply is a function of size of

harvest, a square term defined on size of harvest, prices, onfarm consumption, the proportion of rented-in land in operated area, total credit absorption, a dummy isolating the effect of the presence of NGO-type credit institutions.

The third relation, an identity, merely states that, given opening stock and size of harvest, onfarm consumption and market supply determine closing stock.

The fourth equation states that casual labor input is a function of product price, closing stock, labor input by attached farm laborers, and the extent of the diffusion of irrigation.[27]

The model was estimated by Seemingly Unrelated Regression Estimators (SURE). This is most appropriate because the equations are related through nonzero covariances associated with cross-equation errors. This arises because consumption, labor demand and marked supply are all related through the budget constraint.

RESULTS AND DISCUSSION

The most noteable result from model estimation is that the determination of farm stock using the interactions posited in this model is econometrically tractable. The Theil Inequality Coefficients (TICs) computed for onfarm consumption demand is 14%, and for 13.7% for marketed supply. For a cross-section exercise, this we believe, is satisfactory. TICs computed for rice stocks and casual labor demand are 40% and 35%, respectively.

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[27]Casual labor demand has an apparently perverse (but insignificant) positive coefficient with regard to wage rate. It is dropped from the estimating system. During the "base run", it turned out that this did not matter to the predictive accuracy of the model.

Onfarm consumption is significantly upwardly sloped in price: this suggests a strong direct wealth effect[28]; it is output responsive, too. Market purchase, in sharp contrast, is significantly negatively sloped in price. Labor demand is a significant shifter of consumption demand, as is the size of farm family. Initial stock endowment directly affects consumption.

Marketed surplus during aman season is upwardly sloped in price: the price response is significantly positive. In the aman season, market supply increases more than proportionately to output. In both seasons, market supply falls with onfarm consumption. In the both seasons, credit access does not exert any influence on market supply. But in the boro season, NGO dummy has a significantly positive coefficient, implying that NGOs help poor farms improve production performance, and thus raise their commercialization. In the boro season, the proportion of rented-in land lowers market supply.

Labor demand is directly influenced by the closing stock, the diffusion of irrigation and the labor input by AFLs. Product price has a positive but insignificant coefficient in labor demand function. In particular, the significant independent role of rice stocks on casual labor demand arises probably due to the following effect. Pavailability of onfarm rice stocks translates into an *price effect*: working capital is cheeper for farm endowed with own-account wage good stock, than for farms who have to contract credit, which cost resoarces, and/or buy grain at *higher* market prices (which include marketing margins). This enables the former to produce higher up the production function, employing more units of labor per unit of land. (Though farm operated area is not included in the system, output (Q) is, the latter being a proxy for

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[28]This provides an empirical foundation for the finding reported in Appendix 3 about the demand for district-level private stocks being negatively sloped in lagged prices.

the former.) This suggests another thought. HYVs, supported by the seed-fertilizer-irrigation package, increases the demand for labor directly. But, it has a "second round" positive effect upon the demand for labor due to the greater availability of farm rice stocks. The combined effect availability of farm rice stocks. The combined effect of the HYV-package on labor demand is likely to be higher than due only so far spread of irrigation: this combined effect was so far substatively ignored in the existing studies of farm technological change and labor market process.

Table A6.8: Joint Determination of Rice Consumption, Market Supply, Stocks and Labor Demand, 1990, Using SURE.

Variables	Aman Season		Boro/Aus Season	
	Consumption from own Production	Consumption from Market Production	Consumption from own Production	Consumption from market purchase
	Coef.t	Coef.t	Coef.t	Coef.t
ONE	-127.88*	57.45*	-283.18*	223.11*
FMEM	93.58*	5.15*	152.29*	13.41*
Q	1.28*	-0.31*	0.99*	-0.21*
INCNE	0.00000142	-.0000006	-0.0005	0.0007*
P	0.88*	-0.21*	1.14*	-1.13*
I	-2.18*	1.87*	0.59*	-0.2
AFLDEM	0.11	0.6*	1.05*	-0.06*
DD	-2.09	0.79	53.47	-12.99
ONE	-6.6	-14.11*	-5.47	34.6*
P	0.05*	0.03	0.04	-0.16*
Q	0.55*	0.47*	0.79*	0.74*
Q2	0.0002*	0.0002*	0.0002*	0.0002*
C	-0.23*	-0.21	-0.01*	-0.15*
RIRAT	0.72	-0.15	-12.66*	-10.44*
TCRDT	0.000005	-0.00002	-0.00004	-0.00007
NGOD	-0.02	-0.03	6.9*	7.18*
DD	1.8	4.44*	7.75*	3.12*
I	0.09	0.29	0.05	0.05
Q	0.32	0.29	0.17	0.12
C	0.002	0.07	0.001	0.01
-M	-0.01	-0.06	0.07	0.02
ONE	-19.02	-8.59	31.78	46.65*
P	0.1	0.07	0.14	0.07
I5	1.77*	1.7*	3.68*	3.89*
AFLDEM	0.13*	0.13*	0.07*	0.66*
IRGN	55.28*	55.6*	3.004	2.52
DD	-4.46	-4.6	-1.44	-4.75

Note: * denotes that coefficient is significant at 5% error probability level.

Source: IFPRI Farm Survey 1989/90

Table A6.9: Mean value of the variables in the model

Variables (units)	AMAN SEASON	BORO/AUS SEASON
Home consumption (C) (kg)	963.18	1530.85
Purchase from market (CONM) (kg)	39.26	61.17.
Marketing (M) (kg)	56.82	96.8
Closing stock (I5) (Md)	38.48	14.97
Casual labor demand input (CLDEM) (Mandays)	121.85	125.73
Size of family (FMEM) (Persons)	7.98	7.96
Attached farm labor demand (AFLDEM) (Mandays)	133.21	189
Output (Q) (Md)	123.85	124.43
QQ (Md)	27927.87	30394.78
Opening stock (I) (Md)	6.36	36.86
% of rented-in land (RIRAT)	0.14	0.15
Total credit (TCRDT) (Tk.)	2210.9	3421.52
Price (P) (Tk./Md)	208.5	200.1
Proportion of irrigated area (IRGN)	0.66	0.27
Non rice income (INCNR) (Tk.)	111574.9	15557.5

VII PRICE FORMATION AND MARKET INTEGRATION

The principal objective of this chapter is to study the formation of rice retail price in Bangladesh. An associated goal is to test hypotheses regarding market integration. Towards the first goal, we estimate marketing margins on coarse rice for the year through November 1990. Knowledge about marketing margins is of direct relevance to the appropriateness of prevailing *modus operandi* of Open Market Sales (OMS). Towards the second objective, we conduct a series of F-test involving unrestricted forms, and restricted ones embodying a variety of integration hypotheses.

The chapter is structured as follows. First, we report estimates of instantaneous margins on coarse rice. Second, estimates of temporal-cum-spatial margins are reported. In this connection, we establish a typical storage period reflecting prevailing storage costs and seasonality of prices. Third, price relativity among grades of rice is examined. Fourth, real rice price during fifteen years through 1989/90 are reported for SR areas, non-SR areas and for the economy as a whole. Finally, rates of profits earned by rice market agents are estimated for the study year. The competitiveness of these rates of earnings is then appraised.

VII.1 Marketing Margins for Milled Coarse Rice

Marketing margins are closely related to the overall cost of distribution, where costs are estimated to include "normal profits" and premia for risk-taking. There are two main reasons why knowledge of marketing margins (MMs) for rice is important in this study. First, MMs are an important description of the price formation process in a given market. When most transaction margins are calculated by participants in a proportionate manner, the ensuing data can be so stacked in a manner that makes transparent the division of the price of the product into each stage of the

marketing process. That description has some distributive appeal in food policy discourses. Second, an assessment of MMs for coarse rice in Bangladesh was mandated in the implementation plan of the Bangladesh Food Policy Project. This is because current modus operandi of the Open market Sales (OMS) of foodgrain by the Government of Bangladesh incorporate assumed marketing margins which serve to set public issue prices off from procurement prices. There is currently a lack of consensus between the Government and the USAID as to adequate margins. The issue set off in 1987, when the Government lowered the price spreads from the theretofore 20% and 15% in the Statutory Rationing (SR) areas and non-SR areas, respectively, to 15% and 10%, respectively.[1]

The prescription by the World Bank of the 20% and 15% price spread did not come out of any indepth study of realistic costs and returns of private marketing. The only evidence forwarded by the World Bank was that percentage increase in average prices in the lean-season in October over the postharvest price lows was one of about 20% on average. There are two main concepts of marketing margins (to be defined below) viz. spatial margins and temporal margins. Clearly, the Bank was using the concept of purely

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[1]For a brief review of the circumstances leading the Government upto this, see Hooker, 1989. At this juncture, it may be apt to report briefly how the OMS has evolved. In 1979, the Government instituted the OMS as a way of containing lean-season price hikes. The determination of trigger prices implicated an assessment of competitive price spreads. The World Bank had reasoned that a margin of five-percent-per month was a good approximation, and that intervention would be warranted for a maximum period of 4 lean months, mainly July through October. This pointed up an overall market margin of about 20%. Between 1980 and 1987, the initial trigger price in OMS (called initial OMS price) remained pitched at 20% higher than the procurement price in SR areas: when market (wholesale) prices exceeded a level 20% higher than procurement price, Government would start to release rice through the OMS at that same price. Intervention would cease if market price slipped to below the initial OMS price. For every 10% increase in the market price beyond the initial OMS price, issue price in OMS would increase by one half as much. For other than SR areas, the price spreads assumed were those of 15%.

temporal margin. But, equally clearly, the margins that may be factored into a price stabilization scheme should be closely related to the *prevailing* spatial and temporal *pattern* of private storage and distribution. The need to make some margin assumption arises because the trigger prices are not to be so set as to crowd private marketing activity. Knowledge of prevailing private marketing margins is a moot issue in this connection, as is that of prevailing spatial and temporal pattern of private storage and distribution. As such, the margins in the OMS should be spatial plus temporal margins.

VII.2 Some Definitions/Analytical Issues

Spatial margins are measured by differences between prices prevailing at successive stages of marketing on the same date. (These are also sometimes called instantaneous margins.) *Temporal margins*, on the other hand, refer to the differences between the prices prevailing at a particular stage of marketing during a period, and the price paid for it at the preceding stage during an earlier period, the time lag being the average storage period typical of the market agent at issue.[2]

VII.3 Unidirectionality of Grain Flow

Assumptions regarding the direction of price formation are crucial in estimating marketing margins. It is assumed here that for both Statutory Rationing (SR) and non-SR area markets, the flow of stalk paddy is from rural areas to centers of milling located in secondary markets. Subsequently, the flow of rice is from these markets to major urban markets and to markets in district headquarters.

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[2]Average storage period is estimated subsequently.

A year round unidirectional flow of rice from the countryside to the cities, varying perhaps in magnitude over an entire marketing year, is assumed to occur. This seems to be the only reasonable assumption to make. The alternative assumption, that, during a part of the marketing year, milled rice flows back on a substantial scale from the urban markets to rural markets would appear quite implausible under Bangladeshi circumstances.

As far MMs are concerned, one primarily has to compare farmgate prices with retail prices in representative groups of markets in SR and non-SR areas. This version of the MMs is estimated separately for the aman and boro seasons.

At this juncture some discussion seems appropriate as to the direction of price formation among various SR areas.

Among the SR areas, all except Rajshahi are situated within rice-deficit districts: they, with that one exception, are net importers of rice from the surplus districts. The assumption of an unidirectional flow of paddy/rice from the surplus districts is tenable.

In the SR areas other than Chittagong, parboiled rice is preferred. The direction of the price formation in these markets is from the centers of milling of parboiled rice in the North-West (NW) and North-Central (NC) districts of Bangladesh, generating by far the greater part of her rice surpluses.

Among the non-SR areas, it is assumed that markets in greater Sylhet prefer unparboiled rice, while the all other areas mainly consume parboiled rice.

Given the assumption of unidirectional rural-to-urban marketing model, it is proper to estimate marketing margins by comparing average retail and farmgate prices within the aman and

boro marketing seasons, allowance being made for average storage period in both cases. The rationale here is that urban prices are equal to stalk paddy prices in terms of rice equivalent, plus the marketing margin. The economic rationale is that urban demand adjusts to rural supplies.

The margins are computed using both cfficial outturn ratio averaged over various milling technologies, as also outturn ratios generated by the IFPRI Market Survey. Percentage price spreads can be unambiguously compared across time. This is why they are used more widely in the literature, and in the practice of price policies in developing countries. In this report, proportionate marketing margin (PMM) is the more relevant concept to estimate. In symbols, (where all prices are in rice equivalent):

$$PMM = \left(\frac{P_r - P_f}{P_f}\right) x100$$

where P_r = average retail price in SR areas for a reference rice variety during a market season;

P_f = average farmgate price of stalk paddy, for comparable variety, during the same market season.

P_p = procurement price of paddy

VII.4 Measurement of Key Variables

The choice of measures for the market determined price variables is crucial to the validity of results. We used as weights rough estimates of 1989/90 urban population by all SR and non-SR regions on the sample of IPFRI Market Survey. The districts not on IFPRI sample were excluded from our estimates. This is unlikely to be a serious handicap, because virtually all important cropping variations in the country were included.

VII.5 Market Seasons Defined

Demarcation of the marketing seasons has already been delineated earlier. To recapitulate, for the reference year 1989/90, the period from Nov. 15 through Apr. 14 was defined as the aman marketing season. In terms of Bengali calendar, this is from Aghran to Chaitra. The following seven months, Baisakh through Bhadra -- or April 15 through November 14 -- is treated as the boro marketing season. During the last two months of this period a relatively small quantity of Aus rice is marketed. But because the greater bulk of the marketings is of boro variety, it is proper to treat this whole period of seven months as being the Boro market season.

VII.6 Estimation of market margins

For estimation of instantaneous margin, storage period is assumed to be zero. For temporal-cum-spatial margins, storage period is assumed to equal one month. Subsequent computations are used to argue that, for much of rice-surplus North-western part of Bangladesh, the returns to storage for longer than one month period are, quantitatively, insignificant. On this basis, we compute temporal-cum-spatial margins as though storage period is of a month's duration.

VII.7 Instantaneous Margins for Milled Coarse Rice

Table A7.1 presents average farmgate prices of coarse paddy in sixteen sample markets representing non - SR new districts in the year through November 14, 1990. These are weighted averages for the sample, weights being establishment - level (coarse) variety - specific quantities transacted. Table A7.2 presents average retail prices of coarse milled rice in these sample markets for the same months. These data permit the computation of seasonal average farmgate price of paddy, and retail price of rice. After some

suitable conversions, a comparison between these prices yields instantaneous marketing margins.[3] For SR areas, retail prices were obtained from BBS.

Table 73 reports the alternative versions of instantaneous PMMs. Alternative estimates reported follow from combinations of different estimates of outturn ratios: PMMs are lower when the outturn ratios per Government's own stipulations are used than when prevailing outturn ratios are used. This is because increases in outturn ratios, reflecting higher recovery of rice from given quantity of paddy, *lowers* the cost of purchase in units of rice price: hence, given the retail price, marketing margins increase.

Table 73: Alternative estimates of marketing margins for coarse rice, SR and non SR areas, 1989/90, (%)

Basis of computation	SR area	Non-SR area
1st Basis: Govt. outturn ratio is used	22 (17)	17 (12)
2nd Basis: IFPRI estimate of outturn ratio is used	27 (22)	22 (17)
3rd Basis: Against procurement price (PP)	19 (15)	15 (11)

Note: For assumptions made, see the text. Figures in parentheses are PMM when they are calculated upto the wholesale stage.

Source: Author's calculation

[3]Farmgate prices, when divided by the rice-to-paddy out turn ratios, are converted to rice equivalents. The difference between the retail price and the corresponding rice-equivalent farmgate price, when divided by the latter yields the marketing margin.

It appears from Table 73 that even instantaneous MMs using Government- assumed outturn ratio are 17% for non - SR areas and 22% for SR areas. They are 22% and 27% for these two groups of markets when prevailing outturn ratios are factored in. Marketing margins are the lowest when the denominator is the procurement price. Current margin assumptions of the OMS program are lower than any pair of estimates of this table.

Percentage temporal cum spatial margins can only be higher than the PMMs computed above. This is because actual storage period on IFPRI sample is positive. Current margins assumptions of 10% and 15%.

VII.8 Temporal-cum-spatial margins: what is a storage period?

Several factors bear upon what arbitrageurs typically treat as the storage period. First, it relies heavily upon the seasonal pattern of production. Where, as in the present case, consumption demand for the storable good is seasonally stable, the crop season with the largest proportion of the total annual output would be the most relevant determinant of the storage period. This is especially so if the produce in quantitatively the most important season is also of the most preferred grade in consumption. For in this case, the trade would be induced to build-up stocks to arbitrate over a longer period, that is, even long after the production season is over. Second, cost of storage would play a part: such costs would depend on physical storage facilities, the extent of seasonal quality deterioration, and the cost of capital. The third factor is the traders' informational inefficiency, or, in more general language, the trader capability in anticipating supply and demand at different points of time in future. Finally, there are real or perceived inhibitions to profit-maximizing stocks maintained by stockists that result from government policies.

Seasonality of the production of rice in Bangladesh has evolved. The aman crop, harvested during November through early January is followed by the HYV-boro season --- which accounts for nearly two-thirds the size of output during aman season --- during May-June and then by the aus season during July-August. HYV-boro is a major crop in quantitative terms, and its appearance beginning from May perceptibly lowers prices. The HYV-boro paddy is also fairly heavily marketed. Traders will have strong business incentives not to invest in stocks comprising coarse aman grains well before the onset of the boro season. During the first four months of the boro season, namely, May through August, prices have tended to seasonally collapse, as can be measured from seasonality factors of less than unity for these months (Table 74).

These low seasonality factors suggest that storage demand by the trade during these months do not firm up by enough to prevent a seasonal slippage in prices.[4]

The upshot must be that, in 1990, the period of storage by arbitrageurs in private trade is quite small, perhaps an average of one month or so. This is confirmed later through a comparison between prevailing storage cost and price seasonality.[5] If this

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[4]The presence of these low-price phases in seasonality translates into windows of opportunities for traders buying up grains stocks during June-July, and then unloading their stocks during September-October. But the evidence suggests that such arbitraging stock operations are practised by the traders to some extent. During May-June, traders absorb a net stocks on the order of 0.6 MMT out of the boro market arrivals. But these additions are unloaded during July-August and August-September (Table 68). The storage period for these quantities of grains is at most two months. The number of market participants who store out of arbitrage motives appear, by all accounts, to be small.

[5]This compares with a typical storage period of 7 or 8 months for the erstwhile East Pakistan during the 1960s (Farruk, 1972, p. 76). To quote: "Except for the Boro-growing districts of Sylhet and Mymensingh, the harvest of aman has to be stored and marketed

(Footnote contd. overpage)

seems a for cry from 1968, this indeed is a measure of the profundity of changes regarding seasonality of production and the dim prospects of profitability of speculation in rice stocks.

Table 74: Seasonality factors in coarse rice price, Bangladesh 1973-1990

Months	1973-77	1978-82	1983-87	1988-1990
November	93.1	96.7	99.5	96.8
December	87.1	91.8	94.5	94.8
January	82.1	95.9	98.3	97.7
February	98.5	100.7	99.3	103.9
March	104.6	105.3	104.5	107.1
April	107.3	110.6	106.8	107.1
May	102.0	101.6	99.6	98.9
June	100.5	100.0	97.7	94.8
July	102.3	100.0	98.3	97.1
August	99.5	97.4	98.3	98.2
September	103.4	101.2	102.3	100.5
October	103.4	101.2	102.3	100.5
Difference between max. and min.	20.2	18.8	12.3	12.3

Note: For a description of the method used, see Pindyck and Rubenfeld. It is a version of moving average method. Seasonality factors thus computed are unit-free, and can be compared within a crop year. Difference between the higher and low seasonal factor is a rough indication of the severity of seasonal fluctuation.

Source: Price data obtained from Directorate of Agricultural Marketing.

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until the Aus variety comes on to the market after 7 or 8 months. In such areas the logical storage period would be about 8 months" (p. 76).

VII.9 Quantitative Estimate of Storage Period

Towards this end, we first of all evaluate various components of storage costs. Subsequently, we estimate the prices at the end of assumed storage periods estimated on the basis of the storage costs alone. That is, these estimates are cost-driven. Finally, we express actual prices during those months relative to the above estimates, and on that basis pronounce whether pure speculation in grain pays for itself. On that basis, profit-making (or loss minimizing) storage period is determined.

VII.10 Components of Storage Cost

Rent: Very roughly, we estimate godown rents at about Tk.1.3 per maund per month. This estimate is based on the replacement cost of godown storage facilities in existence with a representative variety of rice millers and traders through-out Bangladesh. However, this is an average over the entire sample. In actual computations, we use regionally different godown rents.[6]

Interest on capital: what interest rate should be used fundamentally depends upon the sources of the invested funds. Credit markets may be perceived as being fragmented: the rates charged by scheduled banks on shortterm advances, currently about 16-17%, may be as little as one half the rates prevailing in the informal markets. Inevitably, the former would be higher than those allowed by the scheduled banks on one-year deposit

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[6]Some authors used the same godown rents for all markets, regardless of their location (see, for example, Farruk, 1972, p. 78). Of course, it is absurd that godown rent in Badamtali, Dhaka, can ever be the same as in Banaripara, Barisal. Because Farruk's results regarding expected seasonal prices for all markets reflect the <u>same</u> costs, the differences between them and prevailing prices can be overstated or understated for particular markets, depending on whether prevailing godown rents are higher or lower than those assumed.

instruments, currently at about 11-12%. Which rate is one to use? Only a small proportion of rice traders on the IFPRI Market Survey sample accessed bank credit, while a larger proportion accessed no-interest informal-market credits. We compute weighted average costs of capital for the various regions on the IFPRI Market Survey districts.[7] The rate we used came to an average of 20% with a dispersion of about 8 percentage points.

Depreciation of the bag: A gunny bag lasts an average of three years, and a bag would probably on average be rebagged between forty eight to fifty times during that span of time. In 1989/90, a B. Twill gunny bag had a retail price of Tk. 29.10. A depreciation of Tk. 0.80 per month or of Tk. 0.40 per maund per month would be a reasonable rate of depreciation.

Losses in storage: Losses range from the qualitative (discoloration and the like) to the quantitative, associated with rodent attack, and weight decline due to dehydration of grains. The first kind of loss is ignored here: the determination of efficient storage period is so done by astute traders as to preclude the occurrence of quality loss.[8] Of the two kinds of quantitative loss, the weight loss is indeterminable (Farruk, 1972, p. 80). Besides, as rice stored has less moisture due to storage, it is usually worth more.[9] The loss due to attack and infestation by rodents, insects and bacteria has recently been estimated. Farruk's interviewees estimated such losses at between 2.5 and 3%

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[7]Farruk had used the same cost of funds for all study markets.

[8]Such a perceptior is ventillated by Farruk, too (1972, p. 79).

[9]When corn, for example, is artificially dried at elevators in the US, total costs of drying and storage should also reflect the change in value due to drying compared with taking a discount for moisture. See Shepherd and Futrell, 1968, p. 437. But data limitations suggest that this fine point is best left alone as a source of very small bias to our results.

per annum. Estimates for the US vary from 1.5% per year to 1-3% for India (Hall, 1970, Tables 4 and 6). A recent study estimated trade storage quantity loss at an equivalent of 1.68% per annum for Bangladesh (Uniconsult, 1991, p. xiii).[10] We use this last estimate in our own computations.

Where seasonal price increases are merely dependent on the cost of storage, such increases may be evaluated by the following relation:

$$E(P_t) = P_o + \sum_{i=1}^{t} (R+D)^i + \sum_{j=1}^{t} P_o\,(i+l)^j$$

where,

E(P)	=	price per maund of rice expected to prevail on the basis of cost of storage;
P	=	realized price per maund of rice at initial period
R	=	godown rent per maund per month (Tk.)
D	=	depreciation on gunny bags per maund per month (Tk.)
i	=	opportunity cost of capital (% of rice price) = 20%
l	=	storage loss (%)
t	=	storage period (months)

We further require that the variable

[10]The Uniconsult study reported average storage period of from 2-3 months, and losses of .35% for such an average period. This translates into an equivalent annual rate of 1.68%.

$\Delta P_t = P_t - E(P_t)$ can be negative, zero or positive depending upon returns to storage.[11]

VII.11 Results and discussion

The results of the analysis are presented in Tables 74 and 75. Estimates for which t_o is November and January, respectively, are for the aman market season, while all the rest are for the boro season.[12]

The results may now be summarized. First, in the North-West Bangladesh, for 16 out of thirty-nine possible cells returns to storage per month of storage period are negative (Table 75, top panel). For the other 23 cells, six have returns to storage per month of storage period of less than 0.2% of product price. On such showing, returns to seasonal *storage* do not appear attractive for the major surplus region, viz. North-West.

For the other important source of surplus rice, viz. Sherpur returns to storage is negative in five out thirteen cells. Similarly, returns to storage in Satkhira and Barisal in the boro

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[11]On this point, Farruk was clearly in error. He argued that ΔP_t (SRP_{2t} in his terminology) should be equal to zero under prefect competition, implying that seasonal price increases just equal the sum of above storage cost items (Farruk, 1972, p. 80). But he misses the point that prevailing seasonality of prices must of necessity involve risk-taking in storage, calling for some normal *return*, which he did not include as another normal cost item.

[12]One caveat may now be entered. One chief reason why these estimates are being reported is in order to evaluate the length of a typical storage period. Because we had the cost of storage data, on which these computation turn, for 1989/90 only, these numbers are reported for that year, too. The conclusion we derive is, quite naturally, influenced by the seasonal price increases characteristic of 1989/90, too. But note that 1989/90 was a year with good crops in all three harvest seasons. The seasonal increases in prices were rather subdued, especially in the surplus districts.

season are uniformly negative.

Returns to storage in Comilla and even in Noakhali are negative. Sylhet is the only district where returns to seasonal storage are clearly positive.

The conclusion from this is that the typical storage period in twelve months through November 1990 is unlikely to be significantly greater than one month, if at all. Traders and millers are not bullish in the study year on speculation in stocks. Instead, they seek to earn profits through spatial arbitrage as intensively as allowed by the marketable paddy surpluses. This empirical conclusion bears upon temporal marketing margins, to which we may now turn.

Table 75: Seasonal increase in price realized as % of expected price under alternative storage periods, major assembly markets.

Markets	t_0 = November		t_0 = January		t_0 = Apr			t_0 = May			t_0 = June		
	Feb.	Mar.	Feb.	Mar.	Aug.	Sep.	Oct.	Aug.	Sep.	Oct.	Aug.	Sep.	Oct.
North-west													
TG-Rangpur-Dinajpur	0.24	0.46	-0.30	-0.15	-4.39	-0.52	-0.08	-4.39	-0.52	-0.08	0.36	4.33	4.70
JP-Bogra-Naugaon	0.97	1.72	0.61	1.28	-1.25	0.39	2.89	-1.34	0.30	2.79	-0.40	1.18	3.62
Rajshahi-Pabna	-0.03	-0.0005	0.24	0.19	-1.28	1.25	2.23	-2.76	-0.26	.76	0.79	3.29	4.29
North-central													
Sherpur Mymensingh	2.97	3.01	-0.15	-0.17	2.23	0.15	3.53	-0.57	-2.23	.71	1.25	-0.52	2.40
East													
Sylhet	1.02	1.87	.48	1.18	1.0	4.1	3.8	1.15	4.1	3.8	1.0	3.95	3.51
Comilla	-2.0	-1.58	-.19	.13	.55	-1.3	-.86	.61	-1.12	-.74	-.58	-2.36	-2.0
Noakhali	3.55	3.57	.37	.24	-4.1	-1.89	-2.9	.22	2.45	1.29	-1.03	1.1	-.11
South-West/south													
Satkhira	2.96	3.49	1.22	1.60	-1.37	-3.03	-3.15	-.81	-2.5	-2.73	-.13	-1.96	-2.21
Barisal	.35	1.64	.68	1.82	-1.14	-3.79	-3.96	.29	-2.47	-2.71	1.82	-1.05	-1.36

Source: Author's calculations, using data from IFPRI Market Survey, 1989/90 and trade sources.

Table 76: Seasonal increase in price realized as % of expected price per month of storage periods, major assembly markets.

Markets	t_0 = November		t_0 = January		t_0 = Apr			t_0 = May			t_0 = June		
	Feb.	Mar.	Feb.	Mar.	Aug.	Sep.	Oct.	Aug.	Sep.	Oct.	Aug.	Sep.	Oct.
North-west													
TG-Rangpur-Dinajpur	.08	.115	-0.30	-0.075	-1.10	-.104	-0.013	-1.46	-.17	-.027	.18	1.44	1.18
JP-Dogra-Naugaon	.32	.43	0.61	0.64	-.31	.078	.48	-.45	.10	.93	-.20	.39	0.90
Rajshahi-Pabna	-.01	-..	0.24	0.095	-0.32	.25	.386	-.92	-.09	.26	.395	1.10	1.07
North-central													
Sherpur-Mymensingh	.99	.75	-0.15	-.085	.56	0.10	.588	-.19	-.74	.24	.625	-.17	.60
East													
Sylhet	.34	.47	.48	.59	.25	.82	.63	.38	1.04	.76	.50	1.32	.88
Comilla	-.68	-.39	-.19	.07	.09	-.26	-.14	.20	-.28	-.15	-.29	-.78	-.51
Noakhali	1.19	.89	.37	.12	-1.02	-.38	-.49	.07	.61	.26	-.51	.37	-.03
South-West/south													
Satkhira	.99	.87	1.22	.80	-.34	-.61	-.52	-.27	-.64	-.55	-.07	-.65	-.55
Barisal	.12	.41	.68	.91	-.28	-.76	-.66	.09	-.62	-.54	.91	-.35	.34

Source: Table 75

VII.12 Temporal Marketing Margin

We estimate temporal margins in four Statutory Rationing (SR) areas and eleven non-SR areas. We compare retail prices in each market with farmgate prices, lagged by one month, in a the production regions implicated in the market chains at hand. The lag is one-monthly, because, by assumption typical storage period is of one month duration. The formula used is as follows:

$$m_{i,t} = \left[\sum \alpha_{ji} \left(\frac{P^r_{i,t} - P^f_{j,t-1}}{P^f_{j,t-1}} \right)\right] x\ 100$$

where
- m = proportionate market margin
- P^r = retail price of coarse rice per unit
- P^f = farm gate price of equivalent paddy quantity
- α_{ji} = percentage share of ith SR city arrivals from j^{th} region
- i = 1, 2, 3, 4
- t = time subscript
- j = subscript for production regions

A few comments can now be offered on the temporal market margins (Table 7). First, where storage period is assumed to be of the duration of one month, the highest margin estimate is of Narayanganj, and is one of 32%. The lowest margin is estimated for Khulna, at 24%. For Dhaka, margin estimates are at 30%. For SR areas as a whole, margins averaged at 29% during the aman season, and 30% during the boro/aus season. For the non-SR areas, margins are estimated at 21%. Note these are margins computed upto the retail stage. Upto the

wholesale stage,[92] these work out at 16% and 25% for non-SR and SR areas, respectively.

The prevailing price margin entailed in OMS pricing are clearly lower than realistic estimates of market margin. Whereas the latter are estimated to be 16% and 25% for the non-SR and SR regions, the Government currently uses only 10% and 15%. The result is a distorted decision regime for public intervention: distorted because the initial OMS prices are set at an artificially low level. Such misguided public interventions in effect squeeze private trader storage and distribution.

VII.13 Market Margin and Retail Price

The ratio of marketing margin and retail price is often used as a shorthand for the secular change in the marketing efficiency of a rice market. A facile equation of this proportion with marketing efficiency is not apt. A cross-time comparison of Bangladesh's rice markets in terms of this is perhaps tenable. This comparison is not without some merit, even remembering that the proportionate share of noncoarse rice, which command somewhat larger market margins, was higher in 1970s.

Islam reported that in early 1970s, the marketing margin varied from 23 to 25% of the retail price (Islam, 1975, as quoted in Ahmed, 1979, pp. 21-22).[93] For 1982/83, a comprehensive study put marketing

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[92]This is because, in the OMS, the assumed proportionate margins are piled up on the procurement price in order to determine the issue price at the wholesale level for the OMS. The retail issue price in OMS is higher than the wholesale issue price by about Tk. 15/md. Comparability makes it imperative to only compute margins upto the wholesale stage. We report margins upto the retail stages, for comparative purposes.

[93]Note at this stage that only about 15% of the overall output were marketed. Mean spatial radius of market transactions was much smaller. A national market had yet to appear.

margins at an average of about 26% of retail price (Islam et al. 1985, p. 140).[94] In this study, the market margins are estimated at 25% of retail price for the four SR-areas, and only 16% of retail price for the sixteen non-SR areas. To arrive at the overall margin, an weighting is needed: this weighted average market margin is put at about 21% of retail price. These estimates are for coarse rice, while the pair of earlier estimates are for composite rice. Therefore, it is still too early to say that market margins as a percentage of retail price has fallen. However, two aspects of the estimates for 1989/90 deserve highlighting. First, just under a half of the rice crop was marketed. A large surplus has been marketed while registering a quite low overall costs of distribution relative to the retail price. Moreover, rice was being transported over longer average distances in 1989/90 than in 1982/83, which added to costs.

One thing can be asserted. It is a testimony to the growing efficiency of Bangladesh's rice markets that, despite major increases in the extent and, more to the point, the geographical decentralization of commercialization of rice surpluses, overall costs of distribution have not only remained relatively low, but have most probably fallen as a proportion of the retail price.[95] The corollary is that the producer share in the retail price, remained constant, or even made some gains. This should not come as a surprise: we already have seen that the farmer currently markets about 52% of his sales on

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[94]The authors estimated a range of 29% to 20% of retail price. The estimate in the text is an weighted average.

[95]Granted, the proportion of the largest terminal markets, Dhaka and Chittagong, has tended to decline. This, however, need not imply that (weighted) average distance traveled is lower than before. For one thing, deficit regions further afield from major surplus regions than either Dhaka or Chittagong may have been opened up due to greater infrastructural outreach. Second, the growing avoidance of lean season price spikes probably means that depressed regions nearer surplus districts can afford rice during such a season, thus calling into being new channels of trade, as against no or little trade before. The creation of trade as against situations of "stockout" would likely increase mean distances.

farm (ch. IV), while a little over two decades ago, this proportion was 28% (Ahmed, 1979, p. 21, citing evidence from 1967/68 Master Survey of Agriculture). A combination of infrastructural diffusion and growing commercialization has quite thoroughly embraced the average Bangladeshi farmer.

A Further Discussion of Marketing Margins Outside SR Cites

The results are reported in Table A7.3 in the Appendix - 3 to this chapter. The estimated marketing margins are higher during the early part of a market season than towards its end. This is a paradox that merits some fuller discussion. This is due to several factors: among others, a seasonality in the risk market agents successfully attempt to reflect in prices charged; a seasonality in the scale of public rice distribution in the OMS (which, *ceteris paribus*, affect the retail rice price).[96] The seasonality in the market margins implies that reported margins have to be averaged over two major seasons. And they have to be trade-weighted. Trade weights were generated by the IFPRI Market Survey, 1989/90.

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[96]The first factor entails the following reasoning. During the first one or two months of the season, all market agents but rice processors and traders particularly have to operate amid a certain uncertainty about the size of the total likely crop for the entire season. There being no public crop forecasting to speak of; agents have to rely on their own devices. One such device is the minimum margin for risk that agents will reflect in the prices they are to charge. Although the large paddy processors and wholesalers tend on the whole to be well-informed, this does not rule out that they would attach a relatively large margin of error to the estimate they form about the prospective size of the overall crop early in the season. That is, they tend to err on the low side. Arguably, minimum proportionate margins will not be unrelated to seasonal levels of rice prices. Early in the season rice prices tend to open up rather high. Paddy prices on the other hand tend to be relatively soft, because in the first months or two market arrivals, thick and fast, tend to be congested. As greater knowledge about the overall size of the harvest filters through, market agents ease up on the subjective risk margin. The margin therefore falls. The second factor is about public issue of grains in OMS. OMS offtake peaks as a season wears off. This puts a seasonal cap on prices. Hence towards the end of a season, estimated margins decline.

Table 77: Market margins for coarse rice by marketing season, 1989/90

(Per cent)

	Aman	Boro	All
Statutory rationing areas	29	30	30
Dhaka	30	31	31
Narayanganj	31	32	32
Chittagong	32	29	30
Khulna	17	30	24
Non-SR areas	19	22	21
Thakurgaon	26	30	28
Dinajpur	23	32	28
Rangpur	16	22	20
Bogra	13	20	17
Joypurhat	17	18	18
Naugaon	19	19	19
Pabna	18	20	19
Netrokona	26	25	25
Kishorganj	23	32	28
Mymensingh	20	20	20
Sherpur	20	20	20
Brahmanbaria	18	25	22
Chandpur	18	17	17
Noakhali	22	23	23
Satkhira	21	20	20
Barisal	20	18	19

Source: For non-SR areas, Table A7.3; For SR area, author's computaions.

VII.14 Price relations among grades of rice

Rice supplies come off in three grades, coarse, medium and fine. Before the advent of the HYV-rice, coarse and noncoarse grains in Bangladesh would split roughly on a 57:43 ratio (Table 77). In the mid-1980s, the ratio had become 64:36. More recently, data from the IFPRI Farm Survey 1989/90 suggest that the proportion of coarse rice had risen still further, to 68%. The reason why the proportion of coarse rice rose over fine is that the greater part of the expansion of rice output has been on account of HYV-boro rice --- an overwhelmingly coarse grain. Medium and fine rice variables have contributed declining increments overall in rice output.

Table 78: Proportion of coarse and noncoarse variety in total rice output.

	Percent of net rice output	
	Coarse	Noncoarse
1974/75-1976/77	57	43
/80	59	41
/83	64	36
/85	64	36
1989/70	68	32

Note: The data for the period through 1984/85 are from Chowdhury, 1989, Table 9.2; the data for 1989/90 from IFPRI Farm Survey, 1989/90. This survey generated data on proportions of coarse and noncoarse rice produced on farm during three successive rice seasons in the period through November 1990. This data is based on farmers' own classification of what they harvested.

Price relativity overtime of fine and medium grades with reference to coarse rice would depend on rates of change in supply and demand for various grades of rice. Technological change has shifted the supply of coarse rice and, less so, of medium grade (e.g. *pajam*

rice). Millers have capitalized on growing volumes of pajam surpluses to upgrade its polish and head rice yield with a view to selling it at a higher-than-customary premium. Some-times and in some markets they have succeeded. This has led in some markets to a reversal of the traditional relativity of the fine and medium price: instead of fine prices being higher than medium's the oppsite is true. Little, however, is known about the demand side for any of the grades. On the basis of movements of supply alone, the expectation would be that relative prices have moved against coarse varieties in populous cities with large concentration of nonpoor consumers, but not perhaps uniformly across the country.

Tables 78 and 79 report on trend growth rate in the proportionate excess of price of fine and medium rice over and above coarse price. In symbols, we define[97]

$$d_{i,j} = \left(\frac{P_i}{P_c}\right) - 100$$

where P_i = nominal price of ith noncoarse rice grade, i being 1 (fine) and 2 (medium)

P_c = nominal price of coarse rice

A significantly positive time trend will imply an increase in the price relative, and conversely. Neither rules out that noncoarse rice price can fall <u>below</u> those of coarse prices.

From the Table 78 below, we note, first, that only in Chittagong and Rangpur, fine rice price over time have made gains over coarse prices by more than have medium prices. For all other markets,

[97]We do not work in terms of real prices. As long as the same deflator is chosen for all grades, deflated results would be the same as those yielded by nominal prices.

including Dhaka and Sylhet, the reverse is time: medium grades command greater premia than fine. The traditional consumer loyalty to fine grades, shown through a larger premia for them as compared with medium ones, has been eroded. This has, in part, due to a conscious upgradation of medium rice, and in part, due to consumer substitution. Second, the premia on fine grades have not everywhere registered significantly positive time trends, despite the fact that most of the incremental supplies has been on account of coarse rice, perhaps this is because the wide plentiful availability of coarse rice gave ample space for potential consumer substitution between fine and coarse grades.

In sum, in Chittagong and Sylhet,market forces have extracted a significantly growing premium in the price of noncoarse rice grades relative to coarse o[illegible] This is plausible for one reason. There must be a presumption that, of all urban areas in Bangladesh, these two cities contributed a major share of the increase in the nonpoor population during the period studies.[98] Put differently, per capita real incomes grew more rapidly in these areas than in the other three markets studied.

Table 79: Time trend in the relative price of fine to coarse rice, various markets in Bangladesh, 1975/76-1989/90.

Year	Dhaka	Chittagong	Rajshahi	Khulna	Sylhet	Rangpur
1975/76-1982/83	.914 (1.58)	.774 (.906)	-2.60* (-4.14)	5.30* (2.41)	1.34 (1.83)	-.229 (-.356)
1983/84-1989/90	.762 (1.29)	4.54* (5.55)	1.44 (1.60)	2.72* (3.5)	2.87* (2.92)	3.59* (5.36)
Overall	.377 (1.82)	1.30* (3.99)	.288 (.930)	.935 (1.36)	.898* (2.93)	1.35* (5.18)

Note: Figures in parenthesis are t-statistics relative to the estimated.

[98]For a forceful if still somewhat episodic, documentation of this point as concerns Chittagong, see Chowdhury.

Table 80: Time trend in the relative price of medium to coarse rice, various markets in Bangladesh, 1975/76-1989/90.

Year	Dhaka	Chittagong	Rajshahi	Khulna	Sylhet	Rangpur
1975/76-1982/83	-.666 (-.935)	2.36 (2.13)	-2.73 (-2.24)	.297 (.266)	-1.28 (-1.10)	-1.18 (-1.47)
1983/84-1989/90	1.98* (2.53)	4.05* (5.12)	2.70 (2.17)	3.07 (2.31)	3.28* (2.71)	-.776 (-.768)
Overall	.530 (1.94)	1.26* (3.34)	.771 (1.65)	1.67* (3.86)	1.54* (3.38)	.328 (1.0)

VII.15 Real Wholesale Prices of Rice by Variety, 1976-1990

Table 81 reports on real wholesale prices of fine, medium and coarse varieties of rice in two classes of terminal markets.[99] Growth rates are reported for two subperiods and an overall period.[100] The data are not of a very high quality: results have, therefore, to be taken as illustrative, rather than definitive. Following observations can be made. First, all varieties, coarse ones included, experience a statistically significant growth rate in real prices during study period. Second, the differences in overall growth rates among the three varieties are not significant. Even so, it is intuitive that prices of finer varieties rose at a higher rate than have coarse ones. This is why the price relative has moved favoring finer varieties. Third, all three varieties have registered about the

[99]Five markets comprise Statutory Rationing (SR) area, viz. Dhaka, Narayanganj, Khulna, Rajshahi and Chittagong. The non-SR area comprises Sylhet and Rangpur. Preliminary population estimates for the municipalities are used as weights to arrive at average prices for five SR areas. The same applies to non-SR areas. Nominal prices are deflated by the index of wholesale prices of manufactures.

[100]Semilogarithmic trend equations were fitted to generate these growth rates. Occasionally, overall growth rates fall outside the range set by component subperiods. This is a paradox, due to use of semilog formulation.

same degree of variability in real prices around estimated trend, ranging between 1.8% to 2.0%.

The conventional wisdom has been that government intervention, which wholly or nearly wholly is denominated in coarse rice, is essential to stabilizing rice prices. From this, proponents of vigorous public intervention derive a rationale for aggressive stock-building operations. The above evidence, however, strongly shows that *stable growth* in prices is even *more* true for fine and medium rice varieties, where there is no government interventions.[101] There is no reason to believe that coarse prices set the toan for others: we would be mistaken were this the case. Information about coarse price elasticities being not on hand, the above is stated as an intuition. Price leadership hypothesis implies that a variety providing more stable price environment *induces* greater price stability affecting other varieties. Production variability will impinge on all, about equally. On the other hand, demand for coarse varieties may be more variable: this is because consumers will want to upscale their rice meals whenever incomes or price relatives would warrant by substituting noncoarse for coarse varieties. The reverse is less likely to happen.[102] All in all, this data is consistent with the position that private marketing of rice in Bangladesh has stabilized

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[101]Variability for fine and medium varieties was each lower, at 1.8% as against 2% for coarse rice. Of course, Government's stabilization mandate is more concerned with *seasonal* price fluctuations, than with annual. This is because an intricate seasonality of production makes year-to-year public storage not only costly but unnecessary. The point remains that stabilizing seasonal prices will have the *additional* effect of stabilizing annual prices: the two *time dimensions* are bound up. By implication, we may even say that seasonal prices of fine and medium varieties have been about as stable as for coarse varieties, and *without* any public intervention.

[102]As a Hong Kong entrepreneur put it, someone who has watched a color TV is unlikely to want ever to switch back to a black-and-white

annual prices just as much as has public interventions but without costing the government money.

Table 81: Real rice price in Bangladesh economy, 1976-1990

Year	Fine			Medium			Coarse		
	SR areas	Others	All	SR areas	Others	All	SR areas	Others	All
1975/76	98.73	90.65	98.24	90.61	83.50	90.17	83.24	74.58	82.73
1976/77	88.78	84.25	88.47	82.45	76.96	82.10	74.17	70.23	73.91
1977/78	100.03	96.30	99.75	91.24	90.20	81.10	81.21	83.69	81.25
1978/79	108.74	107.45	108.57	99.72	96.15	99.44	88.95	88.50	88.85
1979/80	120.35	119.55	120.19	109.83	101.90	109.33	100.12	95.89	99.81
1980/81	94.66	87.60	94.22	83.97	78.90	83.63	75.58	71.80	75.32
1981/82	109.13	96.37	108.40	97.05	86.70	96.44	88.64	80.90	88.17
1982/83	113.64	98.95	112.80	97.90	88.14	97.33	89.17	81.65	88.71
1987/84	120.96	108.08	120.21	110.96	98.71	110.24	102.79	91.68	102.14
1984/85	127.70	121.81	127.28	115.52	116.38	115.45	103.51	99.41	103.21
1985/86	114.52	113.27	114.34	105.80	102.13	105.51	94.97	89.58	94.61
1986/87	134.49	126.74	133.97	120.04	107.37	119.30	106.07	97.36	105.54
1987/88	139.04	143.73	139.13	123.54	118.57	123.17	108.05	108.52	107.96
1988/89	132.14	133.17	132.05	118.34	113.01	117.96	104.72	99.45	104.36
1989/90	117.95	129.91	118.42	108.65	100.05	108.12	91.01	88.87	90.82
Growth rate									
1976-84	2.6*	1.6	2.6*	2.1	1.4	2.1	2.3	1.7	2.3
1985-90	-.5	-1.4	-.5	-.4	-1.1	.4	-1.2	-.8	-1.2
1976-90	2.2*	2.9*	2.3*	2.2*	2.2*	2.2*	1.8*	1.9*	1.8*
Variability	1.8	2.4	1.8	2.0	2.1	2.0	2.2	2.4	2.2
around	1.7	1.6	1.7	1.4	1.5	1.4	1.4	1.7	1.4
trend	1.8	2.1	1.8	1.8	2.1	1.8	2.0	2.2	2.0

VII.16 Seasonal Variability of Rice Prices

Table 82 reports on the pattern of the seasonal incidence of low and high prices.[103] Several results of this table illustrate some important aspects of rice market conduct. First, of all, in the quinquennium through 1984, seasonal trough is almost always in December for both coarse and medium varieties; in the following quinquennium, a visible fluidity sets in. As against the past predominance a small number of strains with relatively early harvests, the more recent quinquennium has occasioned the arrival of a number of high-yielding variety but late-harvest aman varieties for medium rice. For coarse paddy, the increased importance of HYV boro is reflected in the thrusting of May into the roster of seasonal lows, more recently.

Table 83 reports on seasonal fluctuations in prices by rice varieties. Each number is the difference between the highest and lowest seasonality factors by rice variety and by fiscal years. Two results stand out. First, if all years are taken into account, seasonal price fluctuations were the narrowest for fine but widest for coarse varieties. Overall, noncoarse varieties have registered smaller fluctuations. Second, the range of fluctuations has itself been narrower in the more recent quinquennium, than in the more distant, especially for medium and fine varieties. Were public interventions are more effective than private marketing in abetting seasonal price fluctuations, this was not to be the case. The upshot may well be that government operations during much of the decade have been in terms of wheat operations, not rice operations. The inability of wheat operations to influence the severity of price fluctuations of coarse rice, any more than what unhindered market

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[103]For a description of the method used, see Pindyck and Rubenfeld. It is a version of moving average method. Seasonality factors thus computed are unit-free, and can be compared within a crop year. Difference between the higher and low seasonal factor is a rough indication of the severity of seasonal fluctuation.

forces would have done, is demonstrated by the results above. This should not be too surprising: public procurement of rice was historically fairly small (until FY 1990) and did precious little to ameliorate harvest season price collapses. On the other hand, while the OMS possibly has some price-stabilizing mettle, it was never really put to the litmus test because the on the whole favorable production performance of the rice sector obviated any dramatic price spike in most years.

Table 82: Pattern of seasonal lows and highs, by rice varieties, 1980 - 1989.

	Fine rice (wholesale)				Medium rice (wholesale)				Coarse rice			
	Lowest seasonal factor	Month of occurance	Highest seasonal factor	Month of occurance	Lowest seasonal factor	Month of occurance	Highest seasonal factor	Month of occurance	Lowest seasonal factor	Month of occurance	Highest seasonal factor	Month of occurance
1980	92	Feb.	103	Jun.	90	Dec.	106	Jun.	90	Dec.	105	Apr.
1981	91	Feb.	105	May	91	Nov.	106	May	92	Dec.	109	Apr.
1982	92	Jan.	110	Oct.	89	Dec.	111	Apr.	93	Dec.	121	Apr.
1983	91	Feb.	106	Oct.	90	Dec.	108	Oct.	92	Dec.	107	Oct.
1984	91	Mar.	112	Aug.	92	Dec.	109	Jul	94	Dec.	108	Jul.
1985	96	Feb.	102	Oct.	94	Nov.	103	May	92	May	108	Oct.
1986	92	Feb.	110	Oct.	94	Feb.	113	Oct.	92	Feb.	111	Oct.
1987	93	Jan.	111	Sep.	91	Dec.	106	Apr.	88	Dec.	113	Apr.
1988	96	Dec.	105	Sep.	92	Dec.	105	Sep.	95	May	116	Sep.
1989	96	Nov.	107	Aug.	95	Feb.	106	Jul.	95	Nov.	110	Apr.

Note: Each year represents the twelve months through the middle of November.

Table 83: Seasonal fluctuation in rice prices variety, 1980 - 1989.

Year	Wholesale price			Retail price		
	Fine	Medium	Coarse	Fine	Medium	Coarse
1980	11	16	15	7	10	13
1981	14	15	17	12	13	14
1982	18	22	28	14	23	30
1983	15	18	15	12	11	14
1984	21	17	14	18	14	12
1985	6	9	16	6	6	10
1986	18	19	19	16	17	16
1987	18	15	25	14	18	15
1988	9	13	21	11	15	17
1989	11	11	15	10	8	14
1980-1984	15.8	17.6	17.8	12.6	14.2	16.6
1985-1989	12.4	13.4	19.2	11.4	12.8	14.4
All	14.1	15.1	18.5	12.0	13.5	15.5

VII.17 Testing of Market Integration[25]

Ravallion developed a general approach that can estimate the extent to which local prices are influenced by prices elsewhere. By nesting hypotheses regarding market segmentation, as also about short - and long-run market integration within the same farmework, this method is parsimonious. His test of segmentation in rice markets rejected the hypothesis of segmented markets, but the test on short-run integration of markets was inconclusive. Ravallion's model has also been empirically applied by Heytens (1986) on Nigerian data. Timmer (1974) proposed a further use of the parameters from Ravallion's model to construct some indicators that will be explained later.

The Model

The estimating equation that was derived from Ravallion's general approach and used for the present study closely follows Heytens' discussion.

$$(P_{it} - P_{it-1}) = (\alpha_i - 1)(P_{it-1} - P_{t-1}) + \beta_{i0}(P_t - P_{t-1}) + (\alpha_i + \beta_{i0} + \beta_{i1} - 1)P_{t-1} + \gamma_i X + \mu_{it},$$

where

P_{it}	=	price in local market at time period t, i runs from 1 to n markets;
P_t	=	price in the central or reference market (Dhaka in the present study);
X	=	other factors used as dummies for dry or monsoon seasons;

[25]This subsection heavily leans on the presentation in Ahmed and Bernard, 1989, pp. 50-52.

α, β, and γ = parameters of the model to be estimated; and
μ_{it} = the error term.

The model posits the change in local price as a function of the change in the Dhaka market price for the same period, last period's spatial price margin, last period's Dhaka market price, and local market characteristics. In equation (1) β_{i0} measures the extent to which the local price at a given time is determined by the change in the central market price during the same time period. It therefore reflects the extent and the speed of movement of information from the central market to the local markets so that pricemakers there can act to adjust prices.

The term (α_i-1) measures the extent to which last period's spatial price differential is reflected in this period's local market price change. If the margin widened in the last time period (because of a price rise in the central market) and transaction costs remained the same, traders would have an incentive to move rice away from the local market to another part of the marketing chain, thus pushing up prices in the current time period. Other forces might also influence local price changes. Periodic shortages in supply or distribution of communications by local storms or cyclones could influence local price changes and serve the links with the central market. Finally, the general level of price in the central market may provoke price changes in the local market, as is generally considered usual in an inflationary environment. This is reflected by β_{i1}.

From equation (1) the following hypotheses can be tested:

Market Segmentation. The hypothesis that the local market is segmented from the central market means that changes in the central market price will have no effect, immediate or lagged, on prices in local markets. In equation (1) market i is segmented if

$$\beta_{i0} = \beta_{i1} = 0. \qquad (2)$$

This can be determined by testing equation (1) against the following restricted model with an F-test:

$$(P_{it} - P_{it-1}) = (\alpha_i - 1) \quad (P_{it-1} - P_{t-1}) + \gamma_i X + \mu_{it}. \qquad (3)$$

If equations (1) and (3) are equal according to the F-test, then $\beta_{i0} = \beta_{i1} = 0$ and markets are segmented.

Short-Run Integration. This hypothesis requires that changes in the central market price be immediately (within the same month in the case of monthly data) and fully reflected in the local price. In terms of equation (1) it means that

$$\beta_{i0} = 1, \ (\beta_{i1} = 0), \text{ and} \qquad (4)$$

$$\alpha_i = 0. \qquad (5)$$

If both equations (4) and (5) are satisfied, market i is integrated with the central market in the same time period. Acceptance of the hypothesis makes $\beta_{i0} = 1$ and $(\alpha_i - 1) = -1$, indicating that this period's central market price change and last period's spatial differential are fully reflected in the current local price level.

Absence of Local Characteristics. This hypothesis implies that $\gamma_i = 0$, and therefore it reduces to

$$\begin{aligned}(P_{it} - P_{it-1}) &= Y_0 + (\alpha_i - 1)\,(P_{it-1} - P_{t-1}) + \beta_{i0}\,(P_t - P_{t-1}) \\ &\quad + (\alpha_i + \beta_{i0} + \beta_{i1} - 1)\,P_{t-1} + \mu_{it}\end{aligned} \qquad (6)$$

The X variables are only specified as dummy variables defined over the same time frame as each price observation (for example, monthly price data require monthly dummy variables). Such a general specification premits the use of dummies for monsoon and winter-

season months.

Equation (1) can be tested against equation (6) with an F-test in order to determine the significance of local characteristics. Equation (1) can also be transformed into an indirect but more subtle and general indicator of market integration. Assuming that the central market is stable,[26] and there is no effect of local characteristics on local prices, then (α_i) and ($\beta_{i0} + \beta_{i1}$) indicate the relative contributions of past local and central market prices to the determination of the current local prices.[27] If past central market prices are the primary influences on local prices, the local markets is well connected in that central market supply and demand factors are being transmitted to local markets and influences prices there.

Timmer formulated an index of market connection (IMC) in order to measure the relative influences of these two sets of forces. IMC is defined as the ratio of the lagged local market coefficient to the lagged central market coefficient.

$$IMC = \alpha i/(\beta_{i0} + \beta_{i1}).$$

If Ravallion's short-run integration is accepted, then, $\alpha_1 = 0$ and IMC = 0, when markets are segmented, $\beta_{i0} = -\beta_{i1}$ and IMC = ∞. Given the model's specification, ($\alpha_i - 1$) would be between 0 and -1 under normal conditions and the index would normally be positive. The closer the index is to 0 the greater the degree of market integration.

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[26]Stability means ($P_t - P_{t-1}$) =0. It may appear unrealistic, but if one considers that the condition is devoid of seasonal and inflationary effects, it may not be so.

[27]For consistency, Ravallion's notation is used throughout.

Data

We used monthly data for six years through June 1991, with varying degree of missing data ("holes"), for sixty-seven markets. We used data for medium rice varieties, as the holes were least for this variety. Even so, the number of holes was larger for some markets than for others. We dropped twenty-five markets, with 50% or more "holes" in the 72-month price series, i.e. six years through June 1991. For the remaining forty two months, we "plugged" the hole.[107]

Results

Segmentation of markets: Calculated values of F statistics for testing the hypothesis that markets are segmented are reported in Table 84. The hypothesis that a market is segmented --- that is, where price changes in a local market depend only on past prices in that market is rejected at the 1% level of significance for every market. This finding is very similar to the one reached by Ahmed and Bernard while analysing monthly data for a somewhat earlier period. Tested markets fall within *all* geographic denominations in the economy.

Short-run Market Integration: Timmer's IMC ratios are used for evaluating short-run integration (Table 85). In only 7 out of 42 markets, IMC was less than 1. Thus, *prima facie*, only six markets show integration within the domain of monthly prices. The rest are poorly integrated with the Dhaka market. When seasonal dummies are

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[107]Unlike in Ahmed and Bernard, who only worked with 19 districts which each returned a complete data series, "plugging the holes" was forced on us, as, in our case, only six markets each returned a complete series. We plugged the holes for each market by using "seasonal prices" corresponding to normal seasonal factors for that market. The procedure was the only one available in the circumstances. The data are therefore "synthetic" to this extent: we do not wish to claim either "winners" or "losers" from them.

introduced, the number of markets showing significant integration within the domain of monthly prices rises to eight. Overall results about short run integration remain inconclusive. One feature of the changing geography of the disposal of rice surpluses, however, provides some consolation. We noted already that the assumption of Dhaka as the "central" market may not be beyond controversy: the networks of market connection appear to be becoming more and more diversified. If direct shipments from surplus districts to terminal markets are becoming more and more important since the period that Ahmed and Bernard had looked into, then the assumption of Dhaka as the certral market would be questionable. Without access to a mush richer and more comprehensive data base, such a nonradial type market configuration is not inplementable in market integration analysis. Meanwhile, the continued absence of segmentation appears once again to be an important conduct of rice markets.

Table 84: Results of a test for segmentation of markets, using the error sum of squares, 1985/86-1990/91.

District	F-Statistics
Narayngonj	63.2
M.kadim	7.2
Monshigonj	4.0
Norsingdi	8.6
Jamalpur	4.4
Sheerpur	8.2
Kishorgonj	4.8
Netrokona	8.2
Faridpur	30.7
Rajbari	29.3
Gopalgonj	13.5
Madaripur	3.9
Shariatpur	10.1
Pabna	24.2
S.gonj	35.3
Bogra	10.3
Gaibandha	8.9
Kurigram	8.9
Dinajpur	12.0
Thakurgaon	17.5
Rajshahi	45.1
Noagaon	22.2
Nator	27.7
Kushtia	8.3
Meherpur	5.2
Chuadanga	22.1
Jessore	17.8
Narial	21.9

(Table contd. overpage)

District	F-Statistics
Jhenaidah	19.7
Magura	9.2
Khulna	11.8
Satkhira	14.1
Perojpur	20.8
Patuakhali	14.0
Borguna	6.0
Barishal	28.9
Jhalokathi	23.7
Comilla	8.0
Sylhet	4.9
Sunamgonj	6.3
Moulavibazar	19.5
Chittagonj	7.3

Table 85: Results of a test for short-run integration of markets, using the index of market connection, 1985/86-1990/91.

District	Index of Market Connection		
	Dry season	Monsoon season	Whole year
Narayngonj	1.3	0.5	0.9
M.kadim	0.8	32.3	2.7
Monshigonj	1.4	3.3	2.3
Norsingdi	1.3	2.0	1.6
Jamalpur	4.4	1.9	3.4
Sheerpur	5.0	1.8	2.5
Kishorgonj	4.7	1.5	4.4
Netrokona	47.0	4.1	5.1
Faridpur	0.8	1.1	0.7
Rajbari	0.8	3.1	1.0
Gopalgonj	1.1	1.4	1.3
Madaripur	1.0	0.53	0.7
Shariatpur	1.7	18.8	3.2
Pabna	2.0	2.9	1.9
S.gonj	1.0	1.0	0.96
Bogra	0.2	0.7	0.4
Gaibandha	0.3	3.8	0.7
Kurigram	15.7	4.1	7.5
Dinajpur	0.5	1.6	0.7
Thakurgaon	1.6	5.2	2.0
Rajshahi	2.6	5.5	3.0
Noagaon	0.5	2.9	1.1
Nator	1.0	4.8	1.7
Kushtia	4.3	1.5	3.4
Meherpur	50.5	5.9	95.0
Chuadanga	1.6	6.2	2.1
Jessore	4.1	12.6	5.3
Narial	1.8	1.8	1.9

(Table contd. overpage)

District	Index of Market Connection		
	Dry season	Monsoon season	Whole year
Jhenaidah	4.5	2.8	4.3
Magura	3.2	3.0	3.5
Khulna	2.2	0.7	1.3
Satkhira	1.7	8.0	3.3
Perojpur	1.5	10.0	2.2
Patuakhali	1.7	4.3	2.0
Borguna	4.4	3.3	3.2
Barishal	1.5	4.0	1.7
Jhalokathi	0.7	3.0	1.3
Comilla	97.0	2.7	3.2
Sylhet	2.4	3.7	2.7
Sunamgonj	1.3	3.1	2.3
Moulavibazar	2.0	2.0	2.0
Chittagonj	47.5	18.6	4.5
Cox,s Bazar	7.1	6.5	4.4

VII. Test of normal/abnormal profit at wholesale level

It is usual to treat profits to be the ultimate test of the competitiveness of any given market. If profits are "excessive" in the short-run, and information regarding profits is cheaply available to prospective entrants, and finally, if there are no significant barriers to entry, such profits are likely to foster entry until they disappear, leaving in the end only normal profits. These preconditions are never to be taken for granted. Further, it is often difficult to establish that either information is cheaply available or that barriers to entry are nonexistant. Be that as it

may, no treatment of the conduct of a market will be complete without some account of the rate of returns, and of whether they are "excessive" in some widely-accepted sense. It thus becomes imperative to include some discussion of the rate of return at wholesale and retail levels of the rice market. Because profits are evocative, one must exercise utmost caution in one's measurements of the underlying variables.

Net profit is thus estimated:

$$\pi_i \equiv (Q_i \times P_i) + bp_i + cm_i - (C^f{}_i + C^v{}_i)$$

$$\gamma_i = (\frac{\pi_i}{K_i}) \times 100 = (\frac{\pi_i}{FK_i + WK_i}) \times 100$$

where π = net profit from rice trade

Q = output sold

P = price per unit realized

bp = value of by-products

cm = proceeds from custom milling of paddy

C^f = fixed cost = depreciation + salary of permanently employed staff + maintenance of plant and structures[108]

C^v = variable cost = material variable cost + blue - coller workers' wages + interest costs on operating capital loans

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[108]Investment in fixed asset no doubt runs up opportunity costs. However, we chose to compute profits as *inclusive* of the income foregone. In the end, the rate of such inclusive profits, when compared to capital income foregone, will yield the rate of "pure" profit, i.e. the return to risk-bearing. Whether this last is excessive is important to establish.

	=	rate of return
FK	=	Fixed capital
WK	=	Working capital
K	=	FK + WK
i	=	establishment subscript

All fixed capital was based on rough but conservative estimates of replacement costs. Working capital was estimated using survey returns as to the level of inventory (of input and output) and the value of work-in-process (Sen, 1964). For traders, moreover, net trade credit disbursed is added on to working capital. Both net profit and rates of return are first measured for aman, boro and aus seasons before being aggregated to correspond to annual averages.

Delineation of the *wholesale* and *retail* levels warrants some discussion. Automatic mills, major rice mills, and small rice mills are assumed to be *wholesale paddy processors;* paddy traders and rice traders who deal in these two commodities in bulk are assumed to be wholesale traders. *Kutials* and rice retailers are assumed to operate at the retail level.

Table A7.4 presents net profits and total capital employed during the year. Net profits reported for individual seasons are additive across seasons. Total capital employment are annual averages. Table 86 reports the rates of profits earned on the sample. The rates of profits, too, are additive across seasons. The last rows in Table 86 for each of progressive and nonprogressive district types report combined rates of return earned during the study year. A few comments now follow about these estimates.

First, the rate of returns in the overall rice market averages at 44% per year. This average is population weighted. If this *prima facie* appears relatively high, there are valid reasons why

this is so (see below). All classes of rice mills (i.e. automatic, major and small) in the progressive districts register higher rates of profits. However, wholesalers in nonprogressive districts return higher profitability.

Rates of returns at the wholesale level is significantly *lower* than at the retail level.[109] This finding does not go against the grain.

Capitalization typical of the wholesale level is vastly higher than for the retail. One has only to appeal to the law of diminishing returns to explain this result. Equally relevant, it is a compelling evidence against the position, held by some, that rice markets harbor vertically-integrated structures, overwhelmingly controlled by numerically small number of (wholesale) traders/financiers, in order to extract higher profit rates at the expense of itinerant merchants and farmers. Instead, the present set of wholesale-level operators seem not capable of surpassing in profitability the very class of market agents they are supposed to "dominate". They seem satisfied that they, on average, earn more than enough to match the income foregone from the present mobilization of fixed investment: virtually in all cases, interest rates on long-term bank deposits.

Among mechanized processors, the least profitable are the automatic mills, followed by major mills and small mills in that order. This profit-ordering survives the progressive-nonprogressive divide. Why should this be so ? Out of several reasons, we shall note only one, perhaps the most important one.

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[109]It is not self-evident that *other traders* (mainly itinerant traders of both paddy and rice) and *other processors* (i.e. crushers) should be categorized as operating at the wholesale level, though they are not at the retail level, too. But their capital resources are certainly more similar to retailers'. On that basis, we may lump them into the retail category. Then, the conclusion in the text is all the more true.

As the most mechanized among the techniques under study, the automatic mills feature the highest resource *requirement* in terms of what has been called *technological entrepreneurship* (Leff, 1979, p. 53). More than simply a "best-practice" but "off-the import-shelf" technique, an effective technique has also to be adapted to indigenous raw material, energy availability, feasible production scales and local factor endowments. That is, choosing an winning technology is a multifaceted performance where each facet is knowledge - intensive. If the choosor has access to all or most necessary information that bears upon the earning power of a technique over its lifespan, and he is bent upon making use of it, the technique is likely to be remunerative. If, however, the selection of an automated rice plant has been due to blind technological imitation (the copycat trait), or to the desire to seek rent in a deal involving overinvoicing of imported plant funded by poorly-appraised loans, it is likely that the choice itself was removed from the considerations surrounding the effective performance of technological entrepreneurship. In such case, options requiring high degrees of entrepreneurship will yoeld poorly. Either process faults or imbalance will be detected after installation. Or putative byproducts will be below par. Either way, earnings sag. In Bangladesh, the automatic rice mills have often been funded by loans made by termlending institutions like Bangladesh Shilpa Bank (BSB) and the like. It is not surprising that these mills have the poorest rate of yields.

In contrast, especially the small rice mills do not demand a great deal of technological entrepreneurship, as the underlying technique is very accessible. Design errors are remediable at much lower cost. The technology is also more adaptable to supply shocks. In the main, profits are made through buying paddy on the cheap, managing workforce more closely, drying the paddy more consistently in an effort to upgrade the quality of the final product. The units input a higher degree of managerial prowess,

routine but invaluable, into the processing function: the reward is a better rate of earning on assets.

Are profit "competitive' or excessive?

Table 86: Rate of net profit at wholesale and retail level in Bangladesh's rice market, 1989/90

(Percent)

Trade levels	Progressive seasons				Nonprogressive seasons			
	Aman year	Boro	Aus	All	Aman year	Boro	Aus	All
Wholesale								
Processors	16.9	7.9	17.0	41.8	8.3	6.2	9.3	23.8
Automatics	13.9	8.0	9.9	31.8	6.6	5.9	3.8	12.5
Major	13.5	8.1	16.7	38.3	7.1	6.7	12.0	25.8
Small	22.2	7.6	23.1	52.9	10.9	6.1	11.5	28.5
Traders	17.3	12.5	5.4	35.4	21.1	30.7	9.2	61.0
Retail	55.2	40.6	33.8	129.6	47.5	35.6	21.9	105.0
Processors	41.4	22.9	23.6	87.9	35.2	27.7	22.2	85.1
Kutial	41.4	22.9	23.6	87.9	35.2	27.7	22.2	85.1
Traders	82.0	75.0	53.6	210.6	71.4	69.0	21.4	161.8
Other traders	192	123	42.3	357.3	103.3	55.7	36.0	195
Other processors	190	100	177.5	467.5	190.5	133.8	245.9	570

Source: IFPRI Market Survey 1989/90

It is evident that rates of return in both rice trade and processing are lucrative.[31] These rates are higher than the yields receivable on highly secure kinds of government financial papers. They are also higher than those returned for Bangladesh's medium and large-scale industries. So what is happening? Are the data not credible or is there a huge "perception gap"? Before processing any further, a cautionary note is in order.

Fluctuating rates of earnings are a fact of life for agroprocessing activities. Especially so, because ill-suited public interventions can occasionally destabilize rice markets at short notice, turning average prospects gloomy. One needs a smoothed profitability series, as befits any fluctuating data series: a year of decent earning rate can easily be followed by another of desmal profits. We do not have such a series. But this caveat should be borne in mind.

Our reply must be that the data reported are real, and that most available estimates of rates of return in agroprocessing or trade either are understated,[32] or refer to activities which are markedly less intensively managed than are rice traders/millers on this sample. There are good reasons why the rice markets register both marketing margins that are among the lowest in rice-Asia, and remunerative returns to capital. These follow,

(a) Rice's national market: Rice has an almost ubiquitous, national, yearround market. Every single household consumes

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[31]Similar conclusions were reached both by more fragmentary exposes like Harriss (1979), as also by more methodical studies (Islam et al)

[32]Where the data are carefully reported and collected, one gets estimates of rates of return that match ours. For example, a careful study of the handloom industry by this author and a colleague in 1987 reported that rate of return to capital averaged a healthy sixty percent (Chowdhury and Latif, 1990; Chowdhury et al, 1988).

it, and virtually every member in it. Therefore, demand has geographically a very broad basis. A seasoned trader or a paddy processor who has in his title a given quantity of grain of trade quality is highly probable to exchange it for a profit to another participant, if the market is not destabilized by random shocks or inept interventions. This reflects the large, national market for rice that agents can draw upon.

Rice efficient marketing system: No other commodity in Bangladesh has the dense and complementary market contacts of rice.[33] The density of market contacts shows in the articulate reflection of the market demand at the level of initial buyer transparently transmitted to the farmers' economic mindset. This lowers farmers' subjective risks. The resultant impetus to greater output levels is aided by the fact that paddy, after suitable drying, is eminently storeable at not very high cost.[34] Storability is a mechanism for generating some measure of confidence in the reliability of price formation itself.

Rice market infrastructure and price environment: When rice markets function smoothly, with all commercial contacts, well-oiled physical and financial infrastructure and stable price expectations, private rates of returns are pushed upwards as returns to public investment (in buffer stocks, roads and the like, and exchange continuity) are realized. To quote: "Marketing systems that function smoothly ... have strong elements of public goods" (Barghonti et al., 1990, p. 57). Presently, this is shown by the significantly rapid turnover of stocks by study establishments in both progressive and nonprogressive districts,

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[33]This draws heavily upon a powerful account recently done at World Bank (Barghonti, et. al. 1990).

[34]IFPRI Farm Survey, 1989/90 show that the average unit of paddy is stored for two and a half months.

and in both seasons. By comparison, the turnover-stock ratio was two-fifths lower in 1982/83, at the time of the last major study (Islam et al. 1984). Infrastructure has increased by a factor of 27% since 1982/83, while road haulage capacity rose by 69% over the same period. Riverine cargo capacity grew at the rate 5% during the same period. And the number of rural bank branches and the number of rural telephone connections grew by 8% and 6% respectively, between 1983/84 and 1989/90. Price environment in study year stayed stable. Public operations were not destabilizing. All in all, operating conditions in the study period allowed all agents to register high volumes which, even in the face of relatively low margins on each shipment, translated into quite decent rates of return.

Rice market's density of credit relations: A significantly large proportion of all market agents are net recipient of free trade credit. For these recipients, as much as 30% of throughput is financed by one form of trade credit or the other. The degree of confidence in price formation that this evokes is strong. This lowers individual as well as aggregate working capital requirements. Such savings contribute to the outcome of raising returns to total capital employed in private rice marketing.

Rice sector's greater capacity to manage risk: It is a standard result that geographically broadbased adoption of yield-improving technologies is likely to reduce aggregate supply variance, as it will blend local disturbances that are partly uncorrelated(Fafchamps, 1992). Production of rice with HYVs has acquired a truly national scope. Geographical dispersion in rice supplies has growing declined, as has the probability of an aggregate business loss associated with weather risks. Conversely, because margins are relatively constant, a lower variance to rice turnover translates into a low-variance but high-mean returns to capital.

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In sum, the rates of returns are higher but not necessarily excessive, noting what was said about fluctuations. More to the point, if they are high, this is not because a small group of agents, each lavishly capitalized, earn high rates of profit and rents to the hurt of more numerous but less capitalized ones. they are high because the numerically populous class of agents, undercapitalized but sustained by egalitarian credit relations, manage their meager capital resources keenly on their way to high earnings. While returns rate favorably, margins on sales price remain very lean indeed. Relentless turnover of pipeline stocks at competitive margins virtually throughout the year is the best-kept secret of profit-making in this market. Mostly, in the study year, rice agents behave like competitive profitmakers, not profiteers. This is the final straw in this expose of the growing maturity of Bangladesh's rice markets.

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Table A7.1: Farmgate Price for Coarse Paddy, Dec. 1989 - Nov. 1990 (Tk./md.)

New districts	AMAN SEASON					BORO SEASON						
	Farmgate Price of Coarse Paddy					Farmgate Price of Coarse Paddy						
	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
Tha'gaon	190.3	195.05	203.25	206.6	233	211.27	183.81	198.81	200.53	207.2	217.31	228.71
Dinajpur	183.25	194.14	205.55	214.48	224.19	191.33	185.17	189.82	198.01	191.41	226.2	232.37
Rangpur	198.82	195.72	207.3	214.44	219.28	196.33	194.61	207.67	218.26	221.7	235.93	222.47
Bogra	190.31	199.4	208.97	215.36	228.03	188.78	192.23	203.52	211.84	219.77	242.67	252.62
Joypurhat	179.79	190.84	204.83	217.47	220.85	188.06	186.89	200.16	215.8	221.89	232.74	227.68
Naogan	181.49	191.7	202.18	209.57	224.05	194.27	195.27	207.49	215.83	222.64	232.71	226.46
Pabna	185.69	195.56	203.47	221.72	232	184.73	194.07	209.31	220.61	224.11	241.26	250.1
Netrokona	184.54	195.04	205.83	214.96	221.73	185.18	195.38	204.6	210.76	222.25	226.71	235.97
K'ganj	184.57	192.57	205.9	231.21	237	179.44	190.88	201.25	201.25	211.53	217.5	228.13
M'singh	187.78	197.77	210.35	221.16	236.83	189.01	201.2	209.54	217.49	227.19	242.07	274.17
Sherpur	178.19	191.22	205.85	221.64	232.44	179.61	190.85	205.72	214.49	221.02	238.98	252.37
B.Baria	189.37	196.33	208.67	217.67	227	169.29	180.73	200.44	216.43	225.57	247.47	260.26
Chandpur	190.29	201.77	213.52	226.72	239.9	191.3	214.01	224.44	231.84	241.77	246.8	256.05
Noakhali	174.23	189.56	207.24	229.52	246.71	194.12	197.85	214.34	223.37	231.77	255.95	264.34
Satkhira	184.44	192.06	202.74	213.86	223.12	192.2	188	191.7	212.2	223.05	240.57	251.92
Barishal	185.18	195.74	206.14	214.45	233.16	187.37	197.53	210.98	228.2	237.69	252.44	255.06

Note: Month 1 means Nov. 15 - Dec 14, 1989, and so on. This note applies to Table VI, too.

Source: IFPRI Market Survey, 1989/90

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Table A7.2: Retail Price for Coarse Milled Rice, Dec 1989 - Nov 1990 (Tk./md)

New Districts	AMAN SEASON					BORO SEASON						
	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
Thakurgao	372	382	388	390	402	396	388	382	392	402	412	412
Dinajpur	357	366	374	383	391	375	377	378	385	390	404	419
Rangpur	339	348	360	371	378	357	363	361	373	384	433	449
Bogra	344	345	351	360	365	356	359	363	373	377	396	420
Joypurhat	335	345	352	365	385	350	340	360	372	375	385	394
Naogan	337	347	363	372	379	344	352	364	368	380	394	415
Pabna	352	361	366	373	384	355	361	369	376	388	400	420
Netrokona	351	367	378	394	433	367	367	375	381	391	410	425
K'ganj	349	364	375	391	401	368	370	376	380	392	399	407
M'singh	360	371	387	391	399	354	363	371	378	386	399	431
Sherpur	347	359	375	387	396	343	354	364	375	392	382	390
B.Baria	354	365	365	375	388	350	358	374	381	396	402	418
Chandpur	361	372	380	392	405	360	371	386	398	407	410	420
Noakhali	366	385	401	415	427	377	371	387	398	407	428	435
Satkhira	341	354	368	384	397	348	356	364	371	386	390	400
Barishal	350	360	370	384	400	360	365	370	380	400	400	410

Source: IFPRI Market Survey, 1989/90

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Table A7.3: Marketing margins for individual markets in non-SR areas by season

Months	Thakurgaon	Dinajpur	Rangpur	Bogra	Joypurhat	Naogaon	Rajshahi	Pabna	Netrokona	Kishorganj	Mymensingh	Sherpur	B.Baria	Chandpur	Noakhali	Satkhira	Barisal
Dec	32.5	32.1	15.5	19.6	26.6	26.2	19.8	28.3	31.3	28.7	30.5	32.8	27.2	29.0	43.7	26.7	28.3
Jan	31.3	27.1	21.4	16.2	21.7	25.0	17.6	23.5	27.9	26.7	29.2	29.4	22.7	24.3	38.1	26.5	24.7
Feb	26.6	23.0	18.1	13.7	17.6	21.4	15.9	21.0	26.3	24.6	22.6	24.1	18.6	21.2	31.2	25.0	22.9
Mar	28.4	20.3	16.3	11.9	16.8	19.4	11.9	14.3	33.0	22.9	19.0	17.9	17.6	17.9	22.8	22.5	23.1
Apr	12.2	10.4	7.4	3.0	4.6	1.3	4.9	0.6	9.2	12.8	-1.3	-2.6	1.8	-1.0	0.8	2.9	1.9
May	21.2	30.0	22.0	25.5	19.32	19.6	23.5	29.0	30.8	43.3	26.7	30.1	39.6	28.0	28.1	22.2	28.6
Jun	37.2	34.7	22.4	24.6	27.1	23.0	19.5	25.5	26.7	38.3	21.7	25.9	36.6	19.0	29.3	27.8	23.6
Jul	30.1	33.9	18.5	20.9	22.7	17.6	13.6	18.6	22.9	31.4	19.1	20.3	25.4	17.0	21.6	27.7	18.9
Aug	32.3	30.0	16.1	17.5	14.7	16.2	15.8	16.1	22.4	28.5	17.1	20.6	20.8	15.9	20.1	20.1	15.7
Sep	31.2	39.3	28.9	18.9	14.5	16.8	20.6	17.8	21.7	24.5	15.9	14.1	17.6	11.9	21.2	15.4	11.1
Oct	25.1	22.2	25.6	14.2	11.7	18.0	21.8	14.9	23.7	23.5	17.5	7.7	11.5	12.3	12.2	9.7	7.2
Aman season	26.2	22.6	15.8	12.9	17.5	18.7	14.0	17.5	25.5	23.2	20.0	20.4	17.6	18.3	27.3	20.7	20.2
Boro season	29.5	31.7	22.3	20.3	19.3	18.5	19.1	20.3	24.7	31.6	19.7	19.8	25.2	17.4	22.1	20.5	17.5

Source: IFPRI Market Survey, 1989/90.

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Table A7.4: Net profit and capital employed at various levels of Bangladesh's rice trade, year through November 1990

(Progressive districts) (Tk. 000s)

Level of trade/typr of market agents	Aman season		Boro season		Aus season		All year		Total capital employed
	Net profit from		Net profit from		Net profit from		Net profit from		
	Trade	Milling	Trade	Milling	Trade	Milling	Trade	Milling	
Wholesale									
Processors									
Automatic	-	2438	-	1405	-	1727	-	5568	17500
Major	-	494	-	297	-	611	-	1402	3652
Small	-	282	-	96	-	293	-	671	1266
Trader	140	-	101	-	44	-	285	-	807
Retail									
Processor									
Kutial	-	17	-	9.4	-	9.7	-	36	41
Traders	23	-	21	-	15	-	59	-	28
Other traders	50	-	32	-	11	-	94	-	26
Other processors		76	-	40	-	71	-	186	186

(Table contd. overpage)

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(Nonprogressive districts) (Tk. 000s)

Level of trade/typr of market agents	Aman season		Boro season		Aus season		All year		Total capital employed
	Net profit from		Net profit from		Net profit from		Net profit from		
	Trade	Milling	Trade	Milling	Trade	Milling	Trade	Milling	
Wholesale									
Processors									
Automatic	-	728	-	651	-	418	-	1797	11000
Major	-	213	-	200	-	360	-	773	3000
Small	-	211	-	118	-	221	-	550	1925
Trader	171	-	249	-	75	-	495	-	810
Retail									
Processor	-	19	-	15	-	12	-	46	54
Kutial	-	19	-	15	-	12	-	46	54
Traders	30	-	29	-	9	-	68	-	42
Other traders	63	-	34	-	22	-	119	-	61
Other processors	-	141	-	99	-	182	-	422	74

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APPENDIX ON FARM AND MARKET SURVEY METHODOLOGY

1. IFPRI Rice Market Survey

The overall objective of this survey is to assess the structure conduct and performance of Bangladesh's rice markets. The rationale for such a study flows from the argument that specific content and scope of public interventions in rice markets can enrich itself by gleaning insights about the conduct and performance of rice markets.

The particular objectivs of this survey are to:

i) to estimate the country-wide marketing margins in rice, and more particularly, to determine whether and by how much, traders earn more than competitive profits;

ii) to assess the degree of integration, both temporal and spatial, in rice markets;

iii) to assess the role of stocks in the traders' business, and in particular, to pinpoint the determinants of trade-level rice stocks;

iv) to determine the factors influencing costs of marketing, and

assess the structure of marketing costs;

v) to assess the overall competitive health of rice marketing;

METHODOLOGY

A sample survey has been designed to achieve the study objectives. Districts were first statified in order their proportion of net cropped area under high-yielding variety (HYV) strains, under modern irrigation, and the number of rice mills located in them in 1986/87. They were finally stratified on the order of a synthetic index, comprising these component indicators. Twenty one districts were selected from the ordered list of districts with probability proportional to population of the various quartiles. A sample of 636 processors/traders from these districts exhaustively representing the whole gamut of market agents have been interviewed twice during twelve months through June 1991. These districts are representative of all major agroclimatic and cropping - pattern variations. Moreover, in the country they cover districts representing varying densities of paddy processors per thousand population, according to 1981 Census. Firms from twelve "surplus" and nine "deficit" districts composed the sample. Surplus districts are those generating a surplus in their cereal production in 1988/89 over cereal "normative requirement" on government definition. In all, there were 115 paddy traders and 521 rice traders.

2. IFPRI Farm Survey

The overall objective of this survey is to understand the consumption, marketing and storage behavior of surplus-generating cultivator households in Bangladesh. These households comprise the first and most important rung in the private decision making chain with regard to disposal of output as between consumption and marketing. Consequently, this survey complements the Market Survey by potentially illuminating the rice marketing and storage behaviour of cultivator households in the survey districts comprising the sample for the Market Survey. In that sense, this should be considered an extension of the Market Survey.

The specific objectives of this survey are

a) to estimate the overall size of the rice market in 1989/90, and to compare it with that for past years, in an effort to assess the overall change in the degree of commercialization in Bangladesh's rice market;

b) to quantity the role of income, prices, seasonality and infrastructure in determining farm-level consumption, marketing and seasonal stocks of rice;

c) to estimate overall size of onfarm rice stocks ex-production, for the various seasons of the year;

d) to understand the impact of public procurement on private marketing behaviour;

e) to explore quantitatively the extent to which preharvest contacts between traders and farmers help or hinder competition;

METHODOLOGY

Primary data are being generated from a sample survey covering thirty four upazilas drawn from twenty one districts. The district level selection is the same as for the Market Survey. A commonality in the district-level coverage between the two surveys follows directly from the Farm Survey being, essentially, an add-on to the Market Survey. From each of the surplus districts two upazilas were randomly selected, except that the second selection was modified somewhat by a purposive consideration: we wanted to have the two UZs represent a gradation in terms of infrastructural status. Within each selected upazila, two unions were selected by the field research team after visiting the upazilas, when a community level survey was carried out. At this stage, this community survey involved interviews with upazila level public functionaries, particularly in the Upazila complex (e.g. the Upazila Agricultural Officer), Block Supervisors, rice traders etc. On the basis of these interviews, two unions per upazila were selected, one each to represent a gradation at once with respect to

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adoption of modern rice technology and the access to all-weather roads. Within each selected unions, one village was selected. The focus of the study was on the determinants of the marketing and storage behaviour of surplus-generating cultivator households, it was imperative to oversample medium and large farms, in the interest of retaining large enough subsamples in those strata. The reason, is that, especially, the large households account for a disproportional share of total offers to market (Ahmed, 1991). Once the villages were selected, a census of households in large and medium farms was conducted. The final sample was selected from the village -level enumeration. In all, 620 cultivator households were selected from twenty one districts representing hirty four upazilas.

The survey instrument includes questions on (a) demographic, educational and occupational data regarding the household; (b) land ownership and utilization, tenancy status, technology adoption and cropping pattern; (c) production of rice and other crops; (d) rice consumption by source, (production and purchase) rice marketing and storage by month by seasons; (e) net income from crop - and noncrop agriculture; (f) non - agricultural income; (g) pattern and cost of marketing; the use and terms of institutional and other agricultural credit; (i) prices at which coarse and noncoarse paddy were sold by the farmers during the months; labour demand and wages rates; and (j) infrastructural details of access to markets.

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In addition to household level data, an effort was made to collect upazila-level data regarding the farm-technology, irrigation and credit environment of the households. It is proposed to use this second set of data in order to identify, econometrically, household-level demand influences from the impact of expogenous changes in institutionally determined supply.

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