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LABOUR MARKET CHARACTERISTICS IN RURAL BANGLADESH AFTER THE 1998 FLOOD

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ABSTRACT

This paper is one of the few attempts to describe and analyze labor market issues relative to labor market participation and labor supply and demand for labor in rural Bangladesh at the time of the 1998 flood. It presents empirical estimates of the supply function of daily laborers and of the demand for labor in crop production using a panel data set of 750 households. The findings reveal a labor market characterized by low participation rate and low overt unemployment. The participation rate of females is particularly low and may be explained in part by the involvement of a large majority of females in housework and in school (for 10-14 years old). Among those who participate in the labor market, more than one-third were found to be daily laborers, who were mostly males aged between 25 to 54 years earning a daily wage rate varying from Tk. 55 to Tk. 60 including meals. The analysis of the demand for labor shows that hired labor was one-third of all labor used in the rural agricultural labor market and larger farmers (with 150 or more decimals of land) used more hired laborers than smaller farmers (with less than 50 decimals of land). Total labor use as well as labor demand per acre also increased from November '98, just after the flood to round 2 April, and the loss of labor demand suffered during the period of the flood was offset, at least to some extent, by higher demand and higher earnings in the period after the flood.

I. INTRODUCTION

In rural Bangladesh, wage employment constitutes a major source (21-32) of household income for dependent and daily workers together (del Ninno et al, 2001). Participation in the labor market is particularly important for the poor since they have less access to land for farming. Therefore, participating in the labor market and being employed for longer periods of time and at higher wages translates into a better access to income and ultimately to food security.

The flood of 1998, one of the most severe' and longest in recent decades, had a devastating effect on the Bangladesh economy as a whole and on the rural labor market in particular, given the damages on the agricultural sector. In fact, agriculture is by far the largest sector of employment in the economy and absorbs 73 percent of the rural employed population (Labor Force Survey (LFS), 1995/96). The employment loss in crop production due to the 1998 flood, occurred mostly in November-December 1998 when the rain-fed *aman*

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I The level of severity of flood was measured at the district level in terms of the percentage of the area and the number of people affected by the flood. At the same time, the Water Board classified the areas as normal, moderate, severe or non-affected depending on the level and depth of the floodwater. The level of severity provide by two sources was comparable in most cases.

crop is usually harvested and half of the required labor for harvesting and threshing is hired. In response to the loss of jobs available, a few people migrated to non-affected areas in search for jobs. Others tried to earn some income by engaging themselves in transport activities (mostly boating), fishing and in petty trade of fish and other commodities.

In the winter following the flood, the Bangladesh economy showed a strong recovery in the production of the following rice crop, which is the irrigated *boro* crop, which is usually planted in January and is harvested in April/May. The subsequent increase in agricultural production spurred a growth in labor demand.

The main objective of this paper is to describe the labor market situation in rural Bangladesh in terms of the individual participation in the labor market and the labor supply on one hand and the analysis of demand for labor on the other, in the period following the 1998 flood. The detailed analysis of a unique households data set at the time of the reduction of the agricultural production that took place in November 1998 and the following expansion that took place in March/April 1999 gives the opportunity of providing further understanding of the determinants of labor supply and demand for labor, albeit analyzed separately.

II. A REVIEW OF RELEVANT STUDIES

At the micro-level, very few studies have been conducted dealing directly with labor participation in Bangladesh (Hossain et al. 1994; Chowdhury 1991; Mahmud 2000). Most of the studies conducted are limited to the analysis of the behavior of rural women and/or in selfemployment activities due to micro-finance programs.

Choudhury's (1991) study estimated the determining factors for female labor participation employing OLS techniques using district level information for each age group and observed that the determinants of rural female participation are not the same for all age groups. The supply side variables (such as education, per capita livestock, child-woman ratio) in certain age groups and demand side variables such as irrigated area and infrastructure are more important for females who are 15-29 years old. The positive effects on the probability of women participating in the micro-credit program (to be self-employed) are family size, households owning land between 1-249 decimals, health status and negative effects are years of schooling, age, attitude variables (Mahmud 2000).

Varma and Kumar (1996) and Hossain et al. (1994) employed a probit model to determine the factors affecting the participation of the rural labor force in non-farm activities. The Hossain study revealed that the extent of participation was higher for landless households rather than landholding households, and that education has a negative impact on participation in rural non-farm activities except in the case of trade. Trade and shop-keeping were the most important non-farm occupations, followed by services and construction. But in Varma and Kumar (1996) study, the probit estimation shows that higher education levels and bigger

family size increase the probability of entering the non-farm sector, while higher landholdii reduces the probability of participation.

There are more studies available at the micro-level on the demand for labor, particularly with regard to labor absorption in crop production (Hirasima & Muqtada 1986, Alauddin & Tisdell 1995, Salam 1986). It was observed that there was an inverse relationship between farm size and labor use because small farmers adopted more labor-intensive crops and a higher cropping intensity on their farms than large farmers. Most micro-level studies are, however, consistent in their finding of a substantial degree of seasonal variation in employment. The coefficient of variation in monthly labor use for daily labor is significantly high, that is, there is a large variation in labor use from slack seasons to peak seasons. Rahman and Khandker (1996) have shown that rural underemployment is estimated to be around 25-26 percent. Rural workers are found to be fully employed in peak seasons and a shift from wage labor to self-employment (non-farm employed) can create an upward pressure on the wage rate. As the wage rate increases, employers themselves work on their own farms. This will reduce the demand for wage labor, resulting in expansion of self-employment.

Rahaman and Islam (1988) estimated some multiple regression equations for labor use (labor days per year per worker) separately for agriculture and non-farm activities in Dhaka and Chittagong. The data used contains a year long weekly survey of 140 pre-selected rural households in Dhaka and Dinajpur (July, 1981, to June, 1982). The regression analysis for the determinants of total labor use shows a negative influence of both ownership of land and education variables, but education is positively associated with non-farm labor use. In the study, wage rate was not used as an explanatory variable for landless households.

Skoufias (1993a) argues that the wage rate may have different effect on the demand for labor, depending on the stage of production because the productivity of a variable input such as labor depends not only on the total amount used but also on the timing of its application. In this study, season in agriculture is defined as a two-stage process such as planting (in area intensive activities) and harvesting (production intensive activities). Each crop is modeled as two seasons, planting and harvesting. Labor hours used in each cultivated plot by each household for stages one and two, as well as for combined stages, are considered dependent variables. The analysis is based only on the rainy season (*Kharif* season). The author used OLS regressions (Single Stage-pooled) on both planting and harvesting seasons for all rural workers with the following dependent variables: log of total (family plus hired), male and female labor hours, and independent variables: male village hourly wage rate, cropped area, value of fertilizer, irrigation (1 or 0), plot (0=otherwise, 1=leased or shared), cost of seeds, year dummy and village dummy. The wage rate is the village average hourly-wage rate. The average village wage for each category of worker is used to represent the opportunity cost of time of adult males, females and younger household members. The results of the labor demand study suggest that the response of rural labor wages to shifts in the demand for or

supply of labor differ substantially from season to season. The coefficient of the wage rate for male labor is found to be negative.

In another study, Skoufias (1993) uses transformed data measured by a deviation from its individual specific mean to eliminate all individual specific effects. The study shows that increased male wage rates are associated with lower market-labor supply, lower hours of work at home and higher leisure for males. Higher male wage rates increase child schooling. The coefficients of child, land owned and education are found to be negatively significant when related to the labor use of female workers.

Finally, there has been a good deal of research on the understanding of the problems of unemployment and underemployment, and on wage rate determination in rural Bangladesh (reviewed in Islam 1995). The studies on unemployment and underemployment concentrated on estimates of unemployment and underemployment using a combination of 'time' and 'productivity' criteria. It appears that labor participation is likely to be influenced not only by supply side variables such as education, age, household size, value of productive assets, but by demand side variables as well.

III. THE DATA

The data used for the analysis reported in this paper consist of a survey of 757 households that have been interviewed three different times in seven flood affected thanas of the country. The data were collected in October-November, 1998, April-May, 1999, and November-December, 1999. The data contain detailed information on all household members, including labor participation, main type of employment (such as dependent worker, daily labor, self-employment in business and cottage activities and own farm), days worked in each type of jobs and earnings starting a year before the flood in July, 1997, until a year after the flood in December, 1999. Therefore, it allows a good comparison across different seasons and economic situations².

We selected areas that would give a fair representation of the parts of the country affected by flooding. We used the following three main criteria to select the seven flood affected thanas.

The level of flood exposure according to the classification of the Bangladesh Water Development Board based on the level and depth of water. The thanas were categorized as not-affected, moderately affected and severely affected.

The level of poverty, calculated as the percentage of poor people in the district in which thanas were located. Thanas with more than 70 percent of the population below the poverty line were classified as poor.

² For a detailed description of the data set and the survey methodology see del Ninno et. al. 2001.

From the Thanas selected on the first two criteria, we chose those thanas that were included in other studies.

The selected thanas are listed in Table 1. Although these thanas have not been selected to be statistically representative of all of rural Bangladesh because of their geographical representation, they give a very good indication of the situation of the rural labor market between October, 1997, and October, 1999.

Table 1. List of Thanas in the sample

	Non Poor Thanas	Poor Thanas	Total
Severely affected	Muladi BARISAL (BA)	Mohammadpur MAGURA (KH) ^{BINP}	...
	Shibpur NARSHINGDI (DH) ^{BINP}	Saturia MANIKGANJ (DH) ^{Micro}	4
Moderately affected	Shahrasti CHANDPUR (CI) ^{BINP}	Madaripur MADARIPUR (DH) ^{BINP}	...
		Derai SUNAMGANJ (SY) ^{HKI}	3
All Total	3	4	7

Source: del Ninno et. al, (2000)

Notes:

1. BINP: denotes thanas where the Bangladesh Integrated Nutrition project was active
2. Micro: Denotes thanas where IFPRI collected data for the micro-nutrient analysis
3. HKI: Denotes survey areas for the nutritional Surveillance conducted by Hellen Keller International

JEL Classification : J3 - Wages, Compensation, and Labor Costs
 : J43 - Agricultural Labor Markets
 : D1 - Household Behavior

Multistage random probability sampling was employed for the selection of the households to be interviewed. In the first stage, three unions in each thana were randomly selected (with the exception of Saturia, where the random sample of another IFPRI study is used). Then, six villages were selected in each union with the probability proportionate to the population in each village and subsequently, two clusters (paras) were randomly selected using pre-assigned random numbers in each village. At the last stage, three households were randomly selected in each cluster from a complete list of all households in the paras. As a result, six households per village, 36 households per union, 108 households per thana were selected to give a sample of 757 households in 126 villages.

IV. THE SUPPLY OF LABOR

In our analysis of the labor supply, we explore the inter-relationships among market wage rates, participation in the labor market, days worked for wage, hours of work at home, hours devoted to schooling for adult males, females, boys and girls respectively.

IV.1 Labor Force Participation

The labor force participation rate³ was 40.8 percent in the flood and immediate post-flood period (round one) in rural Bangladesh (Table 2). It declined slightly to 39 percent in April-May, 1999, and to 37 percent in October-November. The low rate of participation in economic activities was partly due to the low rate of female participation in income earning activities.

Table 2. Labor participation rate over three periods by age categories

Age Category	Nov-Dec 1998		Apr-May 1999		Oct-Nov 1999	
	Participation rate	Persons	Participation rate	Persons	Participation rate	Persons
All						
10—14	9.57	606	9.76	594	10.09	565
15—24	34.18	667	30.62	676	28.51	698
25—34	49.22	575	46.02	578	43.99	582
35—54	60.28	793	58.26	793	55.97	795
55—60	52.87	157	49.04	157	50.33	153
61—65	59.68	62	54.84	62	50.75	67
Total	40.80	2860	38.60	2860	37.34	2860
Male						
10—14	13.31	308	16.00	300	15.84	284
15—24	54.32	324	51.06	331	52.34	342
25—34	88.35	266	86.52	267	81.48	270
35—54	94.25	435	93.79	435	91.74	436
55—60	84.52	84	86.90	84	89.02	82
61—65	75.56	45	75.55	45	68.75	48
Total	66.14	1462	65.89	1462	64.98	1462
Female						
10—14	5.70	298	3.40	294	4.27	281
15—24	15.16	343	11.01	345	5.62	356
25—34	15.53	309	11.25	311	11.54	312
35—54	18.99	358	15.08	358	12.53	359
55—60	16.44	73	5.48	73	5.63	71
61—65	17.65	17	0.00	17	5.26	19
Total	14.31	1398	10.09	1398	8.44	1398

Source: IFPRI-FMRSP Survey 1998-1999

³ Labor force participation has been defined as the ratio of persons in a given population group aged 10-65 years who are working, plus those not working because they are temporarily sick and those who are not working but are looking for jobs. An alternative participation rate is also estimated in which discouraged workers are also included. Discouraged workers are defined as persons who are not employed and who are not actively looking for a job because they feel that jobs are not available (Appendix table 4.1).

The percentage of males who worked was nearly five times that of females. The rate of participation of women in income earning activities was estimated to be higher (14.3 percent) in the flood and immediately post-flood period and it subsequently declined to 10.1 and 8.4 percent respectively in the period six months and one-year after the flood. The male participation rate instead, remained almost at the same level throughout the three periods around 66 percent.

Table 3. Reasons for not looking for Jobs - All

Age Categories	% of Persons reporting reasons for not looking						Total	Persons
	No need	No job	Sick	Student	H_keeping	Other		
November- December 1998								
10—14	0.64	1.28	0.21	83.51	10.28	4.07	100	467
15—24	1.53	1.28	0.77	42.86	48.72	4.85	100	392
25—34	1.14	0.38	0.76	3.42	91.25	3.04	100	263
35—54	2.68	1.01	2.35	0.67	92.62	0.67	100	298
55—60	1.49	0.00	10.45	0.00	79.10	8.96	100	67
61—65	4.55	0.00	22.73	0.00	68.18	4.55	100	22
All	1.46	0.99	1.66	37.71	54.54	3.64	100	1509
April - May 1999								
10—14	0.60	1.59	0.20	83.13	11.90	2.58	100	504
15—24	1.79	1.28	0.26	41.07	53.83	1.79	100	392
25—34	1.40	0.70	0.00	2.11	93.33	2.46	100	285
35—54	3.54	1.61	1.93	0.64	92.28		100	311
55—60	1.32	0.00	10.53	0.00	78.95	9.21	100	76
61—65	3.85	0.00	11.54	0.00	69.23	15.38	100	26
All	1.69	1.25	1.19	36.89	56.59	2.38	100	1594
October - November 1999								
10—14	0.88	2.41	0.44	85.78	7.88	2.63	100	457
15—24	1.62	1.62	0.54	39.08	56.06	1.08	100	371
25—34	2.15	0.00	0.00	1.43	94.98	1.43	100	279
35—54	1.55	0.31	0.62	0.00	96.28	1.24	100	323
55—60	1.47	0.00	2.94	0.00	82.35	13.24	100	68
61—65	7.14	0.00	10.71	0.00	53.57	28.57	100	28
All	1.57	1.18	0.72	35.45	58.39	2.69	100	1526

Source: IFPRI-FMRSP, Bangladesh Flood Impact Survey, 1998-1999

The higher participation rate in the immediate post-flood period may be explained by the fact that the rural workers found alternate forms of employment within the water sector like boating and fishing (Ninno, 1999).

It is important to understand why some individuals decide to participate in the labor market, while at the same time, others prefer not to participate.

Table 3 above reports reasons for not looking for jobs in the three periods in 1998-99 by age. The main reason reported by about 90 percent of males and about 80 percent of females in the age group of 10-14 years in all the periods is studying. In the age group of 15-24 year olds, nearly 80 percent of males were students. The percentage of male students in this age group increased from 75 percent in round one to 79.3 percent in round two and thereafter to 82.1 percent in round three. A great majority of females over 15 years of age were involved in housekeeping activities. Less than five percent of the labor force reported remaining unemployed voluntarily. Low labor participation may be explained in part by the involvement of a large majority of females in housework, and the participation of a great majority of males (10 to 24 years old) and females (10-14 years old) in school.

The highest participation rate in the labor force is given by males in the 25-60 years old age group and females in the middle of the age range (between 25 and 54 years old). In the crisis period, a higher proportion of women in the age group of 55-65 years were found to be working.

The probit model of the determinants of rural labor participation, reported in Table 4, shows that age is positively correlated with labor participation at a decreasing rate. Not surprising the coefficient relative to males is positive and very large, that is, a male is more likely to participate in the labor market than a female. Similarly, married people are more likely to participate, while primary education has a positive impact on participation, higher level of education are a deterrent to participation. Significant odd values less than one for values of household owned-land and other productive assets signify that larger wealth endowments decrease the probability of participation. The flood dummy variables relative to the severe village agriculture-flood exposure⁴ shows that floods had an overall negative impact on the labor market in the year of the flood.

Note that the size of land ownership negatively influences rural labor participation in each of the time periods. It means that poor households want to supply more workers to the labor market to earn subsistence income for the family, which indicates that leisure substitutes labor when income increases.

⁴ The village agricultural flood exposure variables were calculated as the village median value of the difference in the depth of the flood in the agricultural plots. VFAG2 represents a moderate level of flood exposure and includes a difference in the flood level of an average 2.18 feet; VFAG3 represents a more severe level of flood exposure and measures a difference in the flood level of an average 3.80 feet.

Table 4. Determinants of labor participation: Probit Estimates

labor Participation	Odds Ratio	z-statistics
Age	1.101	14.95
Square of age	0.999	-14.65
Male	8.798	52.95
Household size (hhsizer)	0.982	-2.01
Married	1.087	1.72
um educat (2-5 years school)	1.113	2.13
dum(educat): 6-10 years school	0.833	-3.29
dum(educat): 11 & more years school	0.547	-7.09
Pre-flood Value Of Land	0.999	-0.88
Productive ass Val Using M1	0.953	-3.26
Liquid asse Val Using M2	0.997	-0.62
Housing ass Val Using M1	0.977	-4.55
Domestic ass Val Using M2	0.920	-1.49
Other assets Val Using M2	0.802	-1.48
vflag2 (dum: ag village flood exposure=1)	0.987	-0.13
vflag3 (dum: ag village flood exposure=2)	0.785	-2.46
dprd2 (dum: period=2)	0.847	-3.66
dprd3 (dum: period=3)	0.748	-6.37
Constant	0.076	-16.32
Log likelihood	-2937.18	
Number of Observation	7307	
LR chi2	4194.69	
prob>chi2	0	
Pseudo R2	0.4166	

Notes: assets are multiplied by Tk. 10,000

Source: IFPRI-FMRSP, Bangladesh Flood Impact Survey, 1998-1999

IV.2 Occupations of Working Rural Labor

Tables 5 and 6 provide a picture of the allocation of working individuals between dependent wage, daily labor, self-employment either in business and cottage activities or own farm, and unpaid family labor by gender and age over the three main periods of data collection⁵.

Dependent workers, mostly salaried persons, including also those, whose jobs continue for more than a day, represent only 15 percent of rural employed persons. More than one-third of rural male workers were found to be daily laborers, compared to only 28 percent in the 1995-96 LFS. The percentage of daily laborers (both male and female together) was higher by seven percent in round two, compared to rounds one and round three.

⁵ In rural areas, since people may be engaged in more than one occupation, the respondents were asked to name their principal occupation based on their earnings.

Table 5. Distribution of working individuals by main occupation and gender (Percentages)

	Nov -Dec 1998	Apr- May 1999	Oct-Nov 1999
All			
Dependent Worker	16.65	13.06	15.48
Daily Labor	32.24	39.62	31.52
Own Business	21.64	24.30	33.40
Own Farm	19.15	17.68	15.38
Unpaid Family Worker	9.71	4.71	3.94
Beggar	0.62	0.63	0.28
Total	100.00	100.00	100.00
Number	1123	1103	1066
Male			
Dependent Worker	16.79	12.03	13.76
Daily Labor	34.76	41.63	33.30
Own Business	22.35	24.48	32.35
Own Farm	22.03	19.67	16.70
Unpaid Family Worker	3.74	1.99	3.89
Beggar	0.32	0.21	0.00
Total	100.00	100.00	100.00
Number	935	956	952
Female			
Dependent Worker	15.96	19.73	29.82
Daily Labor	19.68	26.53	16.67
Own Business	18.09	23.13	42.11
Own Farm	4.79	4.76	4.39
Unpaid Family Worker	39.36	22.45	4.39
Beggar	2.13	3.40	2.63
Total	100.00	100.00	100.00
Number	188	147	114

Source: IFPRI-FMRSP, Bangladesh Flood Impact Survey, 1998-1999

About 44 percent of rural male workers were self-employed in own business and own farm in round one. This percentage increased from round one to round three by five percent. More than one-fifth of total rural employed persons were engaged in own business activities and this percentage increased from round one to round two by two percent and by about nine percent from round two to round three. These findings confirm the trend in the increase in the percentage of individuals engaged in self-employment from 1995-96. The percentage increase in female self-employed in own businesses is even higher than that of males.

Table 6. Distribution of working individuals by main occupation and age category (Percentages)

Age	Dependent worker	Daily labor	Own Business	Own farm	Unpaid family worker	Beggar	Total	Persons
November - December 1998								
10-14	25.00	14.29	16.07	17.86	23.21	3.57	100	56
15-24	25.00	14.29	16.07	17.86	23.21	0.00	100	211
25-34	18.91	35.64	24.00	12.73	8.73	0.00	100	275
35-54	12.85	36.62	24.63	19.27	6.21	0.43	100	467
55-60	6.17	24.69	19.75	38.27	8.64	2.47	100	81
61-65	0.00	18.18	21.21	54.55	3.03	3.03	100	33
Total	16.65	32.24	21.64	19.15	9.71	0.62	100	1123
April - May 1999								
10-14	22.41	32.76	17.24	17.24	5.17	5.17	100	58
15-24	20.67	37.5	14.90	16.83	10.10	0	100	208
25-34	14.93	43.66	25.75	11.19	4.10	0.37	100	268
35-54	9.52	42.86	29.44	15.80	2.38	0	100	462
55-60	5.19	27.27	18.18	40.26	5.19	3.90	100	77
61-65	0	13.33	26.67	53.33	6.67	0	100	30
Total	13.06	39.62	24.30	17.68	4.71	0.63	100	1103
October - November 1999								
10--14	20.69	22.41	29.31	6.9	18.97	1.72	100	58
15-24	25.13	27.64	23.62	14.07	9.55	0	100	199
25-34	17.19	33.2	36.72	10.16	2.73	0	100	256
35-54	12.11	36.1	37.44	13.45	0.9	0	100	446
55-60	6.76	24.32	28.38	37.84	1.35	1.35	100	74
61-65	0	12.12	30.3	54.55	0	3.03	100	33
Total	15.48	31.52	33.4	15.38	3.94	0.28	100	1066

Source: IFPRI-FMRSP, Bangladesh Flood Impact Survey, 1998-1999

The proportion of unpaid family workers was found to be lower than in the labor force survey of 1995-96, and declined between round one and round two. This means that when jobs are available, people are willing to participate in the labor market. As agricultural income increases, the demand for activities such as poultry rearing, shop-keeping, etc. around the homestead in which poor women can find employment may also go up.

Table 7 reports that the percentage and the number of households supplying daily labor increased from round one to round two by about 10 percent and then dropped by 11 percent in round three. On the contrary, the number of households supplying self-employed workers declines in round two compared to round one and then reaches the same level in round three

as in round one. The percentage of households and average persons per household involved in business and cottage activities increased from round one to round two to round three. As mentioned earlier, round two refers to the period five months after the flood, when a bumper *boro* crop was harvested.

Table 7. Household labor supply of salaried worker by farm land and periods

Farming							
Land		Oct-Nov '98		Apr-May '99		Oct-Nov '99	
Category	N. Hhs	Hh	Av. Person	Hh	Av. Person	Hh	Av. Person
0- 4.9	300	50	1.22	52	1.31	62	1.21
5--49	160	22	1.23	19	1.16	26	1.19
50-149	188	39	1.23	34	1.24	33	1.21
150-249	68	11	1.00	8	1.13	11	1.09
250 +	41	12	1.42	11	1.18	10	1.20
Total	757	134	1.22	124	1.24	142	1.20
Daily Labor							
0- 4.9	300	144	1.20	145	1.28	113	1.16
5--49	160	74	1.14	81	1.19	66	1.14
50-149	188	56	1.16	68	1.16	61	1.25
150-249	68	19	1.21	29	1.14	23	1.52
250 +	41	9	1.33	8	1.38	5	1.20
Total	757	302	1.18	331	1.22	268	1.21
Self Employed							
0- 4.9	300	102	1.20	97	1.26	154	1.19
5--49	160	53	1.09	55	1.18	71	1.24
50-149	188	48	1.20	58	1.22	77	1.30
150-249	68	12	1.33	14	1.29	21	1.19
250 +	41	8	1.37	7	1.29	12	1.33
Total	757	223	1.19	231	1.23	335	1.23

Source: IFPRI-FMRSP, Bangladesh Flood Impact Survey, 1998-1999

At the aggregate level, 85 percent of rural workers were between 15 and 54 years of age, and only 5 percent were children 10 to 14 years old.

IV.2.1: Dependent Workers. Dependent workers have relatively higher levels of education. More than 14 percent have completed 11 or more years of schooling, compared to about 5 percent for those engaged in business and cottage activities. More than half of dependent workers were hired in the private sector in the period between July-October, 1997, to April-May, 1999. Afterwards, the proportion increased to more than two-thirds. Non-government projects, along with the private sector, employed 73.3 percent of all dependent workers in July-October, 1997.

The percentage of employment increased over the years from July-October, 1997, to July-October, 1999. The rate of increase was much higher during 1998-99. Although the level of employment in the government sector remained almost the same, the percentage of workers employed in this sector declined from 26.7 percent in July-October, 1997, to 15.5 percent in July-October, 1999. On average, more than two-thirds of dependent workers were casual and this proportion increased from year to year. The proportion of permanent employment in the government sector was the highest (90 percent) and that in the private sector is the lowest (less than 10 percent). For more than half of dependent workers, their job was located outside their home district. A year after the flood, in July-October, 1999, the proportion of dependent workers working outside their home district decreased to 30 percent, indicating a change towards locations closer to their village, thana and union.

Table 8 shows the monthly average hours worked and wage earnings of dependent workers for seven periods from July-October, 1997, to October-November, 1999, and by sectors of employment as well. The average monthly wage earnings declined in the periods following July-October, 1997, except in the period of December, 1998--April, 1999, when earnings were higher by about 12 percent. The service, trade, transport and rural manufacturing sectors paid higher monthly earnings than other sectors. Monthly average earnings from the agriculture sector were relatively higher in December, 19'98 -April, 1999. About 60 percent of the dependent workers were employed in the service sector in July-November, 1999. The rural manufacturing sector absorbed about 16 percent of workers, followed by off-farm work (10.7 percent).

IV.2.2: Daily Laborers. Table 9 contains information about the number of individuals working as daily laborers, number of days worked, average monthly earnings, hours worked per month and daily wage rate over seven periods by sector of activity. It emerges that daily laborers were mostly males (90 percent) aged between 25 to 54 years (75 percent), with the females more concentrated in the of 35-54 age group (more than 50 percent of them).

Average monthly earnings, size of employment, and hours worked were higher in December, 1998-May, 1999, compared to the other five periods. These two periods correspond to area and production intensive activities for the *boro* crop. Apparently, after the flood, more agricultural land was used for *boro* cultivation, because of the reduction of the area used for *aman* cultivation and the losses incurred in the cultivation of *aman* because of the flood. The daily wage rate varied from Tk. 55 to Tk. 60 including meals. They never exceeded US \$ 20 a month and dropped even to a lower amount at the time of the peak of the flood, in August, 1998.

Table 8. Monthly average earnings, average monthly days and hours worked of dependent workers by type of job and period.

Agricultural Work	July-Oct 97	July-Oct 98	Nov-Dec 98	Dec 98- Apr 99	Apr- May 99	July-Oct 99	Oct-Nov 99
Earnings per Month (Tk.)	4550	2296.26	1425.43	3128.71	1072.06	1588.00	1532.50
Hours Worked per Month	141	97.89	296.00	372.53	150.76	230.22	257.25
No. of persons Engaged	5	6	10	10	17	5	8
Off-farm Work							
Earnings per Month (Tk.)	2413	1679.24	1264.77	3200.25	1972.00	1650.07	1455.06
Hours Worked per Month	224	209.52	211.33	273.25	208.53	212.19	197.72
No. of persons Engaged	24	23	25	16	15	16	18
Rural Manufacturing							
Earnings per Month (Tk.)	1339	1727.95	1570.69	2393.52	1956.78	1637.89	2460.74
Hours Worked per Month	153	131.40	175.50	303.91	205.91	243.65	187.33
No. of persons Engaged	21	22	24	23	23	25	27
Trade, transport & construction							
Earnings per Month (Tk.)	1221	1852.29	1178.19	1057.5	1948.33	1911.38	1806.44
Hours Worked per Month	164	140.77	154.69	210.09	129.81	177.33	177.33
No. of persons Engaged	11	13	16	18	21	8	9
Service							
Earnings per Month (Tk.)	2555	2079.92	1939.39	2887.45	1866.99	2044.72	2045.67
Hours Worked per Month	159	117.21	137.40	220.33	150.32	182.85	180.26
No. of persons Engaged	62	72	74	79	79	98	97
Other							
Earnings per Month (Tk.)	980	1557.98	131.44	1093.33	1083.2	807.14	740.56
Hours Worked per Month	207.41	142.1	177.89	370.3	181.2	103.25	102.11
No. of persons Engaged	9	17	18	9	10	8	9
All							
Earnings per Month (Tk.)	2191	1908.98	1626.96	2616.2	1770.01	1845.27	1941.31
Hours Worked per Month	173	136.82	169.4	255.53	162.67	192.87	182.62
No. of persons Engaged	132	153	167	155	165	161	168

Source: IFPRI-FMRSP, Bangladesh Flood Impact Survey, 1998-1999

Agriculture is the single largest source of employment for daily laborers. Labor absorption in agriculture varies from month to month, going from 42 percent in the pre-flood and flood period (July-October, 1998) to a high of 61 percent in October-November, 1999. The second most important source of use of daily laborers is the rural manufacturing sector, absorbing 20-24 percent of all daily laborers in July-December, followed by the construction sector in the months of April-May and January-April.

Table 9. Monthly average earnings, average monthly hours worked and daily wage of daily labor by type of job and periods

Agricultural Work	July- Oct 97	July- Oct 98	Nov-Dec 98	Dec 98- Apr 99	Apr- May 99	July- Oct 99	Oct-Nov 99
Earnings per Month (Tk.)	829.09	384.27	590.57	744.75	908.29	656.57	683.15
Hours Worked per Month	132.17	62.54	97.33	112.91	124.48	104.56	103.79
Daily Wage Rate (Tk.)	50.86	50.39	51.67	56.30	67.57	55.08	57.01
Persons	206	134	175	212	231	192	193
Off-farm Work							
Earnings per Month (Tk.)	812.79	534.32	597.31	663.21	595.48	726.44	652.00
Hours Worked per Month	166.83	124.55	133.18	100.43	91.59	106.07	83.53
Daily Wage Rate (Tk.)	46.76	43.50	38.33	52.57	52.62	51.67	63.25
Persons	34	47	31	30	29	16	21
Rural Manufacturing							
Earnings per Month (Tk.)	1186.39	729.21	966.84	1292.50	1030.36	1031.37	970.90
Hours Worked per Month	169.06	114.02	152.81	173.95	123.45	147.03	136.52
Daily Wage Rate (Tk.)	59.92	56.46	56.00	64.57	72.15	63.15	64.10
Persons	82	83	98	58	47	73	63
Trade, transport				-			
Earnings per Month (Tk.)	1655.26	1153.81	1568.33	1744.17	718.33	1547.22	1448.00
Hours Worked per Month	233.42	178.27	220.67	226.52	113.33	241.67	224.00
Daily Wage Rate (Tk.)	70.26	63.47	70.00	83.00	58.33	69.17	66.00
Persons	20	20	18	11	6	6	5
Construction							
Earnings per Month (Tk.)	1670.17	1153.41	1284.52	1080.26	1134.46	1279.90	1308.10
Hours Worked per Month	181.31	118.93	135.94	132.53	133.19	143.34	136.28
Daily Wage Rate (Tk.)	76.03	78.48	77.58	65.83	68.12	79.26	81.90
Persons	29	23	31	102	74	34	30
Other Service							
Earnings per Month (Tk.)	386.21	317.12	414.09	822.39	702.86	710.00	746.00
Hours Worked per Month	104.85	77.85	132	203.39	200.29	154.67	171.60
Daily Wage Rate (Tk.)	26.36	29.55	27.27	36.45	33.57	30.00	30.00
Persons	11	11	11	11	7	5	5
All							
Earnings per Month (Tk.)	995.8	597.81	798.81	921.04	935.76	826.98	808.76
Hours Worked per Month	151.6	97.19	125.62	130.39	124.75	121.58	115.06
Daily Wage Rate (Tk.)	54.59	53.14	54.27	59.59	66.38	59.15	60.82
No. of Persons	382	318	364	424	394	326	317

Source: IFPRI-FMRSP, Bangladesh Flood Impact Survey, 1998-1999

IV.2.3: Rural Non-Farm Sector. The rural non-farm sector is an important heterogeneous sector covering both low productive and large-scale commercially viable

operations. Business and cottage activities, for example, are self-employment non-farm activities, which employed more than one-third of total employment in October-November, 1999.

The RNF' sector's potential for providing sustainable employment (part-time/ full-time) is dependent on the returns to labor relative to the agricultural wage rate, etc. (Varma 1996). Table 10 presents estimates of monthly hours worked, average monthly income, and fixed capital of self-employed persons in various non-farm activities by gender for seven periods from July-October, 1997, to November-December, 1999. We found that the average monthly income from rural non-farm activities was much higher than earnings from daily labor and during the July-October, 1999 period, the average monthly earnings were reported to be 89 percent higher. The monthly income of self-employed persons in non-farm activities was lower than that for dependent workers except in the period of November-December, 1998, when the self-employed earned more than dependent workers by four percent.

The hours worked were less in the period of the flood, from July-October, 1998, to October-November, 1998, and in April-May, 1998, when self-employed persons had to shift their time towards agricultural work. In October-November, 1998 (flood period), more working hours were spent on transport activities, trade and open water fishing. These activities are basically one-person activities with abundant use of unpaid family workers and very little use of wage employment.

Trade accounts for about one-fifth to one-fourth of rural employment in the non-farm sector, followed by rural manufacturing (14-17 percent), transport (14-15 percent) and fish sales (12-17 percent). Rural trade is dominated by retail trade, and together with other business, accounts for 35-43 percent of non-farm employment. Non-farm activities were performed for more than an average of 180 hours per person per month in July-October, 1997, November-April, 1999, and July-October, 1999.

Partial productivity of labor is estimated by average profit per unit of labor and partial productivity of capital is measured by fixed capital per unit of labor. These measures may indicate whether profits could be earned by employing hired labor or whether self-employment generates more income than alternate occupations. The productivity estimates show that other businesses provide the highest profit per unit of labor in the non-farm sector, followed by rural trade. Fish trade, other rural manufacturing and transport are also productive activities, though earnings vary among activities. In all the activities, monthly income per self-employed person was much higher than the earnings of day laborers. This seems to indicate that there exists a dynamic component in the rural business and cottage activities sector.

IV.2.4: Unpaid Family Worker. Besides participating in the formal labor market, individuals perform a large variety of tasks at home, ranging from repairs of their homes, working on their own farm, tending livestock, fishing, cleaning the house, etc. The time

Table 10. Non-farm labor- monthly average earnings, average monthly hours worked, and days worked, capital requirement of non-farm labor by type of job and period

	July-Oct 97	July-Oct 98	Nov-Dec 98	Dec 98- Apr 99	Apr-May 99	July-Oct 99	Oct-Nov 99
Food Processing							
Earnings per Month (Tk.)	5196.67	1058.79	1463.00	812.92	710.00	622.19	639.27
Hours Worked per Month	123.83	102.45	161.30	130.92	79.40	204.11	91.36
Working capital	616.67	1450.00	1250.00	1020.83	630.00	696.88	745.45
FixedCapital	1200.00	1575.00	2025.00	7829.17	8530.00	1287.5	618.18
No. of Persons	6	12	11	13	15	22	16
Other rural manufacturing							
Earnings per Month (Tk.)	1368.66	933.48	1157.67	1739.73	1645.33	1166.55	1131.49
Hours Worked per Month	155.38	107.17	183.12	186.73	153.1	166.99	144.6
Working capital	11634.83	12740.87	11225.00	8657.67	8971.72	6871.17	6437.5
Fixed Capital	6296.72	6801.96	2025.00	4979.71	5238.67	5660.43	5962.22
No. of Persons	33	25	32	35	30	48	47
Trade(wholesale, retail & petty)							
Earnings per Month (Tk.)	1602.51	1117.15	1555.59	2302.99	1450.53	1754.05	1648.83
Hours Worked per Month	180.93	136.94	183.66	180.26	137.79	179.84	170.79
Working capital	11110.78	10432.54	9418.57	13684.03	14572.30	11714.88	11878.31
Fixed Capital	7948.25	7643.00	6814.55	23455.38	6956.01	10381.94	10488.98
No. of Persons	62	67	; 3	75	77	87	85
Fish Selling							
Earnings per Month (Tk.)	1387.89	1163.03	1095.67	1559.8	1968.18	1374.51	1321.66
Hours Worked per Month	210.48	182.31	191.80	168.95	134.59	203.57	183.05
Working capital	1240.74	941.38	946.43	537.5	604.76	1201.06	1098.19
Fixed Capital	3341.03	3129.70	4025	3842.4	5211.36	3147.07	2435.82
No. of Persons	30	33	30	25	23	72	77
Transport							
Earnings per Month (Tk.)	1306.34	822.15	1204.02	1246.96	886.22	1141.72	1169.29
Hours Worked per Month	196.29	118.99	185.52	185.83	140.31	207.43	163.41
Working capital	36.36	16.19	208.82	167.71	348.78	159.07	150.18
Fixed Capital	2750.00	2292.11	2414.63	2878.85	2750.00	2352.54	2011.67
No. of Persons	38	41	41	55	45	61	65
Others business							
Earnings per Month (Tk.)	1829.89	1997.97	2700.53	2336.09	2007.02	2836.79	1668.01
Hours Worked per Month	183.52	145.76	194.29	183.88	159.83	178.52	164.86
Working capital	8865.96	7774.49	8831.91	11675	11928.00	9391.72	8210.99
Fixed Capital	10868.93	9832.56	11821.89	8830.94	8510.41	7357.06	6815.14
No. of Persons	50	50	50		53	66	71
All Others							
Earnings per Month (Tk.)	741.25	297.9	2078.25	1039.7	905.98	1105.47	1518.62
Hours Worked per Month	125.19	82.12	135.22	140.89	112.84	130.07	138.78
Working capital	6368.75	8705.00	7695.56	8428.89	7989.36	8041.23	8436.98
Fixed Capital	4472.5	4023.03	3891.56	4160.22	3408.51	6463.16	7515.28
No. of Persons	44	44	49	47	49	59	56
Total							
Earnings per Month (Tk.)	1488.43	1099.04	1692.14	1732.19	1403.49	1562.81	1412.99
Hours Worked per Month	173.32	128.79	177.29	173.74	37 31	180.40	161.49
Working capital	7048.69	6942.70	6831.63	8027.82	8616.65	6354.19	6125.63
Fixed Capital	6192.67	5820.42	5557.09	9690.42	5710.09	5937.79	5843.98
No. of Persons	263	272	286	306	292	415	417

Source: IFPRI-FMRSP, Bangladesh Flood Impact Survey, 1998-1999

allocation among these activities is presented in Table 11 . During the flood (July -October, 1998), between one-fifth and one-third of family labor was engaged in fishing. Then the percentage declined. In fact, the percentage of family labor in fishing varied from six to nine

Table 11. Average hours and days worked and number of family labor by task performed and month

Year	All family labor						Total
	House repair	Own farm	Kit-garden	Livestock	Fish work	Other	
Jun-Aug '98							
Persons	87	64	6	334	122	38	651
% of people	13.36	9.83	0.92	51.31	18.74	5.84	100
% of time (hours)	2.97	11.52	0.13	45.56	28.57	11.24	100
total persons							
Aug-Sep '98							
Persons	111	49	12	337	157	41	707
% of people	15.7	6.93	1.7	47.67	22.21	5.8	100
% of time (hours)	4.81	7.51	0.2	44.46	31.54	11.35	100
Sept-Oct '98							
Persons	309	75	16	346	216	41	1003
% of people	30.81	7.48	1.6	34.5	21.54	4.09	100
% of time (hours)	17.6	7.8	0.63	36.03	28.67	9.3	100
Oct-Nov '98							
Persons	506	182	46	353	167	44	1298
% of people	38.98	14.02	3.54	27.2	12.87	3.39	100
% of time (hours)	25.03	19.53	0.92	30.51	16.86	7.16	100
Jan-Feb '99							
Persons	180	221	29	294	66	89	879
% of people	20.48	25.14	3.3	33.45	7.51	10.13	100
% of time (hours)	7.362	38.984	0.606	26.767	9.012	17.267	100
Feb-March '99							
Persons	193	230	44	295	69	93	924
% of people	20.89	24.89	4.76	31.93	7.47	10.06	100
% of time (hours)	7.74	37.11	1.41	24.87	9.03	19.83	100
March-Apr '99							
Persons	261	248	45	298	63	95	1010
% of people	25.84	24.55	4.46	29.5	6.24	9.41	100
% of time (hours)	10.94	37.23	0.78	26.3	6.82	17.95	100
April-May '99							
Persons	209	239	40	294	53	96	931
% of people	22.45	25.67	4.3	31.58	5.69	10.31	100
% of time (hours)	6.86	42.72	0.79	28.14	4	17.49	100
Total persons	362	285	69	300	99	98	1213

Source: IFPRI-FMRSP, Bangladesh Flood Impact Survey, 1998-1999

percent in 1999. The other important activities performed by a large proportion of family labor were house-repairs and tending livestock. In January-May, 1999, more than one-third of family labor was involved in their own farms; they spent an average of 74 hours to 87 hours per month on this activity. Time allocation for livestock activities varies from one period to another ranging from one-third to half of family labor time.

IV.3 The Supply Function of Daily Laborers

The most important form of labor participation for landless households is through daily labor. To get a better insight on the determinants of labor supply, we focused on the supply of daily laborers, by estimating a simple model in which the total number of hours worked by daily laborers in a month is a function of the daily wage rate and other individual and household characteristics. In particular:

$\text{Log}(\text{Hours per Month}) = f[\text{log}(\text{daily wage}), \text{gender}, \text{age}, \text{age squared}, \text{categories of educational achievement}, \text{household size and dummies for location (thanas)}]$

To take into account any bias with respect to the participation in the market, we used the standard Heckman correction procedure. Here the probability of all the individuals over the age of 15 of participating in the labor market during the period under consideration is a function of gender, marital status, number of individuals in different age groups, categories of educational achievement, age and categories of farm ownership. The variable of square of age will indicate whether age is positively associated with labour supply at a decreasing or increasing rate depending on the sign of the estimated coefficient..

Table 12. Summary statistics by period for daily laborers

	Jul-Oct '97	Jul-Oct '98	Oct-Nov '98	Jan-Apr '99	Apr-May '99	Jul-Oct '99	Oct-Nov '99
Observations	373	309	356	432	405	334	321
Hours worked per month	153.3	98.3	127.9	129.1	124.0	120.9	114.7
Days worked per month	17.8	11.0	14.8	15.1	13.8	13.9	13.2
Hours worked per day	8.5	8.6	8.5	8.6	9.0	8.7	8.6
Daily wage	55.6	56.6	57.4	59.4	66.2	59.1	60.9
Hourly wage	6.7	6.9	6.9	7.1	7.6	6.9	7.2

Source: FMRSP-IFPRI Household Survey 1998-1999

The household data set used for the estimation, described above, contains detailed information about the participation and wage of daily laborers at seven different points of time. The number of daily workers and the monthly means of the amount of time worked and wages earned for each period are reported in Table 12. Notice that the lowest number of workers was found to be in the period of July-October, 1998, that coincides with the flood period. After that period, the demand for labor increased due to the cultivation of several crops and the tending of rice cultivation and reached the peak in January-April, 1999. This is

the time when the demand for labor is highest because of the preparation of the cultivation of the *boro* rice crop and the cultivation and harvest of wheat, potatoes and other vegetable crops.

In the period between July and October, 1999, the demand was higher than in the previous year, but still lower than in the winter months because of the natural slowing down of economic activities due to a normal flood. In the following month, the level of activity appears to be higher than in the previous year, but still not very high, probably due to the increase of alternative job opportunities. Daily wages remained stagnant between 1997 and 1998, but registered an increase after the flood, especially in the winter time, when the demand for labor appeared to be high due to the increase of labor activities.

A summary of the results of the model presented above is reported in Table 13. The coefficient of the wage variable represents the elasticity of the number of hours worked with respect to the daily wage earned by daily laborers in rural Bangladesh. The values of this elasticity vary from a high value of 49 percent in the first period (July-October, 1997) to a minimum of 10 percent, two years later. In the majority of the estimates, the coefficients of the Inverse Mills ratio (Lambda) are significant. This means it was necessary to correct for the participation bias.

Table 13-Summary of estimation results by period for daily laborers

	Jul-Oct '97	Jul-Oct '98	Oct-Nov '98	Jan-Apr '99	Apr-May '99	Jul-Oct '99	Oct-Nov '99
Wage coefficient	0.46	0.35	0.12	0.26	0.26	0.22	0.10
t test	5.42	2.19	1.27	2.01	2.76	1.49	0.71
Lambda	-0.36	-0.46	-0.23	-0.43	0.10	-0.23	-0.54
t test	-1.90	-1.99	-1.19	-1.92	0.47	-0.93	-2.09
Rho	-0.48	-0.50	-0.31	-0.52	0.14	-0.31	-0.62
Sigma	0.75	0.92	0.73	0.83	0.69	0.72	0.88
Number of obs	2251	2248	2247	2256	2258	2258	2258
Censored obs	1898	1956	1909	1850	1886	1947	1963
Uncensored obs	353	292	338	406	372	311	295
Wald chi2(19)	379.96	312.55	348.65	401.8	409.77	323.26	322.35

Source: Author's estimation using the FMRSP-IFPRI Household Survey 1998-1999

V. LABOR DEMAND IN CROP PRODUCTION

The analysis of labor demand and the use of hired labor in agriculture add another dimension to the study of rural labor markets. As we have seen above, most households rely on agricultural labor. In this section, who is hiring and what are their needs and constraints are given focus and the use of farm labor employed for farm related activities in two stages of the crop production cycle are described.

There are three broad categories of farm workers prevalent in Bangladesh agriculture: family-labor, hired labor and hired permanent (attached) workers. Exchange and contract-labor are also found in the rural labor market.

There is no doubt that family labor constitutes the highest proportion of total labor used. Hired labor constitutes one-third of all labor (del Ninno & Roy 2001). Hired labor is employed on a day to day basis, sometimes for less than a day, sometimes for a consecutive number of days or on a contract basis for various crop operations. Within our study area, the use of contract labor is 17.37 per cent (del Ninno & Roy, June 1999).

Hired labor is important for all categories of farms of various sizes. The distribution of hired labor by farm size is shown in the Table 14. The use of hired labor was relatively higher in round two compared to the other rounds. The main crop cultivated and harvested in round three is *boro* (HYV). Larger farmers (150 decimal and above) used more hired laborers than small farmers (0-49 decimals). The average use of hired labor (person days per acre) in various crop-production shows a great variation under similar cultivation and production activities. The *boro* crop uses more labor than the *aus* and *aman* in both area-intensive and production-related activities. The *boro* (HYV) crop accounts for a larger share of paddy production in recent years, followed by *aman* paddy. However, the *aman* crop covers the bulk of the cropped acreage as well as total person days of employment in rice agriculture.

Table 14. Percentage of family and hired labor by farm land and round in two stages of production

Farm Land	R1	R2	R3	All
Area Intensive Activities				
0- 4.9	27.87	30.36	33.05	31.10
5-49	27.24	21.56	33.42	27.51
50-149	35.68	32.01	47.95	38.37
150-249	34.51	22.30	34.59	30.31
250 +	48.37	25.04	56.96	42.74
Total	33.59	26.96	41.09	33.87
Production Intensive Activities				
0- 4.9	28.34	24.85	31.04	27.96
5-49	26.87	19.96	30.59	25.86
50-149	32.88	30.78	44.12	35.53
150-249	38.39	23.15	39.49	33.49
250 +	47.67	28.41	56.53	43.32
Total	32.93	25.99	39.61	32.63

Source: IFPRI-FMRSP, Bangladesh Flood Impact Survey, 1998-1999

It should be noted that farmers' choices of cropping patterns and land use patterns in Bangladesh are constrained by the timing and depth of flooding. In a normal year, 31 percent of the area cultivated in the sample survey was medium low land, with average flood depth of 0.9 to 3.0 meters (Ninno et al. 2001).

During the 1998 floods, flood-waters on sample farmers' field were almost double their normal levels - 137 centimeters compared with 73 centimeters. On medium high land, flood-waters were on average 88 centimeters higher than in normal years, and even highland fields that normally are not flooded were covered by an average of 22 centimeters of water. The severe 1998 flooding led to substantial aman crop loss: 82 percent of deep-water (broadcast) aman and 91 percent of transplanted aman. Many farmers decided to utilize their cropland just after flood-waters receded. Official unpublished Bangladesh Bureau of Statistics estimates for Thana level crop production, and area cultivated for 1998/99 are broadly consistent with the survey figures.

Consequently, the area under *boro* (HYV) increased significantly, while the area under *boro* (Local) declined marginally. This had a tremendous effect on the increase of the demand for hired labor in the agriculture sector. The area under *boro* (HYV) increased by 48 percent from 1998 to 1999, while that for *aman* (Local) by 97 percent, *aman* (HYV) by 64 percent, and jute by 23 percent (Table 15). The wage rate also increased from the *boro* 1998 to the *boro* 1999 period, both in area and production intensive activities. The use of labor per acre also increased from round one to round two. It appears that the loss of labor demand might have been offset, at least to some extent, by higher demand and higher earnings in the period after the flood.

Table 15. Area under Boro and Aman in 1998 and 1999

Crops	1998		1999		% Increase	
	No. of household	Land (dec)	No. of household	Land (dec)	No. of household	Land (dec)
Feb-March						
Boro(L)	46	5166.0	48	4452.3	4.35	-13.81
Boro (HYV)	184	14145.3	332	20957.5	80.43	48.16
Nov-Dec						
Aman (L)	46	3631.5	104	7146.75	26.09	96.80
Aman (HYV)	55	3529.5	118	5793.65	114.54	64.15
May-June						
Jute	105	3290.0	115	4033.75	9.52	22.61

Source: IFPRI-FMRSP, Bangladesh Flood Impact Survey, 1998-1999

Table 16 presents results of the estimation of a labor demand function for different crops. In this model, labor demand in a season is a function of production (quantity), wage rate, family labor days, size of farmland, flood dummy variables relative to the village agriculture-

flood exposure and percentage of irrigated-boro area. The results show that production was responsive to labor demand, and that family labor substitutes hired labor, as the coefficient of family labor is significantly negative. As expected, labor cost is negatively associated with labor demand. The flood had a negative impact on the production of *aman* in 1998. The impact on the production of *aman* in 1999 was very small and not significant. The impact on the *boro* production of 1999 was very large and significant. This means that in the areas where the fields were covered by water in the flood, farmers expanded their the production of *boro* and as a result, they hired more people.

Table 16. Regressions results on labor demand in crop production Dependent Variable: Hired man-days

	Boro 98		Boro 99	
	Coefficient	t-statistics	Coefficient	t-statistics
In hired man-days				
Production(qty)	0.078	4.33	0.032	2.79
Wage Rate	-0.786	-10.82	-0.670	-10.33
Family labor(days)	-0.286	-8.51	-0.236	-8.32
Farm land	0.944	22.19	0.877	25.28
pboro (% irrigated-boro)	0.003	1.37	0.004	2.45
vfag2 (vill agricul t7ood:moderate)			0.245	2.57
vfag3 (village agricul flood: severe)			0.718	7.36
Constant	2.135	6.49	0.301	5.75
No. of Observations	949		1345	
Adj. R-square	0.435		0.447	
	Aman 98		Aman 99	
In hired man-days				
Production(qty)	0.036	0.82	0.009	0.215
Wage Rate	-0.213	-1.23	-0.907	-4.755
Family labor(days)	-0.234	-3.42	-0.391	-4.368
Farm land	0.855	10.45	1.083	9.872
paman (% irrigated-aman)	-0.018	-1.95	0.007	1.74
vfag2 (vill agricul flood:moderate)	-0.557	-2.47	-0.080	-0.346
vfag3 (village agricul flood: severe)	-0.083	-0.37	-0.043	-0.182
Constant	0.726	0.90	2.733	3.049
No. of Observations	210		189	
Adj. R-square	0.421		0.446	

Source: Authors' estimation from IFPRI-FMRSP, Bangladesh Flood Impact Survey, 1998-1999

VI. CONCLUDING OBSERVATIONS

The labor market in rural Bangladesh is characterized by low participation rate and low official unemployment rate. The participation rate of women is much smaller than that of men since most women are still working in the home and do not participate in the labor market. The results of the model of determinants of labor participation, comparable to those reported

in the literature, confirm that land and other assets have a negative effect on labor participation. We also found that a small increase in education has a positive impact on male labor participation and that more years of schooling have a positive impact on female participation.

The analysis of the activities performed by the people working show a predominance of male daily laborers followed by self-employment and cottage activities. Unfortunately, people working as daily laborers are paid lower wages than other workers and are subject to large seasonal variations and suffer reduced employment and lower salaries at times of economic contraction.

After the 1998 flood, job opportunities and earning of daily laborers decreased. One year after the flood, job opportunities and wages were still lower than in the same period a year before the flood. In the winter after the flood (April-May 1999), the increase in economy activity and a significant expansion of the agricultural production of boro rice and other crops that spurred an increase in the demand for labor and resulted in an increase in labor participation and earnings.

The analysis of the demand for labor shows that all farmers of different landholdings rely on hired labor for their production needs, albeit in different proportions. In the areas where the flood had a worse impact, we noticed an expansion in the production of boro rice and an increase in the demand for labor.

In conclusion, it appears that the labor market in rural areas of Bangladesh is dominated by male daily laborers that are subject to the seasonal variations of demand and that may be subject to further reductions in labor demand caused by disasters and other shocks. There is also a concern for the female workers. Their participation is small and often they participate in the production process as unpaid family labor.

The challenge of improving the labor participation of a growing active population can only be met by an increase in opportunities in off-farm and cottage activities, since off-farm activities grow at a faster rate and provide employment in the agricultural sector. These activities can include sericulture, horticulture, reforestation and watershed development for rain fed areas. This means that infrastructure, training and credit opportunities need to be available and that literacy and education have to be expanded to provide a more efficient labor force.

REFERENCES

- Alauddin, M. and Clem T. (1995): Labor Absorption and Agricultural Development: Bangladesh's Experience and Predicament, *World Development*, Vol. 23, No. 2, pp 281-297, 1995
- Asian Population and Development Association, March 2000. Report on Employment Security System and Labor Policy in Asian Countries, Bangladesh.
- Azam, Jean P., 1993: "The Impact of Floods on Rural Real Wages in Bangladesh", *The Bangladesh Development Studies*, Vol XXI, No. 1(March).

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- Baland J. M., Jean D. and Luc L., 1999: "Daily Wages and piece Rates in Agrarian Economies", *Journal of Development Economics*, Vol. 59, pp. 445-461.
- Bangladesh Bureau of Statistics. April 2000. Preliminary Estimates of Gross Domestic Product, 1999-2000 and Final Estimates of Gross Domestic product, 1998-99.
- Bangladesh, Ministry of Planning, Planning Commission, March 1998. *The Fifth Five Year Plan (FFYP), 1997-2002*, Dhaka.
- Chowdhury Salma (1991): "Participation of Rural Women in the Labor Force: Levels and determinants", *The Bangladesh Development Studies*, Vol. XIX, No.4.
- Hirashima S. and M. Muqtada ed., 1986. *Hired Labor and Rural Labor Markets in Asia*, Studies based on Farm-level Data, *International Labor organizations*, Asian Employment Programme (ARTEP), New Delhi.
- Hossain et al. (1994): *Rural Non-Farm Economy in Bangladesh: A Dynamic Sector or a Sponge for Absorbing Surplus labor?* SAAT Working Paper, ILO, New Delhi.
- Islam Rizwanul (1995): *Rural Employment and Labor Markets in Bangladesh: A Survey*, in *Bangladesh Economy* edited by Salim Rashid, UPL.
- Islam T. and Taslim M. A., 1996. "Demographic Pressure, Technological Innovation and Welfare: The Case of Agriculture of Bangladesh", *The Journal of Development Studies*, Vol. 32, No. 5, June, pp. 734-770.
- Mahmud, Simeen (2000): "The Gender Dimensions of Programme Participation: Who Joins A Microcredit programme and Why?", *The Bangladesh Development Studies*, Vol. XXVI, Nos. 2 & 3.
- Ninno Carlo D. et al., 2001, *The 1998 Floods in Bangladesh: Disaster Impacts, Household Coping Strategies, and Response*, Research report 122, International Food Policy Research Institute.
- Ninno, Carlo Del & Roy Dilip K. 2001a: *Determinants of Labor Market Participation in Rural Bangladesh After the 1998 Flood*, FMRS Working paper no. 22, IFPRI, February.
- Ninno, Carlo, Del et al., 1999. *Impacts of the 1998 Flood on Labor Markets and Food Security and Effectiveness of Relief Operations in Bangladesh*, FMRS Working Paper No. 8, IFPRI.
- Rahaman S., 1998. *Levels and Characteristics of Female Participation in Work Among the Urban Poor in Dhaka*, Urban Livelihoods Study Working Paper 1, Institute for Development Policy Analysis and Advocacy (IDPAA), Proshika.
- Rahamn A. and Islam R., 1988: "Labor Use in Rural Bangladesh --An Empirical Analysis", *The Bangladesh Development Studies*, Volume XVI. No. 4. (December).
- Rahman, R. I., 1993. "Determinants of Wage Employment and Labor Supply in the Labpur Surplus Situation of Rural Bangladesh", *The Bangladesh Development Studies*, Vol. XXI. No.2. (June).
- Rahman, Rushidan Islam & Khandaker, Shahidur R. (1996), *Role of Targeted Credit Programs in Promoting Employment and Productivity of the Poor in Bangladesh*, in "Credit programs for the Poor, Vol. II, BIDS and World Bank.
- Rahman, Rushidan Islam, 1981: "Implications of Seasonality of Rural Labor Use Pattern: Evidence from Two Villages in Bangladesh", *The Bangladesh Development Studies*, Vol. IX, No.1, Winter.
- Salam Abdul (1986): "Farm Labor Use and Its Determinants: Results from Farm Survey in Pakistan", *Pakistan Economic and Social Review*, Vol. XXIV, No.1
- Skoufias, E. 1993. "Labor Market Opportunities and Intrafamily Time Allocation in Rural Households in South Asia". *Journal of Development Economics*, Vol. 40, pp. 277-310.
- Skoufias, E. 1994. "Using Shadow Wages to Estimate Labor Supply of Agricultural Households", *American Journal of Agricultural Economics*. (May) pp. 215-227.
- Skoufias, E., 1993a, "Seasonal Labor Utilization in Agriculture: Theory and Evidence from Agrarian Households in India". *American Journal of Agricultural Economics*. (February) pp. 20-32.
- Varma, Sona & Kumar Praveen (1996): "Rural Non-Farm Employment in Bangladesh", *The Bangladesh Development Studies*, Vol. XXIV. Nos. 3 & 4.