AGRICULTURAL TECHNOLONGY IN BANGLADESH: A STUDY ON NON-FARM LABOR AND ADOPTION BY GENDER

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(ABSTRACT)

There is growing interest in learning the impacts of agricultural technologies especially in developing economies. Economic analysis may entail assessment of employment and time allocation effects of new technologies. An issue of importance in South Asia is the impacts of technological change on a specific type of occupation: rural non-farm activities. In order to fully understand these effects, the research must integrate gender differences and determine if the results would be similar irrespective of gender.

This paper particularly looks at the effects of HYV adoption on time allocation and labor force participation of men and women in non-farm activities. In estimating the effects of HYV adoption on non-farm labor supply, information on the dependent variable, supply of non-farm labor (or the number of days worked while engaged in non-farm labor), is not available for individuals who do not participate in non-farm labor. Hence sample selection or self-selection of individuals occurs. A feasible approach to the problem of sample selection is the use of Heckman's Two Stage Selection Correction Model. Income functions were estimated for males and females while correcting for the sample selection of non-farm wage earners.

An enhanced understanding of the conceptual links among HYV adoption, non-farm labor supply, and gender issues is achieved by discussing the Farm Household Model. The constrained maximization which is drawn from the Farm Household Model would bring about demand functions and reduced form functions for adoption and labor supply. The reduced-form equations are estimated at the individual level for the following: adoption of HYV technology in rice cultivation, and non-farm labor supply of both adult males and females. Regression results are presented for both Ordinary least squares (OLS) and Tobit estimates.

HYV adoption and non-farm labor supply of men and women are influenced by several factors in Bangladesh. The household characteristics assumed to potentially determine technology adoption and non-farm labor decisions are the following: non-farm wages per month of the males and females, farm size, asset value, ratio of yield per decimal land of high-yielding to traditional variety of rice, HYV yield, local variety yield, and the ratio of variance of yield per decimal land of HYV to traditional or local varieties.

The empirical findings suggest that the decision to adopt HYV technology is determined primarily by farm size, value of total assets of the household, ratio of yield per decimal of land of high-yielding to traditional variety of rice, and the ratio of variance of yield per decimal of land of high-yielding to traditional variety of rice. A larger farm size or land owned in decimal unit increases the non-farm labor supply of females, but not of men. HYV yield is significant and positive, while the local variety yield is significant and negative. This means that higher HYV yields increase the supply of non-farm labor of women, while higher local or traditional yields lower women's supply of non-farm labor.

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CHAPTER 1: INTRODUCTION

There is growing interest in learning the impacts of agricultural technologies especially in developing economies. Economic analysis may entail assessment of employment and time allocation effects of new technologies. An issue of importance in South Asia is the impacts of technological change on a specific type of occupation: rural non-farm activities. In order to fully understand these effects, the research must integrate gender differences and determine if the results would be similar irrespective of gender.

I.1 Background

I.1.1 Bangladesh

Bangladesh is located in Southern Asia, bordering the Bay of Bengal, between Burma and India. The largest sector in the Bangladesh economy is agriculture. Nearly two-thirds of Bangladeshis are employed in the agriculture sector, with rice as the single-most-important product. The introduction of high yielding rice varieties has revolutionized rice production in terms of yield per acre (CIA 2007). These varieties are designed to increase yields and in many cases to reduce disease and insect problems. The growth of rice was fueled by the introduction of high-yielding, modern rice varieties, appropriate use of recommended fertilizers and adoption of integrated pest management (IPM) system (Shahjahan May 4, 2007).

Rice accounts for 75% of agricultural land use. High yielding varieties have increased rice production while keeping pace with the population (Heitzman and Worden 2005). Bangladesh has a population of more than 130 million people. In terms of total value of agricultural production in 2005-06, 72% is attributed to crops, 17% to livestock and 10% to forestry. All of these activities accounted for 17% of Gross Domestic Product (BBS 2006). This sector greatly impacts the

major macroeconomic objectives of the nation which are the following: poverty alleviation, improvement of health situation, food security and employment generation (IMF, 2004).

Of the 13.7 million hectares of arable land, rice is grown on 10.27 million ha producing 94 percent of total food grain requirement. (Sattar 2000). There are three rice-growing seasons in Bangladesh: *aus, aman*, and *boro*. Half of the rice acreage is in *aman* (summer crop) hence it is the most important rice crop. *Boro* rice is the most essential irrigated dry season (winter) crop (Ahmed and Sampath, 1992). The Bangladesh Rice Research Institute (BRRI) has been continuing its research activities to develop hybrid varieties with the hope that its scientists would be able to release varieties suitable to local agro-ecological and climatic situations. Putting efforts towards that direction, the institute is carrying out research to reach the target of producing 250 million tons (The New Nation, 2006).

The growth of rice production can be attributed in part to intensive research that has introduced IPM and has increased coverage of high-yielding varieties of rice. The BRRI, the Bangladesh Agriculture Development Corporation (BADC) and non-governmental organizations (NGOs) continuously support rice IPM in the course of research and extension work. IPM has the purpose of reducing the following: (1) agricultural losses due to pests; (2) damage to national ecosystems and (3) pollution and contamination of food and water supplies. Losses due to insects, diseases, weeds, nematodes, animal parasites, and other agricultural pests constrain agricultural productivity. IPM was developed in order to ease farmers' reliance on pesticides while retaining agricultural production and preserving profitability (Mullen, Norton and Reaves, 1997). Insect and disease resistance in HYVs is often an integral component of IPM.

One of the constraints to agricultural growth is the accessibility of cultivable land. Rural Bangladesh is a class society, hierarchically organized primarily on the

basis of ownership and control of arable land. In addition to being a class and patriarchal society, Bangladesh has a Muslim class system which is subdivided into ashraf, the upper class old-money descendants of early Muslim officials, and atraf who are the indigenous majority (Harris and Lloyd 2006). Moreover two distinct processes of economic differentiation occur in the society. One is the process of class formation, which governs the economic mobility of the households. The other is the system of patriarchy, which governs the economic mobility of women independent of class. Women tend to specialize in work that keeps them close to the homestead (food processing and preparation, household maintenance, cultivation of vines and other crops located in or near the homestead, and animal husbandry), while men specialize in work outside the homestead (rice and jute cultivation, trading, and other forms of market work) (Cain, Khanam, Nahar, 1979). Bangladeshi women have a smaller role in decision-making in the household in general, but are involved in pest management, including decisions to apply pesticides (Miller, S.A. et al. 2005).

A study by Oakley has concluded that women in Bangladesh have strong preferences for using traditional local varieties instead of modern high yielding commercial varieties in their home gardens. They consider local varieties to be uniquely adapted to local agroecological conditions, they feel that they represent a significant cultural legacy; they cook quickly and are an important source of vitamins (Oakley 2004). Therefore, there is a need to incorporate these characteristics into HYVs as well.

Statistics show that Bangladeshi women contribute substantially to their households and to the country's economy. The absolute majority of Bangladeshi women work in agriculture. Women represent 45.6% of the farming population (ESCAP 1995). However, 83% of the employed women in rural areas are unpaid family helpers (ADB 2001). The income level in female-headed households is significantly lower than that of male-headed households. Over 95% of female-headed households fall below the poverty line (UNDP 1997).

I.1.2 High Yielding Varieties

Technology spurs agricultural productivity; this is evidenced by the success of the Green Revolution which advanced agricultural development. The support for agricultural innovation is grounded in the following reasons: first, there is a need to cater to the needs of a growing market for agricultural products as consumption of agricultural products is increasing and changing in different ways; second, economies worldwide need to maintain a level of competitiveness and should keep abreast of continuously evolving agricultural technologies. Hence the benefits of agricultural innovations are twofold: increase in yield and reduction in costs. In many cases, improved agricultural technologies can also contribute to environmental improvement. They also may provide income and free up labor that is employed off the farm.

The use of high yielding varieties (HYVs) has resulted in many of these economic benefits for the countries involved. HYVs pertain to a group of genetically enhanced cultivars of crops (i.e. rice, maize, wheat) possessing characteristics of increased growth rate, increased percentage of usable plant parts or an increased resistance to crop insects and diseases as compared to traditional cultivars. For example, in some cases, high yielding varieties possess a disease resistance built in that helps the crops resist rust, blight or other fungus diseases. Such resistance can be a key component of an integrated pest management program.

HYVs of wheat and rice have spread more widely and quickly than any other technological innovation in the history of agriculture in the developing countries. First introduced in the mid-1960s, they occupied about half of the total wheat and rice area in the developing countries by 1982-83. Their area has increased since that time and will undoubtedly continue to grow in the future (Dalrymple 1985). It was during the mid to late seventies when HYV became a pervasive technological occurrence in Asia. Consequently, they have had a huge effect on

improving the levels of rice production in Asia, resulting in a smaller dependency on food grain imports for some countries.

The widespread use of modern or high yielding varieties has helped Bangladesh to move away from serious import dependence on rice, despite a severe increase in population and a decrease in arable land since its independence in 1971. The cultivation of modern varieties reached 65% of the rice area in 2001-2002 (Hossain, Bose, Mustafi, 2006).

One of the benefits of HYV adoption is that they may have a high degree of tolerance to pests, insects, and diseases which can have damaging effects and reduce yields. Increased crop yield and increased farm incomes are the results of their adoption. When included in an IPM program, they provide an environmentally friendly approach to managing crops, avoiding or reducing the use of toxic pesticides. Such an IPM strategy can lessen crop losses due to pests, thus promoting sustainable agriculture. IPM gives the opportunity to manage pests without causing danger to the environment and without causing health hazards to the users (UNESCAP 2000). IPM strategies promote the prudent use of pesticides. Although it could lead to more labor hours, IPM practices produce increased yields and higher returns as compared to the methods they seek to replace (Mahmoud and Shively 2002).

I.2 Problem Statement

In a patriarchal and class society such as Bangladesh, one indicator of a person's economic empowerment is one's capacity to make decisions (i.e. which agricultural technologies to adopt) and have prospects for economic advancement (i.e. job opportunities or the rate of labor force participation).

The agricultural scenario for the women of Bangladesh is characterized by many as being marginalized. Most agricultural activities which the women engage in are not considered as economic in nature. In some cases women's contributions are not recognized and are only seen as "helping out". This occurs when women are not considered to have comparable strength or skills to those of men even though they are engaged in a wide range of laborious tasks. Whenever this happens, the women are not able to make the most of their utmost potential.

The agriculture sector is overwhelmed by unpaid family workers who are disproportionately represented by women. Despite the multiple roles women play in the rural household not only as producers, but as the main caretakers of children and the elderly, they have little control over decision making in terms of implementation of agricultural technologies or access to credit. Sometimes even with similar roles in agriculture, the women are not given equal opportunity and access to the resources available to men. The lack of women's rights to hold homesteads and land places them in a very insecure position (ADB 2001). Hence there is a need to encourage women's relevance.

The main assumption of this research is that HYVs, as one component of an IPM program, will increase the welfare of the farm household. HYVs have income and yield augmenting effects. A question arises, however, as to the impact on women, particularly their labor supply in terms of non-farm activities. Will the prevalence of HYV technology free up time allotted to agricultural activities, thereby increasing the incidence of non-farm activities? Will the results be true

for both men and women? Therefore, the overriding concern of this study is to find the relationships among technology, non-farm employment, and gender. How does HYV adoption affect time allocation and labor force participation of men and women in non-farm activities?

These questions are important because the rural non-farm sector plays a vital role in promoting growth and welfare by slowing rural-urban migration, providing alternative employment for those left out of agriculture, and improving household security through diversification (Lanjouw and Lanjouw 1999).

The economic position of women is visibly raised when they are given the liberty to make economic decisions and when they are given the same economic opportunities as men. Empowerment of women in its real sense is giving women liberty to make their own decisions. With the advent of HYV technology we ask, how does HYV adoption affect women's labor force participation? It is important to note whether HYVs augment or restrict the non-farm labor of women. Simply, this research seeks to establish the gender impact of HYV adoption. It is still ambiguous whether gender is one of the factors that influence adoption rates or not. An interesting angle is looking at the effect of wage rates and average schooling of both men and women in the household on HYV implementation. Does the degree of schooling and amount of wage have a bearing on HYV adoption? Another basic question that this research would like to answer is what other important factors drive non-farm labor besides extent of HYV adoption. Would bigger farmsize and larger asset value encourage non-farm labor?

This research initiative is an important vehicle to comprehend how HYV adoption is interconnected with demographic and economic aspects at the household level in order to advance agricultural development policies in the country.

I.3 Objectives

This study has the following specific objectives:

1. To analyze conceptual links among adoption of HYVs, non-farm labor supply, and gender issues in Bangladesh at the household level.
2. To determine and understand how differently the extent of HYV adoption affects the supply of non-farm labor of men and women.
    a) To determine if HYV technology promotes rural non-farm employment.
    b) To identify other significant factors that drive men and women in farm households to engage in non-farm activities.
3. To evaluate which factors influence HYV adoption rates in Bangladesh, if the adult members of the farm households are employed in non-farm work.

I.4 Hypotheses

1. There is a differential impact of HYV adoption on non-farm employment by gender.
2. Adoption of HYVs reduces employment opportunities in the non-farm sector.
    a) HYV technology decreases time allotted to non-farm activities.
3. Adoption of HYVs is affected by economic and demographic factors such as education, wage, farm size, asset value and yield.

I.6 Procedures and Data Sources

The study uses OLS and Tobit regression analyses with field survey data from 757 households in rural areas at three points in time between November 1998 and December 1999. The data for the analysis are from the 1998 Household Survey in Bangladesh as made available by the International Food Policy Research Institute (IFPRI)'s Food Management and Research Support Project (IFPRIFMRSP). The data set is representative of the 7 thanas of the rural areas in Bangladesh affected by the flood in the fall of 1998.

The primary concerns for collecting data in Bangladesh were food security in the rural areas and providing employment opportunities during and following the period of 1998. Hence it is a useful data set for looking at the non-farm labor effects of HYV technology.

The first round of data collection was completed between the 3rd week of November and the 3rd week of December 1998, the second round was completed between April and May of 1999, and the last round of data collection took place in November of 1999. The regression analysis includes the respondents' demographic and economic characteristics such as age, education, wage, farm size, asset value, and yield per household as independent variables.

Another motivation for the household survey collection was to capture the difference in labor participation in the period following the flood, moreover the researchers also wanted to understand the capabilities of recovering from the shock of the flood. Hence the data collected included the entire scope of household characteristics. A number of survey instruments were utilized to collect the data. The survey questionnaire is categorized into 17 main sections and several subsections; summary description shown on the following page (Ninno 2001).

Table 1.1 Summary Description of the Household Questionnaire

1.	Household information	Sec A1 contains the usual information on the roster, like age, gender, civil status, time of absence from the household and so on. In addition it asks if the individual send or receive money for support.
2.	Education	Sec A2 asks questions on education level for all individuals age 6 and older, dropout rate, and if any development programs are running in the school.
3.	Status and history of employment, job search, training and public works	The employment section is limited to all household members age 10 and over. In sec B1 there are questions relative to labor participation, the main type of work, and the reason for not participating. Sec B2 contains questions relative to job search strategy and attitudes towards accepting a job (willingness to relocate and minimum wage). It contains the history of employment held before the current employment. Sec B3 accommodates information on Training and public works. The main questions relate to the number of weeks spent in public works and job training for each year since 1995.
4.	Dependent job, Permanent and daily labor	Sec B 4 contains information on primary and secondary dependent job: type of job, industry, time allocated, type of contract, salary and benefits for three different times frame.
5.	Casual jobs, daily labor	Sec B 5 lists time spent, tasks, wage rates etc. of causal jobs for three time periods.
6.	Non-ag self employment, Business Activities	Cottage Activities, non-agri self-employment's information for three different time periods.
7.	Agricultural activity, access to agricultural land, production and allocation of production	Sec C is dedicated to the agricultural production Availability of agricultural land, agricultural assets and livestock. In sec 6.1 the number of weeks worked during the past year and the hours worked last week are reported. Details on access (for each of the past four years) and type and acquisitions of agricultural land (orchard, pastures and cropland) are reported.
8.	Fishing activity and livestock	Sec D is dedicated to the management of ponds and fishing activities.

		Sec E reports the type and number of livestock available and the production of animal products derived from them.
9.	Allocation of family labor	Sec F contains information on the allocation of family labor among the alternative agricultural activities
10.	Social assistance, availability of benefits	The sections on social assistance and social benefits constitute a central part of the questionnaire. In sec G, there is the level and the number of months several benefits are received, currently and in the last three years.
11.	Household furniture and durables and other assets	Section H, relates to household durables. It contains the number of items, the current value, and the year of acquisition, as well the time and reason for disposal.
12.	Credit	Section I contains detailed information on the amount of credit received, the interest rate, and the repayment.
13.	Housing and Sanitation	Section J on housing contains questions relative to the quality of the dwelling and the rent paid together with other monthly expenses.
14.	Regular and occasional non-food spending	Non food expenditures include regular non-food spending for the past month in sec O and occasional non-food spending occurred in the past 12 months in sec 11.2 (12 items).
15.	Food expenditure and consumption	The food section (sec K, L, N) contains consumption of food consumed at home and away from home. For all the items that have been consumed during the last month, quantities consumed from purchases, own production, and food received from other sources are listed along with the purchase value, if quantities are not known, and current price.
16.	Health status	Health status includes type of disability and treatment for chronic illness (sec P) and treatment, cost, and type of consultation for acute illness occurred in the past 4 weeks.
17.	Anthropometry	Height and weight have been collected for all children below 10 years of age and for all females between the age of 13 and 45.

I.7 Organization of the Thesis

This thesis is composed of five chapters. Chapter 1 introduced the background, problems statement, objectives of the research, hypotheses, procedures and data sources. The following chapters are organized as follows: Chapter 2 presents a review of related literature; Chapter 3 explains the methodology used in analyzing the data; Chapter 4 provides the results of the econometric models, and Chapter 5 completes the thesis by presenting the conclusions.

CHAPTER II: REVIEW OF RELATED LITERATURE

II.1 Gender Role in South Asia

Analysis of gender issues in South Asia is a complex challenge. Previous studies have indicated that women in developing countries have endured negative consequences due to underdevelopment (Boserup 1970; Papanek 1976; Saffioti 2978; United Nations 1980). These studies have shown that women's status has suffered because women have less access to economic, educational, political and organizational resources than men. Because of diminished investment and slow economic growth in developing countries, women's access to economic resources and chances at labor force participation are reduced (Ward 1984).

Moreover, dramatic gender inequities persist in spite of economic growth. For Women are mostly viewed and treated as inferior to men; women in South Asia are socially, culturally, and economically reliant on men. Women are largely excluded from making decisions, have limited access to and control over resources, are restricted in their mobility, and are often under threat of violence from male relatives (Jejeebhoy and Sathar 2001).

The Bangladeshi society, for instance, is based on specialized gender roles. The households normally function, but are not fixed, around these roles. The women are often excluded from areas where men are present and in some cases do not participate in primary agricultural activities; although the observance of these roles varies among women and households, the sanctions for those who do not comply are severe (Balk 1997).

II.2 Bangladesh Agriculture and Women

II.2.1 Agricultural Development in Bangladesh

Although it now runs a food surplus, Bangladesh is historically a food-deficit country with an extremely unfavorable land–man ratio, which opted to pursue a policy of continued agricultural growth through widespread diffusion of Green Revolution technology with corresponding support of the provision of modern inputs, such as chemical fertilizers, pesticides, irrigation, credit, product procurement, storage, and marketing facilities over the past four decades. As a result, land use intensity increased sharply to 174.7% in 1998/99 from its initial level of 143.9% in 1968/69 (Alauddin and Tisdell, 1991; BBS, 2001) with corresponding increases in input use rates. There has been an observed increase in total rice output due to a shift from traditional to modern rice varieties, as modern varieties are capable of producing nearly twice the yield of the traditional varieties (Rahman and Thapa 1999).

Credit programs can facilitate early adoption of new technology (i.e. HYVs) by farmers operating under risky conditions in imperfect capital, insurance, and information markets. In Bangladesh, institutional credit played a restricted role until 1971. Between 1973-74 and 1979-80, institutional credit supplied to farmers increased by around 50%. Rural loans increased greatly by 1985. As a result, the rate of adoption of HYVs improved rapidly as suitable varieties, and by 1995 modern varieties comprised about 90% of all harvested irrigated rice (Herath and Jayasuriya 1996).

Agriculture grew at 3.2 per cent annually in the 1960s, at 2.5 per cent from 1973 to 1987, and at 2.1 per cent from 1982/83 to 1993/94. Growth was temporarily more rapid in the late 1980s, spurred by the elimination of non-tariff barriers on pumps and power tillers and by lower tariffs on inputs which induced increases in irrigated area and fertilizer use, and by converting from local rice varieties to

modern ones (i.e. HYVs). The sources of this growth were productivity gains, including a shift to higher value enterprises, and more inputs, such as fertilizer, irrigation and labor (McIntire 2000).

Economic development for the past decade shows economic growth rates averaging 5% with noteworthy progress in agriculture, health, and education. Based on the production trends, agriculture growth in 2007 is likely to moderate to reflect more normal agriculture growth following the post-flood high growth (4.5%) of 2006. The Department of Agriculture Extension and other government agencies are encouraging the planting of high-yielding varieties by ensuring adequate supply of seed and necessary inputs, including fertilizer and pesticide; although many parts of the country report a fertilizer deficit. An adequate supply of inputs, including fertilizer, and diesel and electricity for irrigation, must be ensured if the bumper production of 13.98 million tons of 2006 is to be exceeded (ADB 2006).

Agricultural research continues to be important as a source of new seed varieties and farming practices and management in Bangladesh. Publicly funded agricultural research plays an important role in producing seeds that are resistant to pests and diseases. Development of appropriate farming systems and improved production technologies in close association with extension officials and farmers continues to be a prime research target. Private research is also expected to take place on the production of related goods that can be sold commercially, such as hybrid seeds and pesticides (Huda).

II.2.2 Women in Bangladesh

The economic contribution of women is substantial but largely unacknowledged. Available data on health, nutrition, education, and economic performance indicate that in the 1980s the status of women in Bangladesh was significantly inferior to that of men. Women, in custom and practice, remained subordinate to men in almost all aspects of their lives; greater autonomy was the privilege of the rich or the necessity of the very poor. Most women's lives remained centered on their traditional roles, and they had limited access to markets, productive services, education, health care, and local government (Heitzman and Worden 1988).

The life of a woman in Bangladesh is subjugated by a patriarchal social system that controls her mobility, roles and responsibility, and sexuality. Society has dictated that daughters are temporary members of their natal homes; a priority is given to their training in domestic chores rather than to their education. Moreover, involvement in economic activities shows great variation by gender, by nature of activity, and place of residence. Bangladeshi women's activities are fundamentally invisible because most do not operate directly in the market and are largely in the form of unpaid family labor. Women's workloads are heavy and most Bangladeshi women work a "triple shift" split between their market and non-market work and household responsibilities. A considerable number of unpaid family helpers are found both in the agriculture and manufacturing sectors. Women are not only concentrated in a few sectors, but their labor is principally availed without remuneration (ADB 2001).

Women in rural areas are mostly in charge of post-harvest work, and they are also responsible for keeping livestock, poultry, and small gardens. Even so, empirical evidence across countries suggests that the number of households below the poverty line is significantly higher for female-headed than for male-

headed households. Over 95 percent of female-headed households in Bangladesh are considered to fall below the poverty line (ADB 2001).

However it can be observed in recent years that there is a growing consciousness of women's productive roles and their participation in economic development. Nevertheless gender issues have always been a controversial topic due to the difference in opportunities given to men and women. Despite women's extensive involvement in agricultural production, several studies have shown women's limited access to education, health, credit, government extension services, and technological training make it very difficult for the women to be as productive as the men.

II.3 Non-Farm Labor

Few studies have looked into the importance of non-farm employment in which rural farm households increasingly participate. Non-farm wage labor in small-scale industrial and service establishments is predominantly important in rural villages. Households with more adults are able to engage in non-farm wage labor, since the other members of the household can tend to the farms and livestock. Men can find non-farm wage labor in construction, transport, and industrial processing; while the women in domestic services and industrial enterprise (Ruben and Berg 2001).

Non-farm activities can be viewed as a way to lessen rural poverty and reduce income inequality in densely populated agricultural areas where land continues to be a scarce resource. Aside from increasing employment, rural non-farm labor may also discourage rural-to-urban migration, revive traditional crafts, and build small industries using local resources. With these advantages, it may follow that non-farm employment meets the following objectives of policy makers in developing economies: alleviating poverty, reducing income inequality, decreasing unemployment, and building local industry (Stokke, Yapa et al. 1991).

Having looked at gender and non-farm labor in Bangladesh, it is essential to review previous studies on adoption of HYVs to be able to explore its linkage along with non-farm labor supply and gender issues in Bangladesh at the household level. The following section will explain which variables are relevant to the technology adoption decision.

II.4 Technology Adoption

Bera and Kelley (1990) build on two limited dependent variable econometric models to explain the diffusion of high yielding rice varieties (HYRV) in Bangladesh, for the period from 1971 to 1985. Long-run yield potentials, diffusion rates, and effects of other economic variables on the adoption path are determined simultaneously within the models. They selected the final model by using standard econometric model specification tests and non-nested hypotheses test procedures.

They used discrete limited dependent variables. At each time period the farmers have only two choices, to adopt or not to adopt HYRV. Let u_1 and u_2 be the utilities derived from these choices, respectively. They express the following equations:

$$u_1 = x'\gamma_1 + e_1 \text{ and } u_2 = x'\gamma_2 + e_2$$

where x is the set of variables affecting the choice, e_1 and e_2 are random disturbance terms, and γ_1 and γ_2 are parameter vectors, some of whose components might be zeroes. They assume that e_1 and e_2 are distributed as extreme value distribution, that is, their density and distribution functions are, respectively,

$f(e_i) = \exp(-e_i) \cdot \exp(-\exp(-e_i))$, and

$F(e_i) = \exp(-\exp(-e_i)), i = 1,2$

Adoption will occur if $u_1 > u_2$, i.e. if $x'\gamma_1 + e_1 > x'\gamma_2 + e_2$. Therefore the probability of adoption is:

$p = \Pr(e_2 < x'(\gamma_1 - \gamma_2) + e_1) = \Pr(e_2 < x'\gamma + e_1)$,

where $\gamma = \gamma_1 - \gamma_2$. Given a particular value of e_1 the probability p can be expressed as $\exp(-\exp(-x'\gamma - e_1))$.

The model is expressed as a linear function of all the variables that affect the individual's choice, i.e., whether to plant a traditional variety or an HYRV. There are variables relating to the agro-climatic conditions which affect the individual farmer's decision process, and which affect the aggregate adoption rate.

They write, $\ln(p_t/(1-p_t)) = x_t'\beta$, where x_t are the set of exogenous variables including time *t*, and an intercept; and the β is the corresponding parameter vector. Hence the modified logistic function becomes:

$P_t = K/[1+\exp-(x_1'\beta)]$ (Bera and Kelley 1990).

In a similar study by Soetan (1999) the relationship of some socioeconomic variables to Nigerian women's economic control was examined. Economic control was measured by access to resources such as land, credit, training, tractors, extension services, high yielding seed varieties (HYVs), and fertilizers. These resources are critical for income generation and for the survival of women and their households in developing countries. The socioeconomic variables used for analysis include age, level of education, state of residence, religion, occupation, and membership in women's associations. The study found that the education coefficient was positive and highly significant to access to HYVs. This shows that women with formal education have a higher probability of having access to HYVs. (Soetan 1999)

Feder et al (1985) looked into the adoption of agricultural innovations in developing countries and they mentioned several studies, such as Huffman

(1977) and Petzel (1976) that suggest that farmers with better education are earlier adopters of modern technologies and apply modern inputs more competently all the way through the adoption process. Moreover, the effect of farm size largely depends on the characteristics of the technology. Empirical studies (e.g., Hodgdon 1966; Dobbs and Foster 1972; Gafsi and Roe 1979) reveal that inadequate farm size hinders an efficient adoption of specific types of technologies such as irrigation equipment (Feder, Just et al. 1985).

Islam and Taslim (1996) assessed the determinants of HYV adoption in Bangladesh agriculture. Their review of related literature also included similar relationships to those aforementioned (e.g., Barker and Herdt 1978; Hayami and Ruttan 1984). Large farmers with more resources, better education and more access to information sources are in an advantageous situation to adopt HYV technology (Islam and Taslim 1996).

Zepeda and Castillo (1997) explored the role of husbands and wives in farm technology choice in a Wisconsin dairy farm. Empirical results show that the farm and farmer characteristics relevant to the technology adoption decision are education, farm size, and motivation for technology choice. Results indicate that education has a significant positive effect on the probability of adopting rotational grazing, and larger farms are more likely to adopt the technology since they have a longer time horizon in which to recover the costs (Zepeda and Castillo 1997).

In another adoption paper, Rauniyar and Goode (1996) analyzed the differential practice combination in Swaziland by identifying the social and economic factors that were associated with a farmer's being in one of the adoption groups rather than an alternative group. Empirical results indicate that a homestead that had more people working off-farm tended to be in the Advanced Adopters-2 group rather than Advanced Adopters-1. Education did not differentiate Advanced Adopters-1 from Low Adopters. Farm size was only significant in differentiating Advanced Adopters-1 from Low Adopters. The relative unimportance of this

variable is not surprising because the farming practices studied do not involve significant fixed costs. (Rauniyar and Goode 1996).

The preceding section indicated potential determinants of HYV adoption in Bangladesh agriculture. In order to accomplish the objectives of this study, an enhanced understanding of the conceptual links among HYV adoption, non-farm labor supply, and gender issues is achieved by discussing the theoretical framework for the econometric models.

II.5 The Farm Household Model: A Theoretical Framework

Mukhopadhyay (1994) analyzed agricultural technology change in West Bengal to explore the implications of HYV adoption on the critical household activity, labor force participation. The HYV technology is often associated with greater use of family and hired labor. However, as the different farming tasks are often gender-specific, the new technology affects male and female labor differently.

Equations for male and female participation in the agricultural labor market convey that larger farm size, better quality of land, and total assets of households reduce the hired agricultural on-farm labor supply of both men and women. Education, land ownership, and value of household assets tend to reduce wage labor participation in off-farm work in agriculture (on other farms). The extent of HYV technology in the village has a negative influence on women's wage labor supply as expected. It was also shown that the proportion of women's labor is decreased in the HYV technology. Even as the new agricultural technology may have raised the income of farm households, its impact on the status of women is more ambiguous. The new technology has changed women's time allocation patterns and thereby promoted higher fertility and population growth. If labor force participation in agricultural wage employment for women decreases relative to that of men, and more of women's labor is allocated to the production of HYV

crops on their own farms, women's status and control over economic resources may actually be diminished.

Mukhopadhyay drew his reduced-form functions for adoption and labor force participation patterns from a farm household model. He considered a farm household, defined as households engaged in farming on own or leased-in land, that produces and consumes one composite staple commodity, *Q*. The technology adoption probability function, *V*, is given by $V_i = V(Z_{1i}, Z_{2i}, Z_{1i}Z_{2i})$, $i = 1,...,n$ households, where Z_{1i} are regional variables describing the location-specific stock of available technology; Z_{2i} are household endowments and characteristics; and $Z_{1i}Z_{2i}$ are potential interactions between community and household endowments. The production function is $Q_i = Q(L_i, K_i, V_j L_i, V_j K_i, V_j)$, $j = 1,2,...,R$ regions, where *L* and *K* are labor and nonlabor inputs, V_j is the relevant technology in region *j*, and V_jL_i, V_jK_i are interaction variables affecting production. The farm household has a total time constraint: $T_{i,m} = t_{i,m,O} + t_{i,m,H} + t_{i,m,N} + t_{i,m,S} + t_{i,m,l}$ and $T_{i,f} = t_{i,f,O} + t_{i,f,H} + t_{i,f,N} + t_{i,f,S} + t_{i,f,l}$ where *T* stands for total time variable for male *(m)* and female *(f)* members of the household; *t's* refer to allocation of time into five categories; *O* represents labor on own farm; *H* is work off own farm; N is time spent nurturing depending on the number of children; *S* is time spent to improve the quality of children (schooling, health, etc.); and *l* is time spent on leisure.

The farm household faces the market income constraint:

$$PX_i = PQ_i \left\lfloor w_m \left(L_{i,m} t_{i,m,O}\right) + w_f \left(L_{i,f} t_{i,f,O}\right) \right\rfloor + \left\lfloor w_m \cdot t_{i,m,H} + w_f \cdot t_{i,f,H} \right\rfloor,$$

where *X* is the consumption of *Q* by the household; the single price of the commodity is *P*; *L* is the own farm input of hired and family labor by sex; W_m is the wage rate for males and W_f is the wage rates for female labor.

Putting the production function, the time constraint and the market income constraint equations together would yield the following single constraint for the farm household:

$$PX_i + \left[w_m\left(t_{i,m,N} + t_{i,m,S} + t_{i,m,l}\right) + w_f\left(t_{i,f,N} + t_{i,f,S} + t_{i,f,l}\right)\right]$$
$$= \left[PQ_i\left(w_m L_{i,m} + w_f L_{i,f}\right)\right] + w_m T_{i,m} + w_f T_{i,f}$$
$$= \prod + w_m T_{i,m} + w_f T_{i,f} = I_i^*,$$

where $\prod$ is profit and I^* is full income constraint with profit maximizing output of the household.

The assumption is that the household would maximize a single utility function subject to the single constraint.

$$U_i = U\left(X, t_{m,l}, t_{f,l}, N, S\right)$$

If the above conceptual framework is true, the constrained maximization of utility will yield demand functions and reduced form functions for adoption and labor force participation, which depend on profitability, physical infrastructure, and factors affecting the value of time (e.g., technology, market-determined wages, demographic variables, etc.). The new technology, which affects men and women differently, will have differential effects on labor force participation by men and women.

The study is based on data from the Indian Statistical Institute in Calcutta; it covers farm households only and the variables have been constructed at three levels: individual persons, households and communities. The reduced form equations estimated for the technology adoption probability function and the supply function of adult male and female agricultural labor had the following exogenous variables: market wages for men and women, average years of schooling per adult man and woman, land owned in acres, proportion of land suitable for high-yielding variety rice, proportion of cultivable land irrigated, value of total assets of households, ratio of yield per acre of high-yielding to traditional variety of rice, and ratio of variances of yield per acre of high-yielding to

traditional variety of rice. Mukhopadhyay made use of Heckman's two-stage sample selection correction using the inverse of Mill's ratio from the wage status probit (Mukhopadhyay 1994).

In another study by Huffman (1980) econometric evidence of the effects of investments in education and information on the off-farm labor supply of farmers in Iowa, North Carolina, and Oklahoma was presented. He stated that the labor supply decisions of farm household members are the outcome of household utility maximization subject to constraints on human time, income, and farm production. It is assumed that household members receive utility from leisure (L), purchased goods (Y_1), and factors exogenous to current household consumption decisions (Y_2) such as the age, education and household size. The following utility function is assumed to be ordinal and strictly concave:

$U = U(L, Y_1; Y_2), \qquad (U_i = \partial U / \partial i > 0, i = L, Y_1).$

The household faces three constraints. The first constraint is the time endowments of members (T^0) allotted between farm work (X_1), off-farm work (T_{of}), and leisure (L): $T^0 = X_1 + T_{of} + L$. The second constraint is the income received from household members' off-farm work at wage rates (W_{of}), net farm income $(PQ - W_2 X_2)$, and other household income (V) is spent on market goods: $W_{of} T_{of} + PQ - W_2 X_2 + V = P_1 Y_1$ where P is the anticipated price of farm output (Q), $W_2 X_2$ is total variable cost of farm output, and P_1 is the price vector for Y_1. The third constraint is that the properties of the farm production function limit the potential size of the household's budget. The following production function is assumed to be strictly concave, $Q = F(X_1, X_2; X_3), \quad (f_i = \partial Q / \partial X_i > 0, i = 1,2)$.

Conditions for the optimal quantity of off-farm work (T_{of}) of the inputs in household consumption (L, Y_1) and of the two variable inputs in farm output

production (X_1, X_2) are obtained by maximizing the utility function $U = U(L, Y_1; Y_2)$ subject to $T^0 = X_1 + T_{of} + L$, $W_{of} T_{of} + PQ - W_2 X_2 + V = P_1 Y_1$ and $Q = F(X_1, X_2; X_3)$, $(f_i = \partial Q / \partial X_i > 0, i = 1,2)$.

There are two dependent variables: (1) the proportion of farm operators reporting any off-farm work days and (2) the average number of off-farm work days. The estimates of the off-farm labor supply shows strong substitution effects in production and consumption on changing from zero to positive off-farm work as wage increases. The variance of sales shows a positive coefficient which means that off-farm work increases when the distribution of farm size increases, holding average farm size constant. Education has a positive coefficient, implying that off-farm work moves directly with farmers' education (Huffman 1980).

In an extended study by Huffman and Lange (1989) the labor supply decisions of husbands and wives in farm households are drawn from a behavioral model that allows self-employment on their farms and wage work off-farm. The joint wage-labor participation and hours decisions of a husband and wife in farm households in Iowa are examined by developing structural equations within an econometric model. As in Huffman's previous work, the farm household receives cash income from net farm income, other household income, and income from off-farm wage work. The wage-offer equations facing husbands and wives are assumed to depend on their marketable human capital. Furthermore the technology of farm production corresponds to a concave production function. The household utility is assumed to depend on the inputs of home time of the husband and wife and of goods purchased for direct or indirect consumption; utility also depends on husband's and wife's human capital. The major conclusion is that the off-farm labor supply equation of a married individual differs significantly based on whether his or her spouse also works for a wage (Huffman and Lange 1989).

Lass and Gempesaw presented a joint model of off-farm labor decisions for farm operator and spouse in Pennsylvania farm households. They sought to exemplify important features of theoretical models of off-farm labor supply, i.e., Huffman (1980), in an empirical model for the farm family. The model specification goes back to Huffman (1980) which assumed farm households to maximize utility $U = U(O, L_1, L_2; H, E)$ subject to constraints:

$P_o O = P_q Q - RS + W_1 M_1 + W_2 M_2 + V$

$Q = f(S, F_1, F_2; H, G)$

$T_l = L_l + F_l + Y_l$; and $Y_l \geq 0$, for $l = 1,2$.

Two leisure types are considered, that of the operator $(l = 1)$ and spouse $(l = 2)$. The household chooses levels of the following: purchased goods (O), leisure (L_1, L_2), farm labor (F_1, F_2), off-farm labor (Y_1, Y_2), and farm inputs (S). The following are assumed fixed: stocks of human capital (H), prices for other goods (P_o), farm output price (P_q), farm input prices (R), off-farm wages (W_1, W_2), other income (V), and other exogenous factors (F, G) that shift the utility function and production function.

The empirical model of farm family off-farm work consists of supply functions for operator (Y_1) and spouse (Y_2), and two participation decision rules that establish observed values for Y_l:

$$Y_{li} \begin{cases} > 0 \\ = 0 \end{cases} \quad \text{if} \quad \begin{matrix} I_{1i}^* = Z_{li}' \alpha_l + \varepsilon_{li} > 0 \\ I_{1i}^* = Z_{li}' \alpha_l + \varepsilon_{li} \leq 0 \end{matrix}$$

I_{li}^* are the unobserved indicators assumed to correspond to the disparity between individuals' value (W_l) of off-farm time and on-farm time at zero hours of off-farm work.

Two sources of sample selection in the model are the following: the operator works or does not and the spouse works or does not. The selectivity criteria I_{1i}^{*} and I_{2i}^{*} are unobserved, while the binary indicators are observed:

$I_{1i}\begin{cases}=1\\=0\end{cases}$ if $\begin{matrix}I_{1i}^{*}=Z_{li}^{'}\alpha_{l}+\varepsilon_{li}>0\\I_{1i}^{*}=Z_{li}^{'}\alpha_{l}+\varepsilon_{li}\le 0\end{matrix}$. The bivariate probit model is appropriate for first stage estimation of joint participation decisions; while the set of labor supply functions can be estimated in the second stage: $Y_{i}=X_{i}B_{i}+\mu_{i}$, $\forall i\in n^{i}$. Results demonstrate the importance of spouse decisions on off-farm labor supply function structure. Moreover the behavioral assumption that farm operators and spouses make joint participation decisions is verified to be correct (Lass and Gempesaw 1992).

Abdulai and Delgado (1999) examined the non-farm work participation decisions of married men and women in rural Nothern Ghana by using a bivariate probit. The economic model is a time allocation model which assumes that the households in the model allocate each of their members' time endowment among three main activities: non-farm production, farm production, and leisure. The household's utility is a function of goods and services consumed; which include both consumption goods and leisure time: $U=\left(Q,L_{1},L_{2};\Delta^{c}\right)$ where U is household utility function assumed to be monotonically increasing and strictly concave; Q is the set of consumption goods and services; and L_{1} and L_{2} signify male and female leisure hours. The household faces a time constraint; the technology of farm production is represented by a twice differentiable, concave production function. The household is also limited by a budget constraint; hence expenditure on market goods cannot exceed family income. Heckman's procedure was used to correct for the selectivity bias in estimating wage offer and labor supply equations. The following variables were found to be significantly related to the probability of non-farm labor market participation and the amount of non-farm labor performed: education, experience, infrastructure, distance to the capital, and population density (Abdulai and Delgado 1999).

CHAPTER III: METHODOLOGY

Provided that the theoretical framework of the farm household model is reasonable, then the constrained maximization would bring about demand functions and reduced form functions for adoption and labor supply.

The labor supply in Bangladesh based on the 1998 Household survey illustrates that majority of the population engage in non-farm activities as illustrated in Table 3.1.

Table 3.1 Primary Occupation of Males and Females

Entire *N*	1 if Primary occupation is engaged in Non-Farm Activities and 0 otherwise		
	0	**1**	**Total**
Male	574	1,593	2,167
Female	12	2,054	2,066
	586	3,647	4,233

Out of the 4,233 individuals in 757 rural farm households who responded to the survey, 3,647 engage in non-farm labor. It is apparent from Table 3.2 that most of the females engage in non-farm labor, although most males have non-farm labor as their primary occupation as well. The amount of time spent by females doing household work is significant as expected. It is seen that 988 out of 2,054 females in non-farm labor engage themselves primarily in house work, both paid and unpaid. It is important to note that the 4,233 individuals are not all adults since it includes the entire population.

Table 3.2 Share of Household Work by Gender

	Primary Occupation	
Gender	**Household Work**	**Total**
Male	13	13
Female	988	988
Total	**1,001**	**1,001**

The categorization of non-farm activities in the survey include industrial enterprises (i.e., processing of crops, family labor in enterprise, tailoring, sewing, pottery, carpentry, mechanics, wage labor, etc.), trade (i.e., wholesale, contractor, employee, etc.), transport (i.e., boat, driver, etc.), construction work (i.e., masonry, earthen work, house repair, etc.), self-employed profession (i.e., doctor, barber, tutor, etc.), miscellaneous services (i.e., service, pension, etc.), and others (i.e. income from rent, household work, child, student, unemployed, beggar, etc.). This thesis excludes household work, child, student, unemployed, and beggar from non-farm activities.

This study considers farm households, households that own or rent land for rice farming, and looks at the factors that determine technology adoption and non-farm labor supply of men and women who are at least 18 years of age.

III.1 Variable Description

Variables have been organized at two levels: (1) by individual, a total of 4,233 for both males and females; and (2) by household, a total of 757 rural farm households. The analysis is based on the individual classification to account for every single data point gathered in the survey.

III.1.1 *Labor Participation*

The supply of non-farm labor by adult males and females with ages ranging from 18-99 years old is measured by obtaining the number of working days in the non-farm sector per adult man and woman from October 15 until November 14, 1998, which is essentially a month. The average number of days worked doing non-farm activities is computed per individual, and categorized by gender.

Considering only the total number of adults employed in non-farm work, 85% are males while 15% are females (Table 3.3). The respondents provided labor supply in hours; the conversion applied is 8 hours to a day. The average labor supply of men, in terms of number of days worked in a month doing non-farm activities, is 55 days, which is equivalent to 440 hours. As for the women, their average labor supply is 52.6 days in a month, or 420 hours a month.

Table 3.3 Non-Farm Work of Adults by Gender

Adults	Non-Farm Work	Percent
Male	546	85%
Female	98	15%
Total	644	100%

III.1.2 *Adoption of High-Yielding Technology*

The adoption variable is a continuous variable which measures the percentage of plots using HYV technology. Only rice crops are included in this study; the rice ecotypes of Bangladesh are aus, aman and boro. The respondents who planted rice crops totaled 1,615; 44.27% adopted HYV technologies while 55.73% used local rice varieties (Table 3.4).

Table 3.4 Rice Variety by Technology Adopted

Rice Variety	Frequency	Percent
HYV	715	44.27%
LOCAL	900	55.73%
Total	1,615	100.00%

III.1.3 *Monthly Wage*

The market wage in Taka, the currency of Bangladesh, is computed by multiplying the daily rate with the total number of days worked from October 15 until November 14, 1998. The average monthly wages of females and males earned from non-farm work were computed. The data shows that men earn much more than women. The average monthly wage for the men is 3,692.96 Taka; for the women it is merely 1,146.40 Taka.

III.1.4 *Farm Size*

It is interesting to note that Bangladesh has its own agrometrology, unit of measurement for agricultural land area, for local use by farmers and businessmen. By governmental decree in 1982, different districts have their own agrometrology systems as shown in appendix A (Amin 2007). The most common unit of measure used for farm lands is the Decimal which is equivalent to 0.01 Acres or 0.004047 Hectares.

In the 757 farm households surveyed, 40% of the households operated their own rice lands, 18% farmed jointly owned rice lands, while the remaining 42% farmed rented, leased or mortgaged rice lands. The ownership of land ranged from 0.25 to 756 decimals by individual and from 2 to 2,235 decimals by household. The average land owned by household is 189 decimals or 0.76 ha.

III.1.5 *Value of Total Assets by household*

The value of total assets by household is the sum of ownership of real estate, agricultural assets, and other assets in Taka currency. Agricultural assets include stocks of crops (i.e., rice, wheat) and farm animals (i.e., cattle, cow, bullock, goat, sheep, chicken, duck, horse, etc.). Outliers which are greater than 90,000 Taka, totaling 68 observations out of 2,881, were removed from the data set. The average asset value is 27,170 Taka.

III.1.6 *Ratio of Yields and Yield Variances*

The variables that signify technology characteristics are yields and yield variances. The average rice yield per decimal of land of HYVs is 35.63 kg while the average rice yield per decimal of land of local variety is 34.54 kg. The average ratio of yield per decimal of high-yielding to traditional variety of rice is 1.08.

The ratio of variances of HYV to local yields represents a measure of risk. Variance is defined as the expected value of the square of the deviations of a random variable from its mean value. Hence, yield variance is the expected value of the squared deviations from the average rice yield. HYV technology has higher yield variability as evidenced by the ratio of the yield variances of high-yielding to traditional variety of rice which has a mean value of 11.8. In computing for the variance, the missing values are replaced by the average rice yields.

The list of variables, dependent and independent, as well as the mean and standard deviation of each, is shown in Table 3.5.

Table 3.5 Variable List

List of Dependent and Independent Variables with Sample Statistics	
Variable Definition	**Mean (Standard Deviation)**
Endogenous Variables	
Adoption variable: percentage of plots using HYV	0.46 (.3809945)
Number of Days Worked in a month in Non-Farm Activities by adult males	54.76 (3.480169)
Number of Days Worked in a month in Non-Farm Activities by adult females	52.59 (1.367625)
Exogenous Variables	
Age of adult males	38.91 (15.63664)
Age of adult females	38.67 (16.55198)
Non-farm monthly wage of Adult Males in Taka	3,692.96 (1251.146)
Non-farm monthly wage of Adult Females in Taka	1,146.40 (76.21779)
Land Owned in decimal unit	188.65 (252.7795)
Value of total assets in Taka	27,170.46 (22488.1)
Ratio of yield per decimal of high-yielding to traditional variety of rice	1.08 (.3926724)
Ratio of variances of yield per decimal of high-yielding to traditional variety of rice	11.78 (130.4349)

This paper particularly looks at the effects of HYV adoption on time allocation and labor force participation of men and women in non-farm activities. In estimating the effects of HYV adoption on non-farm labor supply, information on the dependent variable, supply of non-farm labor (or the number of days worked while engaged in non-farm labor), is not available for individuals who do not participate in non-farm labor. Hence sample selection or self-selection of individuals occurs.

III.2 Sample Selection

Truncated regression is a special case of sample selection. A truncated regression model by definition is a classical linear regression model for cross-sectional data in which the sampling scheme entirely excludes, on the basis of outcomes on the dependent variable, part of the population (Wooldridge 2000). The truncation of non-farm income is incidental because it depends on another variable, which is labor force participation in non-farm work. A truncated regression model is a limited dependent variable model.

A limited dependent variable (LDV) is defined as a dependent variable whose range of values is substantively restricted. A binary variable takes on only two values, zero and one. Models containing a limited dependent variable are observed only for a restricted nonrandom sample. In a binary response mode, interest lies primarily in the response probability

$$P(y=1|x) = P(y=1|x_1, x_2, ..., x_k)$$

where x is used to denote the full set of explanatory variables. The population regression function is the expected value of y given the regressors x. The predicted probability that the dependent variable equals to 1 is $\hat{y}$.

A feasible approach to the problem of sample selection is the use of Heckman's Two Stage Selection Correction Model. Income functions were estimated for

males and females while correcting for the sample selection of non-farm wage earners.

III.2.1 Heckman's Two Stage Selection Correction Model

A sample selection correction is called for when a survey or program is designed to exclude part of the population. This means that we only observe Y for a subset of the population. The Two Stage Heckman (1979) estimation corrects for non-random sample selection by using two equations.

Given the population model of interest: $y = x\beta + u$, $E(u/x) = 0$, $s = 1[z\gamma + v \geq 0]$ where $s = 1$ if we observe y, and zero otherwise. The correlation between u and v causes a sample selection problem. Thus the first step would be to estimate γ by probit of s_i on z_i, using the entire sample. The inverse Mills ratio, $\hat{\lambda}_i = \lambda(-z_i\hat{\gamma})$ for each i is also computed. Using the selected sample, the observations for which $s_i = 1$, the second step would be to run the regression of y_i on $x_i, \hat{\lambda}_i$ (Wooldridge 2000).

The inverse Mills ratio is computed from the probit equation in the first stage to provide OLS selection bias corrected estimates. Considering a two equation model with a random sample size of *n* $\begin{matrix} Y_{1i} = X_{1i}\beta_1 + U_{1i} \\ Y_{2i} = X_{2i}\beta_2 + U_{2i} \end{matrix}$ where :

X_{ji} is a $1xK_j$ vector of explanatory variables and β_i is a $K_j x1$ vector of parameters, $j = 1,2$. U_{i1} and U_{21} both have normal distribution. Data is available on Y_{i1} only when $Y_{2i} \geq 0$. The joint density is as follows:

$$\begin{pmatrix} Y_{1i} \\ Y_{2i} \end{pmatrix} \sim N_2\left[\begin{pmatrix} X_{1i}\beta_1 \\ X_{2i}\beta_2 \end{pmatrix}, \begin{pmatrix} \sigma_{11} & \rho\sqrt{\sigma_{11}\sigma_{22}} \\ \rho\sqrt{\sigma_{11}\sigma_{22}} & \sigma_{22} \end{pmatrix}\right].$$

The computed inverse Mills ratio $\hat{\lambda}_i = \lambda(-z_i\hat{\gamma})$ is from $\lambda_i = \frac{\phi(Z_i)}{1-\Phi(Z_i)}$ and $Z_i = -\frac{X_{2i}\beta_2}{\sqrt{\sigma_{22}}}$. The negative Z_i is computed from $\frac{\beta_2}{\sqrt{\sigma_{22}}}$ and thus calculates for λ_i.

The Heckman model is also known as the two-step selection model, the adjusted Tobit, or the Limited Information Maximum Likelihood selection estimator. The Heckman model assumes error normality, and using this model requires sufficient variation to identify the *X* coefficient separately from the inverse Mills coefficient. Under explicit error distributional assumptions, inclusion of the inverse Mills term corrects the selection bias (Dow and Norton 2003).

III.2.1.1 First Stage of the Heckman Model

The first equation of the Heckman model is a probit estimator of the probability of having a positive outcome, $\Pr[y > 0|X] = \Phi(X\beta_2, \varepsilon_2)$.

III.2.1.1.1 The Probit Model

Given the regression model $y_i^* = \beta_0 + \sum_{j=1}^{k} \beta_j x_{ij} + u_i$, y_i^* is not observed. What is observed is a dummy variable y_i defined by $y_i = \begin{cases} 1 & \text{if } y_i^* > 0 \\ 0 & otherwise \end{cases}$. The probit function is the inverse cumulative distribution function of the normal distribution such that $F(Z_i) = \int_{-\infty}^{\frac{z_1}{\sigma}} \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{t^2}{2}\right) dt$. The probit model is generally defined as $\Pr(Y=1) = \int_{-\infty}^{\beta' x} \phi(t)dt = \Phi(\beta' x)$. The function $\Phi(\cdot)$ is a commonly used notation for

the standard normal distribution. The log-likelihood function for probit is $\ln L = \sum w_j \ln \Phi(x_j b) + \sum w_j \ln\left(1 - \Phi\left(x_j b\right)\right)$ where w_j denotes optional weights (Greene 2000).

The probability of engaging in non-farm activities given the socioeconomic variables is captured by running a probit regression of the dependent variable non-farm labor status on a number of independent variables. Non-farm labor status is a discrete-binary variable which is equivalent to one if primary occupation is non-farm related and zero otherwise.

$$\hat{P}_j = \delta \mathrm{X}_j + \varepsilon_j$$

where $\hat{P}_j$ is the decision to engage in non-farm labor or not as captured by the dependent variable non-farm labor status. X_j represents the socioeconomic variables that influence labor decisions such as age, education, farm size, ratio of yield per decimal of high-yielding to traditional variety of rice, and ratio of variance of yield per decimal of high-yielding to traditional variety of rice. The last two variables are relevant because they represent the opportunity costs of engaging in non-farm activities. The error term ε_j corresponds to the unexplained factors that drive labor decisions.

III.2.1.2 Second Stage of the Heckman Model

Given that the first step is to estimate a probit model, the estimates of γ from the probit model are used to compute for the estimates of the inverse Mills ratio term $\hat{\lambda}_i\left(-Z_i\hat{\gamma}\right) = \frac{\phi\left(Z_i\hat{\gamma}\right)}{\Phi\left(Z_i\hat{\gamma}\right)}$ where $\Phi(\cdot)$ is the standard normal cumulative distribution function (cdf) while $\phi(\cdot)$ is the standard normal probability density function (pdf) in a truncated standard normal distribution. Once again truncation takes place

when sample data are drawn from a subset of a larger population of interest (Greene 2000).

The second stage, which is estimated by ordinary least squares and uses only the observations with positive values of the dependent variable, is the outcome equation that includes the inverse Mills ratio and the X variables as regressors.

$$\Gamma_j = \psi\hat{\lambda}_j + \xi\Lambda_j + \mathrm{E}_j$$

where Γ_j is the non-farm wage of males and females in Bangladesh. $\hat{\lambda}_j$ is the inverse Mills ratio. Λ_j represents the socioeconomic variables that affect the non-farm market income such as age, education, farm size, ratio of yield per decimal of high-yielding to traditional variety of rice, and ratio of variance of yield per decimal of high-yielding to traditional variety of rice. The full set of regressors included into Λ_j is only available when non-farm labor is chosen in the first stage. The error term E_j corresponds to the unexplained factors that affect non-farm wage of males and females. In order to ensure the impact of non-farm labor participation on non-farm income, the predicted probabilities of non-farm labor participation estimated from the first stage were also included in the second stage.

Hence the equation that shows the sample selection is $\hat{P}_j = \delta \mathrm{X}_j + \varepsilon_j$ while the equation of primary interest is $\Gamma_j = \psi\hat{\lambda}_j + \xi\Lambda_j + \mathrm{E}_j$. The sample rule is that Γ_j is observed only when $\hat{P}_j$ is greater than zero. $\hat{P}_j$ is the decision to participate in non-farm labor or not, the magnitude cannot be determined since there is no information on the size of $\hat{P}_j$. Thus the selection mechanism is that $P_i^* = \delta \mathrm{X}_j + \varepsilon_j$, $P_i = 1$ if $P_i^* > 0$ and *0* otherwise; $Prob(P_i = 1) = \Phi(\delta \mathrm{X}_j)$ and $Prob(P_i = 0) = 1 - \Phi(\delta \mathrm{X}_j)$.

The regression model: $\Gamma_j = \psi\hat{\lambda}_j + \xi\Lambda_j + \mathrm{E}_j$ is observed only if $P_i = 1$, $(\varepsilon_j, \mathrm{E}_j) \sim$ bivariate normal $[0,0,1,\sigma_{\mathrm{E}}, \rho]$ which means that ε_j and E_j have a bivariate normal distribution with zero means and correlation ρ.

CHAPTER IV: RESULTS

This chapter discusses estimation results of the adoption equation and the non-farm labor supply equations of both men and women. However, before proceeding with the results, the sample selection correction model (Table 4.1) is presented since non-farm employment is only observed for a subset of the population.

Table 4.1

Sample Selection Corrected Wage Function of Men and Women in Bangladesh Farm Households, 1998

	Man		Woman	
	1 if engaged in Non-Farm Labor and 0 otherwise	Non-Farm Income	1 if engaged in Non-Farm Labor and 0 otherwise	Non-Farm Income
	ML Probit	Heckman	ML Probit	Heckman
Explanatory Variables:				
Age in Years	0.1384615 *** (8.45)	188.0540000 (0.54)	0.0768828 ** (1.97)	-14.9411700 (-0.67)
Age Squared	-0.0018142 *** (-7.49)	-2.4837310 (-0.53)	-0.0011851 * (-1.73)	0.2335026 (0.67)
Land in Decimal Unit	-0.0005019 (-1.29)	-0.6005166 (-0.43)	0.0003673 (0.54)	-0.1023157 (-0.96)
Yield Ratio	-0.1202305 (-0.68)	-522.1148000 (-1.22)	-0.3850497 (-0.81)	78.3787300 (0.71)
Yield Variance Ratio	-0.0107221 (-0.96)	-15.3585900 (-0.49)	-0.0189522 (-0.46)	3.5911690 (0.65)
Inverse Mills Ratio (λ)	--- ---	1,471.6530000 (0.49)	--- ---	-213.3084000 (-0.67)
Intercept	-2.4899350 (-8.15)	-68.6781900 (-0.01)	-2.5468460 (-3.75)	1,758.0190000 (1.93)

Note: z-ratios reported in parenthesis

*** significant at the 1% level

** significant at the 5% level

* significant at the 10% level

Heckman's two-step consistent estimates were obtained and the sample selection was corrected using the inverse Mill's ratio (λ) as an independent variable in the non-farm wage equation in the second stage.

The non-farm wage equations include the same exogenous variables as the probit equations for both males and females. The reason why the variables indicating HYV yield (i.e. yield ratio, yield variance) is included in both equations is that it denotes the forgone opportunity of participating in non-farm related activities.

The equations imply that age increases participation in non-farm labor at a decreasing rate, as indicated by the positive coefficient of the age variable and the negative coefficient of the squared age variable. The rest of the variables are not significant.

The inverse mills ratio is not significant for both wage equations of men and women. This suggests that the inclination to work in the non-farm sector does not affect the propensity to supply more hours of non-farm labor and earn more non-farm wages.

The reduced-form equations are estimated at the individual level for the following: adoption of HYV technology in rice cultivation, and non-farm labor supply of both adult males and females.

Regression results are presented for both Ordinary least squares (OLS) and Tobit estimates. Tobit regression usually has a greater statistical reliability since it is more appropriate for regression with censored data. When households choose to adopt HYV technology or when they choose to engage in non-farm labor, there is variability that is not being accounted for by the exogenous variables, hence censoring takes place.

HYV adoption and non-farm labor supply of men and women are influenced by several factors in Bangladesh. The household characteristics assumed to potentially determine technology adoption and non-farm labor decisions are the following: non-farm wages per month of the males and females, farm size, asset value, ratio of yield per decimal land of high-yielding to traditional variety of rice, HYV yield, local variety yield, and the ratio of variance of yield per decimal land of HYV to traditional or local varieties. The education variable was dropped due to the limited number of adult respondents who replied to the survey question on years of schooling.

IV.1 Adoption of HYV Technology

Results from fitting the HYV adoption model are reported in Table 4.2. The dependent variable is the percentage of plots using HYV, which is a continuous variable.

The results did not significantly vary between OLS and Tobit. Estimates show that non-farm wages in Taka per month of females are not vital determinants of HYV adoption. However, non-farm wages in Taka per month for the men is positive and significant.

Ownership of land and value of total assets are negative and significant. Increasing the farm size and asset value would lead to less adoption of HYVs. Technology in this case is scale neutral. The decision to adopt HYV is not contingent upon having large acres of land or large asset holdings.

The ratio of yield per decimal of land of HYV to traditional variety of rice is positive and significant. This result shows that the higher the yield per decimal of land of high-yielding as compared to traditional varieties, the higher the likelihood of adopting HYVs. On the other hand, the ratio of variance of yield per decimal of land of high-yielding to traditional variety of rice is negative and significant.

Since HYV technology has higher yield variability, this may act as a risk that could discourage adoption, thus explaining the negative sign.

Table 4.2

HYV Adoption in Bangladesh Farm Households, 1998		
	OLS	**Tobit**
Non-farm Wages in Taka per month		
Men	0.00000835 ***	0.0000219
	(3.20)	(0.93)
Women	-0.0000219	-0.0000221
	(-0.25)	(-0.25)
Land Owned in decimal unit	-0.0001524 ***	-0.0001568 ***
	(-3.47)	(-3.49)
Value of total assets	-0.000000465 *	-0.000000518 *
	(-1.72)	(-1.86)
Ratio of yield per decimal of high-yielding to traditional variety of rice	0.0687265 ***	0.0655648 ***
	(4.29)	(4.00)
Ratio of variance of yield per dec of HYV to traditional rice variety	-0.0001507 ***	-0.0001503 ***
	(-3.59)	(-3.51)
Intercept	0.4287004	0.3865711
	(4.24)	(2.89)
R^2	0.0653000	---
F (Prob>F)	9.76	---
	(0.00)	---
Log likelihood	---	195.93
Dependent variable mean	0.4585468	---
(Dependent variable std dev)	(0.3809945)	---

Note: t-ratios are reported in parenthesis

*** significant at the 1% level

** significant at the 5% level

* significant at the 10% level

IV.2 Supply of Non-farm labor by gender

Table 4.3 presents the results for the non-farm labor supply equations. Both men and women's own-wage effects are positive and significant. This suggests that higher wages lead to substitution effects that are greater than the opposing income effects, leading to increased labor supply to non-farm employment- an upward sloping labor supply, supportive of the utility maximization hypothesis (Abdulai and Delgado 1999).

Although not significant, it is interesting to look at the cross-wage effect. The estimated female wage effect on male non-farm labor supply is negative. This shows that when husbands as a group earn more from non-farm activities, then the wives as a group reduce their non-farm labor supply.

A larger farm size or land owned in decimal unit increases the non-farm labor supply of females, but it does not affect men from engaging in non-farm work. HYV yield is significant and positive, while the local variety yield is significant and negative. This means that higher HYV yields increase the supply of non-farm labor of women, while higher local or traditional yields lower women's supply of non-farm labor.

The variables indicating incentives for HYV adoption are farm size and HYV yield. Both variables significantly and positively affect the supply of non-farm labor of women, but not of men. This could mean that women benefit from HYV technology by having increased employment opportunities. The growth of the agricultural sector, through widespread use of HYV technology, develops the non-farm sector which comprises the following: industrial, trade, transport, construction and self-employed profession.

Table 4.3

Supply of Non-Farm Labor of Men and Women in Bangladesh Farm Households, 1998

	Number of Days Worked in Non-Farm Activities			
	Man		Woman	
	OLS	Tobit	OLS	Tobit
Non-farm Wages in Taka per month				
Men	0.0001587 ***	0.0001587 ***	0.0000016	-0.0001458
	(3.70)	(3.71)	(0.13)	(-0.10)
Women	-0.0000124	-0.0000121	0.0027579 ***	-0.0011283
	(-0.01)	(-0.01)	(6.45)	(-0.12)
Land Owned in decimal unit	0.0004410	0.0004406	0.0003786 *	0.1727082 *
	(0.63)	(0.63)	(1.79)	(1.76)
HYV Yield in kg per dec	-0.0045858	-0.0045907	0.0059919 **	0.1997640
	(-0.51)	(-0.51)	(2.22)	(0.70)
Local Yield in kg per dec	0.0060275	0.0060152	-0.0085679 ***	-0.4700324
	(0.60)	(0.61)	(-2.85)	(-1.61)
Value of total assets	0.0000014	0.0000014	0.0000014	0.0000690
	(0.32)	(0.32)	(1.05)	(0.43)
Ratio of variance of yield per dec of HYV to traditional rice	0.0000318	0.0000314	-0.0000118	1.0008080
	(0.05)	(0.05)	(-0.06)	(0.55)
Intercept	53.99	53.99	49.32	89.42
	(32.90)	(33.01)	(99.51)	(4.63)
R^2	0.0170000	---	0.0574000	---
F (Prob>F)	2.13	---	7.50	---
	(0.0383)	---	(0.00)	---
Log likelihood		-2,169.55		-53.25
Dependent variable mean		54.76		52.59
(Dependent variable std dev)		(3.480169)		(1.367625)

Note: t-ratios are reported in parenthesis

*** significant at the 1% level

** significant at the 5% level

* significant at the 10% level

CHAPTER 5: SUMMARY AND CONCLUSIONS

Former studies have shown HYV adoption increases output or crop yield. It is for this reason that huge investments are made across the globe to develop high yielding varieties for the sake of agricultural development. The strategy to ensure a sustainable agricultural growth is twofold: first, is the application of HYV seeds; and second, is the use of IPM pest management practices. IPM promotes the reduced use of pesticides for crop production. HYV adoption, as an important part of IPM, is appropriate to assist Bangladesh to augment its food production in a sustainable manner, thus having the ability to reduce environmental degradation due to pesticide use. Analysis of HYV technology is needed to examine HYV effects on non-farm labor supply in farm households while integrating gender considerations.

The problems that this research seeks to address are important for the following reasons: first, gender issues have always been explored in Bangladesh. A study conducted by the Bangladesh Institute of Development Studies (BIDS) in collaboration with the International Rice Research Institute (IRRI) shows that social norms in Bangladesh dissuade females' mobility into public domain and confine them to low productive household activities that give them low returns (Hossain, et al 2004). Bangladesh is a patriarchal society and a large amount of decisions in the households are made by the males. Only 10% of the households are female headed. In the rural sector, only 11% of the households are female headed (BBS 2005). In the data collected by IFPRI, only 5% are female headed out of the 757 households. Second, since Bangladesh is an agricultural economy, HYVs bring about benefits to the landed by increasing productivity which translate to higher incomes; HYVs benefit the landless by creating employment opportunities. Lastly, non-farm labor accounts for a great proportion of the labor force. Non-farm employment accounts for 44% of labor force of Bangladesh (BBS 2006).

The empirical findings suggest that the decision to adopt HYV technology is determined primarily by farm size, value of total assets of the household, ratio of yield per decimal of land of high-yielding to traditional variety of rice, and the ratio of variance of yield per decimal of land of high-yielding to traditional variety of rice. Results were different for males and females. The monthly wages earned by men significantly and positively affect the probability of adopting HYVs. However, the monthly wages earned by women have no effect on decisions regarding HYV adoption.

Regarding the supply of non-farm labor, the only similar result for men and women is the significant and positive own-wage effect on the number of days worked in non-farm activities. Larger farm size and higher HYV yields encourage non-farm labor of both men and women; while higher local yields dampen the supply of non-farm labor of men and women.

The motivation to enter non-farm labor may be income diversification, which should be a welfare advantage for both men and women. The variables indicating the effects of HYV adoption on non-farm labor supply of men and women are the following: farm size, HYV yield, and local yield. Under women's non-farm labor supply equation, farm size and HYV yields have significant and positive coefficients, which show that HYVs increase the incidence of non-farm activities. Therefore we can conclude that there is a direct relationship between incentives for HYV technology and labor participation in non-farm activities. HYV technology promotes rural non-farm employment. Hence we reject the hypothesis that adoption of HYVs reduces employment opportunities in the non-farm sector.

HYVs increase rice production as compared to local varieties. The average yield for HYVs is 35.63 while that of local varieties is merely 34.54. Changes in allocation of labor are observed in countries experiencing technological changes in agriculture. Agricultural productivity has led to the development of the rural

non-farm sector. Employment opportunities in the rural non-farm sector have been generated in the course of affecting the following: demand for services for processing agricultural produce, demand for irrigation equipment, demand for trade, transport and construction; all of these are transacted in the rural non-farm sector (Mahabub 2002). These factors increase women's participation in economic activities by creating employment opportunities.

Hence, with the prevalence of HYV technology, we should expect to see women's roles in the farming community of Bangladesh to change – from being unpaid family helpers to becoming non-farm workers earning a decent living.

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APPENDIX A: Agrometrology used in different areas of Bangladesh:

Netrokona

1 Katha = 10 decimal
1 Acre = 10 Katha
1 Ara = 16 Katha = 160 Decimal
1 Butha = 5 Katha = 50 Decimal
1 Kani = 33.5 Decimal
1 Pura = 16 Ara
1 Decimal = 0.1 Katha
1 Hectare = 24.7 Katha
1 Katha = 4 Kuchi

Mymensingh

1 Bigha = 33 Decimal = 5 Katha
1 Katha = 6.75 Decimal
1 Khuchi (Paddy) = 1.75 Seer
1 Pura = 33/30 Decimal

Feni/Lakshmipur Area

1 Korha = 1.5 Decimal = 6 Nal
×1 Nal (1 Nal =7 Hands)
1 Ganda = 4 Korha
1 Kani = 4 Ganda
1 Kani = 4 Kuni
1 Tirpi Kani = 20 Ganda = 1.2 Acre
1 Dron = 16 Kani
1 Ari = 10 Seer/16 Seer
1 Pia = 14 Pura
1 Kuri (Banana) = 24 (numbers)

Faridpur

1 Bigha = 52 Decimal
1 Acre = 100 Decimal
1 Ghati = 1 Seer
1 Pon = 20 Hali
1 Hali = 4 (numbers)
1 Ganda = 4 Hali

Dhaka

1 Pakhi = 26 Decimal
1 Bigha = 3 Pakhi
1 Katha = 20 Pakhi
1 Bira (Betel Leaf) = 20 Ganda = 80 (numbers)
1 Choli = 5 Ganda = 20 (numbers)
1 Hundred (Mango) = 112 (numbers)
1 Bisha (Fish) = 32 (numbers)

Bogra

1 Bigha = 20 Katha = 33 Decimal
1 Kati (Rice) = 20 Seers
1 Dhara = 5 Seers

Comilla

1 Kani = 1.80 Acre/30 Decimal = 120 Decimal
1 Sai Kani = 20 Ganda = 4 Kuni
1 Ganda = 9 Decimal = 4 Korha
1 Kuni = 5 Ganda
1 Kuri (Fish) = 25 (numbers)
1 Kuri (Banana) = 25 (numbers)
1 Seer (Land) = 3 Decimal
1 Chatak (Land) = 1/640 Kani

Pabna

1 Gha (Betel Nut) = 10 (numbers)
1 Pakhi = 29 Kani = 27 Decimal
1 Bigha = 33 Decimal
1 Mone (Paddy) = 20 Katha
1 Dhara = 5 Seers

Gazipur

1 Pakhi = 35 Decimal
1 Seer (Milk) = 105 Tola
1 Maund (Fuel Wood) = 10 Pahar
1 Khara = 5 Seers
1 Hali (Banana) = 5 (numbers)
1 Khata (Rice) = 5 Seers

Rajshahi

1 Bigha = 33 Decimals
20 Katha = 1 Bigha
1 Katha = 1½ Decimal
40 Seer = 1 Maund
1 Dhari = 5 Kg
1 Poa (Betel Leaf) = 32 Bira
1 Bira = 64 (numbers) = 16 Ganda
20 Ganda (Mango) = 1 Pon
1 Pon = 80 (numbers)

Tangail

1 Bigha/Pakhi = 30 Decimal
1 Khada = 16 Bigha
1 Korha = 4 Ganda
1 Dhara = 5 Seers
1 Hali (Mango) = 5 (numbers)
1 Seer = 80 Tola
1 Seer (Milk) = 105 Tola
1 Kuri (Fish) = 22 (numbers)

Barisal

1 Korha = 4 Ganda
1 Korha = 2 Decimal
1 Kati = 20 Decimal
1 Acre = 100 Decimal
1 Kura = 160 Decimal
1 Seer (Keroshine oil) = 60/100 Tola
1 Kuri (Betel Nut) = 22 (numbers)
1 Kathi = 22 Seers

Kushtia

1 Bigha = 33 Decimal
1 Acre = 100 Decimal
1 Par = 80 (numbers)
1 Pakhi = 60 Decimal
1 Dhari = 5 Seers

Khulna

1 Dhari = 5 Seers
1 Bigha = 66 Decimal
1 Chunia = 15 Seers
1 Katha = 30 Seers

Chittagong

1 Kani = 160 Decimal/40 Decimal
1 Korha = 2 Decimal
1 Ganda = 4 Korha/2 Decimal
1 Ari (Paddy) = 18 Seers
1 Maund = 4 Ari

Noakhali

1 Kani = 120 Decimal
1 Kani = 20 Ganda
1 Ganda = 4 Korha
1 Korha = 1.5 Decimal
1 Bira (Betel Leaf) = 18 Ganda = 72 (numbers)
1 Mon = 40 Seers

Gaibandha

1 Bigha = 33 Decimal
1 Bigha = 20 Katha
1 Acre = 100 Katha
1 Bira (Betel Leaf) = 16 Ganda
1 Ganda = 4 (numbers)
40 Seers = 1 Maund

Rangpur

1 Bigha = 2.5 Doan = 60 Decimal
1 Doan = 4 Poa
1 Hali (Fish) = 7 (numbers)
1 Dhara = 5 Seers
1 Mon = 8 Dhara = 40 Seers

Dinajpur

1 Bigha = 48 Decimal
1 Bigha = 20 Katha
1 Gha (Betel Nut) = 10 (numbers)
2 Ganda = 1 Pon
1 Dhari = 5 Kg
8 Dhari = 1 Maund
Hundred (Betel Leaf) = 16 Ganda = 64 (numbers)

APPENDIX B: SURVEY QUESTIONNAIRE

COPING STRATEGIES IN BANGLADESH

(November - December 1998)

Questionnaire

[Questionnaire on Socio-economic status of the household]

1. Districts ..... _____

2. Thana..... _____

3. Union..... _____

4. Village ..... _____

5. Para..... _____

6. Census HH number..... _____

7. Sample Household Number _____
.....

8. Name of the Household Head _____
.....

9. Father/ Husband 's Name of
the Household Head ..... _____

Date of interview:

1st visit			2nd visit		
Day	Month	year	Day	Month	Year

Name of the interviewer..... _____

_____
Signature of the interviewer

INDEX

A. HOUSEHOLD COMPOSITION AND SCHOOL ATTENDANCE

A.1 Household Composition:

MEMBER ID	1. NAME	2. Sex	3. Mother ID Deceased..21 Outside.....22	4. Father ID Deceased ..21 Outside 22	5. Relation to Head Code	6. Age Years	 Months	7. Marital Status (Code) If >1 ☞Q9	8. Code of Spouse	9. Education Maxim-um Class passed	10. General Education Illiterate.....1 Can sign only .....2 Can read only .....3 Can read & write.....4	11. Occupation Primary	 Secondary	12. Has been absent during last 12 months Yes.... 1 No ....2→ next	13. Absent from the HH Days	14. Purpose /reason for absence Code	15. Sent or receive money for support No.....0 Receive..1 Send.....2
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	

*** Note:** If somebody is absent for last 30 days, will not be considered as a HH member

Q2 — Sex code:
Male.....1
Female 2

Q5 — Relation code:
Household head 1
Spouse 2
Son/daughter.....3
Father/mother 4
Brother/sister 5
Son/daughter-in-law 6
Brother/sister-in-law.....7
Grand son/daughter.....8
Niece/nephew 9
Other relatives..... 10
Other non-relatives..... 11
Permanent labor 12

Q7 — Marital status code:
Married 1
Unmarried 2
Widow/widower..... 3
Separated..... 4
Divorced..... 5

Q14 — Code for reason for Staying outside:
Study 1
Visiting relatives 2
In search of city job.....3
Contract agricultural labor.....4
Informal urban employment.....5
Service urban.....6
Abroad (Specify Country).....7
Urban trade.....8
N/A.....9
For flood.....11
Contract labor (non-agri).....12
Rickshaw/van puller.....13
Death 14
Got married and moved away.....15

Note: Ask all Members from **5 to 18** years old and collect information about their schooling.

A.2 School attendance:

ID	Name	1. Age first enrolled in school years. Never attend....0 ☞ 8	2. Still attending school? Yes.....1 No.....2 ☞ 7	3. Total School days during Jul 15 - Oct14, 98 (days)	4. Total School days during Oct15 - Nov 14, 98,days	5. Days of school attended during Oct15 - Nov 14, 98 (days)	6. Reason for missing school Code	7. When stopped		8. Reason for Stopping/ never attending Code	9. Total # of years in school (if <1year, consider as 1 year)	10. School Type mixed ..... 1 Boys or girls 2	11. Any program in the school Code	12. Distance from home Km	13. Time Taken To Go to school Minutes	
								Month	Year						Dry Season	Rainy Season

Note: Collect school information even if the person is not enrolled. In a separate sheet report the name of the school and the location that the people in the HH go to or they would be going to.

Q6 — Reason for missing school

Sick 1
Was engaged in HH works..... 2
Was engaged in some income earning work..... 3
School is closed/preparation for exam 4
Visiting relatives 5
Natural factors: rain, etc..... 6
Other (specify) 7
Flood 8

Q8 — Reason for stopping or never attending code

Couldn't afford..... 1
Sickness 2
Needed for hh work 3
Needed for own farm activity 4
Work elsewhere to earn 5
The school is too far away 6
Not like/refused to send girls to mixed schools 7
Do not want to go 8
Due to marriage 9
Other..... 10

Q 11 — Any program in the school:

No program..... 1
FFE program present and gets 2
FFE program present but does not get 3
Stipend program present and gets 4
Stipend program present but does not get.... 5

B. EMPLOYMENT

NOTE:
- Ask all household members **10 years** and older.
- List all the household members in the correct age group first from the flap and then ask all Questions for that person.

B.1 Status of Employment and other Earning Activities

ID	Name	1. Has "_" been working during the past 7 days? Yes ..1 → 3 No....2	2. In the past 7 days has "_" not been working because he/she is: Sick .....1 Vacation/leave.....2 Not in season.....3 Company temporary closed due to flood.....4 Other reason.....5 →5	3. What is "_"'s main current type of work ? Salary owner/ Dependent Worker..... 1 Daily Labor ..... 2 Own Business..... 3 Own Farm ..... 4 Unpaid family Worker . 5 Beggar..... 6	4. How long has "_" been engaged in this activity Months	5. Is "_" Currently looking for work ? Yes...1 →**7** No....2	6. Why Not? No need.....1 No jobs available ...2 Sick .....3 Disabled .....4 Maternity.....5 Student .....6 Housekeeping.....7 Pensioner.....8 Other (list).....9 Old/Inactive .....10 Go to **B3**

Note: Include Self Employment
Salary workers: Fill section **B4**
Daily Laborers: Fill section **B5**

B.2 Employment - Currently looking for work

Name	ID	7. How long has "_" been looking for a job ? Days	8. What is the main method "_" used to look for a job ? Going to a fixed place ..... 1 Intermediary/ agent ..... 2 Friends/ Relatives ..... 3 Employer ..... 4 Going to sites.. 5 Other..... 6	9. In the past 7 days how many hours has "_" spent looking for a job ? Hours	10. What is the minimum daily salary that "_" would accept for a job ? Taka	11. What is the minimum daily salary that "_" would accept for a job if meals are given? Taka	12. At this wage would "_" move to another town in order to get a job ? Yes . 1 →14 No... 2	13. How far would "_" move at this wage rate Km	14. What was "_" previous main job or activity? [Use codes from list on Sec A Q11 reported on the FLAP] Code

B.3 Public works and Training

ID	1. Name Go through the roster (section A) and ask each person if they have participated in public works and or training programs since 1995. If not enter '0'	2. How many weeks did "_" spend in public works in _____? And in which activity? [Remember to Need to define Season in Bangla] FFW.....1 TR.....2 RMP.....3 Afforestation.....4 Excavation of Pond/ canal...5								3. Indicate code for each year that "_" participated. Government .1 NGO.....2 Both 3			
		1998		1997		1996		1995					
		Weeks	Code	Weeks	Code	Weeks	Weeks	Weeks	Code	1998	1997	1996	1995

B.4 MAIN DEPENDENT JOB - CURRENT (Hire labor – People working for a salary or commission for somebody else) (Oct 15 – Nov 14, 98)

ID	Name	1. What is the sector of "_"' current wage job ? Code	2. What is the type of jobs that he performs? Code	3. What is type of employer "_" works for ? Govt.....1 Govt. Project 2 Non-Govt. Project .....3 Private 4	4. What is the type of agreement Permanent ..1 Casual contract.....2 Exchange....3	5. What is the location of job Code	6. How many hours did "_" work a week in that period? Hours	7. How many weeks did "_" work in that period? Weeks	8. What was the wage (exclude meals) Taka	9. Value of meals/ any other kind. If none write "0" Taka	10. For what period ? Hourly.....1 Daily .....2 Weekly ....3 Monthly ...4	11. Days of work lost last month because of employer? Days

Note: * **I**nclude FFW here !

- Dependent job is defined as a job performed on a regular basis for somebody
- If salary in Q8 is reported in lump sum, convert the value in monthly, weekly or daily

Q5 – Location Code	
Same village.....1	Same District 4
Same UP.....2	Outside District... 5
Same Thana.....3	

Codes for Question 1 - Job Sectors			
Food Processing (Manufacturing ..1	Hotel/ Restaurants.....13	Sewing 23	Other Transport worker 54
Manufacturing of Textile Products2	Electricity/gas/water 14	Pottery.....24	*C.4 Construction Work*
Manufacturing of Wooden Products, Furniture.....3	Transportation.....15	Blacksmith 25	Mason.....61
	Communication 16	Goldsmith 26	Helper.....62
Manufacturing of Paper Products, Printing, Publishing.....4	Army/Police.....17	Repairing of manufactured products . 27	Other construction worker.....63
	Science/ Education.....18	Other Manufacturing.....28	Earthen work 64
Other Manufacturing of Industry ..5	Arts and Culture.....19	*C.2 Trade*	*C.5 Services*
Agriculture 6	Health care 20	Petty Trading (Small retail shop) 41	Service (Employee) 81
Livestock.....7	Sport/ tourism/ retirement.....21	Medium Trading (Retail and insignificant wholesale) 42	Pensioner 82
Fisheries.....8	Finance and credit.....22	Wholesale Trading/ Aratdari..... 43	Service worker in NGO 83
Forestry 9	Management and administration 23	*C.3 Transport*	Servant in house 84
Wholesale Trade 10	Other non material activities.....24	Rickshaw/van Pulling 51	Household work 85
Retail Trade.....11	Others 25	Car/bus/truck Driver 52	Other non material activities 86
Other Business 12		Helper 53	

Q2 – Type of Job performed Code		
Agricultural Work.....01		
Agricultural work (Off Farm)		
Fish culture/ Fishing.....11		
Look after live stocks 12		
Look after Poultry (Duck, Chicken, Pigeons).....13		
Cultivation and other works on fruits 14		
Agricultural labour on other agricultural activities (Off Farm)....15		
Other agricultural activities (excluding 11-15) 16		
Non Farm Activities		
C.1 Industrial Enterprise		
Processing of crops.....21		
Tailoring.....22		

B.4 MAIN DEPENDENT JOB – (July 15, 1998 - October 14, 1998)

ID	Name	1. What is the sector of "_"' current wage job ? Code	2. What is the type of jobs that he perfor ms? Code	3. What is the type of employer "_" works for ? Gov't..... 1 Gov't project ..... 2 Non-gov't project ..... 3 Private..... 4	4. What is the type of agreement Permanent .. 1 Casual contract ..... 2 Exchange ... 3	5. What is the locatio n of job Code	6. How many hours did "_" work a week in that period? Hours	7. How many weeks did "_" work In that period ? Weeks	8. What was the wage (exclude meals) Taka	9. Value of meals/ any other kind. If none write "0" Taka	10. For what period ? Hourly ..... 1 Daily..... 2 Weekly .... 3 Monthly... 4	11. Days of work lost that period because of employer? Days

B.4 MAIN DEPENDENT JOB – (July 15, 1998 - October 14, 1997)

ID	Name	1. What is the sector of "_"' current wage job ? Code	2. What is the type of jobs that he perfor ms? Code	3. What is the type of employer "_" works for ? Gov't..... 1 Gov't project ..... 2 Non-gov't project ..... 3 Private..... 4	4. What is the type of agreement Permanent .. 1 Casual contract ..... 2 Exchange ... 3	5. What is the locatio n of job Code	6. How many hours did "_" work a week in that period? Hours	7. How many weeks did "_" work In that period ? Weeks	8. What was the wage (exclude meals) Taka	9. Value of meals/ any other kind. If none write "0" Taka	10. For what period ? Hourly ..... 1 Daily..... 2 Weekly .... 3 Monthly... 4	11. Days of work lost that period because of employer? Days

B.5 Daily Laborer and Casual Laborer

		Last Month (October 15 – November 14, 1998)						Previous Period (July 15 – October 14, 1998)					
ID	Name	1. Days worked Days	2. Hours worked per day Hours	3. Task Code Flap	4. Daily wage (include value of food) Taka	5. Worked for whom? Code	6. Why "_" did not work more days Work not available .....1 Did not need.....2 Sick .....3 Transport not available .....4 Could not leave family .....5 Other 6	1. Days worked Days	2. Hours worked per day Hours	3. Task Code Flap	4. Daily wage (include value of food) Taka	5. Worked for whom? Code	6. Why "_" did not work more days Work not available ..... 1 Did not need..... 2 Sick ..... 3 Transport not available ..... 4 Could not leave family ..... 5 Other 6

Note: If somebody is hired for several jobs at different daily rate report more than one line – to reflect the wage rates earned

Code for Q5:
Landlord..... 1
Family 2
Neighbor/
Relatives..... 3

B.5 Daily Laborer - Casual Laborer

		Same Period (July 15 – October 14, 1997) – LAST YEAR					
		1. Days worked	2. Hours worked per day	3. Task	4. Daily wage (include value of food)	5. Worked for whom?	6. Why "_" did not work more days Work not available .....1 Did not need.....2 Sick .....3 Transport not available .....4 Could not leave family .....5 Other 6
ID	Name	Days	Hours	Code Flap	Taka	Code	

B.6 Business and Cottage Activities

ID	Name	October 15 – November 14, 1998						
		1. Main Activity Code	2. Days worked Days	3. Hours worked per day Hours	4. Amount of money earned excluding cost Taka	5. Value of fixed capital Taka	6. Value of variable capital [working capita] Taka	7. Why "_" did not work more days Did not need .....1 Sick.....2 Transport not available...3 Could not leave family ...4 Other 5

Note: * Do not include the sale of own assets or other items

- For family members working in the same enterprise:
  - If one works for the other report the owner here and the worker in the dependent work section(**B4**)
  - If they share the ownership use separate rows for each share holder

Q1 - Codes for Business activities

Food Processing (Rice).....1	Wholesale Trade rice 10	Rickshaw/van pulling.....20	Arts and Culture.....25
Food Processing (Milk).....2	Wholesale Trade other 11	Other transportation 21	Health care 26
Food Processing (Other) 3	Selling of Grains 12	Communication.....22	Sport/ tourism/ retirement 27
	Selling of Fish.....13		Finance and credit 28
Manufacturing of Textile Products4	Selling of fruits/vegetables.....14	Hotel/Restaurants.....23	Management and administration .29
Manufacturing of	Selling of Grocery.....15	Electricity/gas/water.....24	Other non material activities 30
Wooden Products, Furniture 5	Selling Poultry 16		Other Business 31
Manufacturing of Paper	Selling Livestock 17		Other 32
Products, Printing, Publishing.....6	Selling of Stationary 18		
Basket Making 7	Other retail 19		
Silk Weaving.....8			
Other Manufacturing of Industry ..9			

B.6 Business and Cottage Activities - Continues

ID	Name	Previous periods – (July 15 - October 14, 1998)							Same periods – (July 15 - October 14, 1997) – A YEAR AGO						
		1. Main Activity Code	2. Days worked Days	3. Hours worked per day Hours	4. Amount of money earned excluding cost Taka	5. Value of fixed capital Taka	6. Value of variable capital [working capita] Taka	7. Why "_" did not work more days Did not need....1 Sick.....2 Transport not available.....3 Could not leavefamily4 Other.....5	1. Main Activity Code	2. Days worked Days	3. Hours worked per day Hours	4. Amount of money earned excluding cost Taka	5. Value of fixed capital Taka	6. Value of variable capital [working capita] Taka	7. Why "_" did not work more days Did not need..... 1 Sick ..... 2 Transport not available..... 3 Could not leave family4 Other 5

C. AGRICULTURAL LAND AND PRODUCTION PATTERN

C1. Land owned and operated

Plot ID	1. Plot Description	2. Plot Type (Code)	3. Size (decimal)	4. Distance from home (meter) if next to it → 0	5. Usual Flood Depth Ft.	6. Depth of flood In 98 Ft.	7. Soil Type (Code)	8. Irrigation Status (code) Rainfed ..... 1 Pond-irrigation ..... 2 Hand tubewell ..... 3 Treddle pump ..... 4 Rower pump ..... 5 STW ..... 6 LLP ..... 7 DTW ..... 8 Traditional: river canal water ..... 9 Others 10			9. Current operational status Code	10. Who owns (member ID or code) If not 0wned → 12	11. Current Market value Taka	12. How acq-uired Code	13. Year acquired	14. Rented out/in or leased No ..... 0 → next In ..... 1 Out 2	15. Total value per month in cash and kind → next Taka	16. Owner of the land Husband's Relative ..... Wife's relative ..... Non-relative	17. Where staying owner of the land? Inside village1 Different village ..... 2 Town ..... 3 Abroad 4	18. Socio-economic status Richer ..... 1 Same ..... 2 Poorer ..... 3 → next
	Homestead							Am	Bo	Au									

Note: Include all type of land & water bodies. If it is part of homestead (kitchen garden) and it is >0.3 decimals it should be counted as a plot separated from homestead. Seed beds/nursery have to be considered as separate plots.

Note: For new plots write over the shaded column.

Q.2 Plot type code:
Homestead 1
Bush/forest 2
Pasture 3
Cultivable land 4
Land in market place 5
Cultivable Pond 6
Derelict pond 7
Waste land 8
Land in riverbed 9

Q.7 Soil type code:
Clay 1
Loam 2
Sandy 3
Clay-loam 4
Sandy-loam 5

Q. 9 -Operation status code:
Fallow 1
Own operated 2
Rented-in/cash 3
Rented-in/share 4
Mortgage-in 5
Rented-out/cash 6
Rented-out/share 7
Mortgage-out 8
Leased-in/group 9
Leased-out to NGO group 10
Taken from joint owner 11
Jointly with other owners 12
Not under Possession 13

Q.10 Who owns code:

Member ID ..... Code
Govt/Khas land 94
Jointly owned with family 95
other families 96
Temporary user right 97
Other than family member 98

Q.12 How acquired code:
Purchase/bought 1
Inherit (wife's family) 2
Inherit (husband's mother's family) 3
Inherit (husband's father family) 4
Temporary user right (wife's family) 5
Temporary user right (husband's family) 6
Rented-in 7

Note: Market value of land is also applicable for joint property

Note: [Obtain information for crops harvested and planted after December 15, 1997 till the date of interview. If more than one crops are harvested on the same plot during the period, then use separate crop pattern lines. In case of inter-cropping obtain information on output on all crops, mention the crop variety. For plots managed by female members, ask the relevant member.]

After interviewing the male respondents, ask the female respondents about the activities & record them on the bottom rows. Mention Bangla months.

C.2 Agriculture plot utilization - CROPS

1. Plot #	2. Name of Crop	3. code	4. Area planted	5. Variety	6. Time planted/ Broadcast	7. Area intensive man days				8. Production intensive man days				9. Cost of inputs Seeds, seedlings, Fertilizer and other			
	Name	Code	Decim.	HYV . . 1 Local . 2	Week/mo	Family	Hired (local)	Hired (Outside)	Total Cost for hired labor	Family	Hired (local)	Hired (Outside)	Total Cost for hired labor	Q Urea (Kg.)	Q TSP (Kg.)	Q Pest (Kg.)	Total Cost

Note: Inter-cropping

If use mound – use local mound of 37.37 Kg each

Include value of own seed/ seedling in Q.9.

If contract labor in Q.7/ Q.8 convert total hours worked into standard days (1 day = 8 hours)

C.2 Agriculture plot utilization - CROPS

Plot #	Name of Crop	code	10. Time of harvest	11. Quantity harvested		12. Loss of output	
	Name	Code	Week/Mo	Kg..... 1 Mound2	QTY	QTY	Reason

Note: Inter-cropping

Q12 - Reason of loss code:
Flood 1
Pest..... 2
Drought 3
Other 4

C.3 Agriculture plot utilization – KITCHEN GARDENS

Note: [Obtain information for crops harvested and planted after December 15, 1997 till the date of interview. If more than one crops are harvested on the same plot during the period, then use separate crop pattern lines. In case of inter-cropping obtain information on output on all crops, mention the crop variety. For plots managed by female members, ask the relevant member.]

After interviewing the male respondents, ask the female respondents about the activities & record them on the bottom rows. Mention Bangla months.

C.3 Agriculture plot utilization – KITCHEN GARDEN

1. Plot #	2. Name of Crop	3. code	4. Area planted	5. Variety	6. Time planted/ Broadcast Week/mo	7. Area intensive man days				8. Production intensive man days				9. Cost of inputs Seeds, seedlings, Fertilizer and other			
	Name	Code	Decim.	HYV ..1 Local..2		Family	Hired (local)	Hired (Outside)	Total Cost for hired labor	Family	Hired (local)	Hired (Outside)	Total Cost for hired labor	Q Urea (Kg.)	Q TSP (Kg.)	Q Pest (Kg.)	Total Cost

Note: Inter-cropping

If use mound – use local mound of 37.37 Kg each

Include value of own seed/ seedling in Q.9.

If contract labor in Q.7/ Q.8 convert total hours worked into standard days (1 day = 8 hours)

C.3 Agriculture plot utilization - KITCHEN GARDEN

Plot #	Name of Crop	code	10. Time of harvest	11. Quantity harvested		12. Loss of output	
	Name	Code	Week/Mo	Kg..... 1 Mound2	QTY	QTY	Reason

Note: Inter-cropping

Q12 - Reason of loss code:
Flood 1
Pest..... 2
Drought 3
Other 4

C.4 Summary of agriculture production Crops, fruits grown in Kitchen garden trees etc.

1. Name of Crop	2. Crop Code	3. Unit of measure Kg .....1 Nos.....2	4. Quantity harvested	5. Quantity Consumed	6. given to the owner of the land/tree	7. Given to the labors	8. Given to others	9. Qty sold	10. Price of selling (Tk./unit)	11. Total value of selling (Tk.)

Note: Write price and costs in taka.

Q2. Agriculture Crop Codes

Major Cereals
B. Aman (L).....11
B. Aman (Mixed).....12
T. Aman (L/LIV) 13
T. Aman (HYV).....14
B. Aus (L) 15
B. Aus (Mixed) 16
T. Aus (L/LIV).....17
T. Aus (HYV) 18
Boro (L) 19
Boro (HYV) 20
Wheat (L).....21
Wheat (HYV).....22
Maize 23
Barley.....24
Job.....25
Cheena 26
Kaun(Italian millet).....27
Joar(Great millet).....28
Bojra(Pearl millet) 29
Others.....30
Jute/Other fibre seed 31

Fiber Crops
Jute.....41
Cotton 42
Lime.....43
Other(bamboo).....44
Other Fibre.....45

Pulses
Chick Pea.....51
Pigeon pea (Aarohor)....52
Lentil(Moshur) 53
Field pea (Motor).....54
Mung 55
Black gram (Mashkalai)56
Chickling Vetch(Khesari) 57
Soybean(Gori kalai/ Kali motor) 58
Other Pulses.....59

Oil Seeds
Sesame.....61
Mustard.....62
Ground nut/pea nut.....63
Soybean 64
Castor (rerri) 65
White mustard 66
Others Oilseeds.....67
Coconut 68
Linseed(tishi).....69
Others 70

Chili 71
Onion 72
Garlic 73
Turmeric 74
Ginger.....75
Dhania/Coriander 76
Other spices 77

Sugar cane 81
Date (Date palm) 82
Palm (Taal).....83
Juice(81, 82, 83) 84

Tea 91
Tobacco 92
Betel nut 93
Betel leaf.....94
Other nesha jaat crops.....95

Pumpkin.....101
Bringal (egg plant).....102
Patal 103
Okra 104
Ridge gourd 105
Bitter gourd.....106
Arum.....107
Ash gourd 108
Cucumber 109
Cow pea.....110
Snake gourd.....111
Danta 112
Green banana.....113
Cauli flower.....114
Cabbage 115
Chinese cabbage 116
Water gourd.....117
Sweet gourd.....118
Tomato.....120
Raddish.....121
Bean.....122
Carrot.....123

Turnip 124
Green Papaya.....125
Kakrol.....126
Yam Stem 127
Other green Vegetables 128
Drum Stick/ Horseradish.....129
Pui Shak.....201
Palang Shak(Spinach). 202
Lal Shak.....203
Kalmi Shak 204
Danta Shak.....205
Kachu Shak.....206
Lau Shak.....207
Mula Shak.....208
Khesari Shak.....209
Other green Leafy vegetables.....210
Potato Leaves.....211
Banana 301
Mango.....302
Pineapple 303
Jack fruit 304
Papaya 305

Water melon.....306
Bangi/Phuti/ Musk melon 307
Litchis 308
Guava.....309
Ataa.....310
Orange.....311
Lemon 312
Shaddock (pomelo) 313
Black berry.....314
Other fruits (lemon like).....315
Other fruits.....316
Boroi(Bitter Plum) 317
Rose Apple.....318
Wood Apple.....319
Ambada//Hoq plum.....320
Pomegranate.....321
Bilimbi 322
Chalta 323
Tamarind(pulp) 324
Olive(wild).....325
Potato 411
Sweet potato.....412
Straw 413
Mulberry(Tunt) 414

D1. Ponds owned and operated

Plot ID	1. Pond Descrip-tion	2. Pond Type (Code)	3. Size (decimal)	4. Distance from home (meter) if next to it → 0	5. Depth of Flood in 98 (Ft.)	6. Depth of Flood in 97 /Usual flood depth (Ft.)	7. Current Operation -al status Code	8. Who owns (member ID or code) If not 0wned → 14	9. Current Market value Taka	10. How acq-uired Code	11. Year acquired	12. Rented out or leased No .....0 → next In .....1 Out 2	13. Total value per month in cash and kind → next Taka	14. Owner of the pond Husband's Relative..1 Wife's Relative..2 Non Relative..3	15. Where Staying owner of the pond Inside village ..... 1 Different village ..... 2 Town..... 3 Abroad 4	16. Socio-economic status Richer.....1 Same.....2 Poorer.....3 → next

Note: Include all type of land & water bodies. If it is part of homestead (kitchen garden) and it is >0.3 decimals it should be counted as a plot separated from homestead. Seed beds/nursery have to be considered as separate plots.

Note: For new ponds write over the shaded columns

Q.2 Pond type code:

Cultivable Pond 1
Derelict Pond 2

Q. 7 -Operational status code:

Fallow.....1
Own operated 2
Rented-in/cash 3
Rented-in/share.....4
Mortgage-in 5
Rented-out/cash 6
Rented-out/shar.....7
Mortgage-out 8
Leased-in/group.....9
Leased-out to NGO group 10
Taken from joint owner.....11
Jointly with other owners 12
Not Under Possession.....13

Q.8 Who owns code:

Member ID.....Code
Govt/Khas land.....94
Jointly owned with
family 95
other families.....96
Temporary user right.....97
Other than family
member..... 98

Q.10 How acquired code:

Purchase/bought 1
Inherit (wife's family) 2
Inherit (husband's mother's family) ...3
Inherit (husband's father family) 4
Temporary user right
(wife's family) 5
Temporary user right
(husband's family) 6
Rented-in 7

Note: Market value of pond is also applicable for joint property

Note: [Obtain information for all activities after January 1, 1998 till the date of interview.

After interviewing the male respondents, ask the female respondents about the activities & record them on the bottom rows. Mention Bangla months. The crop first reaped will have activity # 1. The crop now ..... will be the last #.

D.2 Fish Pond utilization - Record the information of fish catches since July 15, 1998.

1. Pond #	2. Area Decimal	3. Name of fish	4. Code	5. Time of releasing fingerlings Week/ Month	6. Man days				7. Cost of inputs			
		Name	Code		Family	Hired (local)	Hired (Outside)	Total Cost for hired labor (Tk.)	Fingerlings	Feed	Other	Total Cost

D.2 Pond utilization - FISH

Plot #	Name of Fish	code	8. Time of harvest	9. Quantity harvested		10. Loss of output	
	Name	Code	Week/Mo	Kg.....1 Nos 2	Qty.	Qty.	Reason

Q10 - Loss output reason code:

Flood 1
Polluted water/
Toxicity 2
Other 3

D3. FISH POND – PRODUCITON AND INPUTS

D.3 Summary of Fish production (since 15 July, 1998 till the date of interview)

1. Name of Fish	2. Code	3. Source Pond.....1 Open water.....2	4. Unit of measure Kg ..... 1 Nos..... 2	5. Quantity Consumed	6. Given to the owner of the pond	7. Given to the labors	8. Given to others	9. Qty sold	10. Price of selling (Tk./unit)	11. Total Value of selling (Tk)

Note: Write price and costs in taka.

D3. Fish Codes

Ilish 10	Telapia/Puti/Swarputi 16	Other (Large).....21
Koi 11	Chingri.....17	Other (Small).....22
Magur.....12	Rui/Katal 18	Sea fish.....32
Shingi.....13	Tengra/Baim.....19	Other sea fish 50
Khalse 14	Mala/Kachki/Dhela/Chapila ..20	
Shol/Gajar/Taki.....15		

E.2 Other Income from Livestock Production
July 15 – November 14, 1998

1. Type of product	2. Code of prod-uct	Last month						
		3. Total Production Quantity	4. Unit Code Kg ..... 1 Litre .... 2 Piece ... 3 Not applicable 4	5. Wastage /rotten (Qty)	6. Sales			7. Consumed quantity
					Quan-tity	Price	Total value (taka)	
EGG	1							
MILK	2							
DUNG	3							

E.3 Expenditure for livestock Production Last 4 Months
July 15 – November 14, 1998

1. Type of animal	2. Code	3. Fodder bought Taka	4. Medicaments Taka	5. Cost for hired labor Taka	6. Other Expenses if Purchased Taka	7. Did you borrow ? Yes....How much No 0
CATTLE						
GOAT						
SHEEP						
CHICKEN/DUCK						

E.4 Expenditure for livestock Production Between
December 15, 1997 - July 14, 1998

1. Type of animal	2. Code	3. Fodder bought Taka	4. Medicaments Taka	5. Cost for hired labor Taka	6. Other Expenses if Purchased Taka	7. Did you borrow ? Yes....How much No 0
CATTLE						
GOAT						
SHEEP						
CHICKEN /DUCK						

F. FAMILY LABOR ALLOCATION

F1. Time Spent for Agricultural and non-agricultural activities (For the members of 10years old or more)

ID	Name	1. Task Name	Code	2. October 15 – November 14, 98		3. September 15 – October 14, 98		4. August 15 – September 14, 98		5. July 15 - August 14, 98	
				Days	Hrs/day	Days	Hrs/day	Days	Hrs/day	Days	Hrs/day

Note:For each member fill separate row for separate task. especially if they are very different

G. OTHER REVENUES – SOCIAL ASSISTANCE

G1. Sources of other Revenues

1. Code	Description	2. October 15 – November 14, 98				3. July 15 – October 14, 98			
		Cash	Rice (kg)	Wheat (Kg)	Other kind	Cash	Rice (Kg)	Wheat (Kg)	Other kind
101	**Remittances**								
102	**Rental properties**								
103	**Rental of Bullock**								
104	**Food for education(FFE)**								
105	**Stipend for Girls**								
106	**GR**								
107	**TR**								
108	**VGF**								
109	**VGD**								
110	**FFW**								
111	Lotteries								
112	CARE								
113	GKT								
114	Proshika								
115	Grameen Bank								
116	Allowance for the old person								
117	Red Crescent								
118	BRAC								
119	Janakallan								
120	Other assistance								
121	Pension								

G2. Allocation of Social assistance in received in Kind

		October 15 - November 14, 1998						July 15 - October 14, 1998					
		GR	**TR**	**VGF**	**VGD**	**FFW**	**FFE**	**GR**	**TR**	**VGF**	**VGD**	**FFW**	**FFE**
1	Amount received (kg)												
2	Amount consumed (kg)												
3	Amount sold (kg)												
4	Why sold												
5	Sold to whom/where												
6	Value received from selling												
7	Why not sold more												
8	Cost of milling including transport												
9	Time required for milling (in minutes)												

Q4 – Why sold	**Q5 – Sold to whom/where**	**Q7 – Why not sold more**
Do not like 1	Market 1	Like to eat "_" 1
Need the cash 2	Landlord 2	Do not like to sell 2
The HH head wanted cash .. 3	UP Chairman 3	Afraid of being reported..... 3
To get the forced savings 4	Sarder 4	It is not the right thing to do 4
To pay NGO installments ... 5	Relatives 5	Other..... 5
Quality of wheat not good... 6	Friends 6	
Prefers rice 7	Rural Mohajan/ Faria 7	
	Other..... 8	

H. ASSETS

H1. Assets – Ownership of Real estate, Agricultural etc.

Note: Include own housing and other real state property

Description of asset	2. Asset code	3. Quantity/ Nos	4. Who owns (Member ID)	5. If joint property, share owned by the HH member in %	6. Date & mode of acquisition (if received in different times write the year & month of last receipt)			7. Estimated current value: Price paid if bought less than 1 year ago .....1 Current value if older than 1 year .....2 If sale is not possible, ask about costs & time to replace the asset.....3		
					Month	Year	How acquired (code)	Current estimated value	Method used in buying	Estimate of loss due to flood – (%)
Paddy	101									
Rice	102									
Wheat	103									
0-6 months Cattle	300									
Young Cattle 6-12 nos	301									
Cattle	302									
Dairy Cow	303									
Bullock	304									
Baby Goat/Sheep	305									
Adult goat	306									
Sheep	307									
Young Chick (< 2 nos)	308									
Chicken	309									
Young Duck (< 2 nos)	310									
Adult Duck	311									
Pigeon	312									
Horse	313									

Description of asset	2. Asset code	3. Quantity/ Nos	4. Who owns (Member ID)	5. If joint property, share owned by the HH member in %	6. Date & mode of acquisition (if received in different times write the year & month of last receipt)			7. Estimated current value: Price paid if bought less than 1 year ago .....1 Current value if older than 1 year .....2 If sale is not possible, ask about costs & time to replace the asset.....3		
					Month	Year	How acquired (code)	Current estimated value	Method used in buying	Estimate of loss due to flood – (%)

Q.2 Asset code:

Own housing.....1
Other housing 2
Land (for Hh).....3

Plough 11
Power tiller.....12
Share of irrigation/boat/pumps 13
Share of DTW.....14
LLP 15
Threshing machine.....16
Husking mill (diesel).....17
Husking mill (elect)..... 18
Other ag. equip. 19
Large tree 20

Boat (Country) 31
Engine boat 32
Ghani..... 33
Fishing net..... 34

Motor cycle 41
Rickshaw/Van 42
Bicycle 43
Push cart..... 44

Metal cooking pot 51
Sewing machine.....52
Handloom 53
Hand tubewell.....54
Hand saw 55

Radio.....61
Wall clock.....62
Television 63
Jewelry (gold/ silver) 64
Other val. Assets 65
Other 71

Q.4 Who owns code:

Tenant..... 33
Household asset..... 98
Temporary user right..... 94
Shared with other non-member of the household 95

Q.6.3 How Acquired Code:

Cash/kind purchase..... 1
Inheritance (Husband's Family).... 2
Inheritance (wife's Family)..... 3
Credit(partially/fully)..... 4
As gift (Private) 5
Rental/lease..... 6
As gift (Govt./project) 7
Home production 8
Age change 9

H2. Assets – Sales of Assets – Change in Ownership

Description of asset	2. Asset code	3. Sold/lost/consumed : Oct 15-Nov 14, 98				4. Sold/lost/consumed : Jul 15 – Oct 14, 98				5. Sold/lost/consumed – Dec 15, 97 – Jul 14, 98			
		Consumed/sold/lost	Quantity	How much received (Tk.)	To whom sold	Consumed/sold/lost	Quantity	How much received (Tk.)	To whom sold	Consumed/sold/lost	Quantity	How much received (Tk.)	To whom sold
Paddy	101												
Rice	102												
Wheat	103												
Young Cattle 6-12 nos	301												
Cattle	302												
Dairy Cow	303												
Bullock	304												
Baby Goat/Sheep	305												
Adult goat	306												
Sheep	307												
Young Chick (< 2 nos)	308												
Chicken	309												
Young Duck (< 2 nos)	310												
Adult Duck	311												

Code : How lost to whom sold (Q 3.1, Q 4.1, Q 5.1)	
Consumed by household.....1	Sold to Tenant.....5
Lost during the flood.....2	Sold to Friends/neighbors/ relatives.....6
Lost or stolen 3	Sold at Market 7
Sold to Landlord 4	Other.....8

I. CREDIT

This section is relative to any loan still outstanding during past year since December 15, 1997. **Round _____/____/**

Types of Loans:

NGO 1
Bank/ other institutional loss to be repaid in installments 2
Other Source 3
Other small loans/in kind loans (<100 Tk. and >50 Tk.
in the last 4 weeks 4

Note : For each of the loans, please fill out one row. If not enough rows, use additional pages.

I.1 Credit Obtained (applicable for any family member) and source of Loan

Survey Date :

Loan ID	1. Loan type	2. Who has taken the loan? Member ID	3. What was Source of credit Code	4. Reason for asking the loan Code	5. When did you receive credit			6. How much did you borrow					7. Did you provide collateral? No ..... 0 Yes → .....code	8. What is interest rate? → Next If fixed →Q9	9. When did you agree to repay? If no fixed date of repayment write 666666			10. How much in total do you have to repay the lender		
								Cash	Kind						YY	MM	DD	Cash	Kind	
					YY	MM	DD	(Tk.)	Name	Code	Quantity (Kg)	Value of in-kind Tk.						(Tk.)	Code	Value at due date

I.2 Repayment and utilization of Loan

Loan ID		11. Until now have you made any repayments? No.....0 → 4 Yes Full..... → 1 Yes Partial..... → 2	12. How often do you make payments Weekly..... 1 Forth night..... 2 Monthly..... 3 Every 2 Nos..... 4 Yearly..... 5 At a time..... 6	13. How much did you repay until today			14. How much do you still have to pay ?			15. Use of Loan						16. Who decided to take Loan? Member ID or Code
				Cash (Tk.)	Kind		Cash (Tk.)	Kind		Use Code	%	Use Code	%	Use Code	%	
					Code	Tk.		Code	Tk.							
	R1															
	R2															
	R3															
	R1															
	R2															
	R3															
	R1															
	R2															
	R3															
	R1															
	R2															
	R3															

Q.3 – Source of credit

GB	1	Neighbors	16
BRAC	2	Relatives	17
ASA	3	Banchte Shekha	18
Prosika	4	Jagorani Chakra	19
Save the Children	5	Mahajan	20
Nijera Kori	6	Land owner	21
CARE	7	Employer	22
Other NGO (Specify)	8	GKT	23
Krishi Bank	9	MAEP	24
Sonali Bank	10	Other	25
BRDB	11		
GOB Landless Cooperative	12		
Other Cooperative	13		
Govt banks	14		
Commercial Bank	15		

Q.7 – Collateral Code

Land Mortgage	1
Jewelry Mortgage	2
Other Asset Mortgage	3

Q.4, Q.15 – Reason for getting the loan and use of Loan

Food (including crops)	1
Education	2
Doctor/medicine/health	3
Farming (crop)	4
Farming (fish)	5
Farming (livestock & poultry)	6
Cottage industry	7
Business	8
Self employment	9
Repayment of loan	10
Marriage expenses	11
Dowry	12
Purchase of land	13
Agri. equipment purchase	14
Going abroad to work	15
Mortgage in land	16
Other	17

Q.6, Q.10, Q.13, Q.14 – Kind Code

No in-kind transfer	0
Food (including crops)	1
Fertilizer	2
Pesticides	3
Seeds	4
Fodder	5
Labor mandatory to lender	6
Fingerlings	7

Q.16 – Who decided to take Loan

Husband & wife together	98
All/adult household member	44
Outsider of the household	33
Household head & dependents (except wife)	97
Wife & dependents (except head)	96

I.3 Credit Given to Non-members of Household

1. Loan ID	2. ID of len-der	3. To whom (code)	4. How much did you lend			5. When did you lend			6. Interest rate per year	7. When must borrower repay? If no fixed date, Write 666666			8. How much was agreed to be repaid by the due date			9. How much has been repaid until today?		
			Cash (Tk)	In-kind		DD	MM	YY		DD	MM	YY	Cash (Tk.)	In-kind		Cash (Tk.)	In-kind	
				Code K	Value (Tk)									Code	Value (Tk)		Code	Value
																R1		
																R2		
																R3		
																R1		
																R2		
																R3		
																R1		
																R2		
																R3		
																R1		
																R2		
																R3		

Note: Do not include land mortgages for lending out

Add the interest rate question

Q3 – Lender – Code to Whom	Q4, 8, 9 – In kind Code
Landlord.....1	No in-kind transfer 0
Tenant 2	Food (including crop) 1
Friends/relatives/neighbors 3	Fertilizer 2
Other 4	Fodder 3
	Pesticide 4
	Seeds 5
	Labor (for repayment of credit. Estimate with current wage rate).6
	Other (specify) 7

J. HOUSING AND SANITATION

1. How many buildings do you have?..... /____/

2. Description of housing

2.1 Type of room	2.2 Have Yes . 1 No... 2	2.2 Numb er of rooms	2.3 Material used for			2.4 Total size in feet	
			Walls	Floor	Roof	Length	Width
101 – Main room							
102 – Second room							
103 – Third room							
104 – Separate place Kitchen							
105 – Bathroom							
106 – Shed							
107 - Grain storage							

Note: If the household has a separate space used only for kitchen and bathroom, then report it here.

Q 2.3 - Codes for Materials

Earth 1	Chhan.....4	Jute sticks.....7
Bamboo 2	Straw.....5	Tiles 8
Leaves 3	Concrete.....6	Tin.....9
		Other 10

3. Information about Flood

Description	1998 Flood	1997 Flood (Normal flood)
Did you have water in your house, Ft. (if no = 0)		
For how many days (if no = 0)		
Repairing cost if any damage due to flood (no cost= 0)		
For how many days you were out of your home (if no = 0)		

4. Type of toilette used? ..... /____/

None (open field) 1
Kutcha (fixed place) 2
Pucca (unsealed)..... 3
Pucca (Water Sealed) 4
Other (specify)..... 5

5. How do you dispose garbage?..... /____/

Through away in own fixed place 1
Thrown into own place (no fixed)..... 2
Dispose anywhere 3
Others (specifying whether caring environment pollution/ not)..... 4

6. Source of water used

	Drinking water	Cooking water	Washing water
Source of water			
Distance of source (feet)			
Container used for storage			
Purifying process			

Sources of Water

Tube well..... 1	River/ Canal..4
Ring Well/ Indara 2	Supply Water (piped).....5
Pond 3	Other (specify)6

Water Purifying process

None.....1	Boil & filter ...4
Boil 2	Chemical.....5
Filter.....3	Other.....6

Type of Container

Clay pot.....1	Iron Drum 3	Plastic drum..... 5
Aluminum/ Brass/ other metal.....2	Other non-metal pot (big one) 4	Glass Bottle 6
		Other Bottle 7

7. Person in the household collecting water last week

	Name	1. ID	2. Number of trips a day	3. Time for each trip including waiting time Minutes	4. Amount collected Liters
First person					
Second person					
Third person					
Other Than*		40			

Note: Use only for trips outside the homestead

8. Is the house connected with the electricity? ..... /____/
   Yes 1
   No..... 2

9. Source and use of energy

	1. Oct 15 – Nov 14, 98		2. July 15 – Oct 14, 98	
	Cooking	Lighting	Cooking	Lighting
101. Wood				
102. Gas				
103. Cow dung				
104. Leaves				
105. Jute stick				
106. Paddy husk				
107. Kerosene				
108. Electricity				
109. Bamboo				
110. By product/Dust /Straw (Paddy/Wheat/Pulses)				

10. Person in the household collecting firewood last week

	Name	1. ID	2. Number of trips a day	3. Time for each trip including waiting time Minutes
First person				
Second person				
Third person				
Other Than*		40		

Q. 7.1
Other Than Family Member..... 40

Q.10.1
Other Than Family Member..... 40

O. NON FOOD EXPENDITURE

NOTE: RECALL PERIOD VARIES

1. Item		2. Quantity	3. Unit Price	4. Total expenditure Tk.	5. Value of quantity given as gift	6. Value of gift/any other kind received	7. Source of gift Friend/neighbors/relatives .....1 Zakat/ Fetra ....2 Other 3
Last month							
Housing							
101	Rent						
102	Repairs						
Clothing							
103	Adult men						
104	Adult women						
105	Children						
Footwear							
106	Men						
107	Women						
108	Children						
Semi Durable Household Goods							
109	Dishes						
110	Silverware						
111	Pots						
112	Lamps						
113	Basket/bags						
114	Toys						
Household Services							
115	Payment for Servant						
116	Payment for seasonal labor						
Health Expenses							
117	Fees for medical care						
118	Drugs/medicines						

1. Item		2. Quantity	3. Unit Price	4. Total expenditure Tk.	5. Value of quantity given as gift	6. Value of gift/any other kind received	7. Source of gift Friend/neighbors/relatives .....1 Zakat/ Fetra ....2 Other 3
119	Dental Fees						
120	Lab tests						
121	Other treatments						
Family Events							
122	Wedding						
123	Funerals						
124	Birthdays/aniv.circum-cission						
125	Cash gift given						
Education (Since December 15)							
126	School fees						
127	House tutor						
128	Boarding fees						
129	Books						
130	Stationary						
131	Education purpose transportation						
132	Battery						
133	Other educational expenses						
134	Electricity						
135	Pocket allowance						
Non-Durable Household Goods (RECALL PERIOD: LAST ONE MONTH)							
136	Detergent laundry soap						
137	Other (specify)						
Personal Care (RECALL PERIOD: LAST ONE MONTH)							
138	Bathing soap/shampoo						
139	Shaving						
140	Tooth powder/brush						
141	Hair oils						

1. Item		2. Quantity	3. Unit Price	4. Total expenditure Tk.	5. Value of quantity given as gift	6. Value of gift/any other kind received	7. Source of gift Friend/neighbors/relatives .....1 Zakat/ Fetra ....2 Other 3
142	Cosmetics						
Public Transport (RECALL PERIOD: LAST ONE MONTH)							
143	Rickshaw/Van						
144	**B**us/microbus/minibus						
145	Travel to other districts						
146	Repairs of Bi-cycle/ rickshaw						
Entertainment (RECALL PERIOD: LAST ONE MONTH)							
147	Movies/Jatra						
148	Sports						
Fuel (RECALL PERIOD: LAST ONE WEEK)							
149	Firewood						
150	Dried leaves						
151	Cowdung						
152	Jute sticks						
153	Rice bran						
154	Straw						
155	Matches						
156	Kerosene						
157	Gas						
158	Bidi/ Cigarette						
159	Betel leaf/ Bet. nut/ Jarda/ Khar etc.						
160	Other						

K. FOOD EXPENDITURE

Note: If not consumed last week ask last month.

Foods consumed last 30 days from Purchases, home production and received from other sources

Food Item	1. Code	2. Consumed last month? Yes .... 1 No 2	3. Did you consume "_" last week? Yes .... 1 No 2	4. Total quantity con-summed	5. Unit of measure? Kg ..... 1 Grams ..... 2 Liter ..... 3 Nos 4	6. Average unit size [For Nos only] Grams	7. Quantity from own production Quantity	8. Quantity from other sources		9. Consumption of Purchased food				10. If purch-ased in credit No .. 0 Yes . 1
								Quantity	Sou-rce Code	Quan-tity	Unit price	Unit	Total Value	
Cereals														
Coarse rice parb.	101													
Coarse rice non par	102													
Rice Medium	103													
Rice Fine	104													
Wheat	105													
Atta	106													
Rice Atta	107													
Moida	108													
Vermicelli/ Noodles	109													
Chatu	110													
Chira	111													
Muri/Khai	112													
Suji(Wheat/rice)	113													
Barley	114													
Shagu	115													
Moa(muri/chira)	116													
Fried Rice/Rice (Dhap)	117													
Pulses														
Lentil	121													
Chick Pea	122													

Food Item	1. Code	2. Consumed last month? Yes .... 1 No 2	3. Did you consume "_" last week? Yes .... 1 No 2	4. Total quantity con-summed	5. Unit of measure? Kg ..... 1 Grams ..... 2 Liter ..... 3 Nos 4	6. Average unit size [For Nos only] Grams	7. Quantity from own production Quantity	8. Quantity from other sources		9. Consumption of Purchased food				10. If purch-ased in credit No .. 0 Yes . 1
								Quantity	Sou-rce Code	Quan-tity	Unit price	Unit	Total Value	
Black gram	123													
Khesari	124													
Mugg	125													
Mator	126													
Seem bichi	127													
Others														
Edible oil														
Soybean	131													
Mustard	132													
Dalda	133													
Ghee	134													
Cod-liver oil	135													
Palm oil	136													
Seasame oil	137													
Sunflower Oil	138													
Vegetables														
Potol	141													
Bitter gourd	142													
Okra	143													
Egg plant	144													
Tomato	145													
Pumpkin	146													
Sweet gourd	147													
Ash gourd	148													
Water gourd	149													
Beans/ Sheem	150													

Food Item	1. Code	2. Consumed last month? Yes .... 1 No 2	3. Did you consume "_" last week? Yes .... 1 No 2	4. Total quantity con-summed	5. Unit of measure? Kg ..... 1 Grams ..... 2 Liter ..... 3 Nos 4	6. Average unit size [For Nos only] Grams	7. Quantity from own production Quantity	8. Quantity from other sources		9. Consumption of Purchased food				10. If purch-ased in credit No .. 0 Yes . 1
								Quantity	Sou-rce Code	Quan-tity	Unit price	Unit	Total Value	
Barbati	151													
Carrot	152													
Radish	153													
Cauliflower	154													
Kancha kala	155													
Papaya	156													
Green chili	157													
Cucumber	158													
Arum (kachu)	159													
Data	160													
Potato	161													
Sweet potato	162													
Green Mango	163													
Onion	164													
Garlic	165													
Dhundul	166													
Shapla	167													
Kachur lati	168													
Ridge gourd(jhinga)	169													
Motorshuti	170													
Dumur	171													
Chichinga	172													
Kolar Mocha	173													
Shajna	174													
Kacha Kathal	175													

Food Item	1. Code	2. Consumed last month? Yes .... 1 No 2	3. Did you consume "_" last week? Yes .... 1 No 2	4. Total quantity con-summed	5. Unit of measure? Kg ..... 1 Grams ..... 2 Liter ..... 3 Nos 4	6. Average unit size [For Nos only] Grams	7. Quantity from own production Quantity	8. Quantity from other sources		9. Consumption of Purchased food				10. If purch-ased in credit No .. 0 Yes . 1
								Quantity	Sou-rce Code	Quan-tity	Unit price	Unit	Total Value	
Leafy Vegetable														
Pui	181													
Lal shak	182													
Bathua	183													
Bokful	184													
Cabbage	185													
Danta shak	186													
Helencha	187													
Kalmi shak	188													
Kachu Shak	189													
Kalo kachu shak	190													
Katanate	191													
Lau Shak	192													
Pat shak	193													
Dheki Shak	194													
Dhania Shak	195													
Palang Shak	196													
Piaj Kali	197													
Matar Shak	198													
Sajna Shak	199													
Shrisha Shak	200													
Mula Shak	201													
Alu Shak	202													
Paanch mishali Shak	203													
Piaj Pata	204													

Food Item	1. Code	2. Consumed last month? Yes .... 1 No 2	3. Did you consume "_" last week? Yes .... 1 No 2	4. Total quantity con-summed	5. Unit of measure? Kg ..... 1 Grams ..... 2 Liter ..... 3 Nos 4	6. Average unit size [For Nos only] Grams	7. Quantity from own production Quantity	8. Quantity from other sources		9. Consumption of Purchased food				10. If purch-ased in credit No .. 0 Yes . 1
								Quantity	Sou-rce Code	Quan-tity	Unit price	Unit	Total Value	
Rashun Pata	205													
Dudhali Pata	206													
Mashkalai Shak	207													
Shechi Shak	208													
Borboti Shak	209													
Phulkopi Shak	210													
Sharisha phul Shak	211													
Misti Kumra Shak	212													
Gima Shak	213													
Gourd(ash) Leaves	214													
Animal Products														
Beef	221													
Mutton	222													
Liver	223													
Chicken	224													
Duck	225													
Pigeon	226													
Eggs	227													
Milk	228													
Bird/bok/ghugu	229													
Turtle	230													
Vuree(Beef/goat/ buffalo)	231													
Fruits														
Mango	241													
Banana	242													

Food Item	1. Code	2. Consumed last month? Yes .... 1 No 2	3. Did you consume "_" last week? Yes .... 1 No 2	4. Total quantity con-summed	5. Unit of measure? Kg ..... 1 Grams ..... 2 Liter ..... 3 Nos 4	6. Average unit size [For Nos only] Grams	7. Quantity from own production Quantity	8. Quantity from other sources		9. Consumption of Purchased food				10. If purch-ased in credit No .. 0 Yes . 1
								Quantity	Sou-rce Code	Quan-tity	Unit price	Unit	Total Value	
Papaya	243													
Orange	244													
Apple	245													
Coconut	246													
Jack Fruit	247													
Litchis	248													
Black berry	249													
Bel	250													
Pomelo	251													
Grapes	252													
Amra	253													
Kamranga	254													
Guava	255													
Jujube	256													
Olive	257													
Tetul	258													
Dalim	259													
Lemon	260													
Dates	261													
Sugarcane	262													
Green Coconut	263													
Ata	264													
Chalta	265													
Water Melon	266													
Melon/chirail/futi	267													
Rose apple/Gab	268													

Food Item	1. Code	2. Consumed last month? Yes .... 1 No 2	3. Did you consume "_" last week? Yes .... 1 No 2	4. Total quantity con-summed	5. Unit of measure? Kg ..... 1 Grams ..... 2 Liter ..... 3 Nos 4	6. Average unit size [For Nos only] Grams	7. Quantity from own production Quantity	8. Quantity from other sources		9. Consumption of Purchased food				10. If purch-ased in credit No .. 0 Yes . 1
								Quantity	Sou-rce Code	Quan-tity	Unit price	Unit	Total Value	
/Sabeda/ Betfal/Boura														
Palm	269													
Dewya/Zilapi fal	270													
Dates/Palm/ Sugarcane juice	271													
Palmra(green)	272													
Shaluk	273													
Fish (large)														
Rui	281													
Mrigel	282													
Katla	283													
Magur	284													
Singi	285													
Boal	286													
Taki	287													
Hilsa	288													
Tilapia	289													
Swarputi	290													
Kalibaus	291													
Silver carp	292													
Koi	293													
Meni	294													
Aair	295													
Shoul/ Gajar	296													
Dried fish	297													

Food Item	1. Code	2. Consumed last month? Yes .... 1 No 2	3. Did you consume "_" last week? Yes .... 1 No 2	4. Total quantity con-summed	5. Unit of measure? Kg ..... 1 Grams ..... 2 Liter ..... 3 Nos 4	6. Average unit size [For Nos only] Grams	7. Quantity from own production Quantity	8. Quantity from other sources		9. Consumption of Purchased food				10. If purch-ased in credit No .. 0 Yes . 1
								Quantity	Sou-rce Code	Quan-tity	Unit price	Unit	Total Value	
Karfu	298													
Ritha	299													
Aire	300													
Chital	301													
Seafish	302													
Chingree	303													
Baim	304													
Pangash	305													
Brigade / Fighter	306													
Fish (small)														
Puti	311													
Tengra	312													
Moa	313													
Kachki	314													
Chanda	315													
Chapila	316													
Dhela	317													
Khalisa	318													
Pabda	319													
Kajari	320													
Small Shrimp	321													
Eel Fish	322													
Climbing fish	323													
Dhogri	324													
Bele fish	327													
Chewya	328													

Food Item	1. Code	2. Consumed last month? Yes .... 1 No 2	3. Did you consume "_" last week? Yes .... 1 No 2	4. Total quantity con-summed	5. Unit of measure? Kg ..... 1 Grams ..... 2 Liter ..... 3 Nos 4	6. Average unit size [For Nos only] Grams	7. Quantity from own production Quantity	8. Quantity from other sources		9. Consumption of Purchased food				10. If purch-ased in credit No .. 0 Yes . 1
								Quantity	Sou-rce Code	Quan-tity	Unit price	Unit	Total Value	
Poa	329													
Folui	330													
Miscellaneous fish	331													
Kakla	332													
Tatkini/Khila	333													
Bata fish	334													
Boicha	335													
Darkini	336													
Gaira	337													
Guttum/Buita	338													
Batashi	339													
Bacha	340													
Spices														
Dried chili	341													
Turmeric (not dried)	342													
Turmeric (dried)	343													
Jira	344													
Elachi	345													
Cinamon	346													
Salt	347													
Panchforan	348													
Coriander	349													
Ginger	350													
Garam Masala	351													
Kismiss	352													
Color of Mustard flower	353													

Food Item	1. Code	2. Consumed last month? Yes .... 1 No 2	3. Did you consume "_" last week? Yes .... 1 No 2	4. Total quantity con-summed	5. Unit of measure? Kg ..... 1 Grams ..... 2 Liter ..... 3 Nos 4	6. Average unit size [For Nos only] Grams	7. Quantity from own production Quantity	8. Quantity from other sources		9. Consumption of Purchased food				10. If purch-ased in credit No .. 0 Yes . 1
								Quantity	Sou-rce Code	Quan -tity	Unit price	Unit	Total Value	
Other Food														
Sugar	361													
Gur	362													
Sweets (Inside)	363													
Cookies	364													
Tea leaves	365													
Betel leaf	366													
Betel nut	367													
Ice-cream	368													
Horlics	369													
Chocolate	370													
Cake	372													
Patish/Danish	373													
Powder Milk/ Condense Milk	374													
Misri/Tal Misri	375													
Chanachur/Piaju/ Chula	376													
Chips	377													
Goja/Murali/Minki	378													
Khili Pan	379													
Badam	380													
Beverages														
Tea –prepared	381													
Coke/ Seven-up etc.	382													
Tang	383													

Food Item	1. Code	2. Consumed last month? Yes .... 1 No 2	3. Did you consume "_" last week? Yes .... 1 No 2	4. Total quantity con-summed	5. Unit of measure? Kg ..... 1 Grams ..... 2 Liter ..... 3 Nos 4	6. Average unit size [For Nos only] Grams	7. Quantity from own production Quantity	8. Quantity from other sources		9. Consumption of Purchased food				10. If purch-ased in credit No .. 0 Yes . 1
								Quantity	Sou-rce Code	Quan -tity	Unit price	Unit	Total Value	
Prepared foods consumed in or outside the home														
Rice	401													
Khichuri	402													
Panta Bhat	403													
Ruti	404													
Parota	405													
Bhaji	406													
Bharta	407													
Tarkari/ Curry	408													
Dal;	409													
Sweets (Outside)	410													
Curd	411													
Pitha	412													
Polao	413													
Biriani	414													
Salad	415													
Paes	416													
Alur Chop	417													
Singara	418													
Puri	419													
Sandesh	420													
Bonruti/Pauruti	421													
Halua(Rice/wheat)	422													

Q8 – Source Code	
Family and friends 1	CARE 11
Wage 2	BRAC 12
GR 3	Proshika 13
TR 4	Grameen bank 14
VGF 5	GKT 15
VGD 6	Red crescent 16
FFW 7	
FFE 8	
Collected 9	
Borrowed 10	

L. FOOD ALLOCATION AMONG INDIVIDUALS

L1. Food available during the previous day

1. Food type Menu		2. Source Left over from previous day.....1 Food cooked in the Hh .....2 Food purchased .....3 Food received from others.....4 Invitation .....5 Food taken at employers place 6	3. Time of the day Morning.1 Noon.....2 Night.....3	4. Ingredient of major food groups (grams)					
Name	Code			Rice	Wheat	Meat	Fish	Milk	Eggs

Note: * Include all food gathered and consumed during the previous day that contains: Rice , Wheat, Meat, Fish, Milk and eggs

- Start with the foods consumed in the morning, then the foods consumed in the midday and conclude with the foods consumed in the evenings
- Include also foods consumed outside the home
- IF food is left over from previous day include quantity used only that day

L2. Allocation of Food available during the previous day among household members and guests

Note: * Start to **list the recipes** from the previous section and list **all the people that eat that meal in the order they eat**.

- Q2: Start with the household members and then proceed with guests (51, 52..) and proceed with pets (71,72,..)
- Report the amount allocated to each person in quantity or in percentage
- Make sure that all the household members are included in at least one recipe, if not include them at the end
- Make sure that all food cooked is accounted for even if used for others and left over
- For Q6 and Q7 fill out either column. Make sure that the unit of measure that you use is the same for all the individuals. DO NOT confuse cups or spoons of different size. In that case transform all units in grams

Consumed by HH member ..... Code Guest..... 51-60 Pets 71	Farm animal .....72 Left over.....91 Given away .....92 Thrown away 93

1. Food type Menu		2. Consumed by ID code →4 Or Guest Code		3. Guest age and sex Male.....1 Female...2		4. When consumed? Time of the day: Morning.1 Noon.....2 Night.....3	5. Where Consumed At home ..... 1 Employee house... 2 Invitation..... 3 Hotel/Bazar..... 4 Working place..... 5 Absent..... 6	6. Quantity consumed in grams or other units	7. Percent consumed	8. If not consumed any food why Not enough.....1 Fasting.....2 Sick.....3 Do not want.....4 Breast feeding.....5 Other.....6
Name	Code	Name	Code	Sex	Age					

1. Food type Menu		2. Consumed by ID code →4 Or Guest Code		3. Guest age and sex Male.....1 Female...2		4. When consumed? Time of the day: Morning.1 Noon.....2 Night.....3	5. Where Consumed At home ..... 1 Employee house... 2 Invitation..... 3 Hotel/Bazar..... 4 Working place..... 5 Absent..... 6	6. Quantity consumed in grams or other units	7. Percent consumed	8. If not consumed any food why Not enough.....1 Fasting.....2 Sick.....3 Do not want.....4 Breast feeding.....5 Other.....6
Name	Code	Name	Code	Sex	Age					

Code for Section L

Food Menu Code:

Ruti/ Parota 101
Bhat 102
Jau 103
Khichuri 104
Polao 105
Jarda/ Biriani/ Tehari 106
Pitha 107
Muri/ Chira..... 108
Paes/ Khir..... 109
Chal Bhaji/ Gam Bhaji 110
Shemai/ Noodles 111
Chatu 112
Cookies/cake 113
Chips/neemki/patis/puri 114
Dried milk 115
Suji/Halua 116
Moa(Chira/muri) 117
Pauruti/bonruti 118

Curry (Fish/ Meat/ Egg/ Halim) 121
Boiled/ Bharta/ Bhaji/ Bhuna/ Chachchari - (Fish/ Meat/ Egg)..... 122

Ghee 131
Mishti (Sweets) 132
Ghol.....133
Doi (curd).....134
Dudh (Milk).....135

N. EATING PRACTICES

		1. Yesterday			2. Two days ago			3. Three days ago		
ID	Name	Breakfast	Lunch	Dinner	Breakfast	Lunch	Dinner	Breakfast	Lunch	Dinner
71	<12 years (boy)									
72	>=12 years (male)									
73	<12 years (girl)									
74	>=12 years (female)									

Note: Report all meals taken by the members of the household and the meals consumed by guests in the household
If abnormal go back two more days

Home .....1 Outside.....2 Market.....3 Job site .....4 Relatives/neighbors .5	Absent .... 10 Not enough..... ..... 11 Fasting..... ..... 12 Sick..... ..... 13 Do not want..... ..... 14 Breast feeding..... ..... 15 Other..... ..... 16 House+Bazar..... ..... 20 House+Relatives House ..... 20 House+Out side(j) 20

P. MORBIDITY

Note: Report all household member who suffered from any sickness during last two weeks
Fill separate row for each episode of sickness

P.1 Short Term Morbidity (Recall period : last two weeks)

ID	Name	1. Sick-ness Code	2. How many days? days	3. Still sick? Yes ...1 No.....2	4. Able to carry regular activity? Yes... 1 No.... 2 Code	5. Did you consult anybody? Yes.....1 No ..... Why not? code	6. Where did you go? Code	7. To whom did you consult ? Code	8. Who Accom-pany? Member ID, If no 31 other 33	9. Distance to place of consul-tation Km	10. Time spent for going to consulta tion Minute	11. Cost of transpo rt Tk	12 Amoun t paid for consult ation/tr eatment Tk	13. Type of medici ne Code	14. Cost for medici ne & tests	15. Cost for hospital ization

Q.1 - Sickness code		Q.4 - Severity code	Q.7 – Consulted Code	Q.13 - Medicine	Q.5 - Why not consulted	Q.6 - Where did you go
Fever.....1	Ear problem.....14	Lied in bed.....2	Allopath registered.....1	None.....1	Not needed.....2	Hospital.....1
Influenza.....2	Dental problem.....15	Can't stand up.....3	Allopath quack.....2	Allopathic.....2	Could not afford.....3	Clinic.....2
Malaria.....3	Skin problem.....16	Can't sit up.....4	Homeopath.....3	Homeopathic.....3	Reluctance (self).....4	Pharmacy/chamber.....3
Cold.....4	Arthritis.....17	Can't walk.....5	Kabiraj.....4	Ayurbedic.....4	Do not know where to go..5	Other.....4
Cough.....5	Gout.....18	Can't carry heavy object.....6	Dai/TBA/midwife.....5	Kabiraji.....5	No facilities nearby.....6	
ARI.....6	Anemia.....19	Can't run.....7	Spiritual.....6	Spiritual.....6	Poor roads or no vehicle ...7	
Diarrhea.....7	Chicken pox.....20	Others.....8	Paramedics/ Rural practioner.....7	Other (specify)....7	Reluctance of other family member.....8	
Dysentery.....8	Measles.....21				Others.....9	
Cholera.....9	Mumps.....22					
Typhoid.....11	Other infection.....23					
Headache.....12	Other.....24					
Stomach Ache.....13						

Note: If the respondent can not say separately the doctors fee and expenditure for medicines/tests, write total expenditure in the doctors fee column and put * in the column of money spent for medicine/test.

Note: Report any episode of diarrhea or respiratory diseases that any of the household members has suffered since the beginning of the monsoon season
Use one line for each episode of illness and disease

P.2 History and Details about Diarrheal Diseases (July 15 – November 14, 1998)

ID	Name	1. When was "_' sick last time Month	2. How many days Days	3. Mucous in stool Present ..... 1 Absent..... 2	4. Blood in stool Yes .... 1 No 2	5. Was there any vomiting Yes .... 1 No..... 2	6. Severity: Marked anorexia1 Light anorexia .. 2 Apathy irritability ..... 3 In bed ..... 4 High fever ..... 5 Mild fever 6

P.3 History and Details about Acute Respiratory Infections (July 15 – November 14, 1998)

ID	Name	1. When was "_' sick last time? Month	2. How many days? Days	3. Cough Yes.... 1 No 2	4. Breathing with sound Yes .... 1 No..... 2	5. Rapid breathing Yes ... 1 No..... 2	6. Severity: Marked anorexia1 Light anorexia...2 Apathy irritability .....3 In bed.....4 High fever.....5 Mild fever.....6

Q. ANTHROPOMETRY

Q.1

		All females between age **12** and **49**				4. Measured? Yes..... 1 No ..code ☞next	5. Weight of mother/ child (Kg)	6. Height of mother/ child (cm)	7. MUAC (mm)
ID	Name	1. Pregnant Yes..... 1 No 2	2. How many months? Months	2. Lactating Yes ..... 1 No 2	3. Age at first menstruation Years				

Note: Include all household members. Copy ID and names from the flap

Code for not measured:
Absent 2
Sick 3
Refused 4
Other 5

FLAP

A.1 Household Composition:

MEMBER ID	1. NAME	2. Sex	3. Age	
			Years	Months
1				
2				
3				
4				
5				
6				
7				
8				
9				

Q11 —Occupation code

Agricultural Work (On Farm)

Agricultural work on own farm01
Supervisory work on agricultural activity on own farm..... 02
Agricultural wage labour..... 03
Share cropper / cultivate plot owned by others..... 04

Agricultural work (Off Farm)

Fisherman/Fishing..... 11
Fish culture..... 12
Look after live stocks 13
Look after Poultry (Duck, Chicken, Pigeons)..... 14
Cultivation and other works on fruits 15
Agricultural wage labor on other agricultural activities (Off Farm) 16
Other agricultural activities (excluding 11-15) 17

Non Farm Activities

C.1 Industrial Enterprise

Processing of crops 21
Family labour in Enterprise/project 22
Tailoring..... 23
Sewing..... 24
Pottery 25
Blacksmith 26
Goldsmith 27
Repairing of manufactured products.....28
Carpenter 29
Mechanics.....30
Wage labour 31

C.2 Trade

Petty Trade (Small retail shop)41
Medium Trader (Retail and insignificant wholesale) ...42
Wholesale Trader/ Aratdari ...43
Contractor 44
Employee 45
Employer 46

C.3 Transport

Rickshaw/ Van Pulling 51
Boat.....52
Wage labour in transport 53
Other transport workers 54
Driver.....55
Helper 56

C.4 Construction Work

Mason 61
Helper 62
Other construction worker 63
Earthen work.....64
House Repairing/building.....65

C.5 Self Employed Profession

Doctor 71
Kabiraj..... 72
Advocate / Moktar..... 73
Barber..... 74
Washerman..... 75
Full time house tutor 76
Deed writer/Peshkar/Immam Purohit..... 77
Dhatri 78
Kutir Shilpi (Handicrafts)..... 79
Bobine Shuto Bora 80

C.6 Miscellaneous Services

Service (Employee)..... 81
Pension..... 82
Service worker in NGO..... 83
Servant in house (Maid/ Male) 84

C.7 Others

Income or revenues from Hats, Bazars..... 91
Income from rent..... 92
Household work 93
Child..... 94
Student 95
Beggar..... 96
Unemployed..... 97
Disabled 98