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**NUTRITIONAL EFFECTS OF CASH  
VERSUS COMMODITY-BASED  
PUBLIC WORKS PROGRAMS**

by

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## **J. INTRODUCTION**

Bangladesh has achieved impressive growth in food production during the recent past. Yet, about half of the country's 114 million people cannot afford an adequate diet. Faced with limited employment opportunities, these poor people experience poverty and food insecurity on a sustained basis. The rural landless, constituting about 50 percent of rural households, depend mainly on agriculture for employment. Since demand for labor in agricultural production is seasonal in nature, the landless remain virtually unemployed during the slack seasons.

Economic development that would ensure full employment and better wages through market mechanism is not foreseeable in the short to medium term perspective. This situation rationalizes public investment in employment generating programs that normally will not attract private resources.

Public works programs provide employment to the poor and, typically, create public goods such as physical and social infrastructure for which private resources are difficult to mobilize. The Food for Work (FFW), and the Rural Maintenance Program (RMP) are two such public interventions in Bangladesh that attempt to promote rural development by converting surplus labor into capital. FFW normally distributes wheat as wage payment to workers, while RMP pays in cash. Both programs have the short-run potential to directly improve food security of the participating rural poor, as well as a broader potential to facilitate national level economic advancement.

This study attempts to assess the food consumption and nutritional effects of FFW and RMP on households participating in the programs. A recent evaluation of targeted public interventions in Bangladesh suggests that the cash-based RMP is more cost-effective in transferring income benefits to poor households than the food-based intervention programs (WGTFI 1994). The present study examines the cost-effectiveness of cash versus food-based programs in improving food consumption of the program participants.

## **2. PROGRAM FEATURES**

### **Rural Maintenance Program**

- The Rural Maintenance Program (RMP) was piloted on a small scale during 1983-84. Currently, RMP employs 55,000 destitute women to maintain approximately 88,000 kilometers of essential farm-to-market rural roads in 3,700 unions of Bangladesh.

The goals of the Rural Maintenance Program are twofold:

1. to assist in the development of a national system for sustainable, cost effective maintenance of essential rural roads; and
  2. to provide employment, income and training to assist rural destitute women to acquire necessary survival skills.
- RMP employs destitute women in the maintenance of earthen roads. The term "destitute" refers to female heads of household who are divorced, widowed, separated or abandoned, with dependents and no other means of financial support except their own manual labor. RMP, therefore, provides a steady, year round income to one of the poorest segments of society who perform work that is of considerable economic and social utility to their communities. Rural communities benefit from the good roads and the poor women benefit from the improved standard of living for themselves and their dependents.
  - Fifteen women in each union (the smallest administrative unit in Bangladesh) constitute one "crew". A crew is composed of three groups of five women who work in the three wards of each union. Each crew maintains approximately 15 miles of earthen road. RMP undertakes approximately 95 percent of all the rural road maintenance in the country.
  - In an interesting innovation, RMP disburses the cash wages to crew members through direct transfers to the women's group bank accounts. Banks offer other advantages as well. They facilitate introduction of a savings element into the RMP program. And through their accounts, the participants gain credibility with local

banks, this for a group that normally would not have the standing to gain access to formal financial institutions.

- Presently, the women are paid taka 28 per day. Crews work six hours a day, six days a week, except government holidays. A savings component was added to the project in 1988. Since then, a certain fraction of their wages (presently taka 5 per day) is being deducted by the bank before salaries are paid. This is transferred to each individual savings account. Today, each RMP woman has approximately taka 9,500 in savings which may be used to initiate and operate an Income Generating Activity (IGA) when she leaves the project.
- RMP is one of the largest project of CARE-Bangladesh. The Canadian International Development Agency (CIDA) is providing funds for the project through the provision of foreign exchange food aid which is monetized by the Government of Bangladesh. Ninety percent of the crew's wages and part of CARE's operational costs are met out of this monetized amount. The local Union Parishad (council) contributes the remaining 10 percent of crew wages. CARE's role in RMP is to coordinate and monitor field operations and provide all the training needed by the program. It also keeps the government and the donor apprised of the status of all aspects of the program.
- CARE has developed and tested various training methodologies over the last two years in an attempt to release the present RMP crew members from the project without having them fall back into destitution. In fiscal year 1991/92 (FY92), CARE piloted an "Income Diversification Pilot Project" (IDPP) for training the RMP crew members to make productive use of their savings for income generating purposes. These women who have now been released are carrying out their chosen Income Generating Activities (IGA) and managing their families through generated earnings. An external evaluation of the socio-economic condition of the released women was conducted and based on its recommendations CARE expanded the IDP into five hundred unions in FY93 and one thousand Unions in FY94. Under this intervention the RMP crew members will continue to maintain the earthen roads but will gain access to training to assist them to develop individual survival plans before leaving RMP.

- Over the next four years, all of the RMP crew members will receive counselling and training from CARE so that they are able to prepare themselves to leave the project, undertake income generating activities, and maintain a decent standard of living after leaving RMP. Additional women will be hired in their place. This strategy will create approximately 12,000 new jobs per year for rural destitute women.

## **Food for Work**

- The Food for Work (FFW) program was launched by the Government of Bangladesh in 1975 following the 1974 famine. Using food resources donated to the country, the initial purpose of the program was to provide relief for the poor facing severe food insecurity. Over the years, the focus has been shifted from relief to development. Currently, the main objectives of the program are:
  1. to improve the performance of the agricultural sector through the construction and maintenance of the necessary infrastructure for production and marketing of output;
  2. to reduce physical and human losses due to floods and other natural disasters through appropriate protective structures; and
  3. to generate productive seasonal employment for the rural poor.
- Over the past 19 years, seasonal employment has been created for large numbers of people under the FFW program. In recent years, the program generates over 100 million workdays of employment in earthworks each year, directly benefiting about 4 million people. Indirect beneficiaries of the rural infrastructure works are the people living in areas in which the FFW schemes are undertaken. These benefits include: improved performance of the agricultural sector that benefits not only the producers but the consumers as well; enhanced marketing possibilities resulting from road construction and rehabilitation; improved communications between communities; and reduced physical losses and human sufferings through construction of structures to protect floods. Moreover, embankments and rural roads provide shelter to flood victims.

- Figure 1 illustrates yearly quantum of foodgrain utilization under the FFW program since 1979/80. Normally, wheat (mostly imported) is used to pay workers as wages for work done. However, in the 1992/93 season, FFW distributed primarily rice in order to dispose off surplus government stocks.
- Figure 2 shows the seasonal pattern of utilization of foodgrains in FFW during the most recent three years. Currently, about 85 percent of FFW foodgrains are utilized during the January-May period.
- FFW is a large umbrella-type program, under which several ministries, donor agencies, and NGOs operate various kinds of schemes, with wide variations in size of operation. A brief description of institutions involved, and implementation of the FFW program, mostly drawn from Hossain and Akash (1993), and Ahmed et al. (1993), follows. The FFW projects are administered by the World Food Programme (WFP) and CARE.<sup>1</sup> The WFP acts as both a conduit and an administrator for multilateral and bilateral food aid for the program. Major donors include Canada, Australia, the European Community, the Federal Republic of Germany and the United Kingdom. CARE operates on behalf of USAID to administer projects implemented by wheat supplied by the United States.
- Projects administered by WFP are implemented mainly by three agencies: The Water Development Board (WDB), the Ministry of Relief and Rehabilitation (MRR), and the Local Government and Engineering Bureau (LGEB). WDB projects are often large projects such as coastal embankments, flood protection embankments along major rivers, and reexcavation of canals under large-scale irrigation projects. The MRR projects are often construction and repair of interior earth roads, and digging and reexcavation of small irrigation channels. FFW schemes executed by the LGEB include construction and road completion activities of growth-center connecting roads. In addition to the major projects, the Ministry of Fisheries and Livestock executes excavation or reexcavation of fish ponds, and the Ministry of Forests is responsible for forestry development and tree planting schemes. Furthermore, several non-government organizations (NGOs) execute relatively smaller schemes including rehabilitation of fish tanks, ground elevation for flood shelters, tree plantations, and pilot schemes. CARE

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<sup>1</sup>CARE has suspended its FFW operation in 1994.

administered projects are implemented by local government. Dirt roads dominate projects implemented by CARE.

- The target group for FFW includes anyone who is poor, willing and available to do mainly earthwork for food wages. Thus, participation in the program is self-selecting. Workers are mobilized by gang leaders (*sardars*) and supervisors. They work in groups or gangs.
- The basic wage rate stipulated for WDB projects is 40 kilograms of wheat per 1,000 cubic feet of earthwork, plus a variable allowance that takes into account such factors as the distance over which the earth has to be transported and raised. In MRR projects, payments for allied factors are consolidated with the wage for the basic earthwork. The wage rate varies according to the type of project and the sex of the worker. For road and embankment projects, the wage rate is 49 kilograms of wheat for 1,000 cubic feet of earth for men, and 68 kilograms for women. For canal excavation projects, additional wage of 4.65 kilograms per 1,000 cubic feet is paid. *Sardars* are paid 2.33 kilograms and supervisors are paid 0.47 kilograms per 1,000 cubic feet of earthwork done under their supervision, provided that each is supervising the specified number of workers or gangs.
- The Post-Monsoon Rehabilitation (PMR) component of the FFW program is designed for women participation. Under PMR, about 1.75 million workdays are generated for rural women from October to December. The PMR primarily includes social forestry and fisheries development schemes. In some regions, women work together with male laborers in dry-season FFW activities as well. Moreover, FFW project implementation committees (PICs) are encouraged to include women among their members, and PICs for PMR should have at least one woman member.

### **3. SURVEY DESIGN AND DATA COLLECTION**

IFPRI conducted a household survey to assess the food consumption and nutritional effects of RMP and FFW. The present study is based on data collected in that survey. The survey was carried out during February through March, 1994.

The survey was conducted in 16 districts. In selecting sample areas, the focus was on achieving adequate variations in factors (such as distress-proneness, infrastructurally developed and un-developed areas, and population density) that might affect household food consumption and nutrition patterns. The locations of the survey districts, spotted on the map of Bangladesh, are shown in Figure 3.

A sample of 785 households (consisting of 182 RMP, 187 RMP control; 218 FFW, and 198 FFW control) were surveyed. The control households for the respective programs were carefully chosen so that their socioeconomic characteristics (such as, female household head, land size, and type of housing) are comparable with those of households participating in the programs.

A two-part questionnaire was designed to obtain information from the respondents. The first part was used to collect socioeconomic and consumption information, including household income and expenditures, food acquisition and consumption, and anthropometric measurements (age, weight, and height) for preschool children and program participants (workers). The other part included questions on the operational performance of the programs. The survey team consisted of male and female investigators, and supervisors. A team of two investigators, one male and one female, collected information from each sample household.

#### **4. OPERATIONAL PERFORMANCE OF THE PROGRAMS**

This section presents the findings on the operational performance of RMP and FFW, based on information collected from the beneficiaries of the two programs during the household survey. Major findings are highlighted as follows.

##### **Rural Maintenance Program**

- On the average, the RMP workers have been employed by the project for 6.3 years.
- The findings suggest that, 52 percent of the RMP workers were widowed, 10 percent were divorced, 12 percent were separated from husband, and 26 percent were married. Among the married workers, 80 percent reported that their husbands were either disabled or had no income before the workers joined the program.
- Most of the workers (92 percent) considered their social status not degraded due to their participation in the program.
- Among those program participants who had preschool-age children, 14 percent reported that they could not take proper care of their children due to their involvement in the program. Five percent of the workers with under-five children brought their children at the work site.
- After their daily work in the RMP program, 19 percent of the participants earned additional income from other activities. On the average, they earned an extra income of taka 43 per week from these activities.
- Most of the program participants (93 percent) reported that they themselves control their income earned from the program.

## Food for Work

- The FFW workers reported that, on the average, they had worked for 37 days in the program before the survey date. They expected to work for 23 days more during the season, totalling 60 days of work in the program in the 1994 season.
- On the average, the workers participated in the FFW program for 6.7 years. They worked for an average of 60 days during the 1993 season.
- The work duration per day averaged 8.5 hours for a FFW worker. Only 10 percent of the respondents reported that they earned extra income from other work activities besides FFW.
- The FFW workers received a daily wage of 4.4 kilograms of wheat per person per day, on the average.
- When the workers were asked whether they would like to receive their wages in wheat or in cash, 56 percent of them preferred payment in wheat to cash.
- On the average, the FFW participants sold 61 percent of the total quantity of wheat received as wages. They sold their wheat at an average price taka 5.71 per kilogram. The average market price of wheat in the survey areas was taka 5.75 per kilogram during the survey month of March 1994.
- Among those who sold wheat, 80 percent sold at the village *hat* (market); 11 percent to village households; 5 percent to *sardars* (gang leaders); and 4 percent to local shops. The distance of the place of sale from the sellers' residence averaged 2.3 kilometers.

## Leakage

- One of the major goals of RMP and FFW programs is to transfer income to the poor by generating productive employment for them. By definition, therefore, direct income benefits from the programs that were lost in the process of implementation or that accrued to nontarget households are considered "leakages".

- One component of leakage could be the extent of nonfulfillment of the beneficiary eligibility criterion--that is, the programs should provide direct employment only to the poor. Both RMP and FFW programs are self-targeting. Because of the nature of work the programs involve, only the poorest households tend to participate. The results of the present study suggest that the work requirement effectively discourages participation by the nonpoor. Thus, the leakage estimates on this account are zero for both programs<sup>2</sup>.
- The other component of leakage is the shortfall in actual wage received by the program workers from the official wage rates. The survey findings reveal that 100 percent of the RMP workers received the official wages, suggesting zero leakage for RMP. In the FFW program, the estimated quantity of shortfall from the officially stipulated wage rate is 7 percent, that is, a leakage of 7 percent occurred through underpayment to workers.
- As the survey was designed to collect information only at the program-participant level, a potentially large leakage could not be estimated in this study. Past studies have indicated that a major leakage in FFW program occurs through over reporting of work done, which ranges from 7 percent to 26 percent in different projects (see, for example, WGTFI 1994; Hossain and Akash 1993; Assaduzzaman and Huddleston 1993). Since FFW engages mostly in reconstruction or rehabilitation of an existing structure, under-estimation of pre-work status and over-estimation of work performed lead to a large amount of leakage. Moreover, non-compaction of earth gives an illusion of more work than that actually performed, which makes it difficult to measure the actual volume of earthwork.

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<sup>2</sup>The survey findings show that in one union, the RMP workers had to bribe the local union council chairman to ensure their retention in the program. Since the survey did not include a large enough sample of unions to be representative of all unions under the program, the inclusion of these bribed amounts in average leakage calculation would probably give a biased estimate of leakage. The problem of extortion may be overcome through CARE's recently implemented Road Maintenance Association (RMA). In RMA, the women are selected through lottery. Individual RMA members only face dismissal by the RMA itself, by majority member vote. RMA offers some checks and balances to the precarious relationship (i.e., extortion, harassment, wrongful dismissal, etc.) between the union council and the RMP crew individuals.

## **5. PROGRAM EFFECTS ON FOOD CONSUMPTION AND NUTRITION**

This section presents the findings of the household survey on food consumption and nutritional effects of RMP and FFW. The descriptive results are presented first, followed by the results of a multivariate analysis.

### **Household Characteristics**

- Table 1 presents the characteristics of RMP, FFW, and respective control households. Adult literacy rates in rural Bangladesh are very low in general, and extremely low for poor households, particularly, for adult women. Only 4 percent of the adult women in the RMP control group, the poorest households in the sample, attended school.
- An extremely high proportion of RMP and its control households are headed by female. Most female-headed households are either divorced or widowed, and their income-generating opportunities are very limited. Consequently, the female-headed households are among the poorest in rural Bangladesh. According to the 1988/89 Household Expenditure Survey (HES), 4.4 percent of the rural households are female-headed.
- About half of the RMP control household heads work as house servants. Virtually all of these household heads are female. Although the agriculture sector is by far the largest employer in rural Bangladesh, women seldom participate in crop cultivation practices in the field. Most of the heads of households in FFW and its control group are wage earners. Since these poor households are functionally landless, wage earning is their major occupation. The high proportion of wage earner household heads in RMP indicates that these female heads of households earn wages from the program.

## **Expenditure**

- Household consumption expenditures are used as a proxy for income for two reasons. First, based on the permanent income hypothesis, Friedman (1957) argues that expenditures are likely to reflect permanent income and hence a better determinant of consumption behavior. Second, data on expenditures are generally more reliable than income data.
- Table 1 shows per capita expenditures of households in the program and control groups. The differences in per capita expenditures (including income transfer from the programs) between RMP and control, and between FFW and control are statistically significant. Income transfer from RMP program accounts for 38 percent of per capita household income (expenditure). FFW transfers 37 percent of additional income to individual members of the participating households.
- Table 2 presents the shares of household expenditures spent on major consumption items. On the average for the entire sample, 75 percent of total household expenditures are spent on food. RMP households spend relatively less on food than all other groups, in percentage terms. However, as Figure 4 illustrates, RMP households spend about 55 percent more on food than do its control households in absolute terms.
- Table 3 presents the breakdown of the household food budget allocated to each food group. A comparison of the patterns of food expenditures across programs indicates major variations in rice and wheat expenditures. Since FFW workers generally receive their wage payments in wheat, their imputed expenditure on wheat is relatively higher than other groups. The breakdown of quantities of acquisition of different food items is shown in Table 4.

## **Calorie Consumption**

- Table 5 reports the patterns of household-level calorie consumption. In the table, the term "acquisition" is used to mean consumption or intakes, because the information is based on household food expenditure data, and not on individual food intake data. Calorie consumption per capita, as well as per adult equivalent unit (AEU) are presented in the table. Calorie consumption per adult equivalent

unit is a more appropriate indicator of energy consumption than calorie per capita calculation, because AEU incorporates the specific calorie requirements for each age and sex of individual family members. The adult equivalent unit represents the calorie requirements of an adult male.

- Average calorie consumption by RMP members are higher than that of the control group members, and this difference is statistically significant. The difference in average calorie intakes between FFW and control household members is also statistically significant.
- Table 5 shows the overwhelming dominance of rice in the diet. For the entire sample, foodgrains (rice and wheat) account for about 81 percent of total calorie intakes, implying a very little diversity in diet.
- To determine calorie adequacy of the workers of RMP and FFW programs, the calorie consumptions are compared with individual calorie requirements. Individual food intake data have been collected for every worker of RMP and FFW sample over a 24-hour period by recall method. Estimates of individual energy (calorie) requirements of program workers are based on the methodology provided in FAO/WHO/UNU Expert Consultation (1985), and James and Schofield (1990). Energy requirements need to be calculated for individuals in each sex and in specific age groups. The principal components of energy requirements are Basal Metabolic Rate (BMR), weight, age, sex, and level of physical activity. BMR is measured under conditions of absolute rest in the fasting stage. Equations for calculating BMR from body weight of different age and sex groups are obtained from James and Schofield (1990). Using these equations, individual BMR is determined from actual body weight, using the anthropometric data collected in the survey. Physical activities of individual program workers were recorded over a 24-hour period. This information, and the calculated BMR calculations are used to estimate energy requirements of individual program workers.
- Table 6 presents the results on per capita calorie intakes and calorie adequacy ratios (intake divided by requirements, expressed in percentage terms) for the workers, classified by RMP and FFW programs. The average calorie intakes of workers are slightly above requirements, for both programs. Per capita calorie intakes of FFW workers are much higher than the RMP workers. However, the difference in calorie adequacy between the two groups is small, reflecting a high

level of energy requirements by the FFW workers whose nature of work involves a very high level of energy expenditure.

### **Nutritional Status of Program Workers**

- Figure 5 shows the nutritional status of the program workers. The Body Mass Index (BMI) is used as the nutritional status indicator for the workers<sup>3</sup>. The BMI of individual workers is calculated from anthropometric measurements obtained in the survey. A BMI of 18.5 is considered normal for adults (James, Ferro-Luzzi and Waterlow 1988).
- Although the average calorie intakes and calorie adequacies of the program workers are quite high, the results suggest that the nutritional status of a large proportion of the workers is below the normal level (Figure 6). Perhaps disease and poor sanitation contribute to their low levels of nutritional status by lowering the body's absorption capacity of nutrients from food intake.

### **Nutritional Status of Preschool Children**

- Within households, some members are at greater nutritional risk than others. A recent IFPRI study conducted in rural Bangladesh finds that preschool children are at the greatest risk of undernutrition (Ahmed 1993). In the present analysis, the patterns of nutritional status of preschoolers belonging to program and control households are compared.
- The nutritional status of preschool children (aged 6 to 60 months) is determined on the basis of anthropometric data for all preschool children in the sample households relative to a particular growth standard. The standards devised by the U.S. National Center for Health Statistics (NCHS) are used in this study. The

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<sup>3</sup>BMI is defined as: weight (in kilograms)/height<sup>2</sup> (in meters).

levels of nutritional status are expressed in Z-score values<sup>4</sup>, and percent of standard median.

- Table 7 reports three indicators of nutritional status of children: height-for-age, a measure of stunting; weight-for-height, a measure of wasting; and weight-for-age, a measure of underweight. Weight-for-height is a short-run measure (indicating acute undernutrition), while height-for-age indicates nutritional status of children over the long-run (indicating chronic undernutrition). Weight-for-age can be viewed as a medium-term indicator, which reflects both acute and chronic undernutrition. The results suggest, for the entire sample, the prevalence of stunting is 51 percent, and wasting, 63 percent. About 81 percent of the preschoolers are underweight. There is no statistically significant difference in preschooler nutritional status between programs and control groups. Also, the difference in nutritional status between boys and girls is not statistically significant.
- Table 8 shows the severity of undernutrition among preschool children. Weight-for-age is used as an indicator of undernutrition, which reflects both acute and chronic undernutrition. A threshold level of weight-for-age below -3 Z-score is used to indicate a serious nutritional problem. The differences in severely underweight children as percentages of total children in different groups are not statistically significant between programs and control groups. Figure 6 illustrates the findings.

### **Food Consumption out of Increased Income: Cash versus In-kind Transfer**

- A household will usually spend only a portion of an additional income on food purchases. Economists refer to this pattern as the marginal propensity to consume food (MPC). If, say, 75 paisa out of one additional taka income is spent on food, then the value of the MPC is 0.75.

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<sup>4</sup>Z-score = Actual measurement - 50th percentile standard/standard deviation of 50th percentile standard.

Levels of nutritional status in comparison with a reference population can be conveniently expressed in terms of Z-score values. A Z-score value of zero indicates a child who is "normal"; a negative Z-score value indicates an anthropometric measurement below the one in the reference population. The standards devised by the U.S. National Center for Health Statistics (NCHS) are used in the study.

- Do the FFW households have a higher MPC from wage income received in wheat than the MPC from cash wages received by the RMP households? If they do, then this would make a food-based program more effective in providing nutrition support than an equivalent payment in cash. This proposition has been tested in this study using an estimating regression model.
- In the estimated model, the total household income has been decomposed into FFW income transfer in wheat, RMP cash income transfer and all other income (Table 9). The hypothesis tested is there is no difference in MPC for different sources of income. The F-statistic is used to test whether the hypothesis is to be accepted or rejected, by running the regressions under the model and the hypothesis. A test is also performed to examine whether the coefficients of income sources are significantly different in the model.
- The test results suggest that the source of income does make a significant difference in the MPC (Table 10). The marginal propensity to consume food out of cash income transfer is 0.48, while the MPC from wheat income transfer is 0.61. The results of the Wald test suggest that the difference between cash income transfer and income transfer in wheat is statistically significant.
- The fiscal cost of increasing the value of food consumption of a household is inversely proportional to the MPC. Thus, the above estimates suggest that it will cost taka 2.08 (that is,  $1/0.48$ ) to increase food consumption expenditures by one taka through cash transfer. With income transfer in wheat, it costs taka 1.64 to increase one taka worth of food consumption.
- Several studies of consumption effects of targeted food interventions in both developed and developing countries indicate that the MPC for in-kind subsidy transfer is substantially higher than that for cash income. These studies include: U.S. food stamps program (Davaney and Moffitt 1991; Senauer and Young 1986; Benus, Kmenta and Shapiro 1976); rice and cooking oil subsidy program in the Philippines (Garcia and Pinstруп-Andersen 1987); rice subsidy program in Sri Lanka (Edirisinghe 1987); and rice subsidy program in Kerala, India (Kumar 1979).
- The behavioral change that causes a higher MPC for FFW wheat income transfer can be explained by economic theory. The FFW program provides a daily average wage of 4.4 kilograms of wheat per worker. If this wage in wheat is less than the

amount of wheat the households would have consumed without the in-kind wage, then the amount of wheat received is "inframarginal". The wage in wheat is "extramarginal" if the wheat received is greater than the amount of wheat that the recipient household consumed before its participation in the program.

- If the wage in wheat is extramarginal, then the income transfer may have two effects--an income effect and a substitution effect. The pure price effect of wage in wheat is captured through the substitution effect. The net effect, which also includes the income effect, may lead to an increase in wheat consumption<sup>5</sup>, as well as increased consumption of complementary products, and reduced consumption of substitutes, such as rice (Kennedy and Alderman 1987).
- The substitution effect, however, will take place if the resale of wheat received as wage is effectively prohibited, or the resale entails a high transaction cost that decreases the implicit selling price for the wheat recipients. If there is no restrictions on resale, or if there is no transaction cost, then the income transfer is equivalent to the income effect, even if the wheat wage is extramarginal. The FFW program does not impose any restriction on resale of the wheat wage. However, for the FFW workers, a transaction cost is likely to be involved in selling the wheat, because these workers are not professional grain traders.
- If the wage in wheat is inframarginal, then the income transfer has only the income effect, and the price incentive effect at the margin is lost. In this case the consumption effect of income transfer in kind should not be different from cash income transfer which, obviously, has only the income effect.
- During the survey, information was not collected from the FFW respondents on their wheat consumption before program participation, because such a recall would not have provided a reliable information. As a proxy, daily wheat consumption of the control group is compared with the daily FFW wheat wage to determine whether the wheat wage is infra-or extramarginal. Table 4 presents the data on quantity of wheat and rice consumption by the FFW households and the control group of households. The FFW wheat wage per day (4.4 kilograms, on the average) is about 93 times the daily average per capita wheat consumption of the

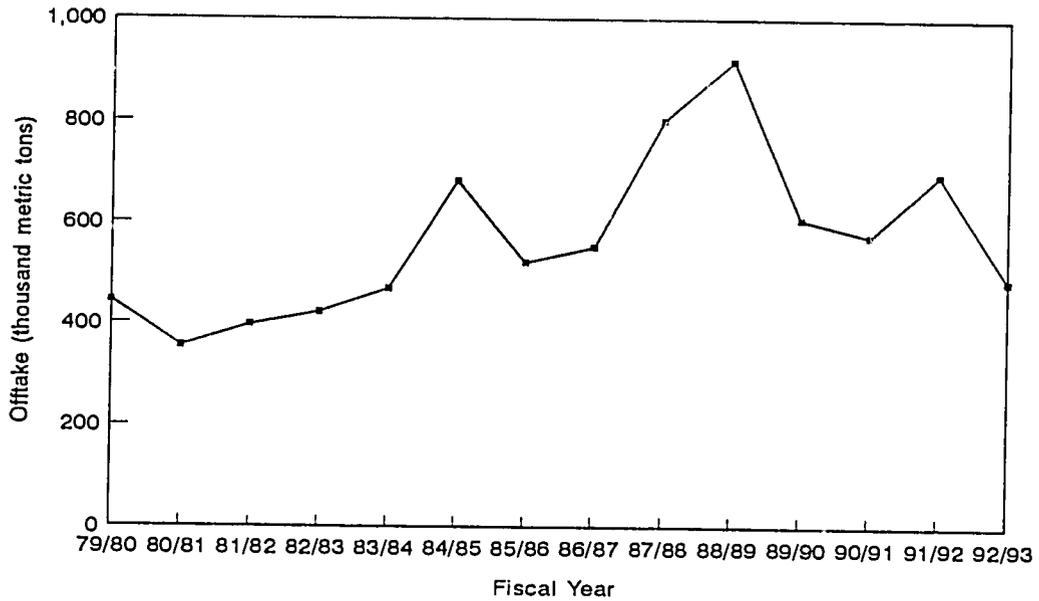
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<sup>5</sup> If wheat is an inferior good, then the income effect of ration will reduce wheat consumption.

control group households. This clearly indicates that the FFW wage in wheat is extramarginal.

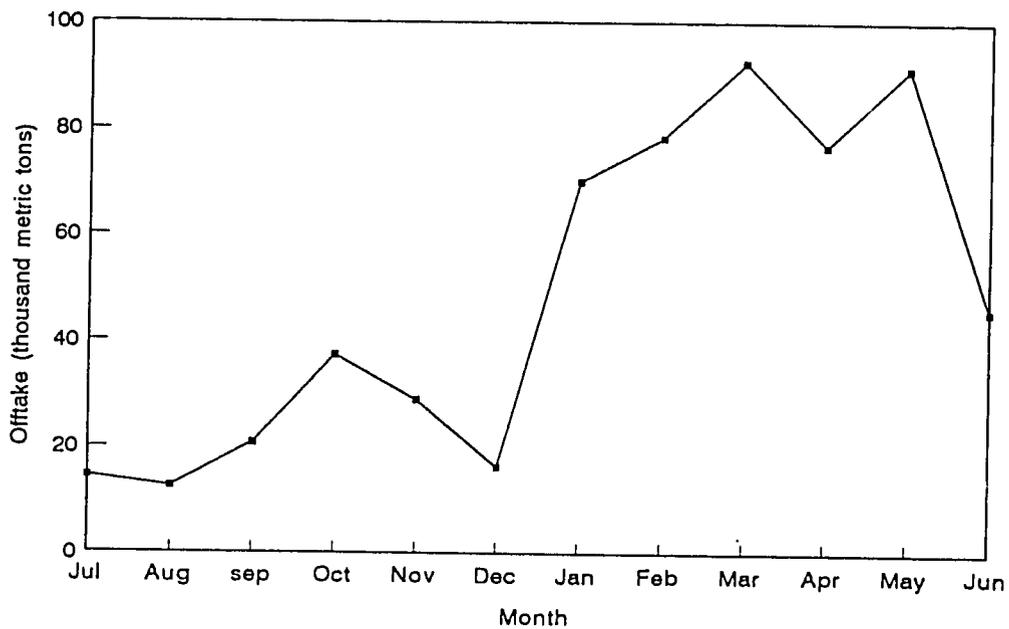
Due to the substitution effect of the extramarginal wheat wage, the FFW households consume much more wheat than that of the control group, and increase the consumption of other products due to the income and the cross-price effects of the wheat wage. Since a large part of the consumption of other products is food by these low-income households, the net effect on food consumption is likely to be quite large. The cash income transfer, on the other hand, has only the income effect on food consumption. This explains why the MPC from extramarginal income transfer in wheat should be higher than that from the equivalent amount of transfer in cash.

Figure 1 –Trend in foodgrain offtakes under FFW



Source: World Food Programme, "Bangladesh Foodgrain Forecast (June)", Dhaka, 1994 (Mimeo).

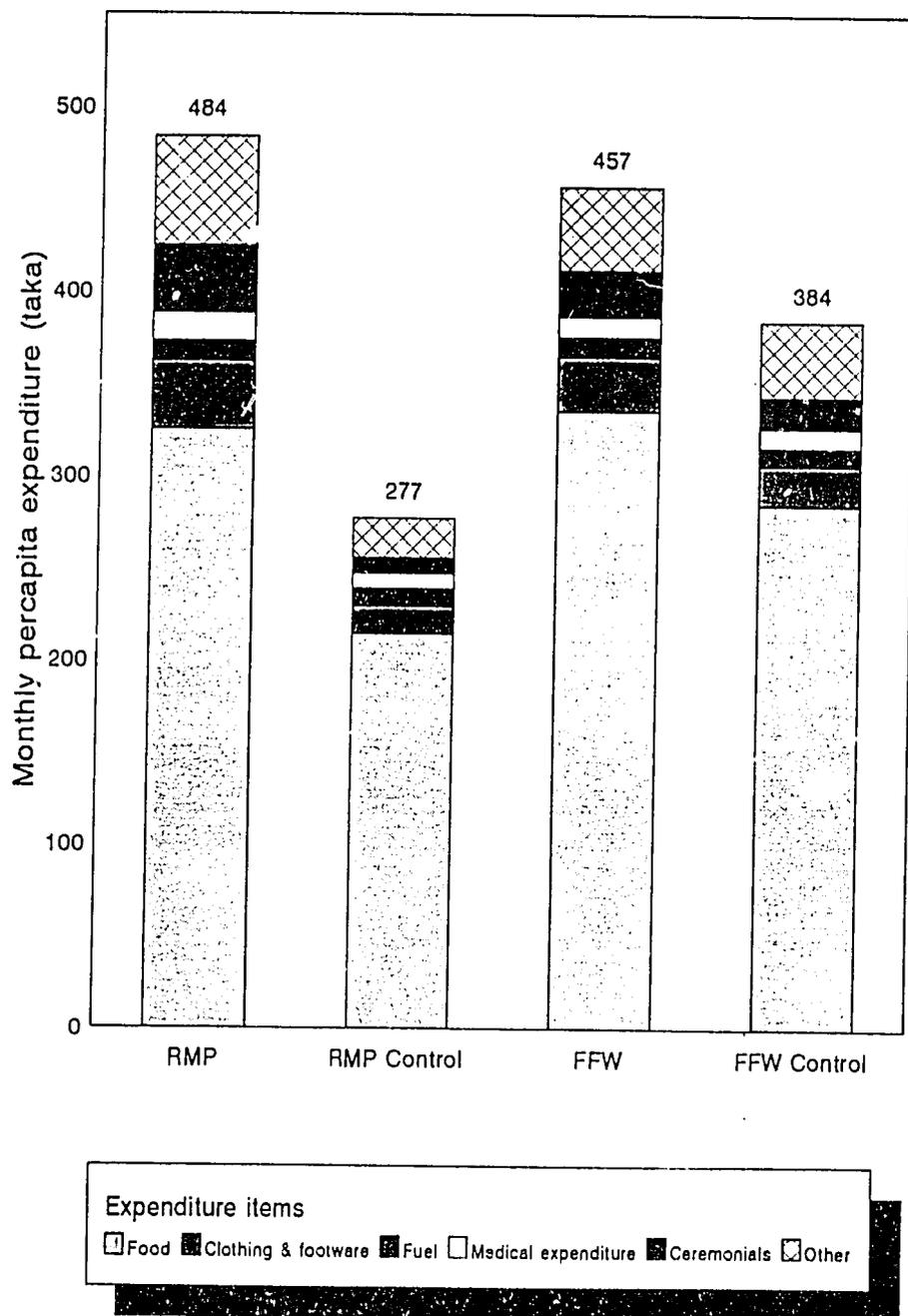
Figure 2 –Seasonal pattern of foodgrain offtakes under FFW



Source: World Food Programme, "Bangladesh Foodgrain Forecast (June)", Dhaka, 1994 (Mimeo).

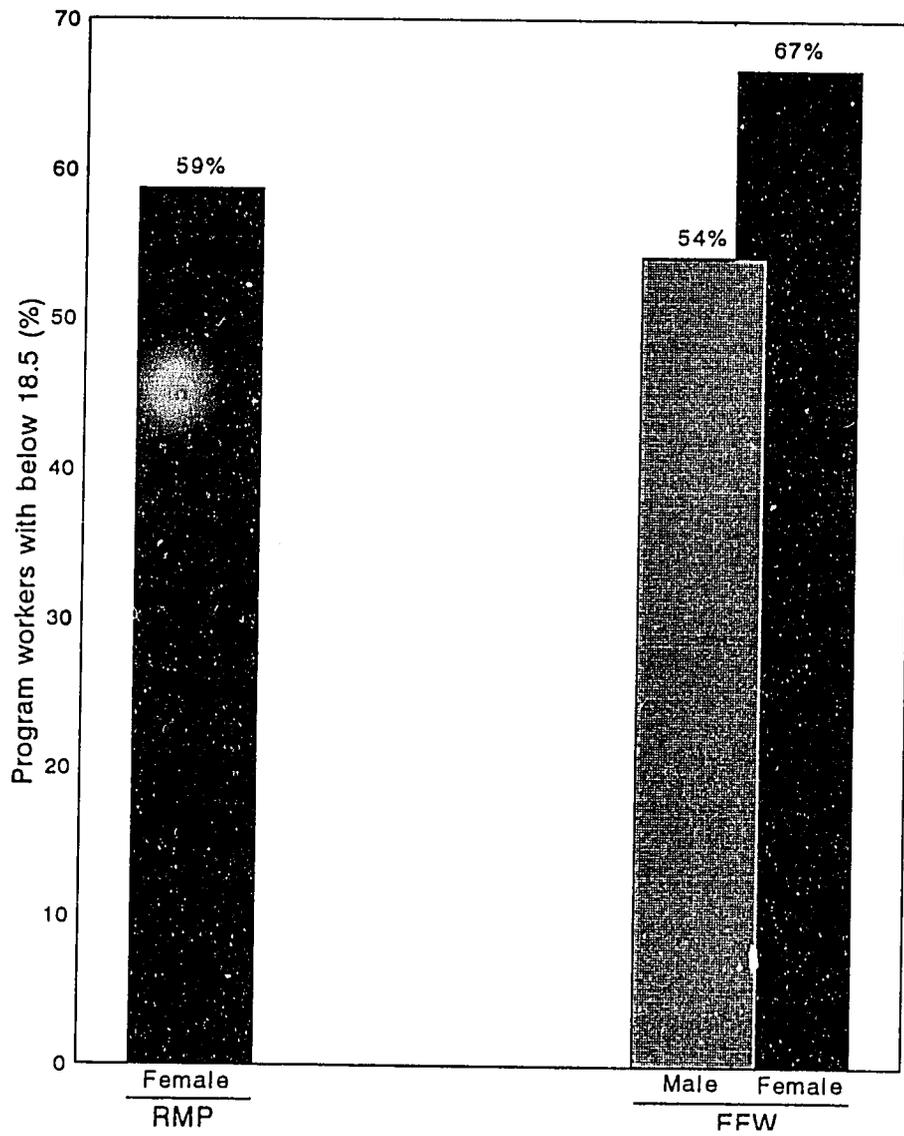


Figure 4—Share of household expenditure on major items



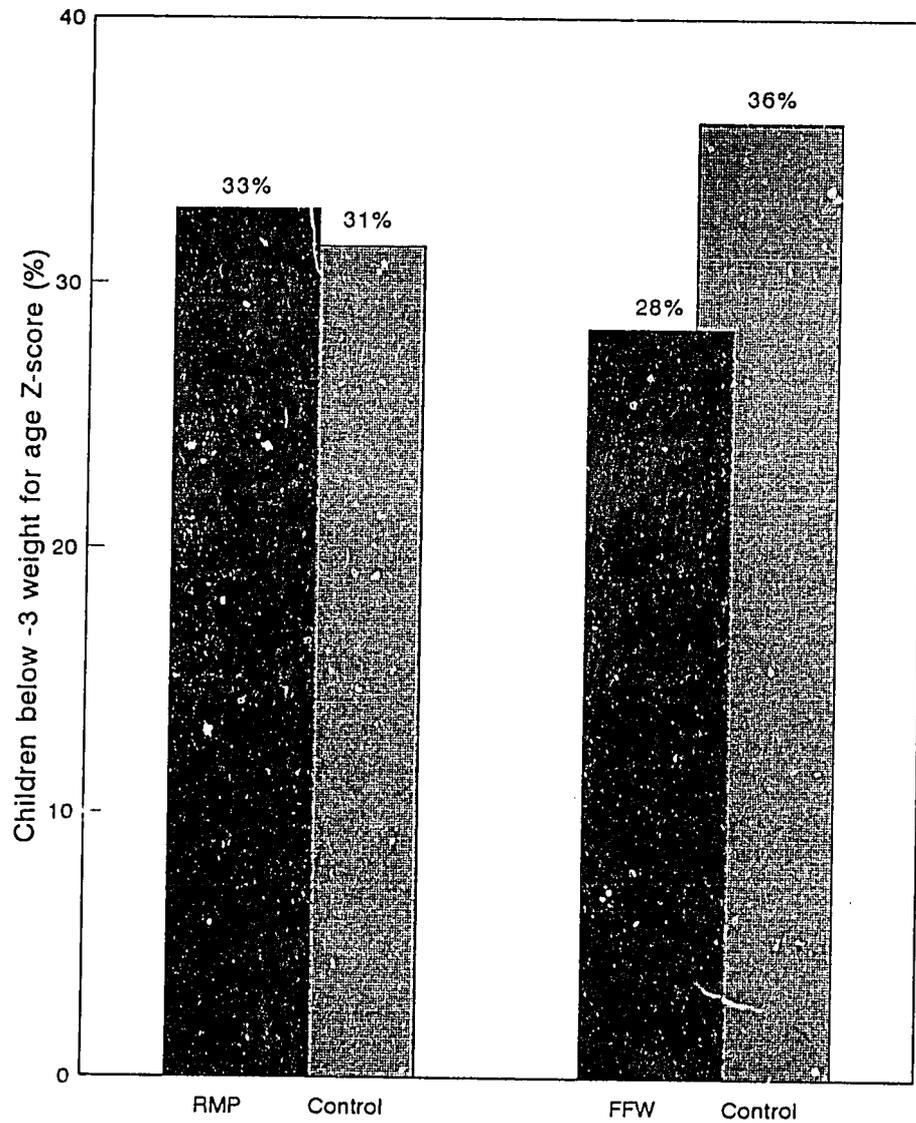
Source : IFPRI, "Nutrition survey on cash versus food-based public works programs, 1994".

Figure 5—Percent of workers with low body mass index  
(Body Mass Index below 18.5)



Source : IFPRI, "Nutrition survey on cash versus food-based public works programs, 1994".

Figure 6—Severely undernourished preschoolers  
(children aged 6-60 months)



Source : IFPRI, "Nutrition survey on cash versus food-based public works programs, 1994".

**Table 1—Characteristics of respondent households**

Characteristics	RMP	RMP Control	FFW	FFW Control	All
Number of sample households	182	187	218	198	785
Household size (persons)	4.2	3.4	5.0	4.8	4.4
Male	1.7	1.3	2.6	2.3	2.0
Male children under 5 years	0.2	0.3	0.4	0.4	0.3
Female	2.5	2.1	2.4	2.5	2.4
Female children under 5 years	0.2	0.1	0.3	0.4	0.3
Households with under-five children (%)	30.8	31.0	51.8	57.1	43.3
No schooling, adult male (%)	71.7	94.6	74.7	82.1	78.5
No schooling, adult female (%)	91.7	96.0	89.4	91.2	92.0
Female-headed household (%)	93.4	97.9	4.6	1.5	46.6
Own cultivable land (decimal)	2.2	1.6	15.4	6.9	6.9
Per capita monthly expenditure (taka) <sup>a</sup>	484	277	457	384	402
Per capita monthly income transfer (taka)	186	0	171	0	-
			(percent)		
Principal occupation of household head					
Farmer	0	0	3.7	1.0	1.3
Wage earner	95.6	17.1	85.3	80.3	70.2
Craftsman	0.5	0	0.5	0.5	0.4
Small business	0.5	8.0	2.8	7.6	4.7
Salaried professional	1.1	0	1.8	0.5	0.9
Fisherman	0.5	0	1.4	1.0	0.8
House servant	0	49.7	0.9	0	12.1
Other	1.6	25.1	3.7	9.1	9.7

Source: International Food Policy Research Institute, "Nutrition survey on cash vs. food-based public works programs, 1994", Bangladesh.

<sup>a</sup> Expenditure includes income transfer from programs.

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**Table 2—Proportion of total household expenditures spent on major commodity groups**

Commodity	RMP	RMP Control	FFW	FFW Control	All
	(taka/person/month)				
Total expenditure per capita	484	277	457	384	402
	(percent)				
Food	70.2	79.4	75.6	75.8	75.3
Fuel	2.5	3.6	2.4	2.7	2.8
Clothing and footwear	7.5	5.2	6.2	5.5	6.1
Medical services and medicines	3.2	2.7	2.3	2.6	2.7
Education	0.3	0.3	0.3	0.2	0.3
Ceremonials and entertainment	5.4	2.2	4.1	3.2	3.7
Tobacco	0.5	0.3	1.8	1.9	1.2
Other goods and services	10.4	6.3	7.4	8.1	8.0
Total	100.0	100.0	100.0	100.0	100.0

Source: International Food Policy Research Institute, "Nutrition survey on cash vs. food-based public works programs, 1994", Bangladesh.

Note: Components may not add to totals because of rounding.

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**Table 3—Proportion of food budget allocated to various foods<sup>a</sup>**

Category	RMP	RMP Control	FFW	FFW Control	All
	(taka/month)				
Per capita food expenditure	340	220	345	291	303
	(percent)				
Rice	46.8	55.7	42.5	52.6	49.2
Wheat	5.7	5.0	11.1	5.0	6.9
Other cereal	0.6	0.3	0.6	0.3	0.5
Pulses	1.8	1.6	1.4	1.3	1.5
Edible oil	3.0	3.1	3.0	3.0	3.0
Fish	5.1	3.0	5.1	4.3	4.4
Meat	3.3	1.5	3.0	2.4	2.6
Egg	0.9	0.7	1.0	0.8	0.9
Milk	1.4	0.7	1.9	0.9	1.2
Potatoes	3.2	3.2	3.2	3.1	3.2
Vegetables	6.7	7.7	5.9	5.8	6.5
Fruits	1.6	1.3	1.5	1.0	1.3
Onion	1.0	0.9	1.2	1.1	1.1
Spices	4.8	4.4	4.8	4.2	4.5
Sugar and gur	2.5	1.6	3.3	2.1	2.4
Salt	1.5	1.8	1.5	1.5	1.5
Other food	9.9	7.4	9.1	10.8	1.3
Total	100.0	100.0	100.0	100.0	100.0

Source: International Food Policy Research Institute, "Nutrition survey on cash vs. food-based public works programs, 1994", Bangladesh.

<sup>a</sup> Based on household food expenditure data.

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**Table 4—Quantity of food acquisition per capita<sup>a</sup>**

Item	RMP	RMP Control	FFW	FFW Control	All
	(grams/month)				
Rice	12,279	10,267	11,809	12,091	11,622
Wheat	1,789	1,190	4,965	1,414	2,434
Other cereal	134	42	116	56	87
Pulses	272	158	208	174	202
Edible oil	192	133	191	165	171
Fish	431	215	461	325	361
Meat	220	60	206	117	152
Egg	65	34	64	49	53
Milk	460	149	630	234	376
Potatoes	1,632	1,161	1,733	1,500	1,515
Vegetables	6,586	5,043	5,620	4,930	5,533
Fruits	1,075	748	1,134	719	924
Onion	262	171	333	270	262
Spices	356	253	355	270	309
Sugar and gur	441	207	637	351	417
Salt	602	499	653	542	576
Other food	1,651	591	1,483	1,975	1,434

Source: International Food Policy Research Institute, "Nutrition survey on cash vs. food-based public works programs, 1994", Bangladesh.

<sup>a</sup> Based on household food expenditure data.

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**Table 5—Calorie composition by food groups<sup>a</sup>**

Category	RMP	RMP Control	FFW	FFW Control	All
	(kcal/day)				
Calorie acquisition per capita	2,183	1,677	2,488	2,009	2,103
Calorie acquisition per AEU	3,008	2,435	3,330	2,768	2,901
	(percent)				
Rice	68.52	74.56	58.44	73.49	68.41
Wheat	9.92	8.12	22.47	8.37	12.58
Other cereal	0.63	0.28	0.54	0.30	0.44
Pulses	1.32	1.07	0.92	0.90	1.04
Edible oil	2.60	2.29	2.32	2.39	2.39
Fish	0.67	0.38	0.57	0.50	0.53
Meat	0.34	0.13	0.28	0.23	0.25
Egg	0.15	0.11	0.14	0.14	0.14
Milk	0.44	0.19	0.55	0.25	0.36
Potatoes	2.41	2.23	2.23	2.34	2.30
Vegetables	5.46	5.30	3.94	4.37	4.72
Fruits	0.61	0.47	0.58	0.37	0.50
Onion	0.20	0.17	0.22	0.22	0.20
Spices	1.30	1.20	1.12	1.07	1.17
Sugar and gur	2.41	1.45	3.21	2.05	2.31
Other food	3.00	2.06	2.47	3.02	2.63
Total	100.00	100.00	100.00	100.00	100.00

Source: International Food Policy Research Institute, "Nutrition survey on cash vs. food-based public works programs, 1994", Bangladesh.

<sup>a</sup> Based on household food expenditure data.

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**Table 6--Calorie composition by food groups for program workers<sup>a</sup>**

Category	RMP	FFW
Calorie intake per capita (kcal/day)	2,329	3,356
Calorie adequacy (percent)	101	102
	(percent)	
Rice	80.53	71.47
Wheat	8.90	16.55
Other cereal	0.22	0.13
Pulses	0.95	1.06
Edible oil	1.14	1.04
Fish	0.40	0.55
Meat	0.01	0.05
Egg	0.07	0.04
Milk	0.31	0.13
Potatoes	2.52	2.68
Vegetables	2.51	2.38
Fruits	0.17	0.16
Onion	0.11	0.10
Spices	0.69	0.64
Sugar and gur	0.37	1.63
Other food	1.09	1.41
Total	100.00	100.00

Source: International Food Policy Research Institute, "Nutrition survey on cash vs. food-based public works programs, 1994", Bangladesh.

<sup>a</sup> Based on 24-hour food intake data.

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**Table 7—Prevalence of malnutrition among preschool children aged 6 to 60 months**

Group	Height-for-Age		Weight-for-Age		Weight-for-Height	
	Average Z-Score	Below 90 Percent of Standard Median	Average Z-Score	Below 80 Percent of Standard Median	Average Z-Score	Below 90 Percent of Standard Median
		(percent)		(percent)		(percent)
RMP	-2.55	50.8	-2.71	80.3	-1.48	68.9
RMP Control	-2.43	37.1	-2.54	77.1	-1.42	62.9
FFW	-2.55	50.7	-2.58	76.8	-1.33	57.2
FFW Control	-2.83	56.5	-2.74	86.4	-1.34	64.6
All	-2.63	50.5	-2.65	80.8	-1.37	62.5
Boys	-2.65	49.8	-2.68	80.4	-1.45	62.2
Girls	-2.60	51.3	-2.61	81.2	-1.29	62.8

Source: International Food Policy Research Institute, "Nutrition survey on cash vs. food-based public works programs, 1994", Bangladesh.

Note: Differences between programs versus control, and male versus female are not statistically significant at the 0.05 level. Levels of significance are based on t-test.

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**Table 8—Severity of malnutrition among preschool children aged 6 to 60 months**

Group	Mean Z-Score of Weight-for-Age	Weight-for-Age Below - 3 Z-Score  (percent)
RMP	-2.71	32.8
RMP Control	-2.54	31.4
FFW	-2.58	28.3
FFW Control	-2.74	36.1
All	-2.65	32.2
Boys	-2.68	33.3
Girls	-2.61	30.9

Source: International Food Policy Research Institute, "Nutrition survey on cash vs. food-based public works programs, 1994", Bangladesh.

Note: Differences between program versus control, and male versus female are not statistically significant at the 0.05 level. Levels of significance are based on Chi-Square test.

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**Table 9—Influences of income transfers in cash and in food on food consumption of RMP and FFW beneficiary households**

Explanatory variables	Estimated Parameters	
	Model	Hypothesis
Constant	10.60 (4.21)***	10.81 (4.47)***
Own income	0.53 (28.45)***	-
Cash income transfer	0.48 (11.92)***	-
Income transfer in wheat	0.61 (12.68)***	-
Rice price	-0.70 (-3.98)***	-0.60 (-3.46)***
Wheat price	0.069 (0.44)	-0.13 (-0.93)
Household size	0.17 (1.22)	0.19 (1.56)
Total income		0.53 (30.77)***
F-statistic	175.77***	257.11***
$\bar{R}^2$	0.73	0.73

Source: International Food Policy Research Institute, "Nutrition survey on cash vs. food-based public works programs, 1994", Bangladesh.

Notes: Dependent variable is daily household food expenditure per AEU.

Income is approximated by total expenditure in all regression equations.

Own income excludes income transfer.

Figures in the parentheses show the t-values.

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**Table 10—Test for differences in marginal propensities to consume food out of income transfers in cash and in kind**

	(taka/day)
<u>Under the model:</u>	
Marginal propensity to consume food	
Own income	0.53
Cash income transfer	0.48
Income transfer in wheat	0.61
RSS	3603.92
Number of households (N)	384
<u>Under the hypothesis (<math>H_0</math>):</u>	
Marginal propensity to consume food	
Total income	0.53
RSS	3685.33
Number of households (N)	384
<u>Test</u>	
F*	4.26
$F_{2, 377}^{0.05}$	3.04
Result of test	Reject $H_0$
Tests of differences between MPCs under the model*:	
	<u>Chi-square values</u>
Income transfer in wheat vs. Income transfer in cash	8.51***
Own income vs. income transfer in cash	0.94

Source: International Food Policy Research Institute, "Nutrition survey on cash vs. food-based public works programs, 1994", Bangladesh.

Note: RSS = Residual sum of squares.

\*The wald test was used to test the hypotheses.

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