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GENDER SPECIFIC DEVELOPMENT PLANNING IN BANGLADESH: A CRITIQUE

Masuda A. Chowdhury *
Tofail Ahmed *

SUMMARY

Gender specific development Planning, a long outstanding issue, gradually earned recognition from academics and practitioners. Because of misplaced emphasis, the movement of gender specific planning may again apt to produce retarded result. There is a tendency within the feminist academic circle to press gender issue without any consideration of the class problematic of the society in general and class analysis of the specific movement itself. The study suggests that gender issue certainly demands separate treatment, but that separation should not exclude the class analysis of the movement itself.

INTRODUCTION

Development as a blanket term and development planning as a practice from its very beginning (from the 1950s) has essentially remained a masculine's domain. Development in theory claims to be gender neutral, in reality it either bypasses women totally or touches them very marginally. On the contrary, 'gender blindness[1] in development planning affects the lives of women in a positively harmful way[2]. The women issue in particular and adverse effect of sectarian development planning (which is largely biased towards the dominant gender) in general have increasingly caught the attention of concerned development thinkers and examined thoroughly over the years (Brett 1990): 1). In the decade of 1980s specially during and after the observance of the United Nations Decade for Women (1975-85), intensive discussions on women's vulnerability was recognised all over the world. Though the full emancipation of women yet to travel a long way, it is now recognised that generalised development strategies of the past couldnot achieve their real developmental goals as they were originally

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perceived, because goals under that developmental paradigm focused more on the capital output ratio to achieve increased GDP and GNP. It was thought that growth strategy (i.e. the increase of GNP) gradually will take care of all other aspects of development (Todaro 1989: 65-67). Rapid growth of GNP was achieved in many countries but at the great cost of poverty, unemployment and inequality of the vast majority of their people. Because of that the very development model developed and practised in the 1950s and 1960s faced severe criticisms.[3] When poverty, unemployment and inequality situations are analysed and applied specifically to women, they are found to be more harsh. The comparative analysis of the status of health, education, nutrition, life cxpectancy, labour participation, employment, income and political participation between men and women in general is found at great variance. All these consequences resulted in new development thinking in the decade of 1980s which advocates for gender based development planning to cater to specific practical and strategic gender needs (Moser, 1991). Present essay focuses on the specific need for gender planning within the broader framework of development planning, because very often development planning willy-nilly excludes women or affects them positively harmful way (Gender and Development course outline, CDS, Swansea p-2). This type of blind folded development policy not only emaciates women but also promotes and perpetuates general underdevelopment of the society.

The study in its first section attempts to review the theoretical issues to underpin the needs and strategies of gender specific development planning. In the second section personal field experience will be brought from Bangladeshi society where women's status is considered to be ``one of the lowest in the world'' (Population Crisis Committee 1988). The concluding section will be devoted to suggest some of the urgently needed practical and strategic issues for inclusion in the future planning.

THEORETICAL ISSUES OF GENDER PLANNING

Gender is relatively a new term which has gained popularity after the pioneering work of Anne Oakley (1972) wherein conceptual distinction between sex and gender is brought. According to Oakley sex is a biological category, whereas the gender identity is determined in the particular context of history, culture and socio-psychological setting of a given society.

Traditional concept of the division of human being and their labour process on the basis of biological sexes confine female role only in her reproductive functions, but the concept of gender crosses the sex boundary and biological role of women. It determines women's place in society as equal human being with men. Though this is nothing of a new discovery, the distinction between sex and gender reconstructed the earlier fixed meaning and notion of women who did not have any other entity beyond their biological traits. Still the new concept of gender and subsequent gender specific development planning has subtle difference in its approaches and strategies with the various feminist movements or feminism in general. Though the feminist movement itself is known by various ideological labellings, according to Rosalind Delmar this could be classified into-radical feminism, socialist feminism, marxist feminism, liberal feminism, lesbian separatism etc. (Mitchel and Oakly 1986:11), However, all feminists accept one common definition of feminism, which says feminism is an active desire to change women's position in society" (Delmar 1986:13). By definition and historical experience feminism is a social movement particularly in its political dimensions and feminists are regarded as its animating spirits (Delmar 1986:16). Gender and development as a distinct approach evolved in the 1980s by absorbing historical experience of all the earlier feminist movements and their concrete achievements. The ideological properties of the movements were translated into concrete programmes embodying the main objectives into one package. International donor agencies, governments and various non-government agencies gradually get involved in specific programme components of the package. As a result, feminist movement which was basically a westerner's domain' gradually expanded in the Third World societies with a new developmental dimensions apart from its overt political and ideological militancy. This militant dimension

of feminism shifted its emphasis in the later years from mere ideological movements to more concrete issues of food, shelter, education, health, job etc. for women which necessitated a specific planning strategy for which the concept of gender planning provided a firm basis.

BASIS OF GENDER PLANNING

Gender planning is based on the idea that men and women play different roles in society and because of their different roles, they often have different needs. Therefore, development plans must 'disaggregate households and families within the communities on the basis of gender identifying men and women, boys and girls' (Moser 1991). The specific needs of the women as weaker gender can be ascertained and addressed by designing some projects and programmes which may make their lives easier and help them in their given tasks. For example, in the productive sector women could be helped by providing better equipments, training and other necessary back up facilities. In the domestic front, project could be aimed at alleviating the drudgery and heavy physical demands of women's work by providing more efficient stoves or grinders, or improving women's access to water. (Breet 1991:6)

WOMEN'S ROLE AND GENDER NEEDS

Women play triple role in society. The first role they play is the reproductive one. Through this role they bear and rear child to guarantee the maintenance and reproduction of the labour force in the society. Secondly, they play a productive role as direct labour force and often as secondary income earner and lastly, they also play a role as community manager. Generally only women's productive role is recognised as economic activity and other roles are just ignored as natural activity of womenhood and they are not rewarded for those roles. On the contrary, men's every role and work is valued and rewarded, either directly through remuneration or indirectly through status and political power. The gender specific planning will attempt to cure the disease of gender blindness of planners by bringing the triple roles of women in the forefront and also put forward the gender interest to translate them into planning imperatives.

STRATEGIC AND PRACTICAL GENDER NEEDS

Caroline Moser by following Maxine Molyneux (1985) classified the gender needs broadly into two- strategic needs and practical needs. Strategic gender needs arise from the analysis of women's subordination to men or men's domination over women which again depend on particular cultural and socio-political context. For example, strategic needs may include some of the following: the removal of institutionalised forms of discrimination such as rights to own and inherit property, sexual division of labour, freedom of choice over childbearing, adoption of adequate measures against male violence and control over women (Molyneux 1958, 223 cited in Moser 1991:160).

APPROACHES TOWARDS ADDRESSING GENDER NEEDS

Since 1950s many policy interventions were initiated. Buvinic (1983) and Moser (1991) categorised them into five categories: (1) welfare approach, (2) equity approach, (3) anti-poverty approach, (4) efficiency approach and (5) empowerment approach. The chronology of the approaches shows a continuous shift in policy perspective towards women from `welfare' to `equity' to `anti-poverty' as categorised by Buvinic (1983) and to other later approaches efficiency and empowerment categorised by Moser (1991). The welfare approach assuming women as passive recipient of development kept its concern limited within the practical gender needs mainly to emphasize the reproductive role. In the 1970s the equity approach brought the productive role in the forefront and particularly focused on `reducing inequality' between men and women, especially in the gender division of labour. Thus the equity approach meets important strategic need (Moser 1991: 163). The anti-poverty approach also highlights the productive role of women. The programme they put forward was alleviation of poverty by increasing the productivity of women in low income households. The efficiency approach emerged as a by-product of IMF and World Bank policy of structural adjustment in the 1980s. Because of its high social cost, the grassroot level women institutions are antipathic to this approach. In most cases this approach fails to meet strategic needs. Moreover, reduction of

resources resulted in blocking the ways in meeting practical gender needs. The latest of all the approaches in addressing the gender issue is the empowerment approach but not necessarily of recent origin. This approach addresses strategic and practical gender needs simultaneously. The specific case of Gabriela in the Philippines and Bombay Forum Against Oppression of Women' as cited in Moser (1991: 169) are two of the illustrations of empowerment approach wherein they combined the strategic needs and practical needs together. The Gabriela project (an alliance of local and National Women's Organisation) combines women's traditional task of sewing tapestry with the discussion of women's legal rights in the constitution. Similarly the Bombay group, though started first campaigning against rape and bride burning, later focused attention on housing. Because they realised through the movement that homelessness gave rise to many other practical problems and access to housing will meet a very important practical need and gradually the movement converted itself to an organisation for lobbying a National Housing Charter which covers strategic purpose as well.

CRITIQUE OF MOSER

Moser's gender planning seems to have downplayed or undermined the class, caste and ethnic considerations. The only reference to the particular issue she mentioned is (1989: 168) that' women experience oppression according to their race, class, colonial history and current position in the international economic order. But Moser's theoretical framework does not address class specific gender issues as well as the issue of dominant global economic order which, in fact, perpetuate a particular form of exploitation and domination from which the Third World societies in general and the Third World women in particular cannot escape. Marketisation, liberalisation and commonditisation programmes promoted by World Bodies from last two decades are patronising a new class of nascent bourgeoisie and petty bourgeoisie against the interest of the poor and the vulnerable already living in inhuman condition. In that case Moser and the other gender proponents working for agencies like World Bank, ODA and FAO are only providing a human face to the growing monsters of dehumanised capitalism. Strategic gender

issues cannot be addressed by ignoring the recent trend of world capitalism and its subsequent impact on the development of new class configuration in the Third World societies vis-a-vis its domination and subjugation aspects.

For example, even within the Women's movement and women development programmes a new generation of dominant and exploitative sisters have emerged. The women's programme related local and foreign NGOs are becoming instrumental in creating power base for middle and upper class women who use these institutions as instrument for serving their vested class interests. They themselves are appropriating huge foreign aid in the name of the poor and underclass women in many of the Third World societies.

In view of the above critique what the present essay emphasizes is the class issue which needs careful consideration within the gender movement to enable it in achieving clear strategic goals. Otherwise the emerging trend will end up in a new class condition of middle class petty bourgeoise women and men to perpetuate the present structure of domination under emerging new capitalist order (ironically called new world order).

GENDER PLANNING AND BANGLADESH

With a current population of 110 million and a per capita income of $ 170 equivalent per annum, Bangladesh is one of the poorest countries of the world. According to the 1986 Household Expenditure Survey, 44.2 million rural and 7 million urban people representing 51% and 56% of the rural and urban population respectively were below poverty level (indicated by 2,122 calories/day/person) and general consensus is that women account for the largest share of the poor (World Bank 1990). The poverty situation accompanied by traditional culture, custom and life pattern segregated them from the main stream of social, economic and political life. For the convenience of relating the theoretical discussion of the previous section, the empirical situation of women only in the areas of health, nutrition, education and labour participation in Bangladesh will be discussed. Then the activities in the sphere of women's development carried out under government and non-government initiatives will be analysed to back the issue of the need for gender planning in its proper perspective.

WOMEN'S STATUS IN FEW SELECTED AREAS

Labour Participation. The civilian labour force (age 10 and above) in Bangladesh expanded nearly 75% from 17.0 to 29.5 million between 1961 and 1985 (World Bank 1990:23).During that period female labour force rose only from 0.9 to 2.7 million whereas male figure rose from 16.1 to 26.8 million (BBS, 1987).

Due to the patriarchal, patrilineal and patrilocal nature of the social system and overall male domination in the economic activities, women's wage and employment conditions are discriminatory both in the formal and informal sectors . On the other hand, in the service sector (formal), for example, in the case of government job, educated women get preferential treatment which reflects a strong middle class affinity or class coalition which is a separate theoretical issue to be dealt with elsewhere.

Health and Nutrition. Females are in more disadvantageous condition than males in Bangladesh in terms of health and nutritional status. There are 94 females per 100 males in 1985 compared to 96 in other low income countries and 104 in industrialised countries (World Bank 1990: ii)

Life expectancy is a year less than males, i.e. 50 versus 51 in 1987 (World Bank 1990). Female infant mortality (upto age 1 year) ranged from 105 to 125 per 1000 lives birth and for male the range is from 90 to 115. So far as the nutritional status is concerned, girls are the highest nutritional risk group as revealed in a recent survey (BBS 1987) conducted by the Ministry of Planning.

Education. Presently the literacy rate of women in rural Bangladesh is about half against the male percentage. The female literacy rate among age 15 and above was 10% against 40% achieved for male during the same period (World Bank 1990:51). The gap is alarmingly high in the sphere of education above the secondary level. The gap that exists between male and female in education at various levels may be seen in the Table-1 adopted from Chowdhury (1990).

According to a recent evaluation of the women in 99 countries which covered 2.3 billion women population (92 percent of total female population) of the world, Bangladesh ranked the lowest among all. While four other South Asian neighbours such as Srilanka, India, Pakistan and Nepal have shown overall improvement, Bangladesh showed an overall

depressing trend. In a scale of rank Bangladesh placed at the lowest in almost all of the individual variables investigated during the evaluation. The table-2 may be seen for clear understanding.

Apart from practical life aspects i.e. labour participation, health, education etc, political participation of women in general and village women in particular is to be considered separately because of its strategic importance. The show piece type and accidental women leadership in political parties and parliament in this case is no reflection of the general political participation of vast majority of village women in Bangladesh. Women are virtually excluded from the electoral process. Their involvement is allowed and encouraged only as' captive voters to support the choice of their husbands, brothers and fathers(Ahmed 1990 : 270-72). Because of widespread poll violence since the seventies, women's participation suffered the most. In an observation of upazila parishad election of 1990 in Chittagong and Comilla women participation was only 6% as against almost 70% of the male (Ahmed 1990 :270).

Table 1: Gender Gap of Student and Teacher at the End of SFYP (1984-85) in Bangladesh (in number).

Type of Institutions	Student			Teacher		
	Male	Female	Total	Male	Female	Total
Primary school	6002000 (59.53%)	4080000 (40.47%)	10082000 (100)	159852 (87.21%)	23447 12.79%)	183299 (100)
Secondary School	1866000 (70.74%)	772000 (29.26%)	2638000 (100)	86667 (88.64%)	11107 (11.36%)	97774 (100)
General College	422693 (82.00%)	92848 (18.00%)	515541 (100)	4909 (82.39%)	1049 (17.61%)	5958 (100)
Engineering University	2292 (93.97%)	247 (6.03%)	2439 (100)	267 (69.39)	10 (3.61%)	277 (100)
Medical College	6261 (75.46%)	2036 (24.54%)	8297 (100)	678 (81.59%)	153 (18.41%)	831 (100)
General University	28378 (79.95%)	7115 (20.05%)	35493 (100)	2386 (89.87%)	269 (10.13%)	2655 (100)

Source : Statistical Year Book of Bangladesh 1987, (Bangladesh Bureau of Statistics, Dhaka). pp. 529-557 (as adopted in Chowdhury (1990).

Women's Development in Bangladesh. Government and non-government agencies along with the donors are implementing various programmes to improve the condition of women in Bangladesh. From the institutional point of view, Bangladesh is at the forefront. of the whole of the developing world to establish a full-fledged women's ministry. More than 1200 hundred women voluntary organisations are also working in the field[6]. At present Bangladesh is headed by a lady Prime Minister and the leader of the opposition is also from the women community. Yet the country couldnot find appropriate ways for the real breakthrough in the status of women in society, because the present women leaders generally represent the privileged class instead of those living in inhuman condition .

Table 2 : Comparative Country Ranking of Women in Different Countries of the World (Maximum Score for each Sector is 20)

Sectors	Health	Marriage & Children	Education	Employment	Social Countries Equality
Sri Lanka	16.0	15.5	10.0	6.0	12.5
Philippines	15.5	14.5	14.0	7.5	12.5
Indonesia	11.5	11.5	9.5	6.0	8.0
India	10.5	12.0	6.0	4.5	10.5
Pakistan	8.0	11.0	5,0	2.0	2.0
Nepal	6.0	9.0	4.0	7.5	10.5
Bangladesh	5.5	4.5	4.0	3.0	4.0
Highest score among all	20 Finland	20 Australia &	18.5 U. S. A. New Zealand	14.5 Sweden	18.5 Sweden & Finland
Lowest score among all	3.5 Afganistan	4.6 Saudi Arabia	2.5	2.0 Benin	2.0 Pakistan Saudi-Arabia North Yeamen	Pakistan Saudi-Arabia U . A . E.

Source : Country Ranking of the Status of Women: Poor, Powerless and Pregnant, Population Briefing Paper, Population Crisis Committee, Washington, 1988, adopted from Chowdhury, 1990.

Note : 1. Out of the total score of 100, Bangladesh scored the lowest with only 21.5 point and Sweden scored the highest with 87 points.

2. Data for each of the 20 indicators were converted mathematically to 5 point scales giving maximum 20 point for each broad sector . Data profile include 99 countries .

Dilemma of Development Efforts. By custom, life of a Bangladesh woman is shaped by the patriarchal, patrilineal and patrilocal nature of the social system . As a result of which her reproductive role gets prominence over all other roles. The productive role she plays is secondary and only complimentary to other roles. The community service role she plays is also very much confined and restricted within homestead. Family is considered traditionally as production, reproduction and consumption unit (Westergaard 1983: 6-4).

The National Government, through its male dominated bureaucracy (Women share only 4% of the total civil service position) and by following generous donors' prescription, is making experiment with various development programmes . If the theoretical mirror of the previous section is used to view those programmes, the basic theoretical inspiration is still drawn mostly from welfarist and anti-poverty approaches which only reflect the predominance of patriarchal view . With the patriarchal approach there is also a very strong component of elite biasness. For example, most of the opportunities created in the name of women's development actually serve the interest of women who belong to the elite classes. For last 20 years many projects and programmes were implemented which couldnot really meet women's strategic needs except creating some jobs for middle class women. Government and the NGOs are not making meaningful attempt to address those particular structural and strategic issues. Instead, government programmes in most cases cater to the practical gender needs of urban middle class women. Similarly most of the urban-based NGOs are also doing the same. The vast majority of rural women who are in abject poverty suffer from ill-health, malnutrition, low literacy and living without enjoying the expected socio-political rights cannot be served by the cosmetic gender activities initiated in the cities . Recently Gramin Bank, BRAC, Nijera Kori and few other NGOs started working in some of the rural pockets. Their activities are also carried out within the safe enclosure of anti-poverty approach, because the women programmes of both the organisations (GOS and NGOs) receive funds and guidances from the

donors. In another analysis the class nature of the state and the NGO stalwarts is basically the same. As a result, they (GOs and NGOs), albeit in competition against each other, ultimately collaborate to safeguard their common class interests.

Secondly, in four of the subsequent government five year plan documents there is a positive trend of increasing resource allocation for the development of women. In the First Five Year Plan (1973-78) neither planning nor programme development focused on women. But during the Second Five Year Plan (1980-85) some TK. 310 million (in 1985 price) for implementation of 25 projects were allocated. That amount increased to Tk. 500 million in the Third Five Year Plan (1985-90) for seven Women Development Programmes and additional 500 million for special Women's development programmes within the sectoral plans of population, local government, rural development and agriculture. Over the past twenty years, government is trying to realise the role of women and restructure its policies to integrate women into the development process. The Fourth Five Year Plan (1990-95) included a separate chapter on women's affairs and each sectoral chapter also contains a section on women. The plan document also declared that women should be "mainstreamed" and not to be treated in social welfare terms.

FUTURE PLANNING AND PROGRAMME DIRECTIONS

Inspite of many limitations mentioned in earlier discussions, Bangladeshi society registered many positive changes in the overall field of women's development since its independence. Firstly, as far as the legal status of women is concerned, constitution which came into effect from 1972 granted equal rights to women in all spheres of life (Article 28 and 29). The constitution has been subsequently amended several times. Two amendments, however, appear to be relevant to the present discussion. The first was done in 1977 which removed the principle of secularism and the second one in 1988 declaring Islam as the state religion of Bangladesh. Because of these amendments, reinforcement of many suppressive and oppressive measures may stage a comeback

with constitutional legitimacy. Otherwise in the 1980s many reforms were initiated which changed civil and criminal procedures in favour of protecting women from violence, dowry, polygamy and divorce.

Commitments made in legislative Acts, governments plan documents and increased resource allocation do not automatically change the situation in a desired direction. For capitalising on the commitment of the government and its resource allocation, really dedicated women activists should undertake the tactical move to maximize both the needs i.e. practical as well as strategic. In the Fourth Five Year Plan female education is considered to be one of the priority areas.

This particular programme can achieve twin objectives. It can satisfy the need of skill development, general education, create more employment opportunity, increase income and also facilitate the process of conscientisation and empowerment. Because, for achieving strategic gender objectives, gender conscious education planning may create basic foundation. Unfortunately most of the women NGOs are implementing programmes without careful consideration of the strategic gender needs. As a result, there still prevails a vacuum in the sphere of wise prioritisation of programmes. Majority of the women organisations are devoting their efforts in population and family planning programmes because of the easy flow of aid money. These programmes address neither practical nor the strategic needs which the oppressed Bangladeshi women require at this juncture of social development.

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1. The term 'gender blindness' has been drawn to emphasize the ignorance of planners about the triple roles of women in society which are known as productive role, reproductive role and community management role (for detail see Moser 1990).
2. For example, growth of prostitution and desertion of women are two of the harmful impacts on women caused by gender blind industrial policy in many countries.
3. Deedly Seers wrote, "The questions to ask about a country's development are therefore: What has been happening to poverty? What has been happening to unemployment? what has been happening to inequality? If all three of these have declined from high levels then beyond doubt this has been a period of development for the country concerned. If one or two of these central problems have

been growing worse, especially if all three have, it would be strange to call the result 'development' even if per capita income doubled" (Seers 1969: 3 cited in Todaro 1989).

4. On the eve of the International Women Day Observance (March 8, 1992), it was announced by Prime Minister of Bangladesh that 1.1 billion Bangladeshi Taka will be spent through 500 women NGOs in Bangladesh (Daily Ittefaque, March 9, 1992).
5. Population Crisis Committee (1988).
6. According to a recent figure released in the news paper by quoting a source of the Directorate of Women's Affairs, (Government of Bangladesh) the total number of women NGOs registered upto 1991 rose to 1200 (Ajker kagaj March 11, 1992).

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NATURE OF WOMEN'S PARTICIPATION IN FARMING SYSTEMS OF NEUVA ECIJA, PHILIPPINES

Md. Wajed Ali Shah *
Romeo L. Saplaco **

SUMMARY

The study explains the nature of women's participation in irrigated rice farming systems of Neuva Ecija, Philippines. The specific objectives of the study were to: (i) find out the nature of women's participation, (ii) determine the relationship between the nature of women's participation and some selected fators, and (iii) describe the associated problems of their participation in rice farming systems. In the pre-production phase of rice farming, women's participation was found less than that of the production and post-production phases, women's participation as implementor was also found higher in the post-production than the pre-and production phases of rice farming systems. The study revealed that demographic and motivational factors were less functionally related to socio-cultural and economic attributes of farm women in rice farming systems of Neuva Ecija, philippines. The socio-cultural barriers were found dominant among the women of medium and large farms and appeared functionally more related to their nature of participation. The identified problems of rural women for participation in rice farming were almost similar in nature but they only differed in some degree and importance across the farm categories. The major problem as stated by the respondents was lack of capital required for farming.

INTRODUCTION

The nature of women's participation does not only vary from village to village and community to community but also from country to country. In Asia, cultivation is mostly relied on animal power. This method requires more strength, and thus the work has been identified for the men. In Africa, agriculture is based on manual use of hoe, and other land preparation is done by men and women jointly and equally.

Agriculture provides the main source of livelihood to 70 percent of the population and employs more than 50 percent

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of the labour force of the Philippines. Almost three-fourth of the total population have been employed in agriculture. Women in the Philippines are engaged not only in household work like rearing children, cooking foods, washing clothes and dishes, but also perform a wide range of farm activities like homestead fruits and vegetables production and livestock raising.

The role of women in agriculture has been changing with the introduction of modern technologies. Realizing the importance of the role of women in agriculture and national development, the Government of the Philippines have given due attention in solving the problems which women are facing in performing different agricultural activities, especially rice farming activities. There seems to be no assessment as yet on the nature of women's participation in rice farming activities. Moreover, there are areas where women's participation are yet to be identified. Thus it is necessary to give special attention to the following questions:

a) What is the nature of women's participation in rice farming systems?
b) What are the possible relationships that exist between nature of participation and some selected attributes of the women?

RESEARCH METHODOLOGY

Guimba is one of the Municipalities of Neuva Ecija of the Philippines, where Deep Tube-Well irrigation was introduced, adopting some degree of farming systems technologies. A list of villages using irrigation water and associated with IRRI farming system programme was made. A total of four villages were selected randomly for the study. In the selected villages, the users of irrigation water in rice farming and their farm size were recorded in co-operation with the IRRI field office staff at Guimba. The farmers who were not married at the time of this study were excluded from the list. The farmers' list was categorised according to their farm size like small (less than 1.00 hectare of land), medium (1.01 to 2.00) and large farms (2.01 to above). Stratified simple random sampling method was employed. A total of 150 samples were drawn. An interview schedule was constructed for the collection of necessary data using structured and unstructured questions in accordance with the objectives of the study.

Initially, a pre-test was carried out with an interview schedule in English and later on, this was translated into local language, that is, into Philippino. The interview schedule with Philippino language was again pretested for validity of the measurement. Data for this study were gathered through personal interview with the respondents. The farmers' wives were interviewed by two female trained enumerators.

METHODS OF ANALYSIS

The nature of women's participation in rice farming systems was categorised as none, as initiators, and as implementors and the assigned scores were O, I, and 2, respectively. The rice farming activities referred to all steps associated with the farming activities were grouped into three phases like:

I. Pre-production phase	:	(seed/variety selection, seed bed preparation, uprooting seedlings, and preparation of land)
II. Production phase	:	(transplantation, fertilization, weeding, plant protection and irrigation); and
III. post-production phase	:	(harvesting, threshing and marketing).

In order to describe the nature of women's participation in rice farming systems, the frequencies and percentages were taken into consideration. Again, the nature of participation was analysed according to different farm categories like small, medium, large and all farms.

RESULTS AND DISCUSSION

PARTICIPATION IN PRE-PRODUCTION PHASE

Data on women's participation in the pre-production phase show that women of medium farms had the highest participation as implementor. The participation rates were 28%, 34% and 8% for small, medium and large farms respectively. In 'all farms' women's participation were 24% as implementor and 8% as initiator. As much as 68% of the women respondents had neither participated as initiator nor as implementor in the pre-production phase (Table-1).

PARTICIPATION IN PRODUCTION-PHASE

In this phase of rice farming system, 70% of the women respondents in large farms and 68% in both small and medium farms did not participate. On an average, 69% of the respondents in 'all farm' category had no involvement in the production phase of rice farming activities.

As initiator, it was found that women in the large farms had relatively higher (16%) participation than in medium (10%) and small farms (4%). On an average, women's participation as initiator was found only 10%.

As implementor, participation by women of small farms (28%) was higher than medium (22%) and large farms (14%). In 'all farms' women's involvement as implementor was found 21%.

PARTICIPATION IN POST-PRODUCTION PHASE

Women's nature of participation in the post-production phase revealed a different trend as compared to the others. Almost one-third of rural women did not participate in any activities. Such trend across farm size appeared as size of farm expanded.

As initiator, the participation was only 14% in all farms. Participation as initiator was found similar in small and medium farms. In large farms it was relatively higher (Table-1).

As implementor 54% of women participated in the post-production activities of rice farming systems. There appeared a negative trend of participation accross farm categories. It suggests that as farm size moves from small to medium and large, the participation of women decreases.

RELATIONSHIP BETWEEN PARTICIPATION AND SOME SELECTED FACTORS

DEMOGRAPHIC FACTORS

A positive relationship between the age of women respondents and the participation rate was observed in rice farming activities, particularly in small farms. This means that as the age of women in small farms increases the participation either as initiator or as implementor also increases. A separate study (Arocena, 1986) also found a positive relationship between the age of women and the rate of participation in income-generation projects of the Philippines.

The level of education was found inversely related to women's participation in small and all farm categories. The result implies that women of the rural Philippines exposed to higher education look for non-farm or white collar jobs. This is likely to reduce their participation in farming activities. Roxas-Aleta (1977) stated that when women had college degrees their participation in non-farm work had become almost double and they tended to continue working even after marriage.

MOTIVATIONAL FACTORS

The correlation test revealed that expectation of gaining technical skills, social prestige and inputs services were significantly related to some degree to women's nature of participation in rice farming activities.

Gaining of technical skills usually brings confidence in the work to be done, and therefore, serves as an intrinsic force for more participation. The results of this study showed a positive relation between gaining of technical skills in small farms of rural women and their participation.

Expectation of social prestige was found negatively related to the women's participation in small farms. This suggests that as their expectation of social prestige increases, the participation rate decreases. There was found positive correlation between production inputs and women's participation in medium farms (Table-2).

SOCIO-CULTURAL FACTORS

The women of the rural Philippines are socially and culturally more liberal compared to other Asian countries. However, the study findings showed a negative correlation between women's socio-cultural advancement and their participation in rice farming activities in the case of medium and large farms. This explicity suggests that social and cultural bindings of the society may cause less involvement of women in farming activities (Table-3).

Besides, husband's attitude towards wife's participation may be a serious cause of non-participation. The result also indicated a positive relation between husband's attitude and his wife's participation. Studies (Khan, 1983; Masood, 1988)

have indicated that husband's attitude many a time dictates or determines the wife's involvement in income-generating activities.

ECONOMIC FACTORS

In rural society of the Philippines land ownership is an indicator of social prestige. Besides, the women of wealthy families are mostly engaged in non-farm activities. This study observed an inverse relationship between the farm size and the nature of participation. Similar nature of participation was also observed in Bangladesh (Abdullah, 1974) and in India (Agarwal, 1985).

Women's wage rate was significantly positive in medium, large and all farm categories. This may suggest a substitution effect. In other words, as the wage rate increases, the women member participates more in farming activities (Table 3).

Income and nature of women's participation were in a negative association. This was found significant in large and all farm categories. This situation may arise due to income effect of the household. Usually, the women who have higher income enjoy more freedom in the trade-off between income and leisure.

CONCLUSIONS AND RECOMMENDATIONS

The nature of women's participation varied across farming activities. The women's involvement in the post-production was found higher than that of the pre-production phase. It was observed from the study that Philippino women were very helpful to their husbands in harvesting, threshing and marketing of farm products. Although their participation varied as either initiator or implementor, their contribution to farming could hardly be ignored.

Based on the findings, it is recommended that the Government of the Philippines and other line agencies may initiate some efforts to link up the rural women with funding agencies to realize more participation in rice farming systems and that, in turn, can provide help in increasing their income. Some relevant training institutions may also get involved in organizing training for the rural farm women so that they can have better understanding of rice production technology and its importance for income generation.

Table 1. Nature of Women's Participation in Rice Farming Systems, Nueva Ecija, Philippines

Farming Activities	Participation in different farm category			
	Small	Medium	Large	All farms
	%	%	%	%
Pre-production phase				
None	66	60	80	68
Initiators	6	6	12	8
Implementors	28	34	8	24
Production phase				
None	68	68	70	69
Initiators	4	10	16	10
Implementors	28	22	14	21
Post-production phase				
None	28	36	34	32
Initiators	12	12	20	14
Implementors	60	52	46	54

Table 2. Correlation Coefficients of Nature of Participation and Selected Variables of Women in Rice Farming Systems

SELECTED FACTORS	FARM CATEGORY			
	Small (N=50)	Medium (N=50)	Large (N=50)	All Farms (N=150)
Demographic Factors				
Age of women	0.2785*	0.0651	0.1060	0.0692
Female members in the household	0.1782	0.2060	-0.2066	0.0895
Family size	0.2278	0.0013	-0.1860	-0.0082
Education level	-0.3093**	-0.1527	-0.1676	-0.2074
Farming experience	0.0897	0.637	0.1974	-0.0358
Motivationl Factors				
Contact With extension agents	-0.0175	-0.0611	-0.1160	-0.0649
Expectation of gaining tech-nical skills	0.3420	0.1057	-0.0096	0.0494
Expectation of social prestige	-0.3205*	-0.1472	0.1042	-0.0049
Expectation of higher income	0.0906	-0.1187	0.0325	-0.0581
Expectation of production inputs	-0.0991	0.2689*	0.0845	0.0473

Table 3. Correlation Coefficients of Nature of Participation and Selected Socio-cultural and Economic Factors of Women Respondents in Rice Farming Systems

SELECTED FACTORS	FARM CATEGORY			
	Small (N=50)	Medium (N=50)	Large (N=50)	All Farms (N=150)
Socio-cultural Factors				
Social and Cultural Liberty	-0.1822	-0.2546*	0.2762*	-0.2141***
Husband's attitude towards wife's participation	0.2743*	0.0777	0.1382	0.16611***
Economic Factors				
Farm size 0.2033	-0.4794***	-0.0992	-0.1927**	
Tenurial status	-0.1437	-0.0925	0.1064	-0.0907
Women's wage rate	-0.0246	0.3234**	0.2833**	0.1537*
Family income	-0.0826	-0.1127	-0.3205**	-0.2275**

*** Significant at 1% level
** Significant at 5% level
* Significant at 10% level

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ISSUES IN SUSTAINABLE DEVELOPMENT IN THIRD WORLD COUNTRIES: AN OVERVIEW

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SUMMARY

The notion of sustainable development has become a widely accepted policy concern among the development planners. This paper has tried to highlight some basic aspects of sustainability and development in the context of developing countries. It argues that ecological factors play a significant role in development process of the developing countries. It also maintains that sustainability of development programme in the Third World depends to a large extent on how best environmental factors are given adequate considerations. Moreover, governmental policies on various issues are not well-coordinated. Finally, it has underlined the need for a well-coordinated comprehensive ecological policy framework to ensure sustainable development.

INTRODUCTION

During the last decade, there had been a growing concern among the development planners that sustainability should be the major and ultimate objective of socio-economic policies in the developing countries (1). As a matter of fact, the notion of sustainable development has officially become a widely accepted policy concern but unfortunately little attention has been given to the crucial question like how the sustainability can be translated into concrete goals (2). The issue of sustainability not only stresses on the application of traditional wisdom more systematically but also adds complexities at the operational level (3).

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The main purpose of this paper is to highlight some basic aspects of sustainability and development in the context of developing countries. The paper is divided into four sections: meaning of sustainable development relationship between ecology and sustainable development, issues of sustainable development in the Third World and conclusion with a few remarks.

MEANING OF SUSTAINABLE DEVELOPMENT

The notion of sustainable development suffers from a problem of definitional crisis (4). Economic literature in most cases shows confusing gamut of sustainable development definitions, goals, conditions and criteria. In general terms sustainability refers to long-term availability of certain means required to achieve certain long-term goals. The very many interpretations of sustainability differ in terms of goals and means. The choice of goals may theoretically be derived from a collective welfare function (5). The OECD (1989), focusing on development aid, considers development sustainable when the recipient country is willing and able to provide sufficient means and resources (financial, managerial, ecological, etc), required in an aid activity after the donor has withdrawn its assistance. Hence sustainability refers to all possible means, including but not confined to environmental ones (6). According to Sachs (1989), sustainability is a dynamic concept taking into consideration the expanding needs of a growing world population implying by this a steady growth. In his view sustainability simultaneously refers to five dimensions: social, economic, ecological, geographical and cultural sustainability (7).

The concept of sustainability adopted in this paper refers to only one type of resources, viz. environmental goods and services. Barbier distinguishes between three types of economic functions of scarce environmental capital: material and energy inputs, assimilation of waste products and a stream of natural services the quality of which is essential for supporting economic production and human welfare. The latter includes maintenance of essential climatic and ecological

cycles and functions (8). The three basic environmental functions comprise environmental amenities, which affect human welfare directly and environmental productivity, on which production of man-made goods and services is based (9). Thus sustainability is defined in terms of continued and sufficient availability of these environmental goods and services over time, i.e. ecological sustainability.

ECOLOGY AND SUSTAINABLE DEVELOPMENT

The environment forms a potential means of welfare improvement. Welfare benefits may emerge from the environment directly through environmental amenities and indirectly through the production of goods and services. The production of goods and services uses renewable and non-renewable natural resources, uses the environment as waste assimilator and benefits from general environmental services (10). At the same time, this is essential for the sustainability notion. The environment also puts constraints on quantitative and qualitative dimensions or consumption and production processes (11). Too much pressure on the environment may negatively affect long-run social welfare both through lower quality environmental amenities and decreased environmental productivity (12).

Development is ecologically sustainable only when long-run (per capita) social welfare improvement is not impeded by environmental deterioration, either through environmental amenities or through environmental productivity, or through a combination of the two. The condition for sustainable development is that production and consumption patterns do not cause such environmental degradation.

A sufficient condition for sustainable development is improvement in the socio-economic or ecological system without affecting the other. And the notion of sustainable development could be captured in a four-dimensional space. The dimensions show time, welfare, socio-economic state and environmental state (13). Our definition of sustainable development, however, would allow deterioration in one system provided it is more than compensated for by

improvements in the other. The possibility of a certain degree of environmental deterioration is, therefore, not excluded. In theory, technological innovations or investments in man-made capital could compensate for a declining environmental stock. Hence by allowing for substitution at the production side, the same quantity of consumption goods could be made available. In many situations, however, this compensation would be insufficient for sustainable development because of the direct negative impact of degrading environmental amenities on social welfare (14).

L. Chapman (1986) argues that conditions for sustainable development include consistency with social values and institutions, encouragement of grassroot participation, etc. Sustainable development is here defined with ecological constraints as the only benchmark (15). Development may be confronted with other than ecological constraints, for instance, mobilisation of savings human capital development or environmental skills. Such factors, however, will be taken into account only as far as they have an impact on long-run ecological-economic interactions. Hence, by emphasizing the role of production and consumption patterns many factors other than environmental are incorporated in the conditions for sustainability indirectly. For instance, if present land use in a region marginally remains within ecological boundaries, these boundaries are likely to be crossed in the future in view of fast population growth. Development would then be unsustainable because environmental boundaries are crossed and not because of population growth by itself (16).

SUSTAINABLE DEVELOPMENT AND THE THIRD WORLD

The sustainability concept by itself is not bound to location or time. Starting from a universal definition of and key criteria for sustainability (17), it is applicable now and in the future and in developing and developed countries alike. Key issues are the organization of production and consumption (socio-economic system), quantity and quality of environmental functions (environmental system), and the interaction between economic and ecological parameters in the short and long run (18). Application of this sustainability concept will lead to

different analytical problems and outcomes depending on location-specific circumstances. This part of the analysis focuses on questions that are likely to dominate sustainability illustration in the developing countries. Of course both the developed and the developing world are highly heterogenous groups and circumstances often differ more in degree than in nature (19). Nevertheless, the rough distinction between developing and developed countries may be an instrumental first step towards location-specific sustainability analysis.

In general developing countries have other environmental system than most developed countries. Climatic circumstances and geographic locations have a distinct impact on features of economic system (20). Many developing countries have highly diversified but fragile economic systems or equally fragile monoculture lands. Moreover, developing countries are still predominantly rural, whereas the developed world is largely urbanized.

Socio-economic systems show many dissimilarities. At the national level, developing countries often show a combination of the following indigenous factors: high population growth rates; low average per capita income levels; low levels of basic needs provision; unequal distribution of income and ownership of production factors; strong dependency on agriculture and other natural-resource based sectors; outdated production techniques; large subsistence sector; large non-market sector; often weak definition of property rights of land and other resources; economically distorted markets for goods, services and finance; strong government interference in some markets but weak control in others. Among the exogenous factors to the country are: consumption and production patterns in developed countries; debt, trade and policies of the developed world and multilateral institutions, etc. (21).

Sustainability analysis focuses on how ecological and economic systems interact (22). Scientific knowledge on such linkages is still scarce, in the developed world and especially in the Third World. Nevertheless the following aspects, which tend to reinforce each other, certainly deserve special attention :

(i) Due to differences in ecosystems, a trade-off between ecology and economy is location-specific. A specific economic activity may be sustainable in a region with relatively robust ecosystems but non-sustainable in drylands (23).

(ii) High population growth rates combined with constraints on land development and low productivity in developing countries contribute to the high rate at which environmental degradation often occurs and the need to find rapid solutions (24). This is especially the case in areas with fragile ecosystems.

(iii) Differences in terms of income level, income distribution and associated consumption and production patterns, have an important impact on the nature of environmental problems in rich and poor countries. Developed countries, at high income levels, mainly face environmental problems resulting from affluence such as pollution generated by high energy consumption, high mobility and high waste generation. Rich countries, more dependent on industry, have output-related problems (25). Moreover, these countries often import required inputs from developing countries and therefore, do not face the environmental problems associated with their exploitation. In addition, global environmental problems are often caused by consumption and production processes in rich countries. Poor countries generally have poverty-related environmental problems: the need to earn a minimum income may lead to overexploitation of natural resources such as land and forests. Similarly, because economic production in many developing countries is largely dependent on resource-based sectors, they tend to have input-related environmental problems (natural resource depletion) (26).

(iv) Especially in developing countries, government policies often offer incentives to economic sectors to embark on or continue activities with harmful ecological effects and unsustainable resource use. Prices set by the government in particular fail to reflect long-run environmental costs and benefits. Examples in many countries are agricultural policies (pricing of agricultural inputs and outputs), industrial policies, infrastructure policies

(opening of fragile areas, provision of services at low charges), interest policies (low real interest rates) and exchange rate policies (over-valuation). At the same time environmental policies are often at the infant stage and enforcement of regulations is generally weak. Administrative and technical expertise are yet to be fully developed. Consequently negative environmental externalities are often not accounted for and do not influence investment decisions (27).

(v) In developing countries information flows, in general and regarding the environment in particular, are often highly imperfect and this tends to lead to sub-optimal investment patterns from the national point of view. Positive and negative external, particularly environmental, effects are usually not recognized by investors (28). The government often fails to compensate either by providing the information or through providing the investment itself (29).

(vi) Environmental problems have different economic consequences in developing countries. In many regions of the developing countries environmental problems have become a quantitative problem (absolute natural resources scarcity) (30). Environmental services simply cease to exist and consequently, because of the strong dependency on natural resources,the income generating potential vanishes. Also because of uneven distribution of income and capital goods, the poor, often most directly dependent on natural resources, tend to be hurt most by environmental decay. Inhabitants face an absolute decrease in output of goods and services and welfare levels drop below the absolute minimum. This reinforces vicious circles of poverty and environmental decay (31).

(vii) At high income levels more resources are available to combat or prevent environmental decay. Protection may be financed through consumption reduction and need not to be at the expense of investments. Moreover, reducing output in environmentally harmful economic sectors may often be compensated by increasing output in other sectors. At extremely low income levels reducing consumption is impossible and hence investm-

ents in environmental protection measures suffer (32). Moreover, environmentally sound alternatives are often lacking. Besides, assessing interlinkages in the Third World countries is difficult in many respects. In general, data available in the field of economics and especially the environment is weak.

CONCLUSION

Ecological factors play a significant role in the development process of the developing countries. It has been emphasized in this paper that the sustainability of development programme in the Third World depends to a large extent on how best environmental factors are given adequate considerations. This is an important aspect that deserves special attention if the process of growth is to be made a broad-based one. However, it has been observed that the various governmental policies related to regional, population, housing and industrial incentives are not well-coordinated in this respct. Instead of having a piecemeal approach in this context, it is highly desirable that a well-coordinated comprehensive ecological policy framework is developed to mark the development process truly sustainable.

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গুচ্ছ গ্রামঃ বর্তমান অবস্থা ও কিছু সুপারিশ

মোঃ ইলিয়াস*

সারসংক্ষেপ

সরকারী উদ্যোগে গৃহীত কর্মসূচীর মধ্যে "গুচ্ছ গ্রাম" একটি বহুল আলোচিত কর্মসূচী। বর্তমান প্রবন্ধটি একটি গুচ্ছগ্রামের উপর পরিচালিত জরিপ হতে প্রাপ্ত তথ্যের ভিত্তিতে লিখা হয়েছে। গ্রচ্ছগ্রামটির আর্থ-সামাজিক অবস্থা বিশেষ করে বিদ্যমান প্রধান সমস্যাবলী এখানে তুলে ধরা হয়েছে এবং এগুলো নিরসনে বাস্তবতার নিরিখে কিছু গঠনমূলক সুপারিশ রাখা হয়েছে।

ভূমিকা

বাংলাদেশ বিশ্বের অন্যতম দরিদ্র দেশগুলোর একটি-এ কথা আজ নতুন করে বলার অবকাশ নেই। যদিও কৃষিই এদেশের অর্থনীতির মেরুদন্ড, কিন্তু বর্তমানে শতকরা ৬০ ভাগ কৃষি পরিবারই কার্যতঃ ভূমিহীন। ভূমিহীনদের সংখ্যা দিন দিন বেড়েই চলেছে। ১৯৮৩-৮৪ সালের কৃষি শুমারী অনুযায়ী কৃষি জমি ও ভিটাহীন ভূমিহীন পরিবারের সংখ্যা হচ্ছে ১১ লক্ষ ৯৮ হাজার ৯৫৬টি; কেবলমাত্র বাস্তুভিটা আছে এমন পরিবারের সংখ্যা ২৭ লক্ষ ১৩ হাজার ৯৬৯টি এবং ০.৫০ একরের কম জমি সর্বস্ব পরিবারের সংখ্যা ৩৮ লক্ষ ৯৮ হাজার ১১১টি। এ সংখ্যা বর্তমানে আরো বেশী হবে।

ভূমির উৎপাদন বৃদ্ধি, ভূমি মালিকানা, ব্যবস্থাপনা ও ব্যবহার কাঠামোর সংস্কারের মাধ্যমে সম্পদ ও আয়ের ন্যায়ধর্মী বন্টন করার লক্ষ্যে সরকার ১৯৮২ সালের জুলাই মাসে একটি ভূমিসংস্কার কমিটি নিযুক্ত করেন এবং কমিটির সুপারিশের প্রেক্ষিতে ভূমি সংস্কার অধ্যাদেশ '৮৪ জারী করা হয় যার আওতায় বর্তমানে ভূমি সংস্কার অভিযান পরিচালিত হচ্ছে। ভূমি সংস্কার অভিযানের আওতায় উল্লেখযোগ্য ও গুরুত্বপূর্ণ একটি কর্মকান্ড হচ্ছে 'অপারেশন ঠিকানা গুচ্ছগ্রাম' যেখানে নিঃস্ব ভূমিহীন আশ্রয়হীন মানুষ পাবে একখন্ড ঠিকানা বা মাথা গোঁজার ঠাঁই। এ কর্মসূচীর আওতায় গত বৎসর অর্থাৎ ১৯৯০ সালে বগুড়া জেলার শেরপুর উপজেলাধীন মির্জাপুর ইউনিয়নস্থ মুকুন্দ গ্রামে "রাজারদীঘি গুচ্ছগ্রাম" প্রতিষ্ঠিত হয়। রাজারদীঘি ও গ্রাম প্রকল্পটি বগুড়া-ঢাকা মহাসড়কের উপর অবস্থিত মির্জাপুর হাট হতে ৩ কিঃ মিঃ পশ্চিমে অবস্থিত। প্রায় ৩২ বিঘা আয়তনের একটি খাস পুকুর বা দীঘিকে ভিত্তি করেই এ গুচ্ছগামটি প্রতিষ্ঠিত হয় এবং সেই দীঘির নাম অনুসারেই এর নামকরণ করা হয় রাজারদীঘি গুচ্ছগ্রাম। মহাসড়ক হতে ৩ কিঃ মিঃ রাস্তা সম্পূর্ণ কাঁচা রাস্তা এবং বর্ষাকালে বা সামান্য বৃষ্টি হলে তা যানবাহন চলাচলের সম্পূর্ণ অযোগ্য হয়ে পড়ে। প্রকল্পের অধীন খাসজমির মোট পরিমাণ ১৮.০৩ একর, তন্মধ্যে দীঘির আয়তন হচ্ছে ১০.৬০ একর। অর্থাৎ বসত বাড়ীর জন্য ব্যবহৃত হয়েছে ৭.৪৩ একর জমি। পরিবার প্রতি বসত বাড়ীর ভূমির পরিমাণ হচ্ছে ০.০৭ একর। প্রকল্পটি বাস্তবায়নে প্রাথমিক ব্যয়ের একটি হিসাব উপজেলার সহকারী কমিশনার (ভূমি) এর নিকট হতে সংগ্রহ করা হয় যা নিম্নরুপঃ

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* লেখক একাডেমীর একজন উপ-পরিচালক। প্রবন্ধে লিখিত মতামত লেখকের ব্যক্তিগত।

- পুকুর সংস্কারসহ ভূমি উন্নয়নের জন্য মোট ১৮,১৬,৩৫০ ঘন ফুট মাটির কাজ করা হয় এবং এ বাবদ ৯৬.২৫ মেঃ টন গম ব্যবহার করা হয়। মাটির কাজ সম্পাদনে ৯২ জন মহিলা শ্রমিকসহ মোট ১৯৬ জন শ্রমিক কাজ করে।
- প্রকল্পাধীন ১০৬টি পরিবারের গৃহনির্মাণের জন্য মোট ২১২ বান্ডিল টিন বরাদ্দ ও বিতরণ করা হয়।
- এছাড়া ঘর তৈরীতে বাঁশের খুটি, চাটাই, বেড়া, কাঠ, বাটাম, মজুরী প্রভৃতি বাবদ ঘর প্রতি ২,৩১০.৩৭ টাকা ব্যয় হয় যার মোট পরিমাণ দাঁড়ায় ২,৪৪,৯০০/- টাকা।
- গুচ্ছগ্রামবাসীদের পানীয় জল সরবরাহের জন্য মোট ৪টি টিউবওয়েল বসানো হয়েছে।
- প্রত্যেক পরিবারকে জন-স্বাস্থ্য প্রকৌশল বিভাগ কর্তৃক নির্মিত জলাবদ্ধ পায়খানা একটি করে সরবরাহ করা হয় যদিও অনেক পরিবার এখন পর্যন্ত তা ব্যবহার শুরু করেনি।

এ প্রকল্পের অধীন মোট ১০৬টি পরিবারকে পুনর্বাসিত করা হয় যার মোট জনসংখ্যা ৪৬৪ জন। রাজারদীঘি গুচ্ছগ্রামটি সরেজমিনে পর্যবেক্ষণ করে এবং কিছু প্রশোত্তরের মাধ্যমে প্রকল্পবাসীদের পরিবারের লোকসংখ্যা, পেশাসহ বিভিন্ন সমস্যাদি জানা যায়। তবে বিস্তারিত জরিপ না হওয়ায় অনেক তথ্য উদঘাটন করা লেখকের পক্ষে সম্ভব হয়নি। সমস্যাবলী তুলে ধরতে যেয়ে আলোচ্য প্রকল্প ছাড়াও সাম্প্রতিক বিভিন্ন পত্র-পত্রিকায় প্রকাশিত গুচ্ছগ্রাম সংক্রান্ত প্রতিবেদন হতে প্রাপ্ত তথ্য কিছু কিছু ক্ষেত্রে বিবেচনা করা হয়েছে। নিম্নের সারণীতে পরিবারের সদস্য সংখ্যা অনুযায়ী তাদের অবস্থান দেখান হয়েছে।

সারণী-১ঃ রাজারদীঘি গুচ্ছগ্রামের পরিবারগুলোর সদস্য সংখ্যা ও শতকরা হার

সদস্য সংখ্যা	পরিবার সংখ্যা	শতকরা হার %	মন্তব্য
১-২	১০	৯.৪৩	
৩-৪	৪৬	৪৩.৪১	
৫-৬	৪১	৩৮.৬৭	
৭-৮	৯	৮.৪৯	
মোট	১০৬	১০০%	

পরিবারগুলোর সদস্য সংখ্যা সর্বনিম্ন একজন হতে সর্বোচ্চ ৮ জন পর্যন্ত রয়েছে। তন্মধ্যে ৩ হতে ৬ সদস্য বিশিষ্ট পরিবারের মোট সংখ্যা ৮৭টি অর্থাৎ মোট পরিবারের ৮২.০৮%। ৭ হতে ৮ জন সদস্য নিয়ে ৯টি পরিবার রয়েছে। এ সমস্ত পরিবারের ছেলেমেয়েদের সংখ্যা ৫ হতে ৬ জন যা জনসংখ্যাস্ফীতির ভয়াবহ চিত্র তুলে ধরে। পর্যবেক্ষণে দেখা গেছে যে, অধিকাংশ ছেলে-মেয়ের বয়স ১০/১২ বৎসরের নিম্নে যারা এখনও উপার্জনক্ষম হয়নি। এমতাবস্থায় সহায়সম্বলহীন পিতা-মাতা দু'জনের পক্ষে এত বড় সংসারের ঘানি টানা দুরুহ ব্যাপার।

রাজারদীঘি গুচ্ছগ্রাম পুনর্বাসিত পরিবার সমূহের পেশা জানতে যেয়ে যে সমস্ত তথ্য পাওয়া যায় তা নিম্নের সারণীতে তুলে ধরা হলো।

সারণী-২ঃ গ বেষণাধীন গুচ্ছগ্রামের পুনর্বাসিত পরিবারগুলোর পেশা সম্পর্কিত তথ্যাবলী

পেশা	সংখ্যা	শতকরা হার
দিন মজুরী	৬৬	৬২.৩০
চাকুরী	৬	৫.৬২
বেকার	৬	৫.৬২
ব্যবসা	৫	৪.৭২
অন্যান্য	৫	৪.৭২
ভ্যান/রিক্সা চালানো	৪	৩.৭৮
অজ্ঞাত	১৪	১৩.২৪
মোট	১০৬	১০০.০০

প্রাপ্ত তথ্যে দেখা যায় নির্ধারিত আয় রয়েছে এমন লোকের সংখ্যা খুবই কম মাত্র ৬ জন শতকরা হারে ৫.৬২% যারা চাকুরী করেন। দিনমজুর হিসেবে জীবিকা উপার্জন করে সর্বোচ্চ ৬৬ জন শতকরা হার ৬২.৩০%। ৬ জন সম্পূর্ণ বেকার। ১০৬টি পরিবারের মধ্যে ১৪টির পেশা জানা যায়নি। তারা খুব সকালে বেড় হয়ে যায় রাতে ঘরে ফিরে। কোন নির্ধারিত পেশা নেই। উপস্থিত প্রতিবেশীগণও তাদের পেশা সম্পর্কে কিছু বলতে পারেনি।

প্রকল্পবাসীদের আর্থ-সামাজিক অবস্থার অন্যান্য বৈশিষ্ট্য বা উপাদান সমূহের সামগ্রীক তথ্য বা পরিসংখ্যান না পাওয়ায় সেগুলো সারণী আকারে দেখানো সম্ভব হয়নি। তবে পর্যবেক্ষণের মাধ্যমে পাওয়া তথ্যের ভিত্তিতে প্রকল্পের প্রধান প্রধান সমস্যাসমূহ চিহ্নিত করা হয় এবং পরবর্তীতে সেগুলো সমাধানের সম্ভাব্য সুপারিশ প্রদানের প্রয়াস চালানো হয়।

সমস্যাবলী

১) গুচ্ছগ্রামের স্থান নির্ধারণের ক্ষেত্রে প্রধান ভিত্তি ছিল খাস জমির প্রাপ্যতা এবং পুকুরসহ খাস জমিকে অগ্রাধিকার দেয়া। ফলে পুকুরসহ মোটাদাগের খাস জমি নির্বাচন করতে যেয়ে দেখা গেছে অধিকাংশ ক্ষেত্রেই গুচ্ছগ্রামগুলো হাট-বাজার, বন্দর তথা অর্থনৈতিকভাবে গুরুত্বপূর্ণ ব্যবস্থাগুলো হতে এমনকি সাধারণ লোকালয় বা জনপদ হ'তেও বেশ দুরে পড়ে গেছে। এতে করে গুচ্ছগ্রামে ঠিকানা প্রাপ্ত নিঃস্ব দরিদ্র মানুষগুলোকে কর্মসংস্থান বা জীবিকার জন্য কষ্ট করে অনেক দুরে যেতে হয়। যেমন-জরিপকৃত রাজারদীঘি গুচ্ছগ্রাম প্রকল্পের মোট ১০৬টি পরিবারের মধ্যে সর্বোচ্চ ৬৬টি পরিবার প্রধানের পেশা হচ্ছে দিনমজুরী। এদের অধিকাংশই মির্জাপুর এবং শেরপুরস্থ ধানের মিলে (বয়লার) কাজ করে যার দুরত্ব যথাক্রমে ৩ কিঃ মিঃ ও ৭ কিঃ মিঃ। এছাড়া বিভিন্ন ধরনের চাকুরী, ব্যবসা বা রিক্সা-ভ্যান চালিয়ে যারা জীবিকা অর্জন করে তাদেরকেও প্রতিদিন ৩ হতে ১০ কিঃ মিঃ পথ অতিক্রম করতে হয়। ফলে গুচ্ছগ্রামের বাসিন্দাদের জীবিকা অর্জনের জন্য গন্তব্য স্থানে

যেতেই প্রতিদিন প্রচুর সময় ও শ্রম ব্যয় করতে হয়। ফলশ্রুতিতে অর্থনৈতিকভাবে সকলেই ক্ষতিগ্রস্ত হয়। এমনকি গুচ্ছগ্রামের বাসিন্দাদের উৎপাদিত শাক-সবজী, ডিম, মাছ প্রভৃতি বিক্রির জন্যও কাছাকাছি কোন হাট, বাজার না থাকায় হয় সস্তায় গ্রামের জনসাধারণের নিকট বিক্রয় করতে হয়, নতুবা সামান্য দ্রব্যাদি নিয়ে কয়েক মাইল যেয়ে সারাদিনে সেগুলো বিক্রয় করে ফিরতে হয়।

২) প্রকল্পাধীন মানুষগুলো সংগঠিত নয় এবং তাদের মাঝে একতার যথেষ্ট অভাব রয়েছে। নামেমাত্র একটি সমিতি সেখানে থাকলেও তার কোন কার্য্যক্রম বর্তমানে নেই। প্রাথমিক অবস্থায় কিছু সঞ্চয় জমা হলেও কোন সাধারণ সভা, সাপ্তাহিক সভা বা মাসিক সভা হয় না। এর কারণ অনুসন্ধান করে জানা যায় যে, প্রাথমিক অবস্থায় জমাকৃত সঞ্চয়ের টাকা নিয়ে পারস্পরিক অবিশ্বাস, জীবিকার তাগিদে মানুষগুলোর ভোর হতে রাত পর্যন্ত গৃহের বাহিরে অবস্থান, অনেকে সন্ধ্যায় ঘরে ফিরলেও সারাদিনের পরিশ্রমের ক্লান্তিতে অবসন্ন থাকায়, সর্বোপরি সমিতির কার্য্যক্রমে তাদেরকে যথাযথভাবে উদ্বুদ্ধ না করায় এর সুফল সম্পর্কে অবগত বা সচেতন না হওয়া ইত্যাদি কারণে দরিদ্র অশিক্ষিত মানুষগুলো সমিতির কার্য্যক্রমে মোটেই আগ্রহী হয় না।

৩) অশিক্ষা বা অজ্ঞতার ফলে গুচ্ছগ্রামের মানুষগুলো নিজেদের স্বার্থ সম্পর্কে মোটেই সচেতন নয়। ফলে প্রকল্প প্রাঙ্গনে প্রাইমারী স্কুল থাকা সত্বেও গুচ্ছগ্রামের ছেলেমেয়েরা স্কুলে আসে না। তেমনিভাবে প্রতিটি পরিবারকে একটি করে জলাবদ্ধ পায়খানা উপকরণ সরবরাহ করা হলেও বহুসংখ্যক পরিবার সেগুলো স্থাপন করেনি বা ব্যবহার শুরু করেনি। তারা যত্রতত্র মল-মূত্র ত্যাগ করে পরিবেশকে অস্বাস্থ্যকর করে তুলছে।

৪) পরিবার পিছু ৭ শতাংশ জমি বরাদ্দ করা হলেও অধিকাংশ পরিবার সেখানে কোন শাক-সবজি আবাদ করেনি। এমনকি সরকারীভাবে যে সমস্ত গাছ সেখানে রোপণ করা হয়েছিল সেগুলোর কোন যত্ন তারা নিচ্ছে না, উপরন্ত তাদের পালিত ছাগল মুরগী দ্বারা সেগুলো ক্ষতিগ্রস্ত হচ্ছে।

৫) প্রকল্পের বাড়ীগুলো দেখে মনে হয়েছে কর্তৃপক্ষ কত বেশী সংখ্যক পরিবার সেখানে পুনর্বাসন করতে পারবেন তার প্রতি অধিক গুরুত্ব দিয়েছেন। ফলে সমষ্টিগত সুযোগ সুবিধা যেমন-মসজিদ, প্রকল্প অফিস বা সমিতির কার্য্যালয় প্রভৃতির জন্য কোন ঘর বা স্থান রাখা হয়নি।

৬) প্রকল্পে পুনর্বাসিত ১০৬টি পরিবারের অধিকাংশই অকৃষি কাজে তাদের জীবিকা নির্বাহ করে থাকে। মুষ্টিমেয় কিছু সংখ্যক লোক বিভিন্ন মৌসুমে কৃষি কাজে দিনমজুর হিসাবে অংশগ্রহণ করে থাকে। এদের জন্য কোন প্রকার ঋণ, বৃত্তিমূলক প্রশিক্ষণ প্রভৃতির ব্যবস্থা এখন পর্যন্ত গ্রহণ করা হয়নি।

৭) প্রায় ৩২ বিঘা জমির উপর যে বিরাট দীঘি রয়েছে তাতে ব্যাপকভাবে মৎস্য চাষের উদ্যোগ অদ্যাবধি গ্রহণ করা হয়নি। প্রকল্প শুরুর প্রাথমিক অবস্থায় জেলা প্রশাসক মহোদয় এবং

স্থানীয় উপজেলা পরিষদ চেয়ারম্যান মহোদয় বেশ কিছু মাছের পোনা উক্ত দীঘিতে ছাড়লেও পরবর্তীতে তার খাদ্য প্রদান বা পরিচর্যা না করায় এগুলো অপুষ্টির শিকার হয়, ফলে যথাযথ বৃদ্ধি হয়নি।

৮) গ্রামটি যেহেতু একটি খোলা জায়গায় অবস্থিত এবং তেমন কোন গাছ-পালাও সেখানে নেই, ফলে সামান্য ঝড়-বৃষ্টি হলেও আক্রান্ত ও ক্ষতিগ্রস্ত হয়।

৯) যখনই কোন রাজনৈতিক উদ্দেশ্য নিয়ে কোন কর্মসূচী সরকার বাস্তবায়ন করেন তখন অগ্রাধিকার ভিত্তিতে তুলনামূলকভাবে অধিক গুরুত্ব দিয়ে তা করেন। স্বাভাবিকভাবেই সরকার পরিবর্তন হলে এ ধরনের কর্মসূচী পুনর্বিবেচনা করে তার গুরুত্ব নির্ধারণ করা হয়। প্রয়োজনে পদ্ধতি ও কাঠামো পরিবর্তত হতে পারে। ঠিক এ ধরনের একটি প্রকল্পই হচ্ছে গুচ্ছগ্রাম যার ভবিষ্যত নিয়ে এখনই কোন মন্তব্য করা যাচ্ছে না।

প্রস্তাবিত সুপারিশমালা

উপরোক্ত সমস্যাদি পর্যালোচনা করে নিঃস্ব আশ্রয়হীন দরিদ্র মানুষের পুনর্বাসনের এই মহৎ উদ্যোগকে আরো সুষ্ঠুভাবে বাস্তবায়নের লক্ষ্যে কিছু সুপারিশ নিম্নে পেশ করা গেলঃ

১) গুচ্ছগ্রাম প্রকল্পকে অগ্রাধিকার ভিত্তিতে জাতীয় কর্মসূচী হিসেবে ঘোষনা করে থানা পর্যায়ে স্থানীয় প্রশাসনকে এর বার্ষিক উন্নয়ন কর্মসূচীর আওতায় তা বাস্তবায়নের দায়িত্ব প্রদান করা যেতে পারে। থানা প্রশাসনের অধীনে কর্মরত বিভিন্ন জাতিগঠন বিভাগগুলোর সমন্বয়ে একটি টাস্ক ফোর্স গঠন করে তাঁদেরকে প্রকল্প বাস্তবায়নের দায়িত্ব প্রদান করা হলে দায়-দায়িত্ব নির্ধারণ ও জবাবদিহি ব্যবস্থা আরো কার্যকর করা যাবে।

২) যেহেতু একেবারে নিঃস্ব, বিত্তহীন মানুষগুলোকে গুচ্ছগ্রামগুলোর আওতায় পুনর্বাসনের ব্যবস্তা করা হচ্ছে যারা অশিক্ষিত অজ্ঞ, অদক্ষ, তাদের কমপক্ষে তিন বছর দায়িত্ব প্রাপ্ত কর্তৃপক্ষের প্রত্যক্ষ তদারকিতে রাখা প্রয়োজন। অন্যথায় প্রদত্ত ভূমি ও উপকরণ অশিক্ষিত দরিদ্র মানুষগুলো ধরে রাখতে পারবে না। ঘনিষ্ট তদারকিতে যে সুফল পাওয়া যায়, গ্রামীণ ব্যাংক তার সর্বোৎকৃষ্ট উদারণ। তদারকির তিন বছরে পুনর্বাসিত মানুষগুলোকে ব্যবহারিক শিক্ষা, স্বাস্থ্য, পরিবার পরিকল্পনা, আধুনিক কৃষি প্রযুক্তি, ধর্ম ও নৈতিকতা প্রভৃতি বিষয়ে জ্ঞানদান ও প্রশিক্ষণের ব্যবস্থা করা যেতে পারে এবং সাফল্যজনকভাবে প্রশিক্ষণ সমাপ্তির পর তাদের জন্য ঋণের ব্যবস্থা করা যেতে পারে। এ ব্যাপারে পল্লী কর্মসহায়ক ফাউন্ডেশন এর সহযোগিতা গ্রহণ করা যেতে পারে।

৩) গুচ্ছগ্রামবাসীদের আয় বৃদ্ধিমূলক কর্মকান্ডে উৎসাহিত করার জন্য নিকটস্থ হাট-বাজার সমূহের সাথে যোগাযোগ উন্নয়নের মাধ্যমে উৎপাদিত পণ্য বাজারজাতকরণ ও অধিকতর মূল্য প্রাপ্তির সুযোগ সৃষ্টি করা যেতে পারে।

৪) কেবলমাত্র কৃষিক্ষেত্রে বা কৃষি নির্ভর পেশায় গ্রামের সকল সদস্যের কর্মসংস্থান সম্ভব হয়ে উঠে না। এমতাবস্থায় গুচ্ছগ্রামের অধিবাসীদের মধ্যে জরিপ চালিয়ে যাদের প্রাথমিক জ্ঞান,

ধারণা ও আগ্রহ রয়েছে এ ধরনের লোকদের বিভিন্ন বৃত্তিমূলক প্রশিক্ষণের ব্যবস্থা করা যেতে পারে যার মাধ্যমে তারা অকৃষিমূলক পেশাতে কর্মসংস্থান করতে পারবে।

৫) প্রকল্পের আওতায় প্রাপ্ত যৌথ সম্পদের সর্বোচ্চ সদ্ব্যবহার নিশ্চিত করার লক্ষ্যে প্রতিটি গুচ্ছগ্রামে একটি করে শক্তিশালী সমবায় সংগঠনের ব্যবস্থা করতে হবে। এ ব্যাপারে বাংলাদেশ পল্লী উন্নয়ন বোর্ড বিশেষ প্রকল্প বা কর্মসূচী নিয়ে এগিয়ে আসতে পারে। প্রায় প্রতিটি গুচ্ছগ্রামেই একটি করে বড় পুকুর বা দীঘি রয়েছে। এসমস্ত পুকুর বা দীঘি সমূহে সমবায়ের মাধ্যমে নিবিড় কর্মসূচী নিয়ে মাছ ও হাঁসের চাষ করলে কয়েক বৎসরের মধ্যে এ সমস্ত দুঃস্থ ও বিত্তহীন পরিবার স্বাবলম্বী হয়ে যাবে এতে আশ্চর্যের কিছু নেই।

৬) যেহেতু গুচ্ছগ্রামগুলোর অবস্থান নদীর ধারে বা খোলা জায়গায় অবস্থিত, এমতাবস্থায় প্রাকৃতিক দুর্যোগের হাত হতে রক্ষার জন্য প্রকল্পের শুরুতেই চারিধারে দ্রুত বাড়ন্ত/বর্ধনশীল বিভিন্ন গাছ-পালা লাগানোর ব্যবস্থা গ্রহণ করা যেতে পারে। এ ছাড়া ঘরগুলোর উচ্চতা কমিয়ে লাগসই প্রযুক্তির প্রয়োগও করা যেতে পারে।

৭) বাংলাদেশে বেশ কয়েক হাজার দেশী বিদেশী এনজিও দরিদ্র মানুষের আর্থ-সামাজিক অবস্থার উন্নয়নে কাজ করে যাচ্ছে। এগুলো বিচ্ছিন্নভাবে কাজ করে যাচ্ছে যা আপাতঃ দৃষ্টিতে দরিদ্র মানুষের ভাগ্যোন্নয়নে কিছুটা সহায়ক হলেও কোন স্থায়ী সমাধান দিতে পারছে না। এমনকি অনেক ক্ষেত্রে এরা সরকারী কর্মসূচীর প্রতিবন্ধকতা বা অন্তরায় হিসেবে দেখা দিচ্ছে। এমতাবস্থায় সরকার বিভিন্ন এলাকায় কর্মরত এনজিও সমূহকে কিছু নির্দিষ্ট গুচ্ছগ্রাম বাস্তবায়নের দায়িত্ব অর্পণ করতে পারে। এতে সরকারের উপর অর্পিত বিরাট দায়িত্বের বোঝা যেমন কিছুটা হাল্কা হবে তেমনিভাবে এনজিও গুলোও জাতিগঠনে সুনির্দিষ্ট ভূমিকা পালন করতে পারবে।

৮) যেহেতু গ্রামগুলো দরিদ্র অশিক্ষিত মানুষ নিয়ে প্রতিষ্ঠিত তাদের কোন প্রতিনিধিত্ব স্থানীয় সরকার তথা ইউনিয়ন পরিষদে নেই। এমতাবস্থায় প্রতিটি গুচ্ছগ্রাম হতে সেখানকার সমিতির সভাপতিকে পদাধিকার বলে স্থানীয় ইউনিয়ন পরিষদের মনোনীত সদস্য হিসেবে রাখার বিধান করা যেতে পারে। এর মাধ্যমে তারা তাদের বিভিন্ন সমস্যার কথা স্থানীয় সরকার সংস্থায় তুলে ধরতে পারবে।

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A COMPARATIVE ANALYSIS OF DIESEL AND ELECTRICALLY OPERATED PUMPS AND TUBE-WELLS FOR IRRIGATION

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SUMMARY

The paper aims at a comparative analysis of diesel and electrically operated pumps and tube-wells for irrigation in Bangladesh agriculture. The analysis is based on field data collected from a total of 140 minor irrigation units (Shallow Tube-wells, Deep Tube-wells and Low-Lift pumps). The relative advantage of the two pump types (electric and diesel) is evaluated mainly in terms of the cost of operation per unit of area irrigated. The other aspects of the two pump types that are also compared include: average area irrigated, average number of farmers participating in the command area and average number of hours of the pump operation per week. The electrified pumps of all types (DTW, STW and LLP) appeared to enjoy a clear cost advantage over their dieselised counterparts. The differences in total operation cost between electric and diesel pumps seemed to arise mainly due to the saving in fuel cost resulting from the use of electricity. Electrified pumps did not appear to enjoy any significant advantage over diesel pumps with respect to area irrigated, number of users and hours operated per week.

INTRODUCTION

Since the creation of the Rural Electrification Board (REB) in 1977, Bangladesh has been experiencing electrification of her villages on a massive scale. This is expected to bring about changes in agriculture through the expansion in the acreage under power operated minor irrigation units: Low-Lift Pumps (LLPs), Shallow Tube-Wells (STWs) and Deep Tube-Wells (DTWs) (REB, 1986: 2). There is no doubt that irrigation water is an essential ingredient of the strategy for raising agricultural productivity. What is less clear, however, is the validity of the assertion that the introduction of electricity in rural areas will

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lead to an expansion in lift irrigation. Assuming that the non-energy related barriers to mechanised irrigation - farm and plot sizes, water availability, access to capital, lack of suitable seeds, draft power, agricultural chemicals - either do not exist or can be overcome, a farmer's decision to mechanically irrigate or not is most likely to be influenced by the cost of such irrigation. This, in turn, is determined largely by the cost of energy used in prime mover. Available evidence shows that energy cost accounts for a major portion of the total operating cost of pump sets (up to 78 percent and 62 percent respectively for typical diesel and electricity operated DTWs) (USAID and REB, 1983 : 200). In the specific context of Bangladesh, the mechanised irrigation units can be powered either by diesel or by electricity. These two can be viewed as perfect substitutes, meaning that the quantity of water that an electrically operated pump set of certain technical specification can lift per unit of time can also be lifted by a diesel operated pump set of the same specification. Viewed in this sense, an association between electricity and the expansion in lift irrigation can only be thought to exist if electricity possesses enough cost advantage over diesel. It may also be argued that electricity, by ensuring an even flow of energy compared to diesel, may enable pumps to operate for longer hours per unit of time and because of this, an electrified pump set of certain technical specification can be expected to have a larger command area compared to a diesel pump of the same specification operated under similar agro-climatic conditions.

OBJECTIVES OF THE PAPER

The above issues are empirical rather than theoretical. The present paper makes an attempt to resolve these issues from empirical observations. To be more specific, it aims at investigating if electricity as a source of energy for pumps and tube-wells offers any advantage, over diesel, to pump users. The relative advantage of the two pump types (electric and diesel) is evaluated mainly in terms of the cost of operation per

unit of area irrigated. The other aspects of the two pump types that are also compared include : average area irrigated, average number of farmers' participation in the command area and average number of hours of the pump operation per week. The analysis is expected to broaden our understanding of the issues and provide an improved basis for future planning of the rural electrification programmes in the country.

METHODOLOGY

The analysis is based on field data collected through a schedule administered to the owners/operators of 140 pump sets, both electrified and dieselised. The pump sets were selected from 56 villages of Savar and Dhamrai upazilas of Dhaka district and Chandina and Daudkandi upazilas of Comilla district. While the electrified pump sets were from electrified villages only, the dieselised pump sets were from both electrified and non-electrified villages. All the pump sets were in operation during the boro season of 1986-87. In the survey villages there were a total of 262 pump sets (66 DTWs, 124 STWs and 72 LLPs). Initially it was decided to include all of these pumps in the survey but ultimately we had to end up with only 140 of them. The rest of the pumps could not be covered mainly because of the unwillingness of the owners/ managers of these pumps to supply all or some of the important information we sought. Some of the cases were deliberately rejected as information supplied were probably made up or fabricated. The distribution of the sample pumps by village, by type and by the kind of energy used is shown in Table 1.

THE FINDINGS

COST OF OPERATION

The total operating cost of a pump set was defined to include the cost of fuel (electricity or diesel), lubricant, repair and maintenance, transportation, the operator's salary and other miscellaneous costs. Clearly then, all the cost components included are not truly variable in nature. In fact, it is the sum of cost components which are: (a) fixed, (b) variable, and (c) partly fixed and partly variable for a given period of time.[1]

Table 1 : Distribution of the Pumps and Tube-wells in the Sample by Village, by Type and by Kind of Energy Used

Pump type	Electrified villages		Non-electrified villages	Row total
	Electric pump	Diesel pump	Diesel pump	
Shallow Tube-well (all are of 5.0 HP)*	31	5	19	55
Deep Tube-well	23	3	13	39
25 HP	12	3	5	20
30 HP	11	-	8	19
Low-Lift Pump	28	4	14	46
5.0 HP	14	2	7	23
7.5 HP	14	2	7	23

*** HP means Horse Power**

The unit of indicator of performance used for calculating the cost was the amount of land (acre) irrigated during the boro season of 1986-87.

The data on the total operating cost of different Tube-Well types (without reference to the unit used to measure performance, that is, area irrigated) are summarised in Table 2. As appears from the table, electrified pumps enjoy a clear cost advantage over their dieselised counterparts. The economic cost (cost of operation) advantage of a typical electric irrigation unit over a comparable dieselised one amounts to about Tk. 8,339.00 for DTWs, Tk. 2,193.00 for STWs and Tk.1,550.00 for LLPs. The advantage appears to be substantially higher when the figures in Table 2 are adjusted for the area irrigated by each type of equipment. The per acre operating cost of irrigation by electrified and dieselised pumps are reported in Table 3. For each electrically operated STW, the mean overall operating cost was Tk.11,153.00 and the average area irrigated was about 12.77 acres[2]. Thus the cost of irrigation per acre for electrically operated STWs was Tk. 873.00. For diesel operated STWs, the mean overall operating cost was Tk. 13,347.00 and the average area irrigated was 12 acres. Thus per acre operating cost for diesel

operated STWs was Tk.1,116.00. Therefore, an electrical STW saves Tk. 243.00 per acre in total operating cost. In similar ways the costs of operation per acre of electrically operated DTWs and LLPs were estimated to be lower by Tk. 294.00 and Tk. 232.00 respectively than their diesel operated counterparts.

The above observations, however, give only a general idea of the total operating cost. The observations show the cost of irrigation at a particular level of operation in terms of area irrigated. But they do not indicate how the cost components – fixed and variable – behave at different levels of operation. In order to make up this deficiency, total operating costs (in taka) observed in different cases were regressed against unit of performance, i. e., area irrigated in acres during the boro season of 1986-87. The results are reported in Table 4. The regression results clearly indicate the superiority of electric pumps over the diesel pumps from the operating cost point of view. On an average, the electrified STWs cost Tk. 515.19 less in fixed cost per season and Tk.192.21 less per acre in variable cost than the dieselised STWs. The electrified STWs, on an average, were estimated to have irrigated about 13 acres in the winter season of 1986-87 (Table 5). At this level of performance, the difference in the total operating cost will be Tk. 3,014.00 in favour of electrified STWs.

Table 2: Mean* Operating Cost of Different Irrigation Equipments (For the boro season of 1986-87)

Cost components**	STW		DTW		LLP	
	Electric (N=31)	Diesel (N=24)	Electric (N=23)	Diesel (N=16)	Electric (N=28)	Diesel (N=18)
Fuel	6,015.00	7,603.00	20,446.64	30,007.87	6,417.17	8,401.44
Lubricant	282.58	516.87	1,102.43	1,131.06	374.21	476.00
Transport	465.16	691.04	1,272.08	1,259.12	798.39	899.88
Repair	1,673.25	1,822.15	3,646.82	2,999.69	1,930.21	1,690.88
Operator's salary	2,390.32	2,316.66	3,800.00	3,512.50	2,357.14	2,043.05
Miscellaneous	327.41	395.83	1,060.87	695.31	307.60	228.55
Total	11,153.72	13,347.12	31,328.84	39,668.56	12,188.72	13,739.44

Source : Survey data

* The mean cost for a particular type of pump set is computed as the sum of each cost component of all pump sets in that category divided by the total number of pump sets in that category.

** The division of the total operating cost into the above six components is in accordance with the way in which records are maintained by most of the pump owners/managers. Fuel costs include the cost of electricity or diesel used to power the machine. Lubricant cost is the cost of lubricant consumed by the machine. Cost of repair refers to the expenses incurred in connection with purchase of spare parts for the machine and payment made to the mechanics/workshops. Transportation cost includes the cost of carrying the machine and accessories to the installation site, cost of carrying diesel and lubricant from market to the pump house and taking the machine or parts of it to and from the workshop. Other miscellaneous cost includes the costs associated with maintaining and cleaning the main drain, etc.

Table 3 : Cost of Irrigation per Acre by Different Pump Categories (Tk)

Cost components**	Pump categories					
	STW		DTW		LLP	
	Electric	Diesel	Electric	Diesel	Electric	Diesel
Electricity	471.00	----------	564.45	----------	451.59	----------
		(53.93		(65.26		(52.65)
Diesel	----------	635.92	----------	878.77	----------	666.72
		(56.97)		(75.80)		(61.15)
Lubricant	22.12	43.23	30.43	33.05	26.61	37.77
	(2.53)	(3.87)	(3.52)	(2.85)	(3.10)	(3.46)
Transpor-	36.42	57.79	35.12	36.79	56.18	71.38
tation	(4.17)	(5.18)	(4.06)	(3.17)	(6.55)	(6.55)
Repairement	131.03	152.46	100.67	87.66	135.81	134.18
	(15.00)	(13.66)	(11.64)	(7.56)	(15.83)	(12.31)
Operator's	187.14	193.75	104.90	102.65	165.85	162.13
salary	(21.43)	(17.36)	(12.13)	(8.86)	(19.34)	(14.87)
Miscellaneous	25.63	33.10	29.29	20.31	21.65	18.13
	(2.93)	(2.96)	(3.39)	(1.75)	(2.52)	1.66)
Total cost	873.34	1,116.25	864.86	1,159.23	857.69	1,090.31
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source : Table 2 and Table 6
Note : Figures in parentheses indicate percentages

Table 4: Regression Estimates Between Total Operating Cost (Y) and Area Irrigated (X)

Pump type	Regression estimates	Tested range	R^2	No. of observations
Shallow Tube-well				
Electrified	Y_E=1,207.44+779.97X_1^* (13.71)	X_E=7 to 17.5	.86	31
Dieselised	Y_D=1,722.63+972.18X_2^* (10.10)	X_D=6.66 to 15	.82	24
Deep Tube-well				
Electrified	Y_E=3,783.02+760.42X_1^* (15.74)	X_E=26.5 to 55	.92	23
Dieselised	Y_D=3,580.69+1054.62X_2^* (57.16)	X_D=25 to 57	.99	16
Low-Lift Pump				
Electrified	Y_E=3,960.10+578.98X_1^* (7.68)	X_E=11.9 to 20	.69	28
Dieselised	Y_D=4,067.90+764.10X_2^* (12.85)	X_D=10 to 15	.92	18

Notes: 1. Y_E and Y_D stand for total operating cost (in taka) of electrified and dieselised irrigation units respectively for the boro season of 1986-87. X_1 and X_2 stand for the amount of land irrigated (in acres) by electrified and dieselised irrigation units respectively during the boro season of 1986-87. X_E and X_D stand for the tested range for the electrified and dieselised irrigation units respectively. The tested range is set by the lowest and the highest command area observed in the case of the sample irrigation units of each type. Figures in parentheses are t-values.

2 The relationships should be considered valid only for the tested range. The relationships may or may not be valid beyond the tested range.

* Significant at 1 percent level.

The electrified DTWs, on an average, cost Tk. 294.19 less per acre of land irrigated than the dieselised DTWs but cost Tk 202.33 more in fixed cost. The electrified DTWs, on an average, were estimated to have irrigated about 36 acres

during the boro season of 1986-87 (Table 5). At this level of performance, the difference in total operating cost will be Tk. 10,389.00 in favour of electrified DTWs.

The electrified LLPs, on an average, cost Tk.107.80 less in fixed cost and TK.185.12 less per acre of area irrigated (i.e., in variable cost). The electrified LLPs were estimated to have irrigated an average of about 14 acres during the boro season of 1986-87. At this level of performance, the difference in total operating cost will stand at Tk. 2,699.00 in favour of the electrified LLPs.

The difference in total operating cost between electrified and dieselised pumps appears to result from lower fuel cost for electrified pumps (Table 3). Per acre fuel cost for electrified pumps is lower by Tk.165.00 for STWs, Tk.314.00 for DTWs and Tk.215.00 for LLPs compared to their dieselised counterparts. Another source of cost saving for electrified pumps appears to be the cost of lubricant which is substantially higher for all three types of diesel pumps. The need to transport diesel and lubricant might also have contributed to the higher transportation cost per acre irrigated for diesel operated pumps than those for electric pumps. Part of the cost reduction for electric pumps, however, seems to have been offset by the higher cost of maintenance and repair compared to the dieselised ones. Per acre cost of payment of salary to the pump operators was more or less the same for both types of pumps.

COMMAND AREA

Estimates vary as to the maximum area that a particular type of pump is technically able to irrigate in Bangladesh. According to the officials of the Bangladesh Agricultural Development Corporation (BADC), the maximum command area should be 20 acres for a 1 cusec STW, 60 acres for a 2 cusec LLP and 100 acres for a 2 cusec DTW.[3] A much quoted study of LLPs in Bangladesh by Alam estimated the maximum capacity of a 2 cusec diesel pump which varied from 60 acres in Naogaon of the Northern part of Bangladesh to 117.75 acres in Sylhet of the Eastern part of Bangladesh (Alam, 1974 : 11).

The actual command areas of different pumps are, however, substantially lower than what is technically feasible. Alam estimated the capacity utilization of LLPs to vary between 9.96 percent in Sylhet to 48.77 percent in Itna of central Bangladesh (Alam, 1974 : 11). Official statistics, which are widely believed to be biased upwards (Pray, 1980 : 1-38), of the command area of different pump types in Dhamrai upazila in the survey year are as follows[4]:

DTW 32 acres (average of 71 units)
STW 10 acres (average of 45 units)
LLP 25 acres (average of 25 units)

There is a consensus that the low capacity utilization is due to such technical factors as poor siting, scarcity of water, low pump discharge, high conveyance losses as well as managerial inefficiencies and institutional weaknesses (Alam, 1974; Huq and Hossain, 1988). It was stated at the outset that electricity and diesel are perfect substitutes as sources of power for pump sets. This, coupled with the fact that tube-well irrigation irrespective of the type of fuel used has very high payoffs, seems to suggest that the type of fuel used is unlikely to affect the command area of a particular pump set.

The findings of the present study with respect to the average command area of the electric and the diesel pumps are reported in Table 5. As appears, the electric pumps of all the three categories (STW, DTW and LLP) have slightly higher command areas than their dieselised counterparts. The mean command area for electrified STWs is found to be 12.77 acres compared to 11.90 acres for dieselised STWs. The electrified DTWs report an average command area of 36.22 acres as against 34.21 acres for the dieselised ones. For the electrified LLPs, the mean command area is 14.21 acres as against 12.60 acres reported for the dieselised LLPs. The differences, however, are statistically not significant.

NUMBER OF USERS

Intuitively, a pump set that has a higher command area is also likely to serve a large number of farmers. This then means that the same factors that constraint the capacity utilization of

a pump set can also be the factors that influence the number of farmers that a pump can serve. It is sometimes alleged that the recent policy of privatization of irrigation units has resulted not only in the reduction in the command area but also in the reduction of the number of participating farmers per pump (Islam, 1987 : 39). It may be attributed to certain factors. First, privately owned pumps are often located optimally in relation to the owner's land and thereby often in a topographical position where the total potentially irrigable area (and the number of farmers therein) is smaller than what a pump can technically cover. Second, supplying water to all farmers within the command area of a pump may be contrary to the interest of powerful owners who, by withholding water, may try to depress the price of a plot of land in the command area and then earn the uncontested first call on the land as it goes up for sale.

Table 5 : Command Area for Electrified and Dieselised Pumps (in acres)

Pump type	Electric pumps	Diesel pumps	Percent difference between electric and diesel pumps
STW			
Mean	12.77	11.95	6.82
Count	(31)	(24)	
Sum	395.95	286.97	
Std. Dev.	2.98	2.06	
DTW			
Mean	36.22	34.21	5.86
Count	(23)	(16)	
Sum	833.16	547.50	
Std. Dev.	8.76	8.89	
LLP			
Mean	14.21	12.60	12.78
Count	(28)	(18)	
Sum	397.94	226.82	
Std. Dev.	1.92	1.54	
Column total			
Mean	19.84	18.30	
Count	(82)	(58)	
Sum	1627.05	1061.32	

Source : Survey data

Statistics : $t_{STW} = .253$
$t_{DTW} = .171$
$t_{LLP} = .399$
None significant
Table t = 2.57 for 1%
1.96 for 5%

The findings of the present study in this respect are presented in Table 6. The average number of participating farmers for 139 irrigation units for which information were available came to 35.72. For electrical pumps there were 36.81 participants per pump and for diesel pumps were 34.20 participants per pump.

In the case of the 54 STWs there was an average of 23.19 users per pump. Of the 54 STWs 30 were electrified and had an average of 24.45 participants per pump. The other 24 diesel operated STWs had an average of 21.45 users per pump. The average number of users for electrical DTWs and LLPs was also slightly higher than dieselised ones. But the differences are not statistically significant.

HOURS OPERATED

The sampled pumps (diesel and electrical), on an average, were operated for 85.82 hours per week or 12.25 hours per day during the peak irrigation period of the boro season in 1986-87 (the two month period from tillage onward). The electrically operated pumps worked on an average for 89 hours per week compared to 81 hours per week for the diesel operated pumps (Table 7).

The 30 electrically operated STWs worked, on an average, for about 91 hours a week whereas the 24 diesel operated STWs worked, on an average, for 78 hours. The mean operating hours were found to be higher for electrified DTWs (103.6 hours/week) compared to diesel ones (89.25 hours/week). Operating hours for electrified LLPs, however, were lower compared to dieselised LLPs. The t-statistics reveal no significant difference for any of the three categories of pumps.

Table 6: Number of Users in the Command Areas of Pump Sets

Pump type	Electric pumps	Diesel pumps	Row total
Shallow Tube-well			
Mean	24.46	21.45	23.19
Count	(30)	(24)	(54)
Sum	734.00	515.00	1249.00
Std. Dev.	7.36	6.13	---
Deep Tube-well			
Mean	65.52	63.37	64.64
Count	(23)	(16)	(39)
Sum	1507.00	1014.00	2521.00
Std. Dev.	11.27	11.81	---------
Low-Lift pump			
Mean	26.46	25.27	26.00
Count	(28)	(18)	(46)
Sum	741.00	455.00	1196.00
Std. Dev.	5.75	5.20	---------
Column total :			
Mean	36.81	34.20	35.72
Count	(81)	(58)	(139)
Sum	2982.00	1984.00	4966.00

Source : Survey data

Statistics : $t_{STW} = 1.565$

$t_{DTW} = 0.569$

$t_{LLP} = 0.724$

None significant

Table 7: Number of Hours Operated Per Week of Electric and Diesel Pumps

Pump type		Electric pumps	Diesel pumps	Row total
STW				
	Mean	90.76	78.41	85.27
	Count	(30)	(24)	(54)
	Sum	2723.00	1882.00	4605.00
	Std. Dev.	28.91	18.29	---
DTW				
	Mean	103.60	89.25	97.71
	Count	(23)	(16)	(39)
	Sum	2383.00	1428.00	3811.00
	Std. Dev.	32.19	21.44	----------
LLP				
	Mean	75.67	77.50	76.39
	Count	(28)	(18)	(46)
	Sum	2119.00	1395.00	3514.00
	Std. Dev.	19.66	19.28	----------
Column total :				
	Mean	89.19	81.12	85.82
	Count	(81)	(58)	(139)
	Sum	7225.00	4705.00	11930.00

Source : Survey data

Statistics : $t_{STW} = 1.91$

$t_{DTW} = 1.67$

$t_{LLP} = 0.31$

None significant

SUMMARY OF FINDINGS

The analysis so far reveals two major facts. First, electrified pumps of all types (DTW, STW, and LLP) appear to enjoy a clear cost advantage over their dieselised counterparts. The differences in total operating cost between the two categories of pumps (electric and diesel) arise mainly due to the saving in fuel cost resulting from the use of electricity.

Second, electrified pumps do not appear to enjoy any significant advantage over diesel pumps with respect to area irrigated, number of users and hours operated per week. Results of statistical tests show no significant difference between the performance of the two types of pump in this respect.

NOTES

1. Of all the cost items, fuel (electricity or diesel) is a truly variable cost as it varies directly with the area irrigated or more appropriately, the hours the pumps are operated. Lubricant, like fuel, is mainly variable. The incidence of machine breakdown that results in major expenses for repair is largely unpredictable. The cost incurred for that may or may not be related to the area irrigated or hour operated in the short run. But over a reasonably long period of operation, such cost will certainly be related to the area irrigated or hour operated (longer the hour operated more frequent will be the incidence of machine failure and therefore, higher will be the repairing cost). In that sense the cost of repair is a variable cost. Usually operators are also the mechanics for petty repair cum night guards of the machine. Part of their services are required irrespective of whether the machine works or not. Hence salary to the operator can be considered as partly fixed and partly variable. Cost of transportation includes the cost of transporting the machine and accessories to the installation site (fixed cost -- applies mostly to the BADC rented pumps), cost of transporting diesel and lubricant from market (petrol station) to pump houses (variable cost) and taking the machine or part (s) of it to and from workshop (related to machine breakdown and therefore both fixed and variable cost).

2. The average areas irrigated by each type of tube-well used throughout this paper are those that are estimated by present study and reported in Table 5.

3 This information was collected through a personal interview with Mr. Sirajul Islam, Senior Sub-Assistant Engineer, BADC, Irrigation Unit -- II, Daudkandi Upazila, Comilla.

4. The statistics were supplied by Mr. Nabi Hossain, Senior Sub-Assistant Engineer of BADC irrigation unit of Dhamrai upazila.

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DETERMINANTS OF EMPLOYMENT IN THE MANUFACTURING INDUSTRIES : THE CASE OF BANGLADESH

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SUMMARY

The knowledge of the responsiveness of employment to the changes in its determinants is necessary in formulating effective economic policies to create more jobs in the industrial sector. An attempt is made to estimate wage and output elasticities of employment by applying CES production function model. It is found that wage-rate and output levels are important variables that affect employment in the industrial economy. Thus one can derive from this analysis the implications of trade and other economic policies in influencing wage-rental ratios.

INTRODUCTION

Bangladesh is a typical poor country with growing unemployment of labour, rising faster than the population growth. Its prospects for future development will depend largely on how best this problem is tackled. While unemployment has its own different aspects and inter-relations with other economy-wide problems, the main concern of this study is to examine only the potential of the industrial sector for helping resolve this problem. The manufacturing industry of Bangladesh is a small sector in the economy and its contribution to total employment is very low. However, given the current heavy pressure of unemployment, even a small additional productive contribution to the existing level of employment is important for Bangladesh.

In formulating effective economic policies to create more jobs in the manufacturing industries, knowledge of the responsiveness of employment to the changes in its determinants is necessary. The purpose of this paper is to

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examine the relationship between employment and its two main determining variables, i. e. output and wage rate of the eighteen manufacturing industries of Bangladesh during the period 1973-74 to 1981-82.

The paper is divided into three sections. Section one discusses issues related to methodology and data, section two analyses the empirical findings and finally there is a concluding section dealing with its implications for Bangladesh.

METHODOLOGY AND DATA

The decision of a firm on the level of employment of different factor inputs is based on the maximisation of profits or the minimisation of costs subject to a technological constraint exhibited by the production function. Therefore, a demand function for any factor input must be derived from an analysis of the production function. The exact form of the production function should be specified in order to derive the demand function for a particular factor input. It is well-known that the CES (Constant Elasticity of Substitution) production is more general in respect of substitutability between different factors of production.[1] Labour demand function for the manufacturing industries is derived from an analysis of the CES production function. Thus following Coen and Hickman[2] four models have been applied to the data of manufacturing industries of Bangladesh. These models are :

$$L_t = c_o W_t^{c_1} Y_t^{c_2} L_{t-1}^{c_3} u \qquad \text{I (a)}$$

$$L_t = c_o W_{t-1}^{c_1} Y_t^{c_2} L_{t-1}^{c_3} u \qquad \text{I (b)}$$

$$L_t = b_o W_t^{b_1} Y_t^{b_2} u \qquad \text{II (a)}$$

$$L_t = b_o W_{t-1}^{b_1} Y_t^{b_2} u \qquad \text{II (b)}$$

where L = labour employed, y = output, W = wage rate, t = time period t, (t-1) = time period (t-1) and c_o, c_1, c_2, c_3, b_o, b_1 and b_2 are constants.

A few comments on some of the variables are in order now. The wage rate is an important explanatory variable of the

labour demand equations. The expected wage rate is the relevant variable in this context, because employers do not have any idea about the current wage rate at the time of employment. Employment decision is taken on the basis of expectation of the current wage rate. It is assumed that the wage rate of period (t-1) is the expected wage rate of period t. But the duration of the period of production is not known. Generally data on wage and employment are available on an annual basis. However, if the period of production is quarterly or less, the current year's wage rate will better approximate the expected wage rate since it gives more weight to the immediate past.

In the absence of detailed knowledge about the duration of the production period, wage rates of both current and last years are used. A comparison of the statistical results with the two alternative wage variables may indicate which one is relatively more important in determining employment in the manufacturing industries of Bangladesh.

Ideally data on man-hours or at least average years of labour should be used. But such data are not available in Bangladesh. Therefore, the number of average daily employees in a year has been used as employment data. For output figures, values in current prices deflated by the price index of the respective sectors have been used. For the wage data the money wage rate conventionally measured has been taken. In deriving the demand function of labour, the real wage must represent the real cost to the employer. To derive such a measure of real wage, money wage has been deflated by the price index of the relevant sector. Such a real wage rate is normally termed as product wage rate. All the data have been taken from the Statistical Yearbooks of 1982 and 1983-84.[3]

EMPIRICAL RESULTS OF THE DETERMINANTS OF EMPLOYMENT

The detailed results of the nineteen disaggregated industrial sectors of Bangladesh economy are presented in Tables 1 to 4. If models I(a) and I(b) are considered, it can be seen from Tables 1 and 2 that in some cases model I(a) has

performed better than model I(b). But in other cases, model I(b) has done better than model I(a). In the case of industries like food manufacturing, beverage, footwear, paper, printing and publishing, leather and its products, machinery except electrical and other manufacturing industries (eight sectors in all), the explanatory power of model I(a) is higher than that of model I(b). On the other hand, in cases of the remaining industrial sectors, the explanatory power of model I(b) is higher than that of model I(a). These sectors are tobacco, textiles, furniture and fixtures, chemical and its products, petroleum and coal products, non-metallic products, basic metal industries, metal products, electrical machinery, transport equipment and rubber (eleven industries).

In seven cases estimates of wage elasticities are statistically significant at a level of confidence of 1 per cent to 10 per cent in the context of model I(a). These industries are food manufacturing, paper, leather, metal products, machinery except electrical, electrical machinery and other manufacturing industries. On the other hand, only in the case of five industries the estimates of wage elasticities are significant at a level of confidence of 1 per cent to 10 per cent in the context of model I(b). These industries are chemicals and its products, petroleum and coal products, non-metallic products, metal products and electrical machinery. The last two of these sectors, i.e. metal products and electrical machinery have also significant estimates of wage elasticity in the context of model I(a). Thus model I(a) reveals that estimates of wage elasticity on the basis of the current wage rates are significant only in cases of seven industries o ıt of a total number of nineteen fits. On the other hand, only in five cases estimates of wage elasticity coefficients calculated by model I(b) with last year's wage are found to be significant. Model I(a) also reveals that in seven cases the estimates of wage elasticities are not significant even at a level of confidence higher than 25 per cent. In the case of model I(b), the coefficients in ten cases are not significant even at a level of confidence higher than 25 per cent.

Table 1 : Demand Function for Labour in Manufacturing Industries of Bangladesh 1973-74 to 1981-82

Industry	C_1	Significance Level of C_1	C_2	Significance Level of C_2	C_3	Significance Level of C_3	$\bar{R}_2$
Food Manufacturing	-.469 (.102)	1%	.405 (.133)	5%	.015 (.010)	15%	.912
Beverage	.442 (.658)	ns	.307 (.332)	25%	-.002 (.029)	ns	.114
Tobacco	-.018 (.327)	ns	.325 (.577)	ns	.012 (.015)	ns	.278
Textile	.058 (.352)	ns	.934 (.402)	10%	.008 (.010)	ns	.369
Footwear	1.312 (.801)	20%	.538 (.202)	5%	.035 (.062)	ns	.526
Furniture and fixtures	.023 (.326)	ns	.329 (.242)	20%	.075 (.357)	10%	.750
Paper and its products	-.609 (.232)	5%	.465 (.276)	15%	-.004 (.021)	ns	.711
Printing and publishing	-.379 (.190)	15%	.926 (.164)	1%	.005 (.016)	ns	.936
Leather and its products	1.038 (.440)	10%	.161 (.215)	ns	.053 (.034)	15%	.420
Chemicals and products	.197 (.214)	25%	.077 (.124)	ns	.028 (.010)	5%	.866
Petroleum and coal products	-.384 (.231)	15%	1.011 (.102)	.5%	-.068 (.064)	25%	.977
Non-metallic products	.633 (.418)	15%	.059 (.182)	ns	.045 (.032)	20%	.529
Basic metal industries	-.193 (.485)	ns	.136 (.360)	ns	.029 (.027)	25%	.237
Metal products	-.410 (.201)	10%	.295 (.131)	10%	.031 (.020)	15%	.845
Machinery except electrical	-.363 (.281)	5%	.643 (.105)	1%	.020 (.022)	ns	.915
Electrical machinery	1.116 (3.60)	5%	-.029 (.109)	ns	.224 (.035)	1%	.901
Transport equipment	-.592 (.983	ns	.170 (.816)	ns	.009 (.209)	ns	.470
Other manufacturing	-.704 (.198)	2.5%	.494 (.158)	5%	.067 (.019)	2.5%	.836
Rubber	.544 (1.172)	ns	.592 (.208)	5%	-.041 (.131)	ns	.970

Note: Figures in parentheses represent standard errors of the estimates.

Source: Calculated from the data reported in Bangladesh Bureau of Statistics, Statistical Yearbook of Bangladesh, 1983-84 and earlier issues.

Table 2: Demand Function for Labour in Manufacturing Industries of Bangladesh 1973-74 to 1981-82

Industry	C_1	Significance Level of C_1	C_2	Significance Level of C_2	C_3	Significance Level of C_3	$\bar{R}_2$
Food Manufacturing	-.142 (.102)	20%	-.026 (.189)	ns	.146 (.090)	15%	.642
Beverage	.234 (.412)	ns	.532 (.279)	15%	-.326 (.554)	ns	.0928
Tobacco	.188 (.134)	20%	.135 (.199)	25%	-.177 (.135)	20%	.483
Textiles	.285 (.259)	25%	1.256 (.417)	5%	-.176 (.166)	25%	.489
Footwear	-.261 (.402)	ns	.545 (.251)	10%	.262 (.418)	ns	.329
Furniture and fixtures	.141 (.186)	ns	.309 (.124)	10%	-.088 (.210)	ns	.775
Paper and its products	-.033 (.149)	ns	.030 (.344)	ns	.069 (.129)	ns	.318
Printing and publishing	-.052 (.198)	ns	.650 (.228)	5%	.082 (.208)	ns	.887
Leather and its products	.238 (.414)	ns	.076 (.341)	ns	-.209 (.439)	ns	.0
Chemicals and products	.160 (.032)	1%	.187 (.020)	.5%	-.111 (.026)	1%	.974
Petroleum and coal products	.230 (.040)	1%	.423 (.113)	2.5%	.022 (.028)	ns	.995
Non-metallic products	.538 (.184)	5%	.301 (.104)	5%	-.509 (.178)	5%	.947
Basic metal industries	-.155 (.171)	ns	-.016 (.158)	ns	.183 (.163)	25%	.323
Metal products	-.167 (.076)	10%	.137 (.112)	20%	.211 (.070)	5%	.856
Machinery except electrical	-.017 (.317)	ns	.380 (.105)	2.5%	.037 (.327)	ns	.754
Electrical machinery	-.449 (.107)	1%	.044 (.081)	ns	.607 (.114)	1%	.936
Transport equipment	.312 (.200)	15%	-.575 (.394)	20%	-.019 (.171)	ns	.617
Other manufacturing	.016 (.175)	ns	.336 (.305)	25%	.081 (.170)	ns	.424
Rubber	-.052 (.094)	ns	.659 (.095)	1%	.072 (.143)	ns	.971

Note : Same as for Table 1.
Source : Same as for Table 1.

Table 3: Demand Function for Labour in Manufacturing Industries of Bangladesh 1973-74 to 1981-82

Industry	b_1	Significance Level of b_1	b_2	Significance Level of b_2	$\bar{R}_2$
Food Manufacturing	-.560 (.091)	.5%	.582 (.073)	5%	.893
Beverage	.463 (.540)	ns	.294 (.262)	25%	.261
Tobacco	-.201 (.235)	ns	.686 (.369)	15%	.316
Textiles	-.133 (.239)	ns	1.011 (.376)	5%	.412
Footwear	1.126 (.689)	15%	.553 (.188)	5%	.580
Furniture and fixtures	-.215 (.385)	ns	.608 (.255)	10%	.605
Paper and its products	-.576 (.130)	1%	.426 (.153)	5%	.758
Printing and publishing	-.422 (.128)	2.5%	.927 (.082)	.5%	.946
Leather and its products	.941 (.487)	15%	.384 (.182)	10%	.275
Chemicals and products	-.310 (.136)	10%	.373 (.078)	1%	.730
Petroleum and coal products	-.287 (.214)	20%	.926 (.0640)	.5%	.976
Non-metallic products	.206 (.307)	ns	.279 (.099)	5%	.454
Basic metal industries	-.562 (.335)	15%	.440 (.213)	10%	.225
Metal products	-.649 (.145)	1%	.426 (.112)	1%	.808
Machinery except electrical	-.721 (.226)	2.5%	.572 (.066)	.5%	.918
Electrical machinery	.756 (.972)	ns	-.368 (.244)	15%	.260
Transport equipment	-.999 (.454)	10%	-.547 (.181)	5%	.538
Other manufacturing	-.994 (.300)	2.5%	.453 (.264)	15%	.540
Rubber	.264 (.672)	ns	.621 (.168)	5%	.972

Note: Same as for Table 1.
Source: Same as for Table 1.

Table 4 : Demand Function for Labour in Manufacturing Industries of Bangladesh 1973-74 to 1981-82

Industry	b_1	Significance Level of b_1	b_2	Significance Level of b_2	$\bar{R}_2$
Food Manufacturing	.049 (.024)	10%	.007 (.212)	ns	.545
Beverage	-.007 (.019)	ns	.454 (.231)	10%	.192
Tobacco	.013 (.010)	20%	.280 (.196)	20%	.421
Textiles	.011 (.010)	25%	.977 (.326)	5%	.478
Footwear	.012 (.061)	ns	.600 (.233)	5%	.397
Furniture and fixtures	.066 (.025)	5%	.324 (.110)	5%	.807
Paper and its products	.045 (.022)	10%	-.008 (.316)	ns	.399
Printing and publishing	.026 (.014)	15%	.720 (.135)	1%	.903
Leather and its products	.042 (.041)	25%	.026 (.246)	ns	.0
Chemicals and products	.094 (.005)	1%	.181 (.040)	1%	.839
Petroleum and coal products	.220 (.037)	1%	.478 (.087)	1%	.995
Non-metallic products	.014 (.025)	ns	.218 (.149)	15%	.443
Basic metal industries	.036 (.019)	15%	.025 (.157)	ns	.294
Metal products	.061 (.021)	5%	.210 (.169)	20%	.656
Machinery except electrical	.019 (.027)	ns	.383 (.094)	1%	.795
Electrical machinery	.160 (.068)	10%	.214 (.123)	25%	.579
Transport equipment	.293 (.094)	5%	-.571 (.360)	15%	.680
Other manufacturing	.098 (.032)	5%	.279 (.263)	25%	.498
Rubber	-.014 (.496)	ns	.696 (.058)	.5%	.975

Note : Same as for Table 1.
Source : Same as for Table 1.

It seems that the current wage rate plays a more important role than the lagged wage rate. This may also mean that the length of the production period is more representative of the expected rate in the current period. The estimates of output elasticities are significant at a level of .5 per cent to 10 per cent in nine cases in the context of model I(a). On the other hand, in the context of model I(b), eight coefficients are significant at a level of confidence of .5 per cent to 10 per cent. In seven cases, the coefficients in the context of model I(a) are not significant even at a level of confidence higher than 25 per cent. In the context of model I(b), five coefficients are not significant at a level of confidence higher than 25 per cent.

Tables 3 and 4 present the results of models II(a) and II(b). Except in eight cases, the explanatory power of model II(a) is higher than that of model II(b). In these eight cases where the explanatory power of model II(b) is higher than that of model II(a), the adjusted R^2, s of the two models are very close to each other. Generally speaking, model II(a) gives better fits to the data. The estimates of wage-elasticity on the basis of current wage rate are significant in eight cases at a level of confidence of 1 per cent to 10 per cent. In the context of model II(b) (i.e. model with lagged wage-rate) the coefficients of wage elasticity are, in nine cases, significant at a level of confidence of 1 per cent to 10 per cent. In model II(a) seven coefficients are not significant even at a level of confidence higher than 25 per cent. In model II(b) five coefficients are not significant even at a level of confidence higher than 25 per cent. All coefficients of output elasticity are significant in model II(a), the level of confidence being in some cases 15 per cent to 25 per cent. Purely on the basis of statistical results, there is no valid reason for choosing one model in place of another. But on balance both models I(a) and II(a) give better explanatory power of the estimating equations. In most cases wage-rates (either current or lagged) and current output emerge as the most important explanatory variables of the employment function.

A FEW REMARKS ON THE EMPIRICAL RESULTS

WAGE AND OUTPUT ELASTICITIES OF EMPLOYMENT

The coefficient of wages in the estimating model measures the wage elasticity of employment. In other words, this means what would be the percentage of change in employment due to a 1 per cent change in the wage rate. It is normally expected that a negative association between employment and the wage rate would prevail. Most of the coefficients are negative as revealed by models I(a) and II(a). But in many cases, particularly in the context of models I(b) and II(b), the coefficients are positive. In a major sector like textile industries, some models have surprisingly revealed that the coefficient of the wage elasticity is positive. But it must be remembered that the dominant section of the textile industries of Bangladesh were nationalised in 1972. For a long time market forces were not allowed to operate in this sector. Except in one or two cases, the estimated wage elasticity of demand in all cases is less than one. This means that the response of employment in the manufacturing industries of Bangladesh is relatively inelastic to the change in wage rate. The estimate of output elasticity measures the responsiveness of employment with respect to change in output. Except in a few cases, the coefficient is positive and this suggests that there exists a positive association between output and employment.

RETURNS TO SCALE

The returns to scale parameter, v, in the production function can be derived from equations I(a) and I(b) as follows:

$$V = \frac{1-c_1}{K} / \frac{c_2-c_1}{K}$$

and from equations II(a) and II(b) as follows :

$$V = \frac{1-b_1}{b_2-b_1}$$

The derived parameters are reported in Table 5 and the level of significance of v different from unity is shown in Table 6. In some cases the estimated coefficients of returns to scale are meaningless from the point of view of economic theory. Most of the coefficients are not significantly different from

unity. This implies that returns to scale are predominantly constant in the industrial economy of Bangladesh.

ELASTICITY OF ADJUSTMENTS

Only four coefficients of lagged employment have been found to be significant at a level of confidence of 1 per cent to 10 per cent in the context of both models I(a) and I(b). In model I(a) nine coefficients are not significant even at a level of confidence higher than 25 per cent. Whereas in model I(b) eleven coefficients are not significant even at a level of confidence higher than 25 per cent. The estimates of elasticities of adjustment for those industries where the coefficients of lagged employment are significant even at a level of confidence of 25 per cent are presented in Table 7. Except in the cases of basic metal (model I(b)), metal products (model I(b)), food manufacturing (model I(b)), and electrical machinery (both the models), in all other industries employers adjust their actual employment to desired employment quite instantaneously. In the industries mentioned above, adjustment takes place after a time lag. This may be due to high adjustment costs which are likely to rise with the speed of adjustment. Besides, lack of specific skills may be another reason for delay in adjustment since some industries are more complex in technology and requires a relatively skilled labour force which may not be adequate in supply.

Table 5 : Returns to Scale in the 19 Manufacturing Industries in Bangladesh in 1973-74 to 1981-82

Industry	Returns to Scale I(a)	Returns to Scale I(b)	Returns to Scale II(a)	Returns to Scale II(b)
Food manufacturing	1.680	9.825	1.366	23.052
Beverage	-4.140	2.568	-3.186	2.184
Tobacco	2.969	-324.870	1.354	3.697
Textiles	1.076	.736	.990	1.024
Footwear	.403	1.563	.221	1.653
Furniture and fixtures	3.188	5.121	1.476	3.628
Paper and its products	1.498	16.205	1.572	-17.763
Printing and publishing	1.057	1.498	1.020	1.404
Leather and its products	.044	-4.722	-.105	-13.947
Chemicals and products	-6.685	31.048	1.919	6.226
Petroleum and coal products	.992	3.986	1.061	3.026
Non-metallic products	-.638	-1.942	10.763	4.828
Basic metal industries	3.625	8.310	1.558	-89.227
Metal products	2.001	3.847	1.534	6.275
Machinery except electrical	1.237	2.559	1.331	2.696
Electrical machinery	.101	2.939	-.629	15.783
Transport equipment	2.090	-.777	1.293	-.818
Other manufacturing	1.423	3.076	1.378	4.987
Rubber	9.563	1.480	2.060	1.428

Notes : The estimating formula for model I(a) and I(b) is:

$$V = \left(\frac{1-c_1}{k}\right) / \left(\frac{c_2-c_1}{k}\right)$$ and that for model II(a) and II(b) is

$$V = \frac{1-b_1}{b_2-b_1}$$

Source : Calculated from Tables 1 and 2, and 3 and 4.

Table 6: Tests of Significance on the Coefficients of Returns to Scale Estimated from the Time-Series Data 1973-74 to 1981-82. (Whether returns to scale are significantly different from unity or not)

Industry	Model I(a)		Model I(b)		Model II(a)		Model II(b)	
	V	Level of Significance	V	Level of Significance	V	Level of Significance	V	Level of Significance
Food manufacturing	1.680	10%	9.825	ns	1.366	5%	23.052	ns
Beverage	-4.140	ns	2.568	ns	-3.186	ns	2.184	20%
Tobacco	2.969	ns	-324.870	ns	1.364	ns	3.697	20%
Textiles	1.076	ns	.736	ns	.990	ns	1.024	ns
Footwear	.403	ns	1.563	25%	.221	ns	1.653	20%
Furniture	3.188	ns	5.121	ns	1.476	ns	3.628	10%
Paper and its products	1.498	25%	16.205	ns	1.572	10%	-17.763	ns
Printing and publishing	1.057	ns	1.498	10%	1.020	ns	1.404	15%
Leather & its products	.044	ns	-4.722	ns	-.105	ns	-13.947	ns
Chemicals & products	-6.685	ns	31.048	ns	1.919	10%	6.226	2.5%
Petroleum & coal products	.992	ns	3.986	20%	1.061	ns	3.026	15%
Non-metallic products	-.638	ns	-1.942	ns	10.763	ns	4.828	20%
Basic metal products	3.625	ns	8.310	ns	1.558	ns	-89.227	ns
Metal products	2.001	15%	3.847	10%	1.534	5%	6.275	ns
Machinery except electrical	1.237	25%	2.559	25%	1.331	15%	2.696	5%
Electrical machinery	.101	ns	2.939	2.5%	-.629	ns	15.783	ns
Transport equipment	2.090	ns	-.777	ns	1.293	ns	-.818	ns
Other manufacturing	1.423	15%	-3.076	ns	1.378	ns	4.987	ns
Rubber	9.563	ns	1.480	5%	2.060	ns	1.428	5%

Table 7: Elasticities of Adjustment in the Selected Manufacturing Industries of Bangladesh

Industries	Model I(a)	Model I(b)
Food manufacturing	.985	.854
Tobacco	-	1.177
Textiles	-	1.176
Furniture	.925	-
Leather and its products	.947	-
Chemicals and its products	.972	1.111
Petroleum and coal products	1.068	-
Non-metallic products	.955	1.509
Basic metal industries	.971	.817
Metal products	.969	.789
Electrical machinery	.776	.33
Other manufacturing	.933	-

Notes : a) The estimating formula is $K = 1-C_3$

b) Since the coefficient of lagged employment is $C_3 = 1-K$, the elasticity of adjustment K is $1-C_3$.

Source : Calculated from Tables 1 and 2.

CONCLUSION

In this paper an attempt has been made to estimate the wage and output elasticities from an analysis of production function. It has emerged clearly that like many other developing countries wage-rate and output levels are crucial determinants of employment in the industrial economy of that country.[4] These suggest that policies which affect wage-rate and output levels will have significant influences on the employment pattern in Bangladesh. Since governmental trade and other economic policies influence the relative wage-rental ratios, they have great implications for the pattern of factor use. In a poor country like Bangladesh, perhaps there is not much scope to manipulate wage rates to foster employment due to political considerations. However, the government can certainly harness all policy measures to increase output levels. This does not mean that the government should not adopt appropriate wage policies to promote employment. What is suggested is that the government has greater political flexibility with regard to output levels.

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EFFECT OF DIFFERENT LEVELS OF WEEDING ON LATE PLANTING BORO RICE

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SUMMARY

An experiment was conducted to find out the effect of different levels of weeding on late planting boro rice in Level Barind Tract. Seven different weeding levels- un-weeded control, one-hand weeding at 15 days after transplanting (DAT), one-hand weeding at 30 DAT, two-hand weeding at 15 and 30 DAT, two-hand weeding at 15 and 45 DAT, two-hand weeding at 30 and 45 DAT and three-hand weeding at 15,30 and 45 DAT-were compared. The highest grain yield (4.11 t/ha) was obtained from three-hand weeding at 15, 30 and 45 DAT, which statistically did not have any significant difference compared to two-hand weeding at 15 and 45 DAT (4.08 t/ha), 15 and 30 DAT (3.88 t/ha) and 30 and 45 DAT (3.67 t/ha). However, there was found statistically significant difference with un-weeded control and one hand-weeding either at 15 DAT or at 30 DAT. But, two hand-weeding either at 15 and 45 DAT or at 15 and 30 DAT was found economically profitable. The extent of loss in grain and straw yield due to un-weeeded control in comparison with weeding varied from 33-69% and 35-68% respectively. The major weed species found along with the crops were Cyperus difformis L., Cyperus iria L., Paspalum distichum L., Hygroryza sp., Jussiaea sp., Heteranthera limosa, Leersia hexandra and Monochoria vaginalis (Burm. f.)

INTRODUCTION

Weeds pose a major obstacle in the way of producing agricultural crops and they are now widely regarded as pests of great menace to agriculture because they lower the production, increase costs and impair crop quality. The favourable environmental conditions commonly occuring during crop establishment period encourages excessive weed growth resulting in severe crop-weed competition (Navarez et al., 1982). Weeding is often done not at the critical period of competition. Thus, it reduces the total production on the one

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hand and increases the cost of production by reducing the effectiveness of inputs used on the other hand (Prasad and De Datta, 1979). Research results in Bangladesh indicate that the extent of yield loss due to weed infestation varies from 23-72% in Aus, 7-80% in Aman and 22-67% in Boro season (Sattar, 1986). Farmers of Level Barind Tract usually cultivate short duration boro rice of 'Purbachi' variety. The optimum time for planting boro rice is from 15 December to 15 February (BRRI, 1991). But the irrigation appliances in Level Barind Tract start into operation in the first week of February, thus the planting time becomes relatively short and a considerable hectarage is planted late (upto last February) resulting in significant yield loss. The situation is further aggravated by the severe crop-weed competition. In Bangladesh different management practices like plant spacing (plant population), seedling age adjustment and fertilization (Nitrogenous) etc, in transplanted aman and in boro rice under late planting situation have been studied to achieve higher yield. However, negligible work has been done to find out the weeding effect on boro rice under late planting situation. The present piece of work was, therefore, undertaken to find out the effects of different levels of weeding on late planting boro rice.

MATERIALS AND METHODS

The experiment was conducted in the farm of the Rural Development Academy, Bogra, during rabi season, 1990. The land was medium high and the soil was clay loam in texture having p^H value 5.5-6.5. The organic matter content of the soil was below 1%. The area of the Academy belongs to level Barind Tract Agro-Ecological Zones of Bangladesh.

The experiment was laid out in Randomised Complete Block design with four replications. The size of the unit plot was 5m X 6m. Seven different levels of weeding were compared. They were : i) un-weeded control; ii) one-hand weeding at 15 days after transplanting (DAT); iii) one-hand weeding at 30 DAT; iv) two-hand weeding at 15 and 30 DAT; v) two-hand weeding at 15 and 45 DAT; vi) two-hand weeding at 30 and 45 DAT; and vii) three-hand weeding at 15,30 and

45 DAT. Thirty-six day old seedlings of boro rice of `Purbachi' variety were transplanted on 28 February, maintaining 20 cm X 15 cm plant spacing with 5-6 seedlings per hill. The crop was fertilized with 80-60-40-20 kg NPKS/ha. Entire P,K,S and one-third of N were applied during the final perparation of the land. The rest N was applied in two equal splits one at 25 and the other one at 45 days after transplanting. Weeding was done as per plan of treatment shown here. To control rice stem borer Dimecron 100 Ec was applied at the rate of 850 ml/ha at 30 DAT. The crop was harvested on 31 May, 1990. Weed samples were taken (from three areas of one square metre each) from each plot just before each weeding regimes. Weed samples from un-weeded control plots were collected at the stage of the crop's maturity (boro rice). Collected weed were classified by species, dried in the sun and weighed. Relative Dry Weight (RDW) of a weed species was calcuated by the following equation :

$$\text{RDW of species A} = \frac{\text{Dry weight of species A}}{\text{Total dry weight of all species}} \times 100$$

Data on yield, yield contributing characters of boro rice and relative dry weihght of weed were taken. Economic data on different aspects of crop production were also recorded. The collected data were then analysed statistically and mean values were adjusted by Duncan's Multiple Range Test (DMRT) whenever necessary. The test carried out by the following formual (Gomez and Gomez, 1976) :

i) $S_{\bar{X}} = \sqrt{\frac{S^2}{r}}$ where $S_{\bar{X}}$ is the standard error of a treatment mean, S^2 is the error mean square and r is the number of replications.

ii) $R_p = r_p \, S_{\bar{X}}$ where Rp is the `shortest significant ranges' $r_p$ (p=2, 3.....,t) are the values of `Significant studentized ranges' obtained from appendix table based on the error degrees of freedom and t is the number of treatments.

RESULTS AND DISCUSSION

The yield and yield contributing characters of boro rice as affected by different levels of weeding have been presented in table 1. The highest number of effective panicles per unit area (248.00) was recorded with three-hand weeding at 15,30 and 45 DAT, which statistically did not show any significant difference with other weeding levels except one hand-weeding at 15 DAT but significantly differed from un-weeded control. The lowest number of panicles per unit area (135.50) was recorded with un-weeded control. Almost similar result was obtained in the case of filled grains per panicle. Different levels of weeding had no significant effect on thousand grain weight. However, highest thousand grain weight (25.05 g) was obtained from three hand-weeding at 15,30 and 45 DAT followed by two-hand weeding (25.02 g) at 15 and 45 DAT.

The highest grain yield (4.11 t/ha) was obtained from three-hand weeding at 15, 30 and 45 DAT which was statistically insignificant compared to two-hand weeding at 15 and 45 DAT (4.08 t/ha), 15 and 30 DAT (3.88 t/ha) and 30 and 45 DAT (3.67 t/ha) but significantly different from un-weeded control and one-hand weeding either at 15 DAT or at 30 DAT. The lowest grain yield (1.26 t/ha) was obtained from un-weeded control. Nearly similar trend of result was also obtained in the case of straw yield. The extent of loss in grain and straw yield due to un-weeded control compared to different levels of weeding varied from 33-69% and 35-68% respectively. Satter (1986) has argued that depending upon the ecological situation. climate and crop establishment techniques, the loss of grain yield varies from 22-67% due to weeds in boro season. He has also mentioned about the highest yield loss in aus and boro season due to weed infestation.

The result obtained here, again, shows that one-hand weeding was not sufficient to shoot at maximum yield. This can be explained by the fact that proper water management upto certain levels in the field was very difficult, and it would be more difficult in the case of farmers' field. This unequal or improper water management in the field in some cases might have favoured better growth of certain weed species or

germination of newer one. Hence, one-hand weeding might not be sufficient to control weeds properly. In another research carried out by Ahmed and others, it is found that in the case of transplanted aus rice, one-hand weeding is not sufficient to control weeds (Ahmed et. al., 1986). It is also argued that if one-hand weeding is done, it must be between 20 and 40 DAT. When one-hand weeding is done at 15 DAT, the most part of the crop growth is found subjected to crop-weed competition reducing yield. Though one-hand weeding at 30 DAT is comparatively better, crop growth in its early and later part is slightly affected.

Among different levels of weeding, gross return obtained from three-hand and two-hand weeding was higher compared to un-weeded control and one-hand weeding either at 15 or at 30 DAT (table 2). Though highest yield (4.11 t/ha) and gross return (Tk. 26937/ha) were obtained from three-hand weeding at 15, 30 and 45 DAT, the return above variable cost was low in comparison with two-hand weeding at 15 and 45 DAT. This might be due to higher weeding cost. This suggests that increase in yield due to weed control not always positively reflected on the return above variable costs might be due to variation in weeding. The highest return above variable cost (Tk. 16790/ha) was obtained from two hand weeding at 15 and 45 DAT.

The result further shows that 'additional benefit compared to extra cost' was the highest (11.17) when one-hand weeding was done at 30 DAT but the benefit-cost ratio was comparatively low (2.38). Again, when two-hand weeding either at 15 and 30 DAT or at 15 and 45 DAT was done, 'additional benefit' was comparatively high i.e. 9.94 and 10.15, respectively, while the benefit-cost ratio was the highest in comparison with one-hand weeding at 30 DAT. This suggests that two-hand weeding either at 15 and 30 DAT or at 15 and 45 DAT was also economically more profitable in controlling weeds and maximising the yield of boro rice. Similar findings have been found in another research work (Satter, 1986).

Cyperus defformis L., the first major weed, was found to grow with boro rice (table 3). Cyperus iria L, second major

weed species, which commonly found in aus rice, was also found to grow along with this crop. It is suspected that in some cases uneven or improper water management, (as has been observed here), might have favoured better germination and growth of such weeds. Other major weed species grew along with the crops were paspalum distichum L., HYgroryza sp., Jussiaea sp., Heteranthera limosa, Leersia hexandra and Monochoria vaginalis (Burm. f).

CONCLUSION

The results of the study suggest that `additional benefit compared to extra cost' was the highest with one-hand weeding at 30 DAT but the grain yield was found significantly low. Hence, reasonably the gross return and benefit-cost ratio were also low. On the contrary, `additional benefit' was comparatively high with two-hand weeding either at 15 and 30 DAT or at 15 and 45 DAT, Again, grain yield of these treatments was also significantly higher compared to one-hand weeding. The gross return and benefit-cost ratio were also higher. Therefore, two-hand weeding either at 15 and 30 DAT or at 15 and 45 DAT may be suggested for higher yield and maximum economic return.

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Table 1. Effect of Different Levels of Weeding on the Yield and Yield Contributing Characters of Late Planted Boro Rice

Levels of weeding	Number of effective panicles/ m^2	Number of filled grains/ panicle	1000-geain weight (g)	Grain Yield (t/ha)	Straw Yield (t/ha)
Un-weeded control	135.50 c	51.25 d	24.80	1.26 d	1.41 c
One-hand weeding at 15 DAT	157.25 b	55.50 bcd	24.82	1.88 c	2.18 d
One-hand weeding at 30 DAT	243.75 a	68.75 abc	24.87	3.40 b	3.69 c
Two-hand weeding at 15 and 30 DAT	246.50 a	72.25 ab	24.90	3.88 ab	4.17 abc
Two-hand weeding at 15 and 45 DAT	247.75 a	74.00 a	25.02	4.08 a	4.35 ab
Two-hand weeding at 30 and 45 DAT	246.00 a	71.50 ab	24.97	3.67 ab	4.14 abc
Three-hand weeding at 15,30 and 45 DAT	248.00 a	74.25 a	25.05	4.11 a	4.47 a

In a column, means followed by common letter (s) were not significantly different at 1% level by DMRT.
In a column, means without lettering indicated that the mean diferences were not significantly different upto 5% level of significance.
DAT = Days After Transplanting.

Table 2 : Relative Profitability of Different Levels of Weeding

Levels of weeding	Gross return (Tk./ha)	Extra cost for weeding (Tk./ha)	Total variable cost (Tk./ha) *	Additional benefit (Tk./ha)	Return above cost (Tk./ha)	Ratio of additional benefit and extra cost	Benefit cost ratio **
Un-weeded control	8307	-	8096	-	211	-	1.02
One-hand weeding at 15 DAT	12372	1156	9252	4056	3120	3.51	1.34
One-hand weeding at 30 DAT	22277	1250	9346	13970	12931	11.17	2.38
Two-hand weeding at 15 and 30 DAT	25380	1718	9814	17073	15566	9.94	2.58
Two-hand weeding at 15 and 45 DAT	26698	1812	9908	18391	16790	10.15	2.69
Two-hand weeding at 30 and 45 DAT	24123	1693	9789	15816	14334	9.34	2.46
Three-hand weeding at 15,30 and 45 DAT	26937	2468	10564	18630	16373	7.55	2.54

* Including weeding cost.

** Benefit cost ratio = $\frac{\text{Gross return}}{\text{Total variable cost}}$

Table 3. Relative Dry Weight of Major Weeds Grown in Association with Boro Rice

Weed species	Relative dey weight (%)						
	Unweeded Control	One hand weeding at 15 DAT	One hand weeding at 30 DAT	Two hand weeding at 15 and 30 DAT *	Two hand weeding at 15 and 45 DAT *	Two hand weeding at 30 and 45 DAT *	Three hand weeding at 15, 30 and 45 DAT **
Cyperus difformis L	26.16	25.93	30.12	29.17	27.61	26.72	27.77
Cyperus iria L.	22.68	22.22	24.10	20.84	20.90	23.66	23.35
Jussiaea sp.	11.63	11.11	9.63	10.00	9.70	11.45	11.68
Paspalum distichum L.	13.95	14.82	12.05	11.67	11.94	10.69	11.68
Heteranthera limosa	5.81	-	4.82	8.33	6.72	6.87	5.83
Hygroryza sp.	11.63	16.66	12.06	13.33	11.94	13.74	13.87
Monochoria vaginalis (Burm f.)	3.49	-	2.41	3.33	6.72	1.53	1.45
Leersia hexandra	4.65	9.26	4.81	3.33	4.47	5.34	4.37

* Cumulative weight of two weeding was considered
** Cumulative weight of three weeding was considered.

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PRODUCTION OF SEEDLING TUBERS FROM TRUE POTATO SEED (TPS) AS AFFECTED BY DIFFERENT PROGENIES AND SEEDLING NUMBER PER HILL

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SUMMARY

True Potato Seeds (TPS) of three progenies viz. 1282-19, Serrana x DTO-28 and Atzimba x R-128.6 were studied in the farm of the Rural Development Academy, Bogra during rabi season, 1990-91. In the experiment seeds of each progeny in the field were arranged at three different levels in terms of the number of seedlings per hill: One-seedling hill, two-seedling hill and three-seedling hill. The experiment was conducted to find out suitable progeny(s) with optimum number of seedlings per hill for production of maximum seedling tubers. Plant height and average tuber weight were found inversely proportional to the number of seedlings per hill, but tuber number/m^2 was found directly proportional to the number of seedlings per hill. The Atzimba x R-128.6 gave the highest yield (48.79 t/ha) which was slightly higher compared to 1282-19 (48.39 t/ha). However, statistically it was found insignificant. Serrana x DTO-28 yielded the lowest (43.62 t/ha). The highest yield (49.82 t/ha) was obtained where two seedlings per hill were used. Combined effect of progeny and number of seedlings per hill was found insignificant. However, progeny Atzimba x R-128.6 coupled with two seedlings per hill gave the highest yield of 52. 87 t/ha.

INTRODUCTION

The average yield of potato in Bangladesh is very low (10 t/ha) in comparison with the western countries and even with other countries of similar Latitude (Rashid, 1984). The main limiting factor for potato production is the non-availability of low cost quality seed (Chaudhury et al., 1987). Depending on the quality, the seed cost constitutes 25-50% of the total cost of potato production (Rashid, 1987). The technology of producing potatoes from true potato seed (TPS) may be the greatest individual factor that would lower the production

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cost. Only 100 grams of true potato seeds are sufficient to plant one hectare of land instead of 1.5-2.0 tons of seed potatoes (Chaudhury et al., 1987). The use of TPS as an alternate technology for potato production is increasing day by day (Anonymous, 1987), not only for saving the seed cost but also for avoiding most of the virus and tuber borne diseases (Jones, 1982). At present more than 30 countries have accepted TPS in their national programme and at least 8 countries like China, Vietnum, Srilanka and the Philippines have succeeded in using TPS technology for commercial production in a large-scale business operations (Brown, 1987). In India research results suggest that TPS progenies give equal or higher yield than standard varieties (Upadhya, 1987). Research results in Bangladesh indicate that small farmers will be more benefited if they adopt TPS technology for potato (Rashid et al., 1990).

True potato seed (TPS) can be used for potato production in three ways: (i) direct sowing in beds; (ii) seedling transplanting; and (iii) planting seedling tubers or tuberlets (Chaudhury et al. 1987). A considerable success has been achieved in growing potatoes from TPS by seedling transplanting method but the higher labour cost involved in seedling production and its after care is the hinderance to the use of TPS (Anonymous, 1988). This suggests the need for further research in this field in order to develop a simple method of direct field sowing for the production of seedling tubers. Again, number of stems per unit area has considerable agronomic importance for potato production. More than one stem grows from each seed potato, whereas true potato seed (TPS) usually gives one stem. To maximize the production of seedling tubers it was felt necessary to find out the number of seedlings to be maintained per unit area. The present study was, therefore, undertaken to select suitable progeny(s) for the production of seedling tubers with optimum seedling number per hill.

MATERIALS AND METHODS

The experiment was conducted in the farm of the Rural Development Academy, Bogra during the rabi season, 1990-91. It was carried out in a medium high land which contains clay loam soil texture. Three progenies viz. 1282-19, Serrana x DTO-28 and Atzimba x R-128.6 were tested. In the experiment seeds of each progeny were arranged in three different levels in terms of the number of seedlings per hill: One-seedling hill, two-seedling hill and three-seedling hill. The experiment was laid out in randomized complete block design with three replications. The size of unit plot was 5.0m x 1.0m. Fertilizers were applied at the rate of 160-100-160 kg NPK per hectare. Full amount of P and K and 50% of N was applied as basal and the remaining N was side dressed on 40th day after sowing. True potato seeds were sown on raised beds on November 25, 1990 maintaining 10x10 cm spacing. After 25 days of sowing seedlings were thinned out as per treatments. Watering was done by watering can to keep adequate moisture in the soil during germination of seeds and their subsequent growth. The seed beds were kept under shade from 10.00 A.M. to 3.00 P.M. during the first two weeks after sowing to protect the seedlings from excessive sunlight and rain. After forty days of sowing, some additional soil was added to the seed beds to prevent greening of tubers and keep the stolons under cover. Dithane M-45 (fungicide) and Dimecron (insecticide) were applied as plant protection measures at 15-day intervals. The crop was harvested on March 10, 1991. Data on yield and yield contributing characters were collected and statistically analysed.

RESULTS AND DISCUSSION

The TPS progenies showed significant variations in yield and yield contributing characters except tuber number/m^2 (table-1). As to the height of the plants, Atzimba x R-128.6 was the tallest (43.4 cm) and significantly different from others. Progeny 1282-19 was the shortest in height (34.6 cm) which, however, statistically did not show any significant difference when compared with Serrana x DTO-28. Three progenies

under experiment- 1282-19, Serrana X DTO-28 and Atzimba x R-128.6 produced tuber number $597/m^2$, $501/m^2$ and $548/m^2$ respectively. Though progeny 1282-19 was at the top in terms of total number of tubers produced per sq. meter, statistical analysis did not show any significant difference with Atzimba which stood the second position in this respect. Likewise, no significant difference was found between Serrana x DTO-28 and Atzimba x R-128.6 in respect of tubers produced per sq. meter. As regards tuber number, it is seen from another experiment that Atzimba X R-128.6, Serrana x DTO-28 and 1282-19 produced 415, 448 and 571 tubers per sq. meter respectively (Anonymous, 1989). Different progenies failed to produce any significant effect on tuber weight. However, maximum tuber weight was obtained from Atzimba x R-128.6 (9.4 g/tuber) and minimum from 1282-19 (8.5 g/tuber). Sikka (1987) has also obtained maximum tuber weight from Atzimba x R-128.6 and minimum from 1282-19. Progeny Atzimba x R-128.6 gave significantly highest yield of 48.79 t/ha but statistically was not different from 1282-19 (48.39 t/ha). The highest yield of Atzimba x R-128.6 might be due to the cumulative effect of tuber number/m^2 and average tuber weight. Lowest yield was obtained from Serrana x DTO-28 (43.62 t/ha). This result is similar to those of the studies done by Rashid et al. (1990), Anonymous (1988) and Sikka (1987), where the authors have obtained the highest yield from Atzimba x R-128.6.

Table 1. Yield of Seedling Tubers as Affected by Different Progenies of TPS

Progenies	Plant height (cm)	Tuber number/m^2	Average tuber weight (g)	Yield (t/ha)
1282-19	34.6	597	8.5	48.39
Serrana x DTO-28	35.4	501	8.9	43.62
Atzimba x R-128.6	43.4	548	9.4	48.79
LSD .01	3.19	61.01	NS	1.79
CV (%)	6.	8.	10	7

NS= Not Significant

Number of seedlings per hill significantly influenced all the characters studied (table-2). Data indicate that plant's height decreased gradually with the increase in seedling number per hill which might be due to the greater degree of competition among the population for resources in and above the ground. Maximum number of tubers (685/m^2) was obtained where the seedling number was higher (three-seedling per hill) and it decreased significantly with the decrease in seedling number per hill. The highest weight of tuber (11.2 g/tuber) was obtained where the number of seedlings was the lowest (one-seedling hill) and it decreased significantly with the increase in of number seedling per hill. The results indicate that the growth in number of tubers /m^2 was directly proportional to the number of seedlings per hill while average tuber weight was inversely proportional to the number of seedlings per hill. In an experiment Chaudhury et al. (1987) have also found that average tuber weight decreases with the increase in seedling number per hill. The highest yield (49.82 t/ha) was obtained where two-seedling hill was used and it differed significantly from other treatments. The lowest yield (43.21 t/ha) was obtained where three-seedling hill was used. Though tuber number/m^2 was the highest with three-seedling hill but the yield was low due to low average tuber weight.

Table 2 : Effect of Seedling Number/Hill for Seedling Tuber Production from TPS

Seedling number	Plant height (cm)	Tuber number/m^2	Average tuber weight (g)	Yield (t/ha)
1-Seedling/hill	42.2	424	11.2	47.77
2-Seedling/hill	38.4	557	9.3	49.82
3-Seedling/hill	32.8	685	6.3	43.21
$LSD_{.01}$	3.19	61.01	1.29	1.79
CV (%)	6.	8.	10	7

The combined effects of progeny and seedling's number per hill were found insignificant for yield and yield contributing characters (table-3). In all the progenies, plant's height and tuber's average weight were inversely proportional to seedling's number per hill, but tuber number/m^2 was directly proportional to the seedling number per hill. Among the three progenies Atzimba x R-128.6 coupled with two-seedling per hill gave the highest yield of 52.87 t/ha.

Table 3: Effect of Progeny x Seedling Number/ Hill for Seedling Tuber Production from TPS

Progenies	seedling number/hill	Plant height (cm)	Tuber number/m^2	Average tuber weight (g)	Yield (t/ha)
1282-19	1	37.6	436	11.2	49.28
	2	35.1	616	8.2	50.61
	3	31.1	738	6.1	45.28
Serrana x DTO-28	1	39.8	413	10.6	43.94
	2	35.3	478	9.6	45.98
	3	31.2	612	6.6	40.94
Atzimba x R-128.6	1	49.2	424	11.8	50.11
	2	44.8	515	10.2	52.87
	3	36.1	706	6.1	43.40
		NS	NS	NS	NS

NS = Not Significant

CONCLUSION

In view of the above findings, it was observed that highest yield was obtained from progeny Atzimba X R-128.6 (48.79 t/ha). Again, in terms of seedling number per hill, highest yield (49.82 t/ha) was obtained where two-seedling per hill was used. Though combined effect of progeny and seedling number per hill was found insignificant, progeny Atzimba X R-128.6 coupled with two-seedling per hill gave the highest yield (52.87 t/ha). Hence, progeny Atzimba x R-128.6 with two-