

APPROPRIATE TECHNOLOGY AND RURAL INDUSTRIAL
DEVELOPMENT IN BANGLADESH: THE MACRO CONTEXT

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I. INTRODUCTION

The purpose of the paper is to review aspects of how the macro environment has affected technology and the development of rural industries in Bangladesh. This paper is thus concerned with three key concepts - macro context or macro environment, appropriate technology and rural industry - which may be profitably clarified at the outset.

The paper is structured as follows. The remainder of section I defines the three key concepts; section II gives an overview of the technological status of the rural industrial sector; section III discusses national policy, institutions and resources concerning technology for rural industries; section IV is concerned with the socio-economic status of the rural industrial entrepreneurs vis-a-vis other groups of actors in the economy to understand the relative position of the former in the national decision making structure; section V analyses technological developments in the rural industrial activity of paddy husking vis-a-vis the corresponding macro environment ; and section VI contains concluding remarks.

1. The Macro Context

The macro environment provides general guidelines, perspectives and dynamics bearing upon the way micro-decision-making units¹ operate. Macro - all general government policies² - which have relevance for technology and rural industrial development are the basic constituents of the macro environment we are concerned with here. Other important elements include institutions

for implementing those policies, procedures involved in the implementation of the various policies, and interest group/lobby activities influencing formulation and/or implementation of such policies.

2. Appropriate Technology

The basic logic of the type of technological advancement that should take place in a country is provided by the prevailing and changing objective conditions relating to such matters as factor endowments, demand for goods and services supplied, scientific knowledge and training, marketing arrangements and so on. And the concept of appropriate technology relates to a given situational context (i.e., a given configuration of objective conditions). And as the situational context changes there will need to be a corresponding change in the technology for it to be appropriate to the new context. Thus, appropriate technology is a dynamic concept, adjusting itself as the situational context changes.

Bangladesh is essentially rural and agricultural and is characterised by very low income, mass poverty, paucity of investible funds, foreign exchange shortage, abundance of labour and low levels of scientific knowledge and training.³ In view of these considerations, appropriate technology for the current situational context of rural Bangladesh would in general be (a) labour-intensive (to respond to the prevailing large-scale unemployment and under-employment), (b) cheap (to allow the limited investible funds available to go as far as possible), (c) economic in the use of foreign exchange, (d) simple to produce, run and repair (as skills are generally limited in supply), (e) productive enough to raise income sufficiently for making progress towards poverty alleviation, (f) user of as much local raw materials as possible, and

(g) suited to the prevailing and potential demand conditions. These characteristics define the basic approach under the present circumstances; but there may be a range of variations among sectors and activities as to what is an appropriate technology - low level to intermediate in general, but also relatively modern in certain cases.⁴

Technologies chosen on the basis of the characteristics enumerated above should help spread employment and income earning opportunities for the rural poor and, hence, help reduce poverty. And since, in Bangladesh, poverty alleviation is the ultimate goal of planned development efforts and expansion of productive employment and upgradation of the technological base and hence productivity have been enunciated as the major means to that end,⁵ appropriate technologies identified for rural industries in terms of specific characteristics such as those suggested above should in principle be acceptable to the Government of Bangladesh. And the same would essentially be true of the previous governments since poverty alleviation has always been a major goal of planned development efforts in this country.⁶ But what may actually be achieved in terms of appropriate technological advancement in any given situation would largely depend on how policies in that regard are formulated and the process is promoted and facilitated. And this paper addresses the question of what has actually been happening to technology in the case of rural industries in Bangladesh.

3. Rural Industry

Instinctively, a manufacturing activity located in a rural area is a rural industry. Conventionally, industrialisation implies modernization and urbanization. Hence, the terms rural and industry would seem incompatible. Again, if cottage and small industries located in rural areas are meant to be

referred to by rural industry, then the concept would appear redundant as cottage industry and small industry are well understood concepts and serve all practical purposes. And yet, rural industry is now a fairly widely used concept. It can indeed serve a useful purpose - but not when, as is often done, it is mechanically used to refer to manufacturing activities located in rural areas or cottage and small industries (exclusive or inclusive of modern ones) located in both rural and urban areas. The analytical and policy significance of the concept derives from the fact that it brings into focus a production system (ownership, organization, management, technology production processes; procurement of inputs, sale of products) that is rural in character - generally traditional, even rudimentary, and intermediate; and, in certain cases, at best relatively modern. Indeed, these industries are usually of cottage and tiny types but also small in some cases, frequently characterized by technological backwardness and low productivity, generally owned by poor people, and largely managed and operated by family workers. Rural industrialisation may be seen as a process of improvement of the rural production system and expansion of the sector, keeping in view rural and national resource endowments and existing and potential demand structure concerning goods and services supplied by these industries. And technology has a crucial role to play in this process.

II. TECHNOLOGICAL STATUS OF THE RURAL INDUSTRIAL SECTOR: AN OVERVIEW

While by far the largest segment of the rural industrial sector is characterised by traditional - primitive to low - technology, a small segment uses intermediate to relatively modern technology. The use of relatively more capital intensive, modernized techniques in certain activities is of

recent origin; and a major factor behind this development has been the availability of electricity in rural areas. As electricity spread, scope for profit making through use of electricity-using improved or new techniques in certain activities such as rice and oil milling emerged, which began to be taken advantage of by richer people who also had access to institutional support mechanisms.

While the traditional technology-based activities are generally characterised by low labour productivity and, hence, low, even negative profitability and high capital productivity, the activities using relatively modern techniques exhibit relatively high labour productivity but relatively low capital productivity. These characteristics, however, vary significantly across activities within each of the two segments (traditional and relatively modernised)(Table 1).

As traditional techniques have remained in use in the activities in which modernized techniques have been introduced, there are two or more distinctly different hierarchical levels of technology in existence side by side in certain activities. Examples are paddy husking (dhenki, small huller, large huller, automatic mill); oil crushing (animal powered ghani, oil mill using ghani or expellers run by electricity); weaving (pitloom, semi-automatic loom, powerloom); gur manufacturing (bullock-driven crusher, electricity or diesel driven crusher); winnowing (traditional method of throwing up paddy into the air using a cula, Bangladesh-Agricultural Research Institute developed winnower still at experimental stage, hand operated Cecoco Japanese designed machine); and wood processing (hand karat, saw mill).

Factor Productivity in Certain
Activities

	VA/L (Tk.)	VA/FC (Tk.)	VA/FC ₁ (Tk.) ¹
Rice husking(<u>dhenki</u>)	2863	2.27	4.57
Rice husking(small huller)*	15186	0.44	0.48
Rice husking(large huller)*	20797	0.94	3.44
Oil seed crushing(<u>ghani</u>)	6435	2.23	2.62
Oil mill	106211	4.89	5.05
Bakery(traditional)	18577	1.41	2.83
Bakery(modern)*	24077	3.16	3.24
Carpentry	11301	4.58	5.19
Furniture*	24151	1.17	2.18
Saw mill*	38927	1.40	2.40
Lime manufacturing	6447	10.13	19.34
Pottery	5518	2.85	7.10
Blacksmithy	12463	10.02	13.17
Coir fibre	1745	1.75	40.72
Coir string	2552	3.58	48.10
Boat making	9937	2.94	23.15
Hogla mat	1601	1.22	27.23
Fish net	12961	6.61	6.73
<u>Shital pati</u>	6549	5.00	5.36
Bamboo & cane	5169	3.43	4.80
Tailoring	6372	2.18	3.35
Engg. workshop*	29916	0.71	0.92
Foundry*	51415	0.52	0.78
Ice factory*	81333	0.62	0.65

Source: Q.K. Ahmad and F.A. Chowdhury, op. cit.

Note 1: VA = value added per year; L = number of workers; FC = fixed capital;
FC₁ = fixed capital excluding land.

Note 2: The surveys were conducted during 1985-86.

* relatively modern; others are traditional.

Other industries displaying technological dualism or wider choice include garments, soap, coconut oil, coir products, bakery, furniture making, shoes boat building, tobacco processing and fish processing.⁷

In so far as the largest segment of the rural industrial sector that uses traditional technology is concerned, appropriate technology would mean an upgraded or new technology. But in the case of the activities exhibiting technological dualism or pluralism, it may be one of the technologies already in use. Hence, a policy concerning appropriate technology for rural industries in Bangladesh should be concerned with the upgradation of technology in general and with choosing among the existing techniques in those cases where alternatives are in existence. When it is a case of upgradation, a question that needs to be answered during the process of the search for appropriate technology is: upgradation to what extent and from what source (local R&D, import, or adaptation from an imported technology) would that to be obtained.

III. TECHNOLOGY FOR RURAL INDUSTRIES: NATIONAL POLICY, INSTITUTIONS, AND RESOURCES - AN OVERVIEW

1. National Science and Technology Policy

The policy goal of upgrading the technological base of the economy⁸ has been a recurring theme in the successive five year plans of Bangladesh.⁹ But little progress has so far been achieved in this regard.¹⁰ In fact, the first national science and technology policy was not formulated until 1980; moreover, little effort was made to implement it.¹¹ However, since that policy was formulated, there has been a growing awareness about technological issues in the development process in the policy making circles of the

country;¹² and the Third Five Year Plan 1985-90(TFYP) called for the fomulation of a comprehensive national science and technology policy and integrating that with national development planning.¹³ Consequently, a new science and technology policy was formulated and adopted in February 1986 (1986 S&T Policy) aimed at raising the technological base of the economy through such measures as proper R&D efforts, integration of technological and socio-economic planning, development of human resources and technological infrastructure, and technological cooperation with other, particularly developing countries.¹⁴

The apex body for all technology related decision making in the country is National Council on Science and Technology (NCST) chaired by the President of Bangladesh, which has an Executive Committee to oversee the implementation of its directives and decisions.¹⁵ The NCST has also set up a Consultative Committee on Transfer of Technology to advise mainly on how best technologies developed within the country or imported from other countries and adopted may be transferred to the actual users of the technologies; and the Committee has since recommended an action programme and the institutional arrangement for implementing the proposed action program.¹⁶ But the 1986 S&T Policy proposals and the recommendations of the Consultative Committee on Transfer of Technology are still at the recommendation stage or, in certain cases, early phases of implementation; and concrete results may be a long time emerging - that is, if the proposals and recommendations are seriously followed through and implemented. This is the position in general. But, it appears from a review of the 1986 S&T Policy and the minutes of the meetings of NCST, its Executive Committee and the Consultative Committee on Transfer of Technology as well as the TFYP proposals that the issue of technology for rural industries has been given a rather low priority.

The 1986 industrial policy also has not included technology for rural industries as a subject for major focus, although certain general statements contained in the policy have implications for or are related to technology. Thus, it has been stated that Bangladesh Small and Cottage Industries Corporation (BSCIC) will conduct continued research and disseminate knowledge for achieving quality and higher productivity, undertake product development and disseminate the knowledge, supply new and improved designs, and assist in the processes of procurement of raw materials and marketing of products. The question of appropriate technology has not even been mentioned.¹⁷

Thus, there is not and has never been a clear-cut policy stance in favour of appropriate technology for rural industries.

2. Institutions

While the micro units are the ultimate decision makers, agencies and organizations concerned with promoting and supporting rural industries are likely to play a crucial role in Bangladesh in the selection of what technologies are used in rural industries as the selection will be largely dependent on the technical information, facilities and extension services that these agencies and organizations will provide to the people concerned. Because most of them are either uneducated or have low level of education and hence their technology-awareness is low and they will therefore need to be propped up for making a proper technology-response.

The BSCIC is the long established, premier public sector agency charged with the responsibility of promoting and supporting all small and cottage industries except handloom and sericulture for which there are Handloom and Sericulture Boards respectively. There is also a host of other public sector

agencies which are one way or another - often in a small way to supplement or support the activities of their main focus, concerned with small and cottage industries in the country. These organizations may be considered parts of the macro-environment for rural industries as they implement government policies and may, through feed-back on the basis of their experiences, influence policy making concerning the sector.

Among the public sector agencies, only the BSCIC, as perhaps would be expected because of its assigned key role relating to the promotion of small and cottage industries, is concerned with noteworthy activities concerning technology. But it is only recently that technology became a major concern of the BSCIC. Traditionally, the organization provided promotional, support and extension services. One study has found that the BSCIC has introduced 18 improved or new consumer and 11 improved or new capital items or groups of items since its inception in the 1950s; and that all but four of the consumer items or groups of items came on stream since 1980.¹⁸ Along with the traditional functions, the organization now provides technological information, product designs, prototypes and production processes as available to its clients. It now has a technology section with a design centre under its planning, development and technology division. A prototype development unit is also planned to be set up. These developments would signify changes in favour of appropriate technology for rural industries in a segment of the macro environment. But, a clear-cut concern for appropriate technology for rural industries is yet to find a place in the national science and technology policy. And unless that happens, the basic frame of reference for detailed

policy making and allocation of resources would continue to remain missing. There is, therefore, an element of ad hocism about what is being done by, for example, the BSCIC although it has to have clearance from the Ministry of Industries and Planning Commission for whatever programmes it embarks upon since, the activities would be pursued, to a large extent, at the initiative of the BSCIC and not as an imperative of the national policy.

There is also a large number of foreign and local non-governmental voluntary organizations(NGOs) involved in the promotion of rural industries. However, in the absence of macro the environment providing effective coordination at policy and operational levels, the activities of these organizations lack co-hereence, articulated focus and proper direction. Many of these agencies and organizations have very little technology awareness. However, there are some which do have sensitivities to the need for technological upgradation and the choice of appropriate technology and have been active in the field. But even these organizations have often tended not to pursue the objective to a great length as this is a rather slow process while showing of quick tangible results in terms of coverage of geographical areas or people with income generating activities of sorts, which are usually traditional in nature, has often been more important from the point of view of continued government and donor support or simply because funds do not come forth for

3. Resources

Table 2 shows public sector allocation for small and cottage industries in successive five year plans starting with the first pre-Liberation five year plan(1955-60) as per cent of the total public sector outlay. It varied between 1.0 to 2.0 per cent in the pre-Liberation period but has consistently been less than 1.0 per cent since Liberation. Again, the various plans since Liberation have allocated, on an average, 4.7 per cent of the total allocation to the industrial sector to small and cottage industries(Table 2).²⁰ This is totally unrelated to the realities in terms of the contribution of the small and cottage industries on the one hand and large industries on the other to GDP and labour absorption. According to official statistics, the shares of large-scale and small-scale industries in GDP (at current market prices) respectively were, on average, 4.6 and 3.7 per cent during 1983-86.²¹ On labour absorption, one official estimate shows that 26 per cent of the rural labour force is gainfully employed in rural non-farm activities (of which the major component is rural industries), while micro studies put the figure at 43-45 per cent.²²

Despite the interest in the rural industries shown by the government, various donor agencies, and many NGOs, the use of credit by and the availability of institutional credit to the sector have remained extremely limited. A 1979-Survey showed that only 6 per cent of the rural enterprises received credit from various sources to meet their initial capital investment; and that, of the enterprises which received credit, only 21 per cent received it from institutional sources while the remaining 79 per cent used non-institutional sources. The situation is similarly discouraging in respect of expansion and working capital.²³ Available evidence suggests that the situation has not improved much since then.

Table 2

Public Sector Allocation for Small and
Cottage Industries in Successive Five
Year Plans Before and Since Liberation

	As % of total public sector outlay	As % of total allocation for all industries
First Five Year Plan, 1955-60	1.14	N.A.
Second Five Year Plan, 1960-65	2.17	21.6
Third Five Year Plan, 1965-70	1.05	7.09
First Five Year Plan, 1973-78	0.62	3.24
Two Year Plan, 1978-80	0.64	3.67
Second Five Year Plan, 1980-85	0.88	6.87
Third Five Year Plan, 1985-90	0.54	4.84

Source: For the First three plan periods from top: Planning Commission, Government of Pakistan, the various plan documents; and for the plan periods since Liberation: Planning Commission, Government of Bangladesh, the various plan documents.

The use of credit by rural entrepreneurs is so limited because of their extremely limited access to institutional credit, which is provided at reasonable rates of interest, on the one hand and usurious rates of interest charged by the non-institutional lenders such as the mahajans on the other. The reasons for their extremely limited access to institutional credit include their inability, in general, to provide the collateral to which such credit is subject, a lack of knowledge on their part about sources of credit, intricate official formalities needed to be fulfilled, payment of bribes that often becomes a 'pre-condition' for getting a credit from an institutional source, rather long gestation time (about three months on average, but in

cases it may be 5 months or more) from making the application for a credit to receiving it, and a substantial cost in terms of days spent (about 12 days on average, but may be 20 days or more in cases) in pursuing the credit applied for. These problems are often so intractable that when the rural entrepreneurs decide to go for credit, they turn more often to usurious money lenders than to institutional sources.²⁴

It thus emerges that the availability of funds to the rural industrial sector is and has been very limited. However, the 1986 industrial policy contains certain proposals towards facilitating resource availability to the small and cottage industries sector by channelling more funds or reducing requirement of funds for setting up and running industries. These include: (a) financial institutions and commercial banks shall have separate windows for financing small and cottage industries; (b) financial institutions and banks should set apart a definite percentage of their resources for the development of small and cottage industries; (c) debt-equity ratio for small and cottage industries shall be 80:20; (d) a Small Entrepreneurs Credit Guarantee Scheme may be introduced under the joint sponsorship of the BSCIC and the Shadaran Bima Corporation (General Insurance Corporation); (e) the rate of interest payable by small and cottage industries shall be 10 per cent; (f) all income arising from export of handicrafts shall be exempt from income tax; and (g) small and cottage industries located in less and least developed areas shall be entitled to income tax rebate linked to production, shall pay an import duty of only 2.5 per cent ad valorem on machinery and equipment with integral parts and components for setting up of new industries and for

balancing, modernization, replacement and extension of existing industries, shall not pay import permit/ LC authorization fee, and shall receive subsidy on costs of fuel used through a special fund to be created by the government.²⁵

These policy guidelines are in the right direction. But while some of them, e.g., the debt-equity ratio and low import duty on machinery and equipment, are not new measures, others are yet to be in place. Moreover, it is often the case that procedures to follow in taking advantage of such provisions are complicated and lengthy, which the poor rural industrial entrepreneurs find extremely difficult to fulfil. They may not also be aware of the facilities on offer or how to go about securing them. If imaginatively implemented, these measures should produce encouraging results in terms of bringing about an improvement in financial environment facing the rural industrial sector.

In so far as technology is concerned, it may be expected that if rural industrial entrepreneurs have access to increased funds, they would decide to use new or improved technology, if available. But as noted earlier (sub-section III.2), their technology awareness is low. Moreover the rural poor have been taking up rural industrial activities simply to use their own labour and that of the members of their families, which otherwise would remain unutilized due to lack of alternative opportunities, to augment family incomes as much as possible, without bothering about productivity and profitability.²⁶ Hence, for making an appropriate technology-response, they would need to be mobilized as suggested in sub-section III.2 in addition to being ensured of the availability of necessary financial resources. But both these conditions have so far remained far from being fulfilled.

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IV. THE CLASS POSITION OF RURAL INDUSTRIAL ENTREPRENEURS AND THE NATIONAL POLICY RESPONSE TO THE NEEDS OF RURAL INDUSTRIES

Why the rural industrial sector faced the macro-environment it does, as described above ? The root cause lies in the class position of the segment of the population from which the rural entrepreneurs mostly come vis-a-vis other groups of actors in the economy. Towards elaborating the answer, let us briefly analyse national power relations and decision making context.

1. The Rural Poor

The bulk of the rural industrial entrepreneurs come from the rural poor groups which are broadly the landless farm workers, non-farm workers, sharecroppers, tenants, marginal and small farmers, and artisans. Various computations available on the below poverty level population, nutrition survey results, and data on the landownership pattern would all show that the rural poor constitute 75-80 per cent of the rural population.²⁷ They live in thousands of villages around the country. They are uneducated or ill educated and have a low level of consciousness about the nature of their problems and prospects. They are often unable to seek out what assistance programmes are there for them; and even when they know that certain programmes to assist them exist, they often fail to take advantage of such programmes because of their inability to fulfill the necessary formalities. Under the circumstances, in order to assist them effectively it is essential that the institutional mechanism reaches out to them with simplified assistance programmes.

2. Rural Elite and Non-poor Group

They are in the main larger landowners who account for about 10 per cent of the rural households; but a few from among the ranks of the land-poor, having been involved in certain vocations such as trade and commerce and/or in politics, also belong to this group. These are the rural households which generally give land for sharecropping, and/or supply loans, and/or provide jobs to the rural poor. They dominate the rural economy and rural politics and also occupy rural leadership positions such as members and chairmen of union and upazila parishads and project committees. Because of their leading socio-economic positions and consequent access to political and administrative systems, they usually succeed in appropriating a share, even the lion's share, of the resources allocated to rural development programmes and projects. They are also the ones who come forward to invest in rural industries or relatively modern types of facilities such as electricity supply and upgraded technology become available and opportunities for substantial profit making present themselves. They are well placed to spot the emerging opportunities and they are also able to raise the necessary funds for the upgraded technology or larger operations which often cost substantial sums of money. The poor are disadvantaged because they may not have the information in time but, more important, their inability to raise the necessary funds as they have meagre means of their own and also extremely limited capacity to raise funds from institutional or non-institutional sources.

As a result, even when a new or improved technology becomes available, which is prima facie appropriate, it gets to be controlled by the richer people and the poor not only fail to acquire this technology but many of those who were in business using lower levels of technology now get displaced and

deprived of their livelihood. Unless alternative employment opportunities could be created for the displaced, the new or improved technology may not be considered appropriate in the ultimate analysis. Moreover, the richer people often tend to upgrade their operations further and thereby introduce further technological inappropriateness. Developments in these directions may be thwarted only through appropriate macro interventions discouraging and restricting, even prohibiting such tendencies.

3. Political Authority and Bureaucracy at Various Levels, Other (Outside Government) Elite Groups Above the Rural Level, and Donors

Political authority and bureaucracy at various levels (national, division, zilla, upazila, union) are involved in decision making and implementation of the policies and programmes. But, given the balance of power and the nature and type of the government that exist in this country, all major decisions are taken by the head of the government-centred national government on the basis of the perceptions and perspectives that the head of the government, his cabinet members and those manning the top echelons of the bureaucracy, both military and civil, have, which often tend to represent their own class interests, prejudices and biases.

Various outside-government-elite groups such as politicians, industrialists, businessmen, consulting engineers, economists, accountants, lawyers and other professional groups acting through their channels of personnel connections or through associations and groupings can and do influence certain decisions in such a way as to be favourable to themselves; and if need be they also act in collaboration with the decision makers for mutual benefit.

Then, there is another source, in fact a very important source that influences economic decision making in this country. This is constituted by the UN and other multilateral and bilateral aid and funding agencies. UN agencies such as FAO, ILO, UNESCO, and ESCAP seek to improve the basis for and the capacity of decision making in Bangladesh by supporting research and training, while other UN agencies such as UNDP, UNFPA and WFP and other multilateral financial organizations such as World Bank, IMF, ADB and IFAD provide assistance in terms of funds for development programmes and projects. In addition, bilateral donors such as USAID, Canadian International Development Agency, Swedish International Development agency and EEC support research and training as well as development programmes and projects in this country.

The mandates, imperatives, dynamics and leadership under which these aid organizations function have their own pulls and pushes bearing on the articulation of the problems and their solutions. Thus, while for alleviation of poverty, such organizations as ILO, FAO, and IFAD advocate extensive interventions in favour of the poor, other organizations such as the World Bank, IMF, ADB and USAID are strongly in favour of increasing reliance on market mechanism. Since the last mentioned organizations provide the bulk of the aid received by Bangladesh, they are highly influential regarding economic decision making in this country, particularly in relation to the activities they support. Rural industries are currently an in-subject for most of these organizations. But R&D for developing and diffusing appropriate technology for rural industries appears to be a neglected subject or one of low priority. Moreover, the thrust on market mechanism strengthens the position of the richer people who, as pointed out earlier, often take advantage of emerging opportunities for profit making and hurt the poor

in the process, and also go for further and inappropriate technological upgradation.

On the other hand, feedback from the lower levels representing the interests of the poor, particularly from the grassroots levels, is not often available in an articulated manner to the highest decision making level, or, even when it is available, it tends to get brushed aside as the viewpoints of the power elites and the donors have the systemic preponderance in the decision making process. The poor, although a very large majority, are atomistic and powerless and have no organized lobbies to articulate their interests and to seek to influence decision making in their favour.

4.

The analysis presented above in this section (i.e. section IV) may provide an explanation as to why the national S&T Policy has failed to deal with technological aspects of rural industries and why appropriate technology has remained a low priority or neglected subject in the industrial policy as well as in various programmes now in place for promoting rural industries in this country, although the sector is recognized to have a great employment and income generating potential for the rural poor.

V. CASE STUDY OF PADDY HUSKING: TECHNOLOGICAL DEVELOPMENTS IN A RURAL INDUSTRY AND THE MACRO ENVIRONMENT

In this section technological developments in paddy husking is reviewed with a view to examining the appropriateness of those developments and the role of the macro environment in relation to them, keeping the analyses presented in the previous sections in view.

1. Growth of Mechanized Paddy Husking and Decline of Dhenki

Paddy husking is a leading rural industrial activity in Bangladesh. How predominant the activity is in rural Bangladesh can be gauged from the fact that the rice production of the country is about 15 million tons. And paddy husking is carried out throughout the country as paddy is produced all over rural Bangladesh. Until the 1960s, almost the entire paddy output used to be husked using the traditional, manual technique of dhenki. Although a good proportion was husked by the households themselves for self consumption, the activity provided an important source of employment and income for vast numbers of workers, particularly women, belonging to landless and landpoor families. But since then, alternative capital intensive, mechanised methods have made heavy in road into the activity. Thus, about 17 per cent of the total national paddy output was husked by these mechanised methods in 1967 and the proportion rose to 20-25 per cent by 1977, to about 30-35 by 1981 and about 45 per cent by 1987. (Table 3)²⁸. The alternative milling techniques include rural or small huller mill, large huller or commercial mill, and semi and fully automatic mills.

Table 3
Growth of Mechanization of Paddy Husking

	1967	1977	1981
Crop husked by			
<u>Dhenki</u> (%)	83	65-75	60-65
Small huller mill (%)	17	20-25	25-30
Commercial mill (%)	-	5-10	10
Number of small huller mills	6500	7600	10493
Number of commercial mills	-	80	320
Of which			
Fully automatic	-	1	15
Semi-automatic	-	-	5

Source: World Bank: Selected Issues in Rural Employment,
March 1983

The dhenki is a heavy wooden bar with a pestle fitted at one end. It is balanced on two knee-high poles, with the wooden bar working as a lever. It is operated by feet. The end without the pestle is pressed down and released so that the pestle goes up and drops heavily into a mortar set below on the ground. Two to three workers (2.6 workers, on average) are required to operate a dhenki. The most common mechanized paddy husking method is the small or rural mill that uses Engleberg steel huller driven by diesel engine or electronic motor (15-25 HP). Such a mill normally provides custom services for neighbouring farmers or small traders, who usually bring in small consignments of a few seers to a few maunds of paddy.

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It employs two or three workers (2.5 workers, on average). Large huller or commercial mills use batteries of four or five steel hullers, driven by flat belts from line shafts powered by steam engines (using husk as fuel) or diesel or electric motors. These mills have attached to them non-mechanised soaking, parboiling, drying, pre-cleaning and winnowing operations using scaled-up traditional technologies; and they operate as both production and service units. On an average, the employment level in such a mill is 20-21 persons. The modern integrated mills use rubber roll hullers and offer a full range of services. Pre-cleaning, soaking, parboiling and drying are handled automatically and rice, bran and husk are automatically separated. Some of them are semi-automatic in the sense that sun drying rather than mechanical drying is carried out. These mills generally operate wholesale business or work on contract to the government (food department) milling government procured paddy. Such a mill employs about 30 workers.

2. Factors Behind the Spread of Mechanized Methods

The main factors behind the spread of rice mills has been the expansion of electricity supply to rural areas and its availability at cheap prices, which created an opportunity for making profits by using electricity-driven machines for husking paddy. In 1977, the cost differential of husking between the dhenki and the huller mill was 12:1 (Tk. 11.8 to Tk. 1.0) that enabled the huller mill owners to charge very low rates for husking (Tk.1.2 to Tk. 3.0 per maund) and yet make good profits²⁹. And in spite of increases in the operating cost of the rice mills since then, the husking cost differential between dhenki and the huller mill was still found to be 7 or 8:1 (Tk.27.40 to Tk. 3.50 or 4.04) in 1986 (Table 4). The high profitability attracted

investment in rice huller mills which, therefore, spread fast along with the spread of electricity supply. The availability of institutional credit for setting up rice mills facilitated the process.

The other favourable factors have included ease of availability of sanction and provision for accelerated depreciations and tax holidays. The 1986 industrial policy has, however, provided that sanction for automatic rice mills will be discouraged in view of the existing over capacity or under utilization of installed capacity. It may be noted that appropriateness or otherwise of the technique does not seem to have been a consideration behind that decision.³⁰

Clearly therefore the macro environment has been very favourable for the rapid spread of rice mills that has occurred in the country.

Let us now turn to the question of appropriateness of the various alternative paddy husking techniques.

3. Appropriateness or Otherwise of the Alternative Paddy Husking Techniques

i. Advantages of Dhenki Compared to Huller Mills

Relevant data in respect of dhenki, small huller mill and large huller mill are presented in Table 4.

a) Employment has met with a serious adverse impact as a result of expansion of rice mills and the consequent displacement of dhenkis. Given that a dhenki can husk 1.43 maunds while a small huller mill can husk about 51 maunds and a large huller mill about 124 maunds of paddy per eight-hour day, a small huller mill displaces about 35 dhenkis and 91 dhenki operators and a large huller mill displaces about 87 dhenkis and

Table 4

Comparative Characteristics of Alternative
Paddy Husking Techniques

	<u>Dhenki</u>	Small huller mill	Large huller mill
Fixed capital, FC(Tk.)	3,285	85,832	453,667
Fixed capital excluding land, FCI(Tk.)	1,630	78,832	123,767
Fixed capital excluding land and building FC2(Tk.)	630	39,632	62,100
Working capital (at current level of capacity util.)(Tk.)	816	2,456	108,479
Employment, L (No.)	2.6	2.5	20.5
Proportion of family workers (%)	62	19	18
Proportion of female workers (%)	100	19	4
Number of days of operation in a year	175	237	195
Average work hours per day	7.2	5.5	13.5
Yearly hours worked	1,260	1,304	2,633
Output, Q (Tk.)	47,750	55,504	5,060,918
Gross value added, VA (Tk.)	7,445	37,964	426,347
Net yearly profit, NP (Tk.)	Negative	22,066	281,412
Paddy husked per 8 hours (md.)	1.43	50.72	124.12
Recovery rate (%)	73.14	70.00	70.00
Proportion of broken kernel (%)	6.0	16.0	10.00
FC/L (Tk.)	1,263	34,333	22,130
FCI/L (Tk.)	627	31,533	6,037
VA/L (Tk.)	2,863	15,186	20,797
VA/FC	2.27	0.44	0.94
VA/FCI	4.57	0.48	3.44
NP/FC	-	0.26	0.62
FC/Q	0.069	1.546	0.090
FCI/Q	0.034	1.420	0.025
Q/L (Tk.)	18,365	22,202	246,874
Per maund cost of processing (Tk.)			
Husking	27.40	4.04	3.50
Other processing	8.59	-	8.61
Total	35.99	-	12.11

Source: Zaid Bakht and K.M. Nabiul Islam, Rural Industrialisation in Mirzapur Upazila: Status and Potential, SRFD, Bangladesh Institute of Development Studies, Dhaka, May 1987.

and 226 dhenki operators. Since a small and a large huller mill respectively create jobs for 2.5 and 20.5 persons, the net displacements are respectively about 89 and 205 persons.

b) The rice mills are sexually highly discriminatory against women. The dhenki operators are all women, while all the employees of small huller mills and about 80 per cent of the employees of large huller mills are male.

c) The rural income distribution is adversely affected by the rapid expansion of huller mills. The displaced dhenki workers come mostly from the landless and low income families who often lose their only source of livelihood at the advent of these mills. These mills thus divert income from large numbers of poor families to a small group of economically better-off mill owners.

d) Capital labour ratio is very low in dhenki compared to the mills. A fixed investment of only Tk. 1,263 including land or Tk. 627 excluding land (which is more reasonable in the case of dhenki which can be and is usually set up within the homestead and does not require additional land and pucca or semi-pucca structure) is required to employ one person in dhenki while the requirement (inclusive of land) is Tk. 34,331 in a small huller mill and Tk. 22,130 in a large huller mill.

e) The dhenki is locally produced with local material, while motors used in the huller mills are of foreign origin although other parts are locally produced.

f) The dhenki uses capital much more efficiently than a mill - value added per Tk. worth of fixed capital (FC) is Tk. 2.27 (when land is included in FC) and Tk. 4.57 (when land is excluded from FC) in the case of dhenki compared to only Tk. 0.44 and Tk. 0.95 respectively in the cases of small and large huller mills respectively.

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g) The other advantages of dhenki husking over huller mill husking paddy are a higher recovery rate (73.4 per cent against 70.0 per cent), lower rate of broken kernel, turning out more nutritious although less polished rice, and allowing easier separation of bran and husk.

ii. Advantages of Huller Mills Compared to Dhenki

a) As noted earlier, compared to dhenki, rice mills are characterised by substantially lower unit husking cost. While dhenki operators earned Tk. 17.78 per day or Tk. 5,334 per year of 300 working days, the annual net profits of Tk. 22,066 and Tk. 282,412 were earned by small and large huller mills respectively.

b) Labour productivity is substantially higher in the mills compared to the dhenki - 5.3 times and 7.3 times higher in small and large huller mills respectively. However, it may be noted that compared to the increase in the corresponding capital intensity (27.2 times and 17.5 times respectively), the labour productivity gains are proportionally much less.

iii. Characteristics of Automatic and Semi-Automatic Rice Mills³¹

In response to the problems of low recovery rate and broken rice in huller mills, no R&D efforts to tackle these problems have been undertaken. Instead, a further technological advancement in the form of large automatic mills have been introduced. The mechanized par-boiling and drying available in these mills help achieve uniform and optimally low moisture content of paddy. Hence, the recovery rate is higher (71.9 per cent), percentage of broken rice is lower and the quality of bi-products (bran and husk) is better in these mills compared to the huller mills.

But these mills have been found to suffer from substantial under-utilization of capacity mainly due to short supply of paddy,³² which far outweighs any cost saving that may arise from higher milling efficiency compared to huller mills. In fact, at the current levels of capacity utilization, the cost of paddy processing per maund has been found to be 2.5 times higher in automatic mills compared to large huller mills. Also, the value added per Tk. worth of investment has been found to be Tk. 0.15 in an automatic mill compared to small (Tk.0.44) and large (Tk. 0.94) huller mills.

An automatic mill displaces about 345 dhenkis and about 1000 women dhenki operators and creates jobs for only 30 persons, mostly men, at a cost of Tk. 2,50,000 per workplace.

A very large foreign exchange cost is also involved in setting up an automatic mill.

iv. Choice between Automatic and Huller Mills

The above analysis (sub-section V.3.iii) shows that on all counts of employment creation, capital costs, efficiency and foreign exchange requirement, the automatic mill is clearly a case of less appropriate technology compared to huller mills in the present context of Bangladesh.

v. Choice between Huller Mills and Dhenki

The choice is not very clear. The dhenki has several advantages over huller mills as noted above; but the main comparative disadvantage in the form of substantially lower labour productivity and hence much higher husking cost per maund that it suffers from makes it quite uncompetitive compared to huller mills. While ^{the} existing dhenki has little to offer to the dhenki

operators in terms of growth in their income and, hence, progress towards the alleviation of their poverty, their displacement from dhenki operation may rob them of their only source of livelihood. There are simply no alternative opportunities existing or emerging in which the large numbers of displaced women may be quickly absorbed. Hence, large-scale displacement of dhenkis and dhenki operators would imply a high social cost. The eventuality along this line consequent upon the expansion of huller mills was ignored as nuller mills were allowed to be set up in large numbers without putting in place programmes to rehabilitate the displaced dhenki operators.

It would thus appear that while dhenki may be too backward a technology to be appropriate, huller mills also have too adverse an impact on employment for them to be appropriate under the present socio-economic context of rural Bangladesh, which is characterised by widespread poverty and unemployment.

Under the circumstances, two lines of action in the direction of appropriate technology would seem to present themselves. One is to seek to improve the mechanical efficiency of dhenki aimed at improving its productivity without much adverse impact on employment. This has been a much discussed subject; and sporadic R&D efforts in such places as Bangladesh Institute of Development Studies within the framework of its Studies on Rural Industries Development Research project (1984-87) and elsewhere have shown that good prospects exist for the development of an upgraded dhenki with substantial productivity increase and cost reduction and a minimum of adverse impact on employment in relation to the present dhenki. But there has never been government sponsorship of or support to R&D efforts on the subject.

The other would be to seek to alleviate the adverse employment impact of the huller mills and thereby improve their appropriateness under the present context. Programmes could be put in place to organize the displaced dhenki operators and assist them with credit and other facilities to take advantage of the opportunities given rise to by the mechanical efficiency of the huller mills rather than languish in unemployment on displacement from dhenki. Assisted and facilitated, the displaced women could, working in groups, purchase paddy in bulk, store it, perform pre-husking operations (soaking, par-boiling and drying), develop contractual links with huller mills for regular husking of the pre-processed paddy, perform post-husking winnowing operations, store the rice, and finally sell it at a profit. But even a policy stance to that end has not been formulated, let alone putting such programmes in place.

Given a macro environment lacking in sensitivity to the need for appropriate technology for rural industries, shaped by dominant elite interests and buttressed by aid dependence, as described in previous sections, it is not surprising that appropriate technology for a rural industrial activity like paddy husking has not received, as analysed above, proper attention and support through appropriate macro-policies, institutions and resource allocation.

VI. CONCLUDING REMARKS

Rural Industries are a very important source of employment and income for the rural poor in Bangladesh. But these industries have largely remained characterised by technological backwardness and low productivity. In certain cases, however, improved and modernized techniques have been introduced although traditional techniques have remained in wide use side by side in the same industries. In these cases of technological dualism and pluralism, the poor have generally remained stuck with the traditional techniques while the improved and modernized alternatives have generally been captured by relatively well-to-do people. Some of the improved or new techniques are also inappropriate given the existing situational context in rural Bangladesh. How things have been shaping up in one such case, viz., paddy husking, has been discussed in this paper. Similar developments have been taking place in such other rural industries as oil extraction from oil seeds, wood works, and gur/sugar making from sugarcane.

It emerges from the analyses presented in this paper that what has been happening in respect of technology and the development of rural industries in Bangladesh has been, in a large measure, in resonance with the dictates of the macro environment that has its roots in the country's highly unequal socio-economic structure and the dependent nature of its economy giving rise to forces stacked against the interests of the ordinary rural industrial entrepreneurs who belong to the ranks of the rural poor. Micro interventions concerning upgradation of technology in respect of certain rural industries have made some useful contribution, but their scope and reach have remained very limited under the prevailing circumstances.

NOTES

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- 1&2. The terms micro-decision-making units or, simply, micro units and macro-policies are used here in broad senses as has been done by Frances Stewart (in "Macro-Policies for Appropriate Technology: An Introductory Classification" in Frances Stewart (ed.), Macro-Policies for Appropriate Technology in Developing Countries, Westview/Boulder and London, 1987, P.2. Micro units include conventional private sector firms (with owners, employers and employees), public sector firms, cooperatives, and family and household organization. Macro-policies include conventionally understood macro-policies, viz., policies concerning major economic aggregates such as money supply, interest rate, public expenditure, budget deficit, exchange rate and so on as well as such policies as those concerning technology, market access and so on.
3. Rural population constitutes over 80 per cent of the total population of the country (see Bangladesh Bureau of Statistics, Government of Bangladesh, Statistical Pocket Book of Bangladesh 1986, P.108); per capita annual income in 1985-86 was Tk.4629 or about US\$ 150 (see Statistical Pocket Book of Bangladesh, op. cit., P.415); people below the poverty line account for over three-fourths of the total population of the country and those critically poor account for over 50 per cent; on an average only 1.64 per cent of the GDP was saved during 1980-85 (see Statistical Pocket Book of Bangladesh, op. cit., P.412); foreign exchange earnings pay for one-third to 40 per cent of the merchandise imports of the country (see Statistical Pocket Book of Bangladesh, op. cit., P.386); and about 40 per cent of the total available labour time of the country remains unutilized. For data and comments on poverty and unemployment levels see, for example, Q.K. Ahmad and F.A. Chowdhury, Rural Industrialisation in Bangladesh: A Synthesis Based on Studies on Rural Industries Development in Selected Upazilas, Bangladesh Institute of Development Studies, Dhaka, June 1987, Section III. One may also see this report for somewhat elaborate discussions on the concepts of appropriate technology and rural industry, which have been liberally drawn on for ideas presented here on the two concepts.
4. The characteristics-approach to appropriate technology serves the purpose at hand here. For a critical look at this approach and the alternative welfare-approach to appropriate technology (when it is defined as a set of techniques which make optimum use of available resources in a given environment, see Frances Stewart, op. cit., Pp.2-5. It may be noted that she has also preferred the specific characteristics-approach over the welfare-approach mainly for reasons of action orientation of the former as opposed to the latter.

5. Planning Commission, Government of Bangladesh, Third Five Year Plan 1985-90(TFYF), Chapter II.
6. See Planning Commission, Government of Bangladesh, various five year plans.
7. Q. K. Ahmad and F.A. Chowdhury, op. cit., Pp. 39-40.
8. Not only for the rural industrial sector (noted in section II) but largely also for the agricultural and the urban informal sectors, an appropriate technology would usually be an upgraded technology because of the preponderance of traditional technologies in these sectors.
9. Various five year plans, op. cit.
10. Science and Technology Division, Ministry of Education, Government of Bangladesh, National Science and Technology Policy, February 1986(1986 S&T Policy).
11. ibid.
12. ibid.
13. TFYP, op. cit., Chapter entitled Scientific and Technological Research.
14. 1986 S&T Policy, op. cit.
15. ibid.
16. Science and Technology Division, Ministry of Education, Government of Bangladesh, Report of the First Meeting of the Consultative Committee on Transfer of Technology, 13 April 1987.
17. Ministry of Industries, Government of Bangladesh, Industrial Policy - 1986, Dhaka, July 1986.
18. Q. K. Ahmad, Upgrading of Technology for Rural Industries in Bangladesh: A Review of Experience, ILO/ARTEP, New Delhi, October 1987.
19. The NGOs which have made some contribution towards upgrading technology for rural industries in Bangladesh include Bangladesh Rural Advancement Committee(BRAC), Mirpur Agricultural Workshop and Training School(MAWTS), Micro Industries Development Assistance Society(MIDAS), Proshika (Centre for Human Development), Rangpur Dinajpur Rural Services(RDRS), Mennonite Central Committee(MCC), Rural Technical School(at Suruj in Trngail Zila), Dhaka Shishu Programme(DSP). Again their technology activities are of relatively recent origin, mostly occurring during the past few years. It has been found that these organizations together have, up to 1987, introduced 20 improved or new consumer and 48 improved or new capital items or groups of items, most of which are either at the experimental stage or in limited commercial use. See Q. K. Ahmad, "Upgrading of Technology for Rural Industries in Bangladesh: A Review of Experience, op. cit.

20. To indicate how meagre these sums are in absolute terms, it may be pointed out that the allocation to small and cottage industries in the TFYP, i.e., for the 1985-90 period, was Tk. 1350 million (US\$ 43.5 million), or 5.4 per cent, out of a total allocation to the industrial sector as a whole of Tk. 26,000 million (US\$ 838.7 million). See TFYP, P. 247.
21. See Statistical Pocket Book of Bangladesh, op. cit., P.416. The full contribution of rural industries to the GDP is not reflected in the contribution of small industries as officially shown. Cottage and tiny activities are unlikely to have been taken into account in the official estimates. Micro studies show a much higher contribution of rural industries to GDP. For example, the Rural Industries Study Project (RISP) of BIDS found it to be 8.3 per cent (see Rural Industry Study Project, Final Report, BIDS, Dhaka).
22. The source of the official estimate is: Bangladesh Bureau of Statistics, Government of Bangladesh, Pilot Manpower Survey 1979, Dhaka, June 1980.
For sources of other figures quoted see Q.K. Ahmad and M.U. Ahmed, "A Review of Rural Non-Farm Activities in Bangladesh" in S. Mukhopadhyay and Chee Peng Lim (eds.) Development and Diversification of Rural Industries in Asia, APDC, Kuala Lumpur, 1985.
23. The entrepreneurs (well over 90 per cent of all entrepreneurs), who do not receive credit, raise (a) the initial capital largely from personal savings out of income from agriculture and other occupations but also from sale of land and other assets, inheritance, and dowry; (b) the expansion capital mainly from profits made in the activities concerned but also from personal savings from other sources of incomes, and sale of land and other assets; and (c) working capital from various sources noted under (a) and (b) above, but since the capacity of the rural entrepreneurs is extremely limited in respect of all these sources, raising of working capital, which is needed on a rolling basis regularly, becomes a very formidable problem. (See footnote 24).
24. See M.U. Ahmed, "Financing Rural Industries in Bangladesh" in Q.K. Ahmad (ed.), The Bangladesh Development Studies: Special Issue on Rural Industrialisation in Bangladesh, March-June 1984.
25. Industrial Policy - 1986, op. cit.
26. This is the main reason why many rural industrial activities continue to exist even though, as noted earlier, they suffer from low productivity and hence low, even negative profitability.
27. One may see, for example, Q.K. Ahmad, "Prospects of Agrarian Reforms and their Roles in Rural Development in Future Development Strategies of Bangladesh" presented in a seminar on Evaluation of Agrarian Reform Measures in Bangladesh organized by Centre on Integrated Rural Development for Asia and the Pacific (CIRDAP) in collaboration with Lincoln Institute for Land Policy USA and Asian Institute for Rural Development (AIRD, India) held in Dhaka, 29-30 July 1986, for data on below poverty level population, calorie deficient population and landownership pattern assembled from different sources.

28. The figure on the proportion of paddy husked by mechanised methods in 1987 has been obtained from the Directorate of Industries, Government of Bangladesh.
29. Gloria L. Scott and Marilyn Carr, "The Impact of Technology Choice on Rural Women in Bangladesh: Problems and Opportunities", World Bank Staff Working Papers, No. 731, Washington, 1985, P. 53.
30. Industrial Policy 1986, op. cit.
31. For data used here on automatic mills see Q.K. Ahmad and F.A. Chowdhury, op. cit.
32. A fully integrated automatic mill has^a daily capacity of over 1000 maunds, which is difficult to come by except under contract for husking government procured paddy.