PROPOSAL
FOR
COLD STORAGE

BRAC

BANGLADESH RURAL
ADVANCEMENT COMMITTEE

DACCA, BANGLADESH

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DECEMBER
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DACCA

Summary of Proposal

Bangladesh Rural Advancement Committee proposes to install one cold storage unit of 4000 tons potato preservation capacity with an attached ice-plant of 10 tons/day capacity at Daudkandi in Comilla district which is a major potato growing area. The envisaged project will meet 0.8% of the net national potential demand for potato cold storage capacity and in line with BRAC's interests in income generation in the rural sector will add a total of Tk.4.0 million annually as net income by potato growers. The supply of ice is also expected to improve prices of catch obtained by local fishermen. The net profits amounting to Tk.2.5 million per annum and above will go into funding BRAC's development projects for improving the lot of the underprivileged and disadvantaged poor in the rural areas. The return on total capital employed of 17% per annum and above on a reasonable revenue earning basis by the third year of operations is accepted as highly satisfactory. The entire project is estimated to cost about Tk.17.3 million (eqv. US$ 1.11 million) including initial working capital requirement.

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APPENDICES

1. Bangladesh Rural Advancement Committee:

The Bangladesh Rural Advancement Committee (BRAC) is a non-governmental organisation involved in various activities with the objective of contributing to the economic and social development of rural Bangladesh. Founded and run by Bangladeshi nationals it is registered under the Societies Registration Act 1860.

Begun in a small way in February 1972, to rehabilitate refugees of the 1971 liberation war returning to Sulla Thana in the district of Sylhet, BRAC has grown into an organisation with projects and activities in several other districts. The scope of operations has evolved from rehabilitation to integrated rural development, human and institutional development, and the design, testing and implementation of innovative approaches, techniques and methodologies for rural development. The focus of development has shifted from community approach to mobilisation and organisation of the poor and disadvantaged sector of the population.

In addition to the physical and operational growth of the organisation, seven years of practical experience in the planning and implementation of rural development programmes has enabled BRAC to foster the development of people and institutions so necessary for long-term and self-sustaining growth of rural Bangladesh. All the sectoral programmes such as agriculture, horticulture, pisciculture, animal husbandry, duck and poultry raising, nutrition, health care, family planning services, and functional education are initiated and controlled by cooperative groups of disadvantaged people. In support of self-sustained growth of the group activities BRAC provides training, extension, credit and logistics assistance. Linkages among the village level groups are being promoted through local and project level associations.

The present annual operational cost of approximately $600,000 is met by project grants from overseas non-profit organisations and international agencies.

A summary of the organisation's current activities is given in Appendix I.

2. Feasibility of the Project:

The acreage under potato cultivation and its yield in Bangladesh have both registered a significant increase in past years. In 1966-67, potato cultivation in 173,000 acres yielded a national total of 590,000 tons at an average of 3.41 tons per acre. This in 1976 - 77 rose to 191,000 acres producing 724,000 tons at an average of 3.79 tons per acre.

Presently, the productivity per acre in this country is amongst the highest in Asia. With more availability to farmers of higher yielding seed varieties, the high profits from potato cultivation in relation to other winter cash crops, the possibilities of consumption of potato as a staple food complementing rice or even as an alternative and with the possibilities of expanding cultivation into scarcely irrigated and fallow lands, the scope for future increase in total national production also appears to be extremely good in this country. Appendices II & III discuss in more details the state of potato cultivation and yield in Bangladesh and the potential for future expansion.

However, due to the perishable nature of potato in relation to cereal crops and the tropical climate prevalent in Bangladesh, the greatest obstacle to potato cultivation has been the lack of adequate refrigerated storage space for potato stocks. A substantial part of the entire crop is consumed shortly after harvest and most of the rest is left to prevailing high temperature situations. Harvest is in the spring, when, as in other tropical countries, there is a quick rise in temperature followed

by intense heat in the summer. The potato harvest loses in weight gradually and is highly prone to shrivelling, rotting or sprouting. A majority of the farmers use home-based storage methods, but, according to local agricultural experts the weight loss is as high as 40% within about 2 months of harvesting.

Inadequate storage facilities also affect ex-growers price trends very sharply. During harvest time of end - March to early-April prices paid to growers prevail at Tk.830 per ton at wholesale rate. During June - July these go up to Tk.1450 per ton for table potato. In September - October prices reach Tk.2,600 per ton. Seed potatoes go up to Tk.3,000 per ton and above during sowing time which is in December.

In 1977 - 78 the total number of cold storages in operation was 77 with a storage capacity of 87,000 tons. Allowing for home -based storage capacity, the total potential demand for cold storage space is estimated at 476,000 tons on 1977 basis with projected demand of 571,000 tons in 1981. An additional cold storage capacity of 30,000 tons is expected to be in operation during 1981 leaving a net national demand gap for cold storage capacity of 454,000 tons by 1981. Appendix IV provides the logic behind the above estimates.

In this backdrop BRAC proposes to set up one cold storage in Daudkandi in Comilla district with a potato storing capacity of 4000 tons. The feasibility of the proposed capacity and location is discussed in Appendix V. The project would cost about Tk.17.3 million i.e. about US$ 1.11 million. Expected to take nearly a year to implement, this project is envisaged to commence operations by 1981. By that time it will meet about 8% of the net storage demand gap existing in Comilla and 0.8% of the net national storage demand gap. An ice-plant of 10 tons/day capacity will also be operated by the same compression system and is included in the total project cost. Its feasibility is discussed in Appendix VI.

3. Rationale Behind the Proposal:

Over the years BRAC's activities in the field of rural development have expanded both in scope and dimensions. This has led to corresponding increases of operational expenditure. The annual expenditure for 1979 is estimated to be around taka 10 million which by 1982 is expected to double when projects currently at preoperating stages become operational.

BRAC's operations have so far been funded by International agencies and non government organisations. Although no difficulties have thus far been encountered on having projects funded, uncertainty of a continuous flow of funds saps staff morale. BRAC therefore felt as a matter of policy, that the dependence on foreign sources for project funds should be reduced and a measure of control established over its own future.

Thus with a view to generating funds domestically and creating stable and long term sources, BRAC decided to set up a number of income generating projects consistent with BRAC's overall development goal.

BRAC printers, an offset printing press was set up in 1977 to operate commercially after meeting BRAC's own printing needs which are considerable. This has started making profits and by 1980 will be able to contribute more than Tk. 1 million annually in support of BRAC's rural development activities. Additional industrial units like the proposed cold storage would enable BRAC to meet a substantial portion of its fund requirements from its own sources. It is expected that the cold storage would be able to contribute to BRAC more than Tk.2.0 million annually from 1982.

BRAC's concern for development in the agricultural sector and for improving income of the rural poor and marginal farmers has been the major consideration in the selection of a cold storage unit over other viable industrial projects. Agricultural

marketing and pricing mechanisms in this country have long been to the detriment of growers.

The prices received by growers include a bare surplus over costs. For small growers at or near the subsistence level who constitute the majority of the rural population, the problem is more acute since the entire produce is sold out at harvest time when prices are their lowest. The early sales by the small growers is dictated almost wholly by the need to repay loans for agricultural inputs and to meet immediate consumption needs.

This factor is aggravated in the case of potato by its perishable nature. Consequently also price differences over the year are greater for potato than for other cash crops with non cold storage stocks selling at the lower end and cold storage stocks availing the higher margins. With a difference of about Tk.2100/ton between harvest time and sowing time as payment received by growers and with a cold storage rental rate of Tk.1100/ton the net loss of additional potential benefit to growers not able to avail storage space would amount to Tk.1000/ton.

With the excellent potential for potato, as discussed in Appendix III, both as a food and as a cash crop, BRAC feels that cold storage capacity in the country should be considerably expanded. The stabilisation effect on the pricing will be of more benefit to small growers even if large growers are better able to afford storage rentals. On a macro-level a sizable increase in marketing stocks if created will definitely reduce pressures on immediate after-harvest sales thus bringing up floor prices on which the subsistence farmers survive. Also the potential thus created for replacement of other less profitable crops will be beneficial even if expanded production results in static after-harvest prices.

However, even with expanded cold storage facilities, small growers particularly those on subsistence living will continue to be deprived of direct marginal benefits unless reservations of space are preferentially kept for small individual stocks since all cold storage owners prefer large individual stocks for easier handling. Also, the ability of small growers to store for prolonged periods has to be created through extension of advances against stocks or marketing loans to enable these growers to meet their inputs cost replacement and immediate consumption needs. BRAC would be in a position to do so through extending the credit services of its Rural Credit and Training project to small client growers who can simultaneously be given preferential treatment in renting space.

In quantitative terms, the proposed cold storage unit, with the commencement of operations, will have the potential to increase farm earnings for not less than 10,000 cultivators. At the rate of Tk.1000/ton as net additional benefits obtained by growers from cold storage facilities, BRAC with its proposed 4000 tons capacity unit would have the potential to directly generate a total rural net income of Tk.4.0 million annually. A similar rationale would also to a large extent apply to the ice plant included in the project.

4. Objectives of the Project:

The general objective of this project is to create a stable domestic source of income in support of BRAC's rural development activities and reduce its dependance on external funding.

The specific objectives this project would be required to meet will be as follows:

1. To establish and operate an efficient cold storage unit with generation of profits at a reasonable return on total capital employed .

2. To improve earnings of small and marginal farmers directly through preferential storage space reservation and assistance in obtaining marketing loans.

3. To reduce wastage and spoilage due to heat of a valuable food crop.

4. To indirectly assist in improving prices of catch of the local fishermen by assuring steady and cheaper supply of ice to fish wholesalers.

5. To benefit the rural poor through development activities financed out of profits generated by the cold storage unit.

5. Physical Particulars of the Project:

The cold storage unit will basically have a warehousing structure with an air conditioning plant for maintaining an even temperature of about 4°C with effective internal ventilation for removing heat generated by the stored potato stocks while assuring a high humidity without condensation to reduce water content loss and also assuring a good atmospheric oxygen content through supply of fresh air to allow normal vegetative respiration. The ice plant would merely be an extension of the ammonia condensation system to a small section of the warehouse building.

Land & Site:

The actual land requirement of the entire project would be about an acre. Plots of one acre are quite readily available at Daudkandi on the river-side and would cost about Tk.0.2 million. A suitable site would be somewhere between the two river-crossing ferry ghats on the eastern bank of the Meghna river. This would be adjacent also to the all-weather Dacca-Comilla-Chittagong trunk road.

Building:

Whole potatoes when heaped together in bulk occupy 40.71 cft. per ton. To allow for space taken by sacking, stacking,

racks, passage ways, room-partitions and allowance for effective air-ventilation the building space actually required in relation to potato bulk volume is 3.8:1. For 4000 tons the space thus required comes to 618,792 cft.. With a building height of 48 ft. from floor surface to ceiling surface which is normally allowed for tier-stacking of potato the cold storage room floor space thus required comes to about 12,800 sft.. Enough shaded space in the form of a tin shed would also be required for receiving, sorting and grading and fanning(to remove excess moisture and heat gathered during transportation.) An intermediate pre-cooling room is required where potato sacks are subjected to a temperature of about 13^{0}C for 72 hours. Provisions have been made for machine room, ice plant, manager's accommodation, guest room, boundary wall, water tank, etc.

Machinery and Equipment:

Machinery and equipment like compressors, motors, condensers, air-cooling units, etc. have to be imported. Enquiries are being made with American, European and Japanese manufacturers for offering the entire unit. Both cost and quality will be important considerations in final selection. On C&F Chittagong basis machinery and equipment inlcuding a standby generator set will on the medium range cost about Tk.4.5 million. Local material for wood racking, wall insulation material, galvanised and mild steel sheets for ice-cans and ducting and other materials and fittings,etc. would cost an additional Tk.2.5 million.

Supply of Operational Inputs:

Electricity from a 33 kv overhead power supply line from the local substation which is connected to the Karnaphuli power grid system would be perennially available. Diesel for the standby generator can be abundantly had from nearby petrol pumps.

The few cylinders of ammonia gas that would be required every year are readily available in Dacca and Chittagong and can be transported to Daudkandi very conveniently. As for spares BRAC would require the machinery suppliers to guarantee these for a minimum of 10 years. Minor maintenance can be done locally or with assistance from workshops in Dacca, Comilla or Chittagong. Labour for loading, unloading, sorting, bag turning, etc. will be readily found in the locality.

6. Cost of Project:

Total cost of project has been estimated as follows:

(Tk. in 000's)

Land & land Dev.		
- Land - 1 acre	200	
- Land Dev.	100	300
Civil Construction		
- Cold storage Room	5504	
12800 sft. x Tk.430		
- Office & pre-cooling room	315	
2000 sft. x Tk.150		
- Unloading & Processing Shed (tin roofing)	84	
2800 sft. x Tk.30		
- Machine room & Ice Plant	600	
3000 sft. x Tk.200		
- Boundary wall, water tank, drainage, etc.	510	
- Manager's Accom. & Guest room	120	
800 sft. x Tk.150		
- Contingency Allowance 10% of above	713	7845

Mach. & Equipment

Imported machinery		
- Compressors, electric motors, oil separators, ammonia condensors & receivers, pipes & pipe fittings, air cooling units, insulation beads, etc. on C&F Ctg. basis	3600	
- Diesel generating set(C&F)	900	
- Custom duty, clearance, etc. (5% of C&F value)	225	
- Internal Freight	100	
- Erection & Installation	200	
- Contingency 10% of above	502	5527
Local machinery & materials		
- G.P. & M.S. sheets, wood, gas, beads, G.I. pipe, Bitumin, wire net, common salt, door fittings, locks etc.	2500	
- Lifting crane, brine agitator, condenser pump	58	
- Transformer 300 KVA	300	2858
Furniture & fixtures		60
Prel. & start up expenses		60
Total fixed cost		16,651
Net Initial Working Cap.		612
Total cost of project		17,263

At the official exchange rate of US$ 1 = Tk.15.5 the total cost of project amounts to US$ 1,114000. Calculations of initial working capital requirement have been shown in a later section.

7. Schedule of Implementation:

From final commitment of funds, the implementation process will roughly take one year. The breakdown of basic activities is given in Appendix VII. Work on land- procurement, architectural plans, building specifications and selection of machinery will start earlier than the final commitment of funds which is expected by end January 1979. Building construction and machinery manufacture and shipment are expected to begin by March to April 1979. Work on the project can be completed by February 1981.

8. Revenue Projections:

The total revenue projections, the bases of which are discussed in Appendix VIII, are as follows:

Revenue on potato at 100% capacity @ Tk.40/ton: Tk.4400,000

	Y - 1	Y - 2	Y - 3	Y - 4
				(Tk. in 000's)
Capacity	85%	90%	95%	95%
Rent Revenue	3740	3960	4180	4180

Sales of Ice: 8 tons/day @ Tk.600/ton for 200 days
= Tk.960,000

				(Tk. in 000's)
Gross Revenue	4700	4920	5140	5140

9. Costs of Operation:

Calculations on costs of revenue, operating and non-operating expenses are provided below:

(1) COST OF LABOUR

Technical staff(Indirect labour)

Technical supervisor 1 @ 1000/mth.	Tk.1000
Technical helpers 4 @ 600/mth.	2400
Labour 15 @ 400/mth.	6000
Total monthly cost	Tk. 9400
Annual cost Tk.9400 x 12	Tk. 112800

Indirect labour cost projections: (Tk. in 000's)

	Y - 1	Y - 2	Y - 3	Y - 4
	113	113	113	113
Add: 5% increase + Bonus 1 mth. salary	9	15	21	28
	122	128	134	141

Temporary labour(Direct labour)

Loading	Tk.1.50/bag of 2½ mds.
Unloading	Tk.1.50/bag of 2½ mds.
Turning	Tk.0.25/bag of 2½ mds. x 3 times/year
Total	Tk.3.75/bag of 2½ mds./year

Lab. cost at 100% cap. utilisation -
44,000 bags x 3.75 = Tk.1,65,000

Direct labour cost projections:

	Y - 1	Y - 2	Y- 3	Y - 4 (Tk. in 000's)
Capacity	85%	90%	95%	95%
Annual costs	140	149	157	157
Total labour cost	262	277	291	298

(2) MANUFACTURING OVERHEAD(Projections)

	Y - 1	Y - 2	Y - 3	Y - 4 (Tk. in 000's)
Power 55 KW x 2 x 24 x 300 = 792000 KWH @Tk.0.60 with 2% annual increase	475	485	494	504
Stores, spares & repair	20	30	40	40
Lubricants	10	10	15	15
Refrigerant gas	30	30	35	35
Brine	15	15	15	15
Insurance on plant & eqpt. & stored potato	100	110	120	120
	650	680	719	729

(3) DEPRECIATION

	value	rate	amount(Tk.in 000's)
Building	7846	2.5%	196
Machinery & equipment	8385	10.0%	839
Furniture & fixtures	60	15.0%	9
			1044

(4) ADMINISTRATIVE SALARIES

Manager 1 @ Tk.2500	2500(+ free accomn.)
Accountant 1 @ Tk.1400	1400
Clerk 1 @ Tk.600	600
Typist 1 @ Tk.700	700
Peon 1 @ Tk.500	500
Darwan 2 @ Tk.600	1200
	6900 p.m. i.e. Tk.83000 p.a.

Administrative Salary Projections

	Y - 1	Y - 2	Y - 3	Y - 4 (Tk. in 000's)
Annual Adm. salaries with 5% annual increase	83	87	92	96
Bonus 1 month's salary	7	7	8	8
Total	90	94	100	104

(5) GENERAL EXPENSES

Printing & stationery	5000
Postage, Tel. & Telephone	7000
Travelling expenses	8000
Legal & Audit	5000
Selling expenses	5000
Total general expenses p.a. Tk.	30000

(6) AMORTIZATION

	value	rate	amount(Tk.in000's)
Prel. Expenses	60	15.0%	9

10. Earnings Forecast

On the basis of estimates for revenue and costs of operation made previously earnings of the new project for the first 4 years of operations are projected in the estimated income statements below:

ESTIMATED INCOME STATEMENTS (Tk. in 000's)

	Y - 1	Y - 2	Y - 3	Y - 4
REVENUES	4700	4920	5140	5140
COSTS OF REV.				
Labour costs	262	277	291	298
Manufacturing O/Hs	650	680	719	729

	Y - 1	Y - 2	Y - 3	Y - 4
Depreciation	1044	1044	1044	1044
	1956	2001	2054	2071
GROSS PROFIT	2744	2919	3086	3069
OPERATING EXPENSES				
Administrative salaries	90	94	100	104
General exps.	30	30	30	30
	120	124	130	134
OPERATING PROFIT	2624	2795	2956	2935
NON OPERATING EXPENSES				
Amortisation	9	9	9	9
NET INCOME	2615	2786	2947	2926

The profitability of the project can be judged from the return on the total capital employed defined as the ratio of annual net income to the total cost of project of Tk.17,263,000.

	Y - 1	Y - 2	Y- 3	Y - 4
Return on T.C.E.	15%	16%	17%	17%

11. Net Initial Working Capital Estimates

The working capital requirement for starting operations are estimated on the following bases.

(Tk. in 000's)

Current Assets Req.

1. Advances to growers at 5% of Rental Revenue 187
2. Temporary labour: loading & turning cost 99
3. Manufacturing O/Hs for 5 mths. 271
4. Permanent labour cost for 5 mths. 47

5. Admn. salaries for 5 mths.	35
6. General expenses for 5 mths.	13
	652
Less: Current Liabilities	
Deposits from ice-purchasers for 15 days	40
Net working capital Req.	612

12. Break - Even Analysis

To determine a reliable estimate of break-even on potato rentals only, the sales revenue from ice should be neglected and ice production assumed to be nil. This will reduce from manufacturing overheads the cost of brine and about 5% of the electricity bill. The break-even analysis therefore works out as follows, based on 95% capacity utilisation in the 3rd year of operation:

			(Tk. in 000's)
1. Total Rental Revenue			4180
2. Variable Costs			
Direct Labour			157
Manufacturing O/Hs		719	
Less: Insurance		(120)	
5% of power		(25)	
Brine		(15)	559
			716
3. Fixed Costs			
Insurance			120
Depreciation			1044
Amortisation			9
Admn. Salaries			100
			1273

4. regulated Costs

Indirect Labour	134
General Expenses	30
	164

Assuming 20% of annual regulated costs to be variable and 80% fixed, the total variable and fixed costs come to:

(Tk. in 000's)

Tot. V.C. = 716 + 33 = 749

Tot. F. C. = 1273 + 131 = 1404

The break-even parameters can thus be worked out as follows:

B - E Revenue(Rentals) = F.C. x Rev. ÷ (Rev. - V.C.)

= 1273 x 4180 ÷ (4180 - 716)

= Tk.1,536,000

B - E Tonnage = 1396 tons

B - E Capacity of Operations

= 35%

13. Cash Flow Projections

The total cash generated from operations of this project are given below:

	Y - 1	Y - 2	Y - 3	Y - 4
			(Tk. in 000's)	
CASH INFLOW				
Net initial working capital	612	-	-	-
Cash surplus from previous year	-	4280	8119	12119
Net Income	2615	2786	2947	2926
Depreciation	1044	1044	1044	1044
Amortisation	9	9	9	9
	4280	8119	12119	16098
CASH OUTFLOW	-	-	-	-
CASH SURPLUS	4280	8119	12119	16098
TOTAL PROJECT COST				

CURRENT ACTIVITIES OF BRAC

1. Sulla Project:

Begun in Februrary 1972, Sulla is the original and still the largest rural development project. Phase I rehabilitation programme ran from February to October 1972 which mainly consisted of a large housing programme (10,200 units) and the rehabilitation of fishermen.

Phase II ran from November, 1972 to December, 1975, where BRAC was involved in eight sectoral activities, the emphasis having shifted from rehabilitation to the development of rural institutions and infrastructure. BRAC provided building materials to 175 villages for the construction of community centers designed to become the focal point for community activities. A functional education programme was initiated to provide adult education to the almost entirely illiterate population of the project area. Both these projects met with limited success initially but provided valuable experience for workers of BRAC in approaching rural problems. In the field of agriculture, BRAC workers organised block farmers, set up demonstration plots, and provided low lift pumps, power tillers and vegetable seeds. Embankments were built under a Food For work project to prevent damage to crops from early flooding. Assistance was also given to landless farmers to lease land for group farming and inputs were made available to the fishermen communities. Health care and family planning activities were undertaken by recruiting qualified doctors and training local young men and women as paramedics and family planning workers. Throughout

Appendix I Contd.

Phase II BRAC workers and local people involved in BRAC projects were provided training in various fields. (See Bulls Project Report on Phase II).

In Phase III, the last and current phase which ends in December, 1980, the focus has been redefined to the mobilisation and organisation of the landless and disadvantaged people in ensuring their participation and control in the process of development. These organisations of the landless, the marginal farmers and the women are already becoming quite strong and close attention is being given to developing the groups to a self-reliant stage.

The Bulls project is funded by OXFAM-U.K., OXFAM-Canada, Canadian International Development Agency (CIDA), Bread for the world (Germany) and Community Aid Abroad (Australia). (See Bulls Annual Reports.)

2. Manikganj Project:

The Manikganj Project began in April, 1976. As a result of the experience gained in Bulls it started at a more advanced stage.

The approach in Manikganj has been to promote rural development activities through formation of groups of the people themselves and with a minimum number of BRAC personnel. The role of BRAC staff is building rural institutions and the creation and training of different cadres of rural workers.

Disadvantaged members of the community are carefully identified and brought together in a process of conscientisation through group workshops and a specially designed

Functional Education Course. They are then supported in undertaking income generating ventures and social action for their own benefit. BRAC support includes training of the group members in agriculture, horticulture, duck and poultry raising, pisciculture, sericulture in addition to village level health and family planning work. Most income generating activities are initiated through the groups' own savings with substantial credit support from BRAC.

The Manikganj Project has Bread for the World funding for three years. (See Manikganj Project Plan and Annual Reports).

3. Jamalpur Project:

The Jamalpur Project, in the district of Mymensingh, about 100 miles from Dacca, started modestly in 1974 in cooperation with UNICEF. BRAC agreed to provide non-formal education to 850 destitute women involved in a food-for-work project. The 15 teachers since then expanded their activities to cover other development activities in 30 villages around Jamalpur town. The project's target population include poor and destitute women but the types of activities are similar to those in other BRAC field projects.

This project is now being funded by OXFAM-America and will extend upto 1981. (See Jamalpur Women's Programme, and Annual Reports).

4. Materials Development:

In May 1974, BRAC embarked on a 21 month pilot project to develop innovative functional education materials and

methodology for Bangladesh. A Materials Development Unit - three writers, one illustrator, plus their supervisor - was set up to develop, test and produce functional education materials for adults in various parts of the country on an on going basis.

The functional education materials consist of 60 lessons. The lessons are designed to deal with the major issues affecting the lives of the rural population and also to provide a level of literacy and numeracy skills. There are 81 charts, a lesson book containing the sixty lessons, a teacher's manual and several games used to reinforce the lessons.

The Materials Development Unit has developed a 14 lesson health education module with multi-coloured posters dealing with maternity, nutrition, family planning, and general and children's diseases.

MDU is also involved in writing books on health, nutrition, education, agriculture etc. and booklets dealing with the major issues covered in the functional education course to proved a permanent source of reference for the neo-literates.

Presently, the Materials Development Unit is running a number of exprimental schools with a view to developing Materials for Primary Education.

BRAC's approach to non-formal functional education has found acceptance among almost all the major voluntary organisations involved in development activities in Bangladesh and is used extensively.

The Materials Development Unit, initially funded

by OXFAM-Canada and OXFAM-America, is currently being supported by internal resources generated from the Printing Press. (See Report on Development of Innovative Methodologies in Functional Education for Bangladesh, 1977).

5. Training and Resource Center (TARC):

The emphasis on human and institutional development and the increasing demand for BRAC's functional education method have tremendously increased the need for providing training to several kinds of workers. As a result, a permanent training facility was established within BRAC in January, 1978.

BRAC purchased 15 acres of land in Savar in the outskirts of Dacca for the establishment of the Training and Resource Center with facilities for training in planning, implementation, leadership, group dynamics consciousness raising, communication and practical skills in Functional Education teachers training, poultry, fishery, horticulture, seed multiplication and cooperative management. The center consists of classrooms, a library and documentation center, dormitories for trainees, accommodation for trainers and administrative staff, demonstration plots and fish tanks, a hatchery, and a poultry farm.

Because the training needs and demands of trainees differ, TARC staff and functions have, since July, 1978, been divided between BRAC Head Office and the Savar Campus. At the BRAC Head Office, TARC staff train the staff of other voluntary agencies and of government departments. And the training staff in Savar train BRAC field staff and members from the organised groups of the disadvantaged

from BRAC's field projects. In addition, Savar-based st provide outreach services to organised groups from areas where BRAC has made contact or had field activities but n actual field project.

The Outreach team's responsibilities are:

a. To scout out and form viable landless groups, i different parts of the country.

b. To provide continuous training and educational support to these groups.

c. To ensure regular follow-up, guidance and techni cal and material assistance for implementing their programmes.

The TARC is funded for 3 years, through 1980, by a grant from OXFAM-America and OXFAM-U.K. (See TARC Projec Proposal and Annual Reports).

6. Gonokendra Journal:

The journal began as a monthly publication in April, 1973 to reinforce the functional education programme in the Sulla project area. The journal's content was orien to increasing the awareness of the problems of rural dev ment and providing knowledge about matters of interest t the rural population.

In June, 1974 UNICEF came forward with financial support for the distribution of the journal to all primary and secondary schools throughout the country. Thus, Gonokendra became a national journal. From its inception to the present, the circulation has increased from 2,000 to 65,000 with a readership of more than 200,000. The number of pages has increased from eight to twelve, whic

includes a four page insert for new literates and school children. The editorial, last page feature and cartoon deals with some pertinent aspect of development. The news and literacy page and the features on health, agriculture and women are designed to appeal to the general readership.

It is presently being financed from income generated by the printing press. (See Gonokendra Follow-up survey, 1977).

7. Research and Evaluation:

The Research and Evaluation activities in BRAC have been in response to the recent awareness that research on rural issues and institutions must be more deeply rooted in the lives and occupations of the rural populations. The theme of involving villagers in the research concerns coincides with the view that development workers themselves must ask penetrating questions on rural issues to produce a greater movement towards participatory research.

This concern with "participation" in research has been reflected in the emphasis of the Research and Evaluation section's studies. Training and workshop sessions have taken place where researchers and field-workers have exchanged ideas to develop new research methodologies. The concern here was to create an interest amongst the field-workers to be directly involved in research activities and to absorb the research approach into their daily work. Meanwhile the researchers were encouraged to have a greater first-hand experience of the issues and problems that confront the field-worker.

On another level, the concern has been to bring the disadvantaged villagers into the research process and to encourage them in identifying and analysing their own situation in the socio-economic environment. Emphasis has been placed in trying to understand their environment through their own perceptions. A series of studies has been initiated to serve as a forum for the peasants' own perceptions. In this way BRAC hopes to throw light on solutions to rural problems that will be directly relevant and meaningful to the peasants.

Meanwhile, the research staff have continued to produce village micro-studies that examine the way in which resources flow within a village. This research adds to BRAC's store of knowledge on the various socio-economic institutions that regulate the lives and relationships between the villagers.

In evaluation, BRAC has continued to extend the base-line surveys within its project areas in order to gain demographic as well as socio-economic information. Programme evaluation has continued to monitor changes and developments within programme operations. Meanwhile, specific programme sectors such as Food-for-Work projects, health-care projects and functional education programmes, have been evaluated for impact, effectiveness and performance.

The Research and evaluation Project is funded by a grant from Ford Foundation.

8. Rural Credit and Training Project (RCTP):

One of the major constraints of economic uplift of the poor in Bangladesh is their inability to get institutional credit for productive purposes at reasonable cost. This project, started in January, 1979, seeks to assist the landless, women and other economically disadvantaged groups in income generating activities with credit, training and extension provided by staff experienced in rural development. Four branches have already been set up and 10 more are planned to be set up in 1980 and '81 in different areas of Bangladesh to test an institutional model to help the poor in productive pursuits.

This essentially experimental project, planned to last for 5 years, has been funded for first three years by NOVIB with the support of the Netherlands Ministry of development Cooperation to the tune of US $1.6 million. (See Proposal for Bangladesh Rural Credit Trust, A Scheme to Finance the Rural Poor in Productive Pursuits, 1977).

9. Urban Resettlement Programme:

BRAC has undertaken the community development aspect of the Mirpur-Bashantek Rehabilitation Project, a joint project of the Bangladesh Government and the United Nations Capital Development Fund to relocate and rehabilitate the residents of a squatter resettlement. The UN requested CONCERN, and Irish-based voluntary agency, to undertake the housing and sanitation of the new site, and BRAC to facilitate the community organisation of, and job creation for the residents. BRAC is presently organising functional groups for cooperative income generating activities.

10. Oral Therapy Programme:

Diarrhoea is one of the major causes of death in Bangladesh. It is estimated that the average person has between three and six episodes of diarrhoea/year and that more than 200,000 children under five die from diarrhoea annually. Recently, a new treatment for diarrhoea, called oral therapy, was devised.

After a year of research and field studies BRAC has developed a method of oral therapy, which is appropriate for rural Bangladesh, and a program which trains village women to use this method. During the first six months of the program BRAC field workers have trained over 22,000 village women to use oral therapy for the treatment of diarrhoea. In the near future BRAC plans to expand this program.

Two BRAC publications, Oral Replacement Therapy in Rural Bangladesh with Home Ingredients and Oral Therapy Program: Jamirgonj Thana, describe and evaluate the BRAC Oral Therapy Program.

11. Aarong:

The need for a marketing outlet to serve the producers supported by BRAC and MCC was keenly felt and the Directors of the two organisations, early in 1978, decided to cooperate in establishing a marketing outlet for their products. It was however felt that exclusive marketing of sponsoring organisations product would not be a visible undertaking and the decision was therefore taken to widen the scope of the outlet to include the products of other voluntary agencies and poor craftsmen, preference being given to the

sponsoring organisations. Thus a retail shop was opened in Dacca in December, 1978 called ARONG with the objectives of:

Generating employment among disadvantaged groups of rural producers by providing supporting services and marketing facilities and

Promoting traditional crafts of Bangladesh.

The two year development phase of this project is funded by Bread For The World, Germany and Inter Pares, Canada.

12. Printing Press:

A modern printing press has been set up in the Mohakhali suburb of Dacca. The decision to set up a printing press was taken with the dual objective of making BRAC less dependent on foreign donors and to facilitate the production of BRAC's functional education materials and other publications.

The Printing Press is already making a profit and is financing BRAC's monthly journal.

The construction of the press building and the equipment are funded by OXFAM-Canada with support from CIDA.

POTATO CULTIVATION & YIELD IN BANGLADESH

Potato, an important staple in many countries of the world is used in Bangladesh primarily as a vegetable, except in periods of scarcity when it is widely taken as a substitute of principal food. Potato is however an important cash crop and its production of dry matter per unit area of land is higher than other vegetables and cereals.

In this country potato is a winter crop with sowing in November and harvesting in March. There are two main varieties, local and Dutch. The local like Lal Ghil, Nagrai, etc. are low-yielding at about 2.5 tons per acre while the Dutch are high yielding and are grown from seeds which were introduced into Bangladesh during 1958-59 since when potato production has registered a substantial increase. The yield per acre is about 8 tons. Popular Dutch varieties are Bintje, Multa, Marls, Patrones, Mirka, Arka, Cardinal, Desiree, Ultimus and others. Although degeneration occurs, the major portion of the Dutch variety seeds comes from local cultivation while some (about 8000 tons annually) is imported from Holland and distributed to the farmers through the Bangladesh Agricultural Development Corporation (BADC).

Potato cultivation is more or less scattered over all the districts of Bangladesh. But areas where intensity is relatively more are the two main silt regions namely:

(i) the Brahmaputra silt area comprising parts of the districts of Sylhet, Comilla, Noakhali, Mymensingh and Dacca in the eastern region, and

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(ii) the Teesta silt area comprising parts of the districts of Pabna, Bogra, Rangpur and Dinajpur in the northern region.

Only three districts, namely Dacca, Rangpur and Comilla however, contribute to about half of the total national production.

Although potato was introduced into the Indian sub-continent in the 17th century it was not until the 1930's that cultivation of potato became widespread in Bangladesh. In 1947-48, immediately after the partition of India, Bangladesh grew potato on 88,000 acres to produce 211,000 tons at the rate of 2.54 tons per acre. With the introduction of annual import of HYV seeds, adoption of improved cultivation techniques, increased use of fertiliser and irrigation, and expansion of acreage under potato cultivation the yield has registered a substantial increase in past years. In 1966-67, cultivation of 173,000 acres yielded a national total of 590,000 tons at an average of 3.41 tons per acre. This in 1976-77 rose to 191,000 acres producing 724,000 tons at an average of 3.79 tons per acre.

This shows that there have been increases by above 50% for every decade in the national production figures over the last three decades. Expecting a similar trend over the next 10 to 20 years would not be unreasonable.

POTENTIAL FOR FUTURE GROWTH OF POTATO CULTIVATION

About 62% of the total acreage presently under potato cultivation is sowed with local variety seeds. This is because HYV seeds are not available in sufficient quantity and these are also costlier. Small and subsistence farmers, who constitute the majority of the farming population find it easier to store local variety potatoes domestically since these have better resistance to spoilage than the HYVs which come invariably from the cold storages or are freshly imported for the season by the BADC in limited quantities. In an ideal situation, if HYV seeds were made readily available to all farmers at sowing time, the total national production would have increased by at least 90% on the same acreage.

Potato is also now one of the most profitable cash crops in the country, while for winter it gives the highest profits as compared to other vegetables and boro rice which grow in the same season. On maximum market price levels for produce, an acre of land would for boro rice give a profit of about Tk.6000 on an inputs cost of Tk.2000, for radish or okra give about Tk.3700 on an inputs cost of Tk.1300 and for cauliflower give Tk.5900 on an inputs cost of Tk.2000. On the other hand one acre would give for local variety potatoes a profit of Tk.6500 on inputs cost of Tk.2000 and for HYVs give a profit of Tk.13000 over an inputs cost of Tk.3000.

Although generally consumed as a vegetable, its use as a staple food has also been noticed in this country in recent times. Particularly during 1974 to 1975 when the

price of rice went up considerably, a substantial part of the potato crop was found to be consumed as a substitute for rice. People in Bangladesh have already known a number of ways of consumption of potato and even its mixing with wheat or rice for use as a staple food has been noticed. Its relative cheapness and a gradual recognition of its high nutrient value would certainly increase its consumption in comparison to other cereals, consequently giving importance to its cultivation.

Possibilities of horizontal expansion in terms of acreage for potato are also great. A very large tract of cultivable land remains fallow in Bangladesh during winter due to the scarcity of irrigation water sufficient enough for the cultivation of rice. But potato requires much less water while most of such land is also suitable for potato cultivation.

That potato cultivation has all the potentials of expanding in Bangladesh can be indirectly inferred from the fact that at present the average productivity per acre is the highest in Asia after Japan, Turkey and S.Korea. The reason lies in the very favourable soil and climatic conditions prevalent in Bangladesh. The silty and sandy loam soil that the country possesses is highly suitable for any root crop including potato. The well defined winter season is also a great boon for both quality and quantity. The temperatures during winter do not generally fall sufficiently for potato cultivation in most of South-east Asia, while in countries to the west climatic variations are often too extreme.

DEMAND FOR POTATO COLD STORAGE FACILITIES

The greatest hindrance to potato cultivation in Bangladesh has been the lack of adequate storage facilities. Harvest is in the spring when as in other tropical countries, there is a quick rise in temperature followed by intense heat in the summer. A bulk of the entire crop finds its way quickly into the retail market and is consumed shortly after harvest while most of the rest is left to prevailing high temperature conditions under indigenous storing methods used by growers and "aratdars" or stockists. These potato stocks lose in weight gradually and most usually shrivel, rot or sprout. According to local agricultural experts the weight loss is as high as 40% within about 2 months of harvesting. Fungal and bacterial infections like blight, pink rot, soft rot, black leg, etc. often make a sizeable proportion inedible.

Due to its perishable nature price trends show a marked variation over the year. During harvest time of end-March to early-April prices paid to growers at wholesale rate prevail at around Tk.830/- per ton. During June-July these go up to about Tk.1400/- per ton for table potato. In September prices reach Tk.2600/- per ton. Seed potatoes go up to Tk.3000/- per ton and above during sowing time which is in December. This is an increase of about 250% over March prices. Corresponding prices for imported seeds is about Tk.9000/- per ton. These variations are also reflected on retail prices in Dacca. During 1977, retail prices in March were about Tk.1.80 per seer i.e. Tk.2000/- per ton while in December these went up to

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Tk.3.80 per seer i.e. Tk.4200/- per ton which shows an increase by 110%.

Over the last two decades there has been a gradual but steady awareness of the strong need to get returns on the higher side and to extend the period of profitable marketing by both growers and wholesalers. Consequently, the demand for refrigerated storages has grown substantially. A large number of cold storages have come up which can preserve potato at 4°C for the entire season. By 1966, Bangladesh had only 14 cold storages with the capacity to store about 11,000 tons of potato. By end 1977, the total number of cold storages in operation had increased to 77 with a total storage capacity of about 87,000 tons. This means that the total cold storage capacity accounted for 2% of the total crop during 1966 and 12% of the total crop during 1977. Over this decade storage capacity grew by about 700% while potato production increased by 23%.

The difference in production and storage capacity on 1977 basis is about 640,000 tons. However the actual demand for storage capacity would be less and can be assumed. The acreage under cultivation was 191,000 acres. Assuming it to be the same in preceding and succeeding years the total seed requirement at the rate of 0.55 tons per acre comes to 105,000 tons all of which needs cold storage space. For table potato, on the basis of the assumption that growers and stockists can hold stocks through home-based methods for 3 months marketing requirement the cold storage requirement for 6 months comes to 371,000 tons. The total potential demand for

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potato storage therefore comes to 476,000 tons.

Applying the production increase rate of 50% per decade, the potential demand for cold storage capacity by 1981 on 1977 basis may be projected to 571,000 tons.

In addition to the present capacity in operation, there have been till date 23 applications to the local industrial credit institutions for financing both new projects and expansion of existing units to a total of about 50,000 tons capacity. Given the existing procedures of screening, sanctioning and implementation, it is expected that by 1981 a total additional capacity of 30,000 tons would come into operation with total national cold storage capacity amounting to about 117,000 tons in operation.

This leaves a net national demand gap of 454,000 tons for potato storage capacity.

Appendix

FEASIBILITY OF CAPACITY & LOCATION OF PROPOSED COLD STORAGE

BRAC proposes to set up one cold storage in Daudkandi in Comilla District of 4000 tons potato storage capacity along with a complementing ice-making plant of 10 ton/day capacity. Comilla District is a major producer of potato with a yield of 87,000 tons in 1976-77 ranking second after Dacca District which produced 219,000 tons. Comilla has been chosen in view of the already large number of cold storages in Dacca District. Comilla has 6 cold storages at present with a total storage capacity of 6500 tons against 45 cold storages in Dacca with a total storage capacity of 54,000 tons.

The geographical location of Daudkandi would however enable it to draw potato from not only Comilla District but also from Manshiganj, the largest potato-growing sub-division of Dacca District.

At 1977 acreage of 22,250 acres, seed requirement in Comilla District would be about 12,000 tons. Six months marketing requirement of table potato may be estimated at about 50,000 tons. The total potential demand for cold storage capacity comes to about 62,000 tons. Currently, there have been 8 applications to the local industrial credit banks for either setting up of new projects or for expansion of existing capacity with a total additional capacity of about 12,000 tons out of which about 6,000 tons is expected to be operative by 1981. The net demand gap for Comilla District for cold storage capacity can thus be calculated at 50,000 tons.

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The cold-storage capacity of 4000 tons proposed to be set up by BKJC will thus absorb about 8% of the net storage demand gap existing in Comilla District and 0.8% of the net national storage demand gap.

BKJC's proposed unit at Daudkandi would make available cold storage facilities directly to Comilla Sadar South Sub-division, particularly Daudkandi and Chandina Thanas and Chandpur sub-division, particularly Kachua, Matlab and Chandpur Thanas. Good road and river communications exist between Daudkandi and the interior of Daudkandi, Chandina and Kachua Thanas. Excellent and intensive river and canal communications also connect the interior of Chandpur and Matlab Thanas with Daudkandi. Transportation of potato by cheaply available ox-carts and country boats from the hinterland would be a matter of at the most 4 to 5 hours. These 5 thanas produce more than 60% of potato from Comilla District.

Within this area there are only 2 privately owned and one BADC owned (for storing mostly imported seed) cold potato storages with a total of 3000 tons capacity. Most of the/ goes over long-distance transportation to cold storages in Narayangonj and Fatullah near Dacca and some to Comilla town.

To the west of Daudkandi on the opposite banks of the Meghna river is Gazaria Thana and to the south-west are Munshigonj, Tongibari and Lohajang Thanas of Munshigonj sub-division all of which are highly productive potato areas with good water communication of maximum 7 hours

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with Daudkandi. The potato, particularly on the eastern belt of this region takes almost the same time to reach the cold storages situated in a belt to the north of Munshiganj sub-division. In Munshiganj town itself there are only 3 cold storages with a total of about 5000 tons capacity which is highly insufficient for the surrounding areas themselves. A good portion of this potato can also be diverted to the proposed storage at Daudkandi if capacity is made available.

REVENUE ESTIMATES ON POTATO STORAGE RENTALS & ICE SALES

The prevailing custom with all cold storage owners is to rent out the entire capacity of their storages to growers. Very few owners engage in trading. The reason is that although trading would give a much higher profit margin, this would require a very large amount of working capital which very few owners can afford to obtain and place their risks on. Also, most of the cold storages fully depend on power supply from the main grid line and very few have standby generators. The potato stocks are therefore prone to spoilage from prolonged power supply disruptions. Although such occurences are rare, this does sometimes happen in which event the owners have to compensate client growers by reducing the amount of payable rent or by paying off the growers at cost price depending on the extent of the spoilage. Sometimes spoilage also happens from faulty storage or from bad stocks overlooked during pre-storage sorting. Since almost all the stocks are insured by the storage owners, the money is recovered from the insurance companies, which is again a lengthy and sometimes unsuccessful process.

Rental rates are governed by the market and depend on a particular year's demand for storage space. These rates are fixed for a year irrespective of the period stored for by the clients. Loading is completed immediately after harvesting in March while unloading starts from around June and continues till December in a year at the end of which storages are completely empty for the next two to three months. The rate is charged on all stocks irrespective of

when these are unloaded. The rates have shown an increasing trend over the years. During 1965-66 the rates were about Tk.7/- per maund where 27.5 maunds = 1 ton. This increased to Tk.10/- in 1969-70. After the independence of Bangladesh this rose, mainly from currency devaluation and inflationary pressures, to about Tk.18/- in 1972-73, Tk.26/- in 1974-75, and Tk.30/- in 1976-77. These rates were mutually agreed on by a majority of the cold storage owners who are members of theBangladesh Cold Storage Association. Non-members are not bound by these rates but usually follow general market trends. Also rates charged are a nominal percentage lower for districts other than Dacca and Comilla. On enquiry, however, it has been found that actual charges to growers are much higher in the case of almost all cold storages. For example in 1977 growers paid upto Tk.40/- and above per maund in Munshiganj although the rate declared was Tk.30/-, the excess receipts not being shown in the books by the owners. Apparently, the Association officially declares lower rates for avoiding taxation on income.

By the time it comes into operation in 1981, the proposed cold storage would be able to charge rents at the rate of not less than Tk.40/- per maund. Trading would also be considered by the proposed cold storage. Additional working capital requirements would be met from commercial bank loans. The marked difference in prices paid to growers would provide a much higher return per ton after paying off interest than pure rentals. For the purpose of revenue projection the return on storage per

mound of potato has been estimated at Tk.40/-. It is expected that the cold storage will run at 85%, 90% and 95% capacity utilisation in the 1st, 2nd, 3rd and subsequent years of operation.

Revenues on Ice

Ice has an excellent demand from fish whole-salers who collect fish from fisherm n at various points of the Meghna river and transport these over long distances. Daudkandi itself is a major centre for fresh water fish, specially for shrimp catch. Fish whole-salers in Daudkandi presently procure ice from Narayangonj at rates ranging from Tk.50 to Tk.100 per can depending on the season where one can of ice weighs 2½ mounds. Ice is carried to Daudkandi by motor launches in sack and/or mat wrappings by which method a considerable loss of weight cannot be avoided. Iced fish are taken to Dacca, Chittagong, and Comilla. Due to scarcity of ice, prices of fish in Daudkandi are considerably lower than in Dacca.

Although exact requirement for ice in Daudkandi has not been calculated, it is felt that the entire capacity of 10 tons/day production can be utilised for most of the year. There is presently no ice-making plant at Daudkandi. The projections on revenue from ice have been made at a rate of Tk.55/can i.e. about Tk.600/ton.

Appendix VII

SCHEDULE CHART OF PROJECT IMPLEMENTATION