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<td>Akef, Quazi Muhammad Asadullah</td>
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**Digitisation Notes:**

Appendix VI missing in original. Ink of some page from appendix light in original.
A PROTOTYPE SYSTEM FOR THE CONTROL OF LAND USE AND SETTLEMENTS IN THE PLANNED DEVELOPMENT OF BANGLADESH

BY
Quazi Muhammad Asadullah Akef

(Volume-2)

Thesis presented for the Degree of Doctor of Philosophy
University of Edinburgh
December 1974
V. MEASURES TO MEET THE REQUIREMENTS
It has been asserted more than once in this work that increased productivity per unit of land and man is the only key to success in Bangladesh. The technical possibilities of increasing productivity in agriculture are truly enormous. The gap between what obtains in Bangladesh and what is achievable under certain circumstances permits 'room-to-breathe' optimism. But, while examining one possibility or the other, we must constantly remind ourselves of certain valid realities. Plans as well as the corresponding measures to achieve them must be based on the conditions that prevail in the land concerned. Conventional wisdom in economics have had many of us believe in the patent answer of applying more and more capital to ensure increased production. Money economy, 'capital-inflow' and 'market-forces' have blurred the vision of many of us. But in a poverty-stricken country where capital is not available, a set of actions based on the presumption that capital will be available is outrageously naive. True, capital may be obtained through foreign loans and grants, but that is against the principle of self-reliance which the new-born country is so ardently preaching. Foreign aid is non-self-respecting, and subjugates a country to foreign domination - economic, technological, political and cultural. Whereas the principle of self-reliance is a dynamic force
in itself - a force which is magnetic and self-activating through which a community can define its own goals and work out devices to achieve them.

It is also obvious that while some improved technology, or cultural practices, increase the land requirement per man, other technology may decrease the land requirement being equally promising in terms of return. Similarly, the same output may be obtained in many cases through the application of different factor proportions of human labour and machines. Yet, unfortunately, one techno-economic pattern tends to dominate all societies (except China). The large international diffusion of capital, technology and ideas have tended to use the techno-economic solutions of the rich countries to resolve the problems of the poor countries, regardless of their suitability.

But through a painful and wasteful experience it is now being realized that one and the same technology may not work miracles all over the world and that some 'western transplants yield strange fruits'. On the basis of personal experience in some underdeveloped countries, Harold Dickinson and his colleague Henry Ord conclude that inappropriate technology today is an increasing handicap to the development of poor countries

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for the following reasons:

a) they absorb scarce local resources, including capital and skilled manpower;

b) they impose high foreign exchange costs, either on the present generation who sacrifice alternative imports or on future generations who will be called upon to service the foreign debt obligations;

c) they frequently have adverse 'demonstration effects'.

More directly alarming has been the employment implications of the technological selection of the poor countries. Experience in the Third World countries so far have made it clear that the most important single factor which has conditioned the ability to absorb the growing labour force in these countries is the technology that has been adopted whether in industry or agriculture. In the light of pitfalls of the First Development Decade, the UN has redefined the guiding principles of the Second Development Decade in the following words:

"The developing countries, with ample reserves of unskilled labour and the need to find greater use of their primary materials, require technologies which would substitute labour and

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* Harold Dickinson of the School of Engineering Science, University of Edinburgh, and Henry W. Ord of the Centre for African Studies, Dept. of Economics, University of Edinburgh, publicized the issues through a pamphlet around which the Conference on Appropriate Technology was held in September 1973 at the same University.
local materials for capital and foreign exchange."\textsuperscript{2}

There is a growing awareness amongst economists, development planners and scientists that technology must be suited to socio-economic needs of a community, and that simple technologies and easily usable capital equipment must be produced indigenously instead of importing expensive and complex technologies from abroad. It is widely accepted these days that technology, in order to be squarely helpful, must be indigenously based and suited, that is, it must be developed with a knowledge and understanding of the indigenous technology and must be appropriate to the social and economic situation in which it is intended to be used.

Technological selection must therefore be guided by the principles of appropriateness to a given situation, the criteria of appropriateness being technical suitability, social desirability and economic sensibility. Harold Dickinson advocates that in all kinds of production situations it is necessary to find a technology that can meet production requirements whilst making fullest use of immediately available resources - raw materials, credit, capital, labour, transport, market - and which is acceptable, or adaptable, to the society that wishes to make use of it. Such a technology, asserts Dickinson, is called an 'Appropriate Technology' and it must be

\textsuperscript{2} U.N.; World Plan of Action for the Application of Science and Technology in Development, New York, 1971, No. 71.A.18.
both technically and socially appropriate. According to Dickinson an appropriate technology with particular reference to the rural sector should:

(i) use local materials and power resources;
(ii) minimize the content of imported materials;
(iii) ensure production in adequate quantity and acceptable quality for the existing or potential market;
(iv) ensure regular supply in guaranteed quantity by the available transportation but without any spoilage;
(v) use existing or easily transferable skills and avoid complicated, time-consuming and costly re-training;
(vi) ensure increasing job prospects;
(vii) minimize labour displacement and thereby liquidate technical unemployment or under employment;
(viii) minimize social or cultural disruption by increasing production in small increments rather than by large jumps;
(ix) minimize the demand of capital on local or national resources;
(x) minimize foreign exchange requirements;

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3 Dickinson, H.; Development and Dissemination of Appropriate Technologies in Rural Areas, International Workshop sponsored by the German Foundation for Developing Countries, University of Science and Technology, Kumasi, Ghana, July 1972.
(xi) use capital in coordination and compatibility with the local, regional and national economic plans;
(xii) ensure that the main economic benefits return to the producers and are not captured by some middle interests;
(xiii) facilitate greater integration of the basic producers into the major flows of the national economy.

The characteristics of appropriate technology cited above may be taken as a sound set of objectives which would guide our selection of technology for the development of vast rural sectors of Bangladesh. Since the rural sector is the main organ of the national economy, we cannot afford any wrong-doing there. Only by adopting an appropriate technology tailored to the realities of the country can we hope to be able to mobilize our meagre resources towards productive activity both for consumption and for capital creation. This is a prognostication rather than an example of wishful thinking or an inspired slogan.

**Crop Rotation**

The first imperative in the field of technical improvisation, therefore, is to modify the current practices so that production may be increased and/or diversified without radical demands being made on resources or on the structure of local economy and
society. We have already noted that under the existing circumstances the only way to increase productivity is through increasing cropping intensity. But while endeavouring multiple cropping we must also remind ourselves continually about the importance of crop rotation, for "monoculture," warns Dr Richard J. Vogl, Professor of Botany at the California State College,

"leads to ecological complications while diversity provides stability in biological systems, a resistance to biological and environmental catastrophes or upsets."^4

Luckily, production requirement for consumption and cash coincides with the goals of sound agricultural practices. Multiple cropping in suitable rotation is therefore the first course of action. But the most formidable bottleneck is the lack of moisture. We have noted in Chapter 9 that most of the fallowing takes place in the dry season which means that the principal reason for such fallowing is the shortage of water which limits biological activity in the season. At present only rabi crops (a minor crop) are grown largely where either water is supplied through irrigation or land holds adequate moisture, i.e. in the beels, river beds and other depressions. Concern for animal feed and soil preparation for the following early rain crops are also associated with fallowing. At any rate, irrigation will play the key role in multiple cropping since climate is permissible for growing crops

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round the year. There is no dispute that with the availability of irrigation water many more crops of crucial importance can be grown. In some experimental farms, it had been possible to grow successfully with irrigation three crops in suitable rotations, some of which are as follows: ¹⁵

(i) aus or jute - transplanted amon - pulse or groundnut;
(ii) aus - transplanted amon - soyabean;
(iii) aus - green manure - wheat or potato.

On the other hand, excess water in some parts of the country constitute such a problem that drainage becomes as necessary as irrigation. It is therefore important to regulate local and regional hydrology in such a way that crops can be grown extensively throughout the year. Drainage and water control is essential not only to ensure much desired grassland and vegetable crops, but also to protect the conventional crops from inundation by excessive flooding. It is well acknowledged that control of major excesses could raise production substantially even if seasonal normal inundation remained the widespread pattern.

It is not therefore difficult to see that given the required infrastructure in water management, a fruitful synthesis between the nutritional requirements, economic objectives and sound agronomic/ecologic practices is

possible in the way of multiple cropping by rotation and mixed arable-animal husbandry. Based on this principle, a national framework of cropping landuse and a probable rotation may be provided as follows:

(Figures in million acres)

<table>
<thead>
<tr>
<th>Summer</th>
<th>Rainy</th>
<th>Winter</th>
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<tbody>
<tr>
<td>Jute</td>
<td>4.0</td>
<td>Amon</td>
</tr>
<tr>
<td>Pulses</td>
<td>2.5</td>
<td>Amon</td>
</tr>
<tr>
<td>Oilseeds</td>
<td>5.0</td>
<td>Amon</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Legume-</td>
</tr>
<tr>
<td>Glycine</td>
<td>0.5</td>
<td>Fodder</td>
</tr>
<tr>
<td>Vegetables</td>
<td>0.5</td>
<td>Legume-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fodder</td>
</tr>
<tr>
<td>Legume-Fodder</td>
<td>5.5</td>
<td>Amon</td>
</tr>
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</table>

Total cultivated 19.0 21.0 19.0
Current fallow 4.0 2.0 4.0

Note:
In view of lower rates of yield from Aus as well as its competition with jute, Aus has not been considered in this cropping model. On the other hand, consumer preference favours Amon. Besides, the harvesting time of Amon conveniently coincides with the onset of dry season. Hence it is desirable that heavy emphasis be put on Amon and the season be left almost exclusively for the crop.
The total cultivated land as shown here is obviously higher than the requirement as estimated in the preceding chapter. This is due to the rounding of land requirement in every item for the sake of convenience. The idea, however, is to demonstrate the theoretical feasibility of a cropping ratio of 2.5 and its landuse implications.
Crop rotations and mixed arable-animal husbandry as envisaged in the aggregated model of cropping-landuse and rotation will provide the foundation of greater economic and social security through higher and diversified production and fuller use of labour of the peasant and his family. At the same time, it can be expected to provide the foundation for raising and maintaining soil fertility. Within the framework of this macro-model, the local cropping map and cropping calendar will have to be prepared with the help of local knowledge and cooperation of the local producers. In fact the macro-planning will have no value if it is not translated into the reality of local situation and if the basic producer does not understand the purpose of it. The peasants must be made to understand that what is laid before them or wanted of them is to their interest. In order to protect general interest as well as to ensure compatibility between policy and practice, a system of cropping licences may be introduced at the local level authorizing the individual peasants to grow crops only according to the local cropping map and cropping calendar. The licences should have equal force and effect as a building permit in an urban area; and failure to comply should be similarly subjected to punishment. It may be noted here that such a rigorous discipline is a pre-requisite for a higher rate of production. The fact that the ratio of production per acre per annum in Japan and in India is considerably higher than the ratio of yields in those
two countries is unquestionably due to the meticulously planned and carried out system of multiple cropping in Japan whereby full use is made of every acre during the year within the limits of moisture and environmental temperature.

**Water Management**

In the preceding discourses it has been said in a number of ways that the existing agricultural system in Bangladesh is the result of a natural response to an unrestrained water regime consisting of a long dry season, uncertain precipitation and an unpredictable degree of floods and inundation. Jute is sown in a period when rainfall is very uncertain, and a drought of one to two weeks may have devastating consequences. Submersion of young jute is always a threat if the monsoon is too early or the sowing delayed. Uncertainty of monsoon also affects the major cereal crop Amon when it terminates early instead of tapering off into October, a precipitation pattern very essential for a satisfactory harvest of the crop. Every year substantial areas of crops are damaged or destroyed by flood. The level of floods, the time and the rate of its rise - all are sources of danger. Even the supposedly adapted variety of broadcast Amon which grows up to three inches per day and can stand submerged condition for three days, may collapse if the water level rises too quickly. On the contrary, the rabi crops suffer from low productivity due to the lack
of adequate moisture. Experiments have revealed that yields of winter (rabi) crops now grown without water can be doubled if they are properly watered. Experiments in West Bengal have demonstrated that the average difference in yields due to irrigation alone (without manuring or other improved cultural practices) was more than ten maunds of paddy crops per acre. 6

One must therefore accept 'water management' as the most important single technical measure towards ensuring a system of higher land productivity. The confluence of great rivers and their enormous flows in Bangladesh constitute both a challenge and an opportunity.

Comprehensive water management obviously involves operation at two levels: regional and local. In technological selection also these two areas must be treated separately. During the early years of association with Pakistan, some thought was directed towards water management at the regional level. At that time the Krug Mission opined that there was little or no prospect of alleviation of flooding in then East Pakistan by catchment conservancy, detention reservoirs in the lower reaches or diversion. Under the FAO Technical Assistance Programme, Dr Van Blommestain prepared an interim report on 'A Multipurpose Project for the Brahmaputra-Ganges Delta' where it was suggested that

6 Damodor Valley Corporation Data Book, Calcutta, 1956, p. 66. In estimating increased food production expected from irrigation the Indian Planning Commission uses the yardstick of one-third of a ton (9 maunds) per acre.
13 million acres could be assured of freedom from inundation only with a very complete system of flood control. As for the remaining area, Blommestein's report indicated that, from an engineering point of view, a part of the area could be irrigated during the dry season with moveable pump units.\(^7\)

Water works of the type mentioned above presupposes cooperation from India, though not mentioned in the reports. Projects proposed in Von Blommestein's report include the following:

- a. Ganges-Kobadak scheme
- b. Padma-Faridpur scheme
- c. Teesta scheme
- d. Surma Valley scheme
- e. East Meghna scheme
- f. West Brahmaputra scheme
- g. East Brahmaputra scheme

Hopefully these schemes when completed would ensure the control of major excesses. But the necessity of cooperation from India is a constant pre-requisite. Due to the politico-religious obsessions of the Pakistan Government no attempt was made to enlist such cooperation from India. It is inconceivable that the huge volume of water can be controlled downstream in Bangladesh unless it is tamed in the riparian regions of India. Happily,

\(^7\) Cf. FAO; The Appraisal of Agricultural, Fishery and Forestry Resources in relation to needs in the Lower Ganges-Brahmaputra Basin, FAO/59/9/6421, August 1959, Chapter V, p. 65.
a Joint Rivers Commission (JRC) has been formed recently between Bangladesh and India in order to consider long-term perspective planning for flood protection, dams and storages for irrigation and power in Brahmaputra-Ganges basin and the Commission has recommended a number of studies for moderating flood peaks as well as for augmenting low flows in the region. Reportedly, the work of the Flood Control Commission in India is being coordinated with similar work in Bangladesh towards the much desired joint efforts in flood prevention.\(^8\) The news is profoundly encouraging. But in the light of the unhappy ecological aftermaths wrought by conventional techniques of dams and barrages, a note of warning must be sounded so far as the technical specifications of the intended large water works are concerned. Well intentioned water management projects have produced disastrous results. For example, the Aswan High Dam was built for the purpose of storing excess water during flood season for more efficient use during the summer whereby agricultural production could be increased for a growing population. But the results appear to be very discouraging. Reportedly the apparent benefits in higher crop yields are being cancelled out by growing ecological complications (like increased coastline erosion, eroding river banks, loss of plant nourishing silts) and increased human misery in the appearance in new areas of a

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debilitating disease called bilharziasis. The selection of water management technology must therefore be weighed against the probable ecological dangers that it might bring in its wake. After all, there is no point in optimizing crop yield if in the process increased dangers to life and living becomes inevitable. In addition to the engineering issues of technical specifications, environmental issues throughout the length and breadth of the basin must also be taken into consideration involving terracing and afforestation in order to control run-off and reduce erosion in the riparian region.

The other component of water management is the task of water-lifting and distribution at the local level. Strangely enough, this area has never been considered a state responsibility with any degree of seriousness, and as a result the operational efficiency of the traditional technology has hardly been questioned. The indigenous

9 Turk, Amos et al.; Ecology Pollution Environment, W.B. Saunders Co., London, 1972. Turk et al. report that Aswam High Dam has wrought a number of problems: (i) the sediments that the flood waters of the Nile washed out to sea did nourish a rich variety of marine life. The absence of this has resulted in the loss of 18,000 tons of sardines per year, (ii) with the floods under control, the previous process of natural rinsing away of salts from the soil has stopped and with increasing salinity, the soil is becoming less and less fertile, (iii) as the sediments sink behind the High Dam, clear silt-free waters rush downstream more rapidly than before eroding the river banks and undermining the foundations of hundreds of bridges that span the Nile, (iv) the trapping of the silt behind the High Dam is a loss of nutrients downstream causing soil infertility, (v) the debilitating disease called bilharziasis spread by water snails follows along the paths of irrigation canal infecting about 80% of the people who work on them. P. 36.
technological equipments, viz., bucket, bamboo swing-basket, wooden dona (tilting scoop-boat), offer advantages in that they can be made locally using local materials but their capacity to discharge water in the field is very low. In the past attempts were made to introduce Persian wheels and Egyptian screws but could not be popularized because they were equally time-consuming and could not be made locally, hence expensive. However, in view of the large water demand by the boro crop against the low discharge capacity of the indigenous devices, power-driven pumps and tube-wells have been adopted by the Government as the panacea, regardless of their foreign exchange implications both in the equipments and their maintenance.

A more desirable solution may perhaps be found in the introduction of Humphrey Pump which is a combined engine-pumping unit intended for low head pumping applications. It is an elementary type of internal combustion engine employing water piston which also acts as an energy storage device in the same way as the fly wheel in a conventional engine. ¹⁰ The machine (see Appendix X) appears to be simple and can supposedly be made using local labour, and hence may be constructed cheaply.

¹⁰ Dunn, P.D.; Humphrey Pump for use in the Developing Countries, Appropriate Technology Conference, University of Edinburgh, September 1973, mimeo. Reportedly the Humphrey Pump was invented by H.A. Humphrey at the beginning of this century. But interest was lost in the Humphrey Pump after the First World War and much information on the development was destroyed in a fire in the inventor's office. The idea was revived at the University of Reading three years ago and a 4-inch diameter pump has been constructed and operated satisfactorily for some time.
But the greatest advantage lies in its use of fuel. The pump is a multi-fuel user; it can be operated on natural gas, petrol or even with kerosene with suitable vapourising arrangements. The use of animal dung or vegetation or mixtures of both to generate methane as a fuel has also been suggested as a clear possibility. It has been indicated that 225 lbs. of cow-dung fed to the gas generator and fermented can yield gas energy* to pump 124,000 gallons of water at 20% efficiency and an assumed 20 ft. head. Since very little loss of nitrogen is involved in the fermentation process, the residue can still be used for composting. The gas also can be used for other purposes including cooking and lighting.11

This seems to be an incredible technological promise whereby cow-dung, which is now considered almost a waste, could be turned into a multi-purpose resource. And irrigation at local level may be maintained at no operating cost at all; and the initial cost is also very small. Therefore, following the technological alternative suggested above, about 30,000 gallons of water can be pumped every day only using the dung of a pair

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* P.D. Dunn reports that bio-gas produced by fermentation in a specified digester contains about 60% methane and the remaining 40% is carbon-dioxide, it has a calorific value of 550 BTU to 650 BTU per cft. compared to 1012 BTU per cft. for pure methane. The typical yield for dry vegetation is 4 to 5 cft. of gas per lb. and for dung the corresponding figure is about 1 cft. per lb.

11 Dunn, P.D., op. cit.
of bullocks, * without sacrificing anything, because the dung can again be used for maintaining soil fertility. One would be a fool not to try such a promising possibility on the ground of its not being a very neat sophisticated package. So long as capital is the main constraint, we must try the measures which demand the least capital, no matter how clumsy those measures may appear to be physically. We must remind ourselves that only with desperate efforts can we ensure full use of the immense water resources towards the year round use of the limited land resources. The next quarter century is crucial indeed. Both the aggregate volume of food plus the balance in the diet and the economic diversity needed during the next 25 years can be met only by starting the use of land in all seasons now. Nothing short of such a policy would do.

Soil Management

The most fundamental truth about the basis of our existence is our relationship with the earth, more precisely the life sustaining top layer of the earth. This top layer is by far the most indispensable natural resource for our survival. The rise and fall of settlements and civilizations had been, and still are,

* Data from Bangladesh indicate a daily output of 27 lbs. of dung per cow/bullock. At the rate of 1 cft. of gas per lb. of dung, a pair of bullocks would provide a source of 54 cft. of gas which, fed to Humphrey Pump, would pump 30,000 gallons of water.
conditioned by what happens to the top soil of the corresponding areas. Poverty of nations can largely be explained in terms of their respective ability to protect the top soil either in the past or at present. A down-to-earth analysis would reveal that hungry soil and meagre crop, hungry belly and feeble mind - this is where poverty starts. So poverty, hunger and soil infertility are all one problem and a problem to be solved by production of more crops by proper soil management.

The over-riding concern of soil management should be to maintain and/or boost its productivity by maintaining its health. A healthy soil is internally alive and is in a dynamic process. There are at least five vital elements in a healthy soil which are in a continuous interaction amongst them. They are: (i) finely ground rock particles, (ii) organic matter in transformational stages, (iii) living and active soil micro-organisms, worms and insects, (iv) moisture and (v) air. The most important product of the interactive process is humus which turns out to be the chief element of a healthy soil. Humus improves the physical structure of the soil by supporting the soil's organisms, increasing permeability, improving aeration, stabilizing the soil's temperature and serving as a storehouse of plant nutrients. It therefore follows that a healthy, fertile soil is the one which is rich in its humus contents.

One of the leading authorities on humus and soil microbiology, Professor Salman A. Waksman, informs that
a decrease in the organic matter content of the soil accompanies soil deterioration and is itself the cause of further deterioration of soil, whereas an increase of the content of organic matter and nitrogen is a sign of soil improvement. Therefore a regular return of organic matter to the soil in adequate quantity is an essential pre-requisite for its good structure and high fertility. The presence of soil microbes, the actual agents of decomposing the organic matter, is equally important as an essential counterpart of the organic matter.

But on a purely economic motivation, a group of food producers have been shortsightedly educated into a wrong system. To them it is expedient to follow agricultural-chemical-prescription for the sake of high yield and quick return. Or is it man's inherent hostility towards natural laws which was first demonstrated by eating the 'forbidden fruit'? Anyhow, a large part of the world's food production has become falsely based on the synthetic fertility of artificial fertilizers. Many experts consider them to be the only means of staving off world hunger. Chemical farming has disregarded the biological laws long enough and is now under the shower of a backfire. Neither crops nor plants are biologically so constituted as to permit any haste. Forcing a plant has

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12 Ambassador College; Conquer Disease through Agricultural Law, a pamphlet from the Agriculture Department, Ambassador College, Bricket Wood, St. Albans, Herts., England, p. 7.
brought about a change in its inner bio-chemistry - chemically fed plants contain more carbohydrates and less protein. Insects are out for carbohydrates and hence pests, plant plagues and diseases proliferate.

Chemical fertilizers can accelerate plant growth and expedite consumption of organic matter and humus, but they can neither add to the humus nor replace it. Thus the use of chemical fertilizers depletes organic residue which in turn depresses the microbial life in the soil. The physical structure of the soil is thus destroyed. On the evidence of Sanborn experiment Professor Barry Commoner endorses the view that organic matter content and the physical condition of the soil on the chemically treated plots declines rapidly.

Pharmaceuticals for agriculture, artificial fertilizers, hormones, weedicides, pesticides, fungicides, etc. have proved to be nothing more than elements of delusion. Agriculture is a matter of organic growth which has to be promoted and nursed with mother's care and never rushed. There is only one system that can

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14 Based on the works of Sir Albert Howard (The Soil), Professor Glen Wakeham of the University of Colorado, and Dr. Shewell-Cooper, and the 50-year Sanborn Field Study, Missouri Experimental Station. Cf. ibid.

work effectively and permanently anywhere and everywhere — a system wherein each square yard will be enabled to produce its own organic requirements. After all this is how nature is designed. But with the growing importance of meaningless specialization such basic relations have been ignored; for instance, livestock has been separated from crop production — this has been the fundamental error in establishing an anti-ecological system. Ever since the penalties of mal-management of soil have been compounding in a vicious spiral — increasing dependence on chemical fertilizers has led to increasing acidity, decreasing microbial activity and hence decreasing fertility which in turn has justified higher dosages of chemicals. The most obvious questions to ask are what has been gained? where is chemical agriculture heading? what will happen to agricultural production when the sources of chemical fertilizers (nitrate from South America and phosphate from North Africa) are depleted?

It is beyond any question that proper crop rotation and the use of organic manure can very effectively maintain the organic nitrogen content (humus) of the soil by enriching microbial activity system. On the other hand, it is also known that soil fertility on an individual farm can be so depleted, through failure to return manure, crop residues and other enriching elements, so as to change that farm within a single human generation from a place of good health to one of deficiency diseases.
for the farm animals and for the families that live upon it.\textsuperscript{16} The imperatives are clear but to advocate biological farming is to swim against the current. In the contemporary academic world initiatives on this line are usually put off because of an apparent lack of information, although to a traditional farmer in the Third World country the idea of biological farming will make much sense and be more readily accepted than chemical agriculture. However, one who is deeply interested in biological farming may still find a surprising deal of information now forgotten and buried under the debris of recent civilization.

One of the unique sources of biological farming that one can ever come across is the contribution of Sir Albert Howard who was knighted for his revelations in organic residues and their fundamental link with the health of the biotic web. In his work, "An Agricultural Testament", Sir Howard has stated that soil fertility is the real basis of health and resistance to disease in a complex biological system, and that full possibilities of the improvement of a new variety can only be achieved when the soil is provided with an adequate supply of humus.\textsuperscript{17}


\textsuperscript{17} Howard, Sir Albert; An Agricultural Testament, Oxford University Press, London 1939. (Sir Albert Howard was the Director of the Institute of Plant Industry, Indore, and Agricultural Adviser to States in Central India and Rajputana.)
In order to ensure addition to the humus content of the small fields of the Indian cultivators, a practical method of manufacturing humus from vegetable and animal was devised under the direction of Sir Howard at the Institute of Plant Industry, Indore, between the years 1924 and 1931, and the method was called the Indore Process.

The raw materials needed for the Indore Process of composting are very simple and easily obtainable. They are:

(i) **Vegetable Wastes** which include vegetation of waste areas, grass, plants grown for shade and green manuring, sugar cane leaves and stumps, all crop residues not consumed by livestock, cotton stalks, weeds, sawdust and wood shavings, and plants grown for providing compostable material on roadsides, vacant corners or on the borders of the fields.

(ii) **Animal Residues**, i.e. the urine and dung of all livestock animals, the droppings of poultry as well as human excreta. Dried blood, slaughterhouse refuse, powdered hoof, horn and bones, fish manure, in one word, waste products of the animals in some form or other all are essential if real humus is to be made.

(iii) **Bases for neutralising excessive acidity** which may be provided by powdered chalk or limestone or wood/kitchen ashes either alone, together, or mixed with earth.
In addition, water is needed throughout the process while abundant aeration is essential during the early stages. The principle underlying the process is very simple and straightforward: (a) the admixture of vegetable and animal waste with a base for neutralizing acidity and (b) the management of the mass so that the micro-organisms which do the work can function in the most effective manner.\(^{18}\) The details of the Indore Process of composting is appended with this work (Appendix VIII).

Following the Indore Process, 1350 cft. of ripe compost could be produced from one pair of oxen/cows at the Institute of Plant Industry, Indore, where vegetable waste materials were reportedly less plentiful than animal waste.\(^ {19}\) In Bangladesh where wild vegetation, particularly water-hyacinth, is in abundance, the rate of production per pair of bullocks could be much higher. This possibility was suggested by Sir Howard himself in his most positive assertion that

"one of the greatest advances in food production in the world can be achieved by the conversion of water-hyacinth first into humus and then into rice."\(^ {20}\)

Ironically the possibility has not yet been realized.

It will not perhaps be an exaggeration to reiterate that freshly prepared humus is the biggest asset of the farmer

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\(^{18}\) Howard, Sir Albert, *op. cit.*, p. 41.


which must be cared with the same seriousness as that of any other conventional economic asset. With Indore Process in mind, a truly big prospect seems to be in store for Bangladesh.

Another sound practice of maintaining soil fertility is to arrange after harvest grazing with the livestock which automatically ensures a return of animal residue to the soil. The real value of this light animal manuring is supposed to be not in the return of the residue as such but in the inoculation of the soil with the rumen bacteria which are transferred by the livestock animals in their droppings. However, this is no substitute for composting.

The technology of soil fertilization advocated so far precludes the use of chemical fertilizers. But some fertilizer plants have already been set up which cannot be scrapped. Nevertheless, it must be recommended that any further expansion in the production of chemical fertilizer be ruled out and chemical fertilizer be used only as a periodic supplement to composts, perhaps in the same proportion as it is used in China, i.e. less than 20% of the total manures. Unless we ensure an adequate return of organic matter and restrict release of inorganic chemicals into the soil, the sustenance of our life will be in total jeopardy.

The responsibility of proper soil management still demands something more - a comprehensive system of soil conservation is called for not only covering the
territories of Bangladesh but the entire Ganges-Brahmaputra basin. It is difficult to see how the frequent calamities of regional or sub-regional flooding can be averted unless the contributory causes of soil erosion and siltation is set right. The process of gully formation, sheet erosion and of leaching, all are cancerous processes for land. Although maintaining soil fertility in itself is a measure of soil conservation, it alone is not enough. Fencing of eroded/gullied lands, afforestation, controlled grazing by rotation and such other soil conservation measures must be taken up in due earnest covering the catchments of the rivers in the Himalayas as well as those in the plains of the Ganges-Brahmaputra basin implying both regional and local/individual actions.

Tools and Implements

We have noted earlier that one of the major factors behind the low and static agricultural productivity in Bangladesh is the lack of suitable tools and equipment. In the light of present knowledge it is clear that the agricultural operations performed by the use of archaic and unimproved tools and equipment remain inadequate, and hence low productivity. In reviewing the differentials of agricultural development in China and India we observed that large-scale tool improvement brought about substantial increase in the yield of grains in China, while the lack of the same was mainly responsible for the
drag in Indian productivity. A tool reform movement may indeed ensure large gains in productivity if guided rationally.

The danger of tractor mechanization has already been examined. It can only be reiterated here that on the one hand tractor technology will destroy the local economy by displacing labour and disrupting the micro-eco-system and on the other it will cripple the national economy by placing a heavy burden on the foreign exchange for the machines, their spares and the fuel requirement, let alone the capital requirements for training, services and repairs. Consideration of tractors and other fuel-consuming power equipment must therefore be ruled out from the discussion of improving tools and equipment. Improving the local plough and other traditional implements and improvising new ones should be the first concern. Unfortunately this is the area where least imagination has been deployed by the agricultural engineers and/or development planners and decision makers.

Luckily the heritage of knowledge in agricultural tools and implements for local use is not as poor as it is often supposed. For instance, the 'Kishan Plough' which was developed through research in order to suit the conditions of Bengal, is quite simple to operate and efficient at the same time. It is a light (26 lbs.) mould-board plough with wooden handle and drawbar, and a replaceable metal share. The design is such that it requires minimum draught power and the depth of ploughing
can be varied by attaching different notches of the drawbar to the yoke. There is no reason why this should not be popularized and provided in large scale until a better one is evolved through more rigorous research.

Technical improvisation in the past resulted in the development of a Rotary Seed-treater and a Gravity Seed-treater. The Rotary Seed-treater is very simple to make and operated by hand. It is made from oil drums with a handle attached to it and two openings for input and output, and mounted on a pedestal for the ease of rotation. The capacity of this treater is 2 maunds (79.5 Kg) per hour. The Gravity Seed-treater is little more elaborate but its capacity is fifteen times higher than the Rotary treater yet uses no external energy. It is like a cupboard with sloping boards inside and an adjustable funnel (hopper) at the top. The chemical is administered by a perforated pipe through which passes an auger. The auger pipe is fed with chemicals by operating the auger manually. The kinetic energy produced by the falling mass of seeds drives the components of the machine.

A seed drill for paddy is another indigenous technological improvisation for sowing seeds in line. It is made exclusively of bamboo and/or wood and is so simple in design that it can be made by the members of the peasant families themselves. The simple components of the drill are: a bamboo hopper, a metering roller, two drive wheels and a frame. The drill loaded with seeds is attached to the plough drawn by bullocks. As the
plough moves onward, seeds are deposited in the furrows and then covered up by a subsequent device. The drill can be made to follow an initial line marked by ropes or sticks. With this type of drill about 0.66 acre can be sown in a day of eight hours. Similar drill has been designed for sowing jute seed also.

Improvements were also accomplished in implements for weeding and intercultural operations. There exists in the country (perhaps rusting in the office premises of the Agricultural Officer) samples and designs of hand-operated rice-weeder, hand-operated hoe for crops grown in rows and animal-drawn rake, the widespread use of which could minimize the drudgery of agricultural operations and at the same time ensure better yields. These implements are not as simple and cheap as the seed drill or seed treater, because of the use of metal in them. Nevertheless, it is quite possible to make such implements at local level in small-scale foundries and metal workshops deploying the talent of the traditional blacksmiths. Surely it will not be out of place to mention here that the Chinese 'backyard foundries' are no myth - the communes have been making their own tools and equipment.*

* In the face of a great deal of scepticism about the 'Backyard Iron and Steel Movement' of early 1958 in China, Wheelwright and McFarlane have cleared the basis of misunderstanding and have argued that the 'Backyard Foundries' can be regarded as the prelude to the wider use of small commune industries. So far as the size of the small iron industries are concerned, the authors have referred to blast furnaces as small as 3.5 cubic metres (at Wuhan) capable of producing 180 tons of steel per year and employing 18 people in three shifts. The cost totalled 200
Successes were also achieved by the Agriculture Research Institute in developing threshers and winnowers, and such equipment demonstrated remarkable technical efficiency and socio-economic desirability. For instance, both the Pedal Thresher and the Combined Pedal Thresher and Winnower are simple mechanical devices operated by human labour. The Pedal Thresher is basically a roller fitted with metal staples which work as grain separators. The roller is mounted on antifriction bearings and is operated by foot through a system of levers and gears, thus requiring very little effort. The capacity of the thresher is 2 maunds (79.5 Kg) of paddy per hour.

The Combined Pedal Thresher and Winnower is nothing more than two separate devices for performing two different functions, used in the same mechanical set-up. The threshing device consists of a revolvable drum made of wooden bars with 'V' pegs fixed on it which work as grain separators by combing action while in rotation. A metal hood protects the grains from being splintered away. After the threshing operation, the winnowing component is attached, and by rotating the drum in opposite direction a draught is produced which is used

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200 yuan (£36) and was constructed by 12 people over 9 days. This example can only open our eyes to the possibility of widespread establishment of really small-scale metal workshops. Cf. Wheelwright, E.L. and McFarlane, B.; The Chinese Road to Socialism, Penguin Books Ltd., Harmondsworth, Middlesex, England, 1973, Ch. 2.
to blow away the lighter particles like chaffs and straw. The entire operation is based on manual labour and the capacity is 3 maunds (119 Kg) of threshing and 20 maunds (795 Kg) of winnowing per hour. Apart from this, knowledge of a simpler hand-operated winnower also exists in the country. This is basically a wind-blowing device consisting of a wooden fan and a few sieves placed in a box-frame and operated by hand, the capacity being a good 15 maunds (596 Kg) per hour.

It is interesting to note that the heritage of knowledge in agricultural technology is very satisfactory in that the technological equipment discussed in the preceding paragraphs fully satisfy the criteria of appropriateness, that is, they are technically suitable, socially desirable and economically sensible, and their use is not in conflict with the environmental issues. What is more gratifying to observe is that these technological improvisations took place in the country even before the inception of the Intermediate/Appropriate Technology Movement.*

But what is lamentably regrettable

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* The Intermediate Technology Development Group was founded in 1965 by a group of engineers, scientists and others from industry and the professions, all with personal knowledge of developing countries. Their object is two-fold: (a) stimulate new thinking and action on the part of both rich and poor countries so that overseas development finance could work more effectively, and (b) supply basic and applied research in Britain and training facilities on the spot to provide the type of industry best calculated to relieve unemployment and poverty in the developing countries. From the very outset the Group's aim has been to discover, devise and make known a new range of self-help techniques to meet the actual conditions and resources of developing countries: technologies they can afford, that make /
is the fact that no success has been achieved in popularising those tools and equipment. The previous governments have amused themselves by emphasizing prestigious projects like the still mill or the fertilizer factory. Production of agricultural tools and implements and its role in basic development became a forgotten issue.

Any government in Bangladesh now will be profoundly wise to bring about a renaissance in better tool-making and using in a mass scale. The cultural infrastructure (knowledge) is already there - what is needed is a true earnestness at the policy making level and a strong will to effectuate the policy at the grass root level. No government will be pardoned if it neglects this primary imperative. Engineers and scientists of the country will stay condemned if they do not further the mission of developing appropriate technology. Borrowed technology will not glorify the role of the native scientists and technologists, and technological enslavement will not spare them. The gravity of the issue, vastness of the area of action and the corresponding breadth of responsibility can hardly be over-emphasized in the context of Bangladesh.

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make possible the mobilization of their labour power for productive activity. - Intermediate Technology Report '71, ITDG, 9 King Street, London, p. 4.
Seed Production and Plant Introduction

It is common sense that a country like Bangladesh with a chronic food problem should, in addition to other inputs, introduce crop varieties which have the promise of higher yields. But there is a great paradoxical issue involved here: many new varieties of cereals (rice and wheat particularly) that are excellent in their countries of origin fail miserably in a foreign environment because of their vulnerability to diseases to which they have not been exposed hitherto. This implies that inter-continental or even intra-continental transplantation of high-yielding varieties is ruled out - countries and even regions within countries will indeed have to be self-reliant and self-sufficient in developing high-yield varieties ecologically suited to their own micro-environment. In order to benefit from the knowledge of other people in other regions, at the most the new varieties may be imported and then gradually adapted to its foreign micro-environment.

This is reportedly what is being done in the area of plant introduction in Bangladesh. The indigenous varieties (about 4000) of rice are obviously of poor quality, and allegedly it was a difficult job to find out varieties superior to this huge number of indigenous ones and maintain their desired characteristics. Therefore, at present high-yielding variety of rice is being imported from the International Rice Research Institute, Los Banos, Philippine, and being adapted to local
On principle, there is nothing wrong with the current practice. As a matter of fact, so far only the IRRI varieties seem to have offered the cornucopian promise of a yield more than three times higher than that of the present indigenous varieties. But, in view of the urgency of the situation that the country is in, a much more serious and invigorating programme is demanded.

The necessity of plant introduction has its necessary counterpart in the necessity of seed production. In fact it is to obtain better seeds that plant breeding of improved varieties is so important. The objective of plant breeding and seed production is therefore one and the same - to find and to employ better yielders. It is well known that by biological law the final limit in yields is set by genetical origin of the seed, no matter how well the soil is prepared or how rational the cropping system is. This simple but universal relationship is well realized by the peasants in Bangladesh also. They fully understand that in the final count the yield is dependent on the inherent potentiality of a particular variety that is employed. But they are faced with the chronic problem of how to obtain better seeds. Most of the peasants keep some of their produce as seed, but those are of poor genetic quality in terms of purity, germination and yield, and are susceptible to pests and diseases as well. Besides, the seeds spared for sowing in the next year do not receive proper care and attention which they deserve. Thus their rate of germination
reduces demanding excess sowing.

At the grower's level the problem of seeds appears to be (i) producing good seed and (ii) processing/preserving the foundation seeds. So far as the first part of the problem is concerned, there is hardly any cut and dried solution so long as "it is desirable to use first generation hybrid seeds". Since the individual peasants cannot be expected to produce first generation hybrids themselves, they must be supplied the same from some special agencies. It is true that there are seed multiplication farms operated by public servants but their contribution to the total requirement is negligible. As pointed out earlier (Chapter 9) in 1969-70 when the biggest distribution of seed took place, only 0.5% of the total requirement was met by public sources. Following the example of free-market economies, an attempt was made (1958 onwards) to raise a group of registered seed growers which turned out to be no more than individual peasants with business motivation. The system could not ensure field inspection, testing or preservation since there are no standards or regulations.

The appropriate answer seems to lie in the introduction of a programme wherein adequate quantity of the desired seeds will be produced at the village level under Government Technical aid/supervision, and by the villagers themselves on the basis of mutual cooperation with their

own land and labour. Under this system profit motive will be ruled out and the primary objective will remain at the helm provided of course the technical support from the Government is there in a very dynamic manner.

The other part of the problem is storage and preservation of seeds. The storage facilities that the individual peasants have, i.e. the bins made of bamboo or reed, as well as the treatment of the seeds are very inadequate and wasteful. The inevitable result is huge deterioration of seeds. The technological response towards the problem from the Government's side has been extremely unimaginative — construction of brick-built structures as seed storehouses/rooms at Thana and Union levels. These seed stores are nothing more than simple masonry rooms. Recently cold storages have been set up in some places which are used for more perishable seeds like those of potato, or alternatively just for the preservation of other perishable agricultural commodities. But the cost involved is prohibitive for ordinary peasants.

The Ferro-Cement Hermetic Storage Bin, constructed and tested at the Asian Institute of Technology, Bangkok, is well worth trying in Bangladesh. It is intended to enable a farmer to store safely his grain harvest for many months, the capacity ranging from 3.5 tons to 10 tons. It is simple enough to be built anywhere by local labour, cheap, reliable and durable under tropical conditions including flooding. The results of tests carried out on such bins are also quite encouraging. The moisture
content of the paddy at the start of the test was 11%, and at the end of the test it was 12%. After 18 months of storage the seeds remained viable with germination of 95%. The precautionary measures to be followed while using the bin are also simple - that the bins should be shaded by thatch or trees when possible, and that the grains to be stored should not have moisture content of more than 12%. Further progress is expected in this project in the very near future.\textsuperscript{22} The details of construction and a drawing of the cross-section of the bin is appended with this work (see Appendix IX).

The discussion on the varietal improvement of seeds must, of necessity, be extended so as to include non-cereal food crops and non-food crops as well. It seems that possibilities in these areas are larger than that of cereal crop mainly because the areas are yet to be explored fully. A great deal of optimism is breathed by FAO in confiding that

"there is every reason to believe that selection and breeding could do at least as much to raise yields and improve the quality of the food crops other than cereals such as various roots, pulses, fruits and vegetables."\textsuperscript{23}

Little attention has been given to these areas both in the developed countries as well as in the developing

\textsuperscript{22} Intermediate Technology Bulletin No. 9, Intermediate Technology Development Group, International Development Centre, Parnell House, London.

countries. Yield of potato, for instance, is very low in the subcontinent of India as compared to those in USA or Ireland. Such is also the case with sugar cane or beans where the rate of yield in the subcontinent is about one-sixth of that of USA and other developed countries. The magnitude in the gap only indicates the range of theoretical possibilities that could be achieved.

Still less attention has been given to the breeding and selection of herbage and fodder plants. Tropical indigenous grasses are usually coarse and woody containing high percentage of carbohydrates and low protein. Obviously cows need as much a balanced diet as human beings do. There is little wonder therefore that in the USA with less than half the number of cattle per person they get at least twice as much meat and many times as much milk in India or South American tropics. The imperative is clear: raise the productivity of grasses and fodder both in quantity and quality. Although there is a great deal of scope for increasing yields nothing has been done in the tropics so far. While alfalfa has been successfully established in the humid areas of the U.S. and Argentina, such an attempt has not yet been conceived in Bangladesh. Attention in this area is urgently warranted if cattle resource is to be developed without the help of costly additives in their feed.

The promises of varietal improvement in livestock is even brighter than those in crop yields. Improvement in this area has altogether been neglected so long
because of the obsessive preoccupation with crop yields particularly in the context of the developing countries. It is well known that in terms of output in milk/meat/egg per unit of livestock the European countries are much ahead (8-10 times) of South and South-east Asian countries. This is precisely due to the fact that over the last 200 years temperate Europe and other newer countries have made phenomenal progress in upgrading livestock through selective breeding, scientific feeding and disease control, whereas in the tropics very little has been accomplished. Notwithstanding the poor heritage, finer breeds of livestock can be developed in Bangladesh. For example, certain herds of Sindhi and Sahiwal propagated in Pakistan and India have never been tried in any significant scale nor with any earnestness in Bangladesh. The riverine and marshy condition of the country perhaps make it an ideal home for buffaloes. While the arid UAR has developed certain breeds of buffaloes and India also can pride herself on the same, the possibility could not catch the imagination of the animal geneticists in Bangladesh. It is clear that the potentialities for raising the productive capacity of livestock either by selective breeding from the few superior animals which exist, or by cross-breeding with European types or by importation and adaptation of European breeds are indeed very great. However, it must not be forgotten that a purposive breeding most

certainly presupposes an efficient measure of disease control and a programme of balanced feeding without which the optimal limits of the biological capacity of the improved animals will never be achieved.

Since fish has been envisaged, in this work, as the main source of protein in the national diet, attention must be paid on the varietal improvement of this resourceful crop. In this connection, Milk-fish may be referred to as a promising variety which has proved remarkably productive in fertilized pond-farming in Indonesia, Taiwan and the Philippine Republic. Another variety worth introducing in Bangladesh is Mullet, a largely herbivorous fish which is now extensively farmed not only in Hawaii and China but in Israel and India too. 25 Needless to say, ecological principles must be borne in mind while new varieties are assessed. The menacing aquatic plants in the ponds and inland water bodies of Bangladesh could very profitably be converted into proteins by introducing herbivorous fish species. At the same time a monitored propagation of carnivorous species will ensure a balanced stable community.

There are still many other plant and animal species which may be introduced in the humid tropic of Bangladesh in order to use fully the basic resources of land, water and sunshine. Plant species adapted to growth in continuous sunshine may yield fabulous output per unit

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of land. Intensive and extensive research is now needed on plants that are nutritionally valuable directly or indirectly. One exciting possibility is the introduction and controlled propagation of blue-green algae, which will not compete with other crops for land or growing space yet supplement plant crop and/or animal crop profusely. The blue-green algae are found to proliferate in land and water of all descriptions – saline, alkaline, brackish or fresh, hot or cold. They flourish even in waters which appear only temporarily. Their growth can be luxurious in places of high humidity combined with high temperature and in a parasitic or symbiotic association with other plants and animals. They derive their food from a process of photosynthesis using the energy of light to build carbohydrates and some fats out of the carbon dioxide in the air and water.26

One major contribution that the blue-green algae has so far been observed to be capable of making is that of bolstering soil fertility and thereby boosting crop yield by virtue of their high capacity of nitrogen fixation. They have also been found to be a capable agent of reducing soil erosion. Besides, they are obvious sources of fish feed and animal fodder.27

26 Echlin, Patrick; The Blue-green Algae, Scientific American, June 1966.

27 Ibid; R.N. Singh of the Benares Hindu University has reportedly shown that the introduction of blue-green algae to saline and alkaline soils in the province of Uttar Pradesh increases the nitrogen content of the soil and also increases the capacity of holding water. Astushi Watanabe
However, their growth in an epidemic form may become a source of hazard to human life and hence must be allowed only in a monitored way.

**Plant Care**

Quite often it is found that increased use of manures, adequate water and selected exotic strains provide a congenial environment for the proliferation of numerous groups of unwanted organisms and plants. These undesirable species not only compete with the crops for nutrients, water and light, they are also very potent source of livestock poisoning or grain contamination. But today in the reality of the ecological crisis, the issue of plant care and pest control has become increasingly littered with paradoxes. It is argued that if a plant needs to be saved by drugs that means it is unhealthy, for healthy plants need no medication in the same way as a healthy person does not need any medicine. It is further argued that by producing healthy crops we

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of the University of Tokyo is reported to have tested several species of blue-green algae in rice paddies and found that the filamentous from the 'Tolypothrix Tenius' yielded 1.25 ton of nitrogen per acre per year. Watanabe inoculated the cultures (developed at his lab) which over a period of years increased the nitrogen in the soil by 30% and the yield of the rice crop by 20%. Continuous bloom of algae in fishing lakes in Alabama and Mississippi nourished the large number of small animals on which fish feed and as a result fish population boomed. Experiments in Kansas, Oklahoma and Texas by W.E. Booth proved that coating of blue-green algae on prairie soils binds the particles of soil and reduces erosion.
can eliminate the necessity of pesticide, fungicide, herbicide, etc., and that a healthy crop can grow only from a healthy soil. While the logic here has been convincing, the cultural practice advocated therein demanded heavy inputs of labour. The commercial pesticides/fungicides/herbicides, on the other hand, acted quickly and saved labour, and hence its popularity. But over the decades the most common pesticides, i.e. DDT and other chlorinated hydrocarbons, have proved to be vicious pollutants. They are not easily broken down and are concentrated in the food chain ending up in the human body. Dr Joseph J. Hickey, Professor of wildlife ecology at the University of Wisconsin, has called DDT the chemical of extinction. On the contrary, Dr Norman E. Borlaug, Nobel Peace Prize winner (1970), defends DDT and other agricultural chemicals placing all faith on them, and attacks 'ecology fever' as unfounded.

The technique of 'biological control' of insects and pests, however, is above such controversies. The idea is not new though it could not win the race against the commercialized chemicals because the results of biological control took time to show its efficacy. According to this technique insects are used to control plants and other harmful insects, bacteria to control both plants

28 Schurter, D. and Walter, E.; World Crisis in Agriculture, Ambassador College Press, Pasadena, California, USA, 1971, p. 38.

and insects. The method involves the use of any organism that is thought likely to be able to limit the multiplication of any pest - indigenous or exotic.  

Obviously the problem of speed in action remains a challenge for which certain types of controllers are to be favoured which could be easily bred and released fast at the very first instance. However, Professor Jean Dorst of the Paris Museum of Natural History cautions us that in certain cases the introduction of parasitical species or predators should be considered after extremely detailed investigations, because any ill-considered acclimatization can be dangerous. In this field the role of the International Biological Programme could and should be emphasized and expanded much more than it has been so far. True, excellent results have been produced so far, and highly original methods based on selective sterilization, growth hormones and genetic intervention are currently under study; but what is imperative at the national level is to devise simple and trustworthy methods based on those results - methods which could be understood and used at the local levels by the millions of peasants.

The idea of natural insect deterrent has flowered in completely new areas as well. Dr Noel Vietmeyer

30 Pirie, N.W; Food Resources Conventional and Novel, Pelican, 1969, pp. 70-72.
31 Dorst, Jean; The Age of Agricultural Chemical Warfare is Over, CERES, Vol. 5, No. 1, Jan.-Feb. 1972, p. 54.
et al. inform us that the compound azadirachtin, isolated from Neem seeds, has been found to be a strong feeding deterrent for locusts. The compound is absorbed by plant roots and pervades the whole plant making even the new growth bad-tasting to insects. It has also been found that a suspension of crushed seeds or leaves from Neem tree, when applied to plant foliage, deters some insect species from feeding. Fortunately Neem tree abounds in the length and breadth of Bangladesh. Is it not a clear lead for the scientists in Bangladesh to pick up the idea and develop it for the benefit of the source of sustenance of the country, instead of hammering on the stale yet expensive idea of agricultural chemicals? Should it not be more attractive as a project to the Bangladesh planners than the fabulously expensive aeroplanes for fumigation technique of plant protection?

It is obviously more than high time that we go for less spectacular and more sensible and realistic ideas.

The lines of action indicated so far in order to meet the production requirements is based on a completely different perspective of resource use and a different technique of production than what the conventional wisdom have had us follow. If the principles of self-reliance are to be adhered to and if optimum benefit is to be derived from the indigenous resources, action programmes for development will have to follow the lines indicated.

It is intended throughout to make it sufficiently clear that a truly intensive and revolutionary pattern of land and water use in combination with a fuller utilization of indigenous resources is the key to any success at all. When the density of population is increasing in a situation of meagre and fixed natural resource endowment, that resource, i.e. land, must be tended much more assiduously. Agriculture in the context must be taken in the spirit of horticulture. The salient features of the envisaged production system would be:

(i) cropping would be released from its existing climatic bondage and farming operations would continue round the year;
(ii) livestock raising would be functionally integrated with farming as an integral part of it and will thereby remain a major essential economic activity;
(iii) pond cultivation, the principal source of protective food, would be treated as important as cereal production. All water bodies would be accorded much more intensive attention and care since they are no less valuable than the scarce land. Ponds and tanks would become the central elements in the physical structure of the settlements;
(iv) production operations would receive much more labour and technical inputs; hence productivity would be increased and unemployment decreased;
(v) the one-crop subsistence economy would transform into a diversified self-sufficient economy heading towards surplus;

(vi) technological inputs being indigenously based, would not make any demand on scarce foreign exchange resources;

(vii) technology being appropriately selected would not hopefully disrupt the local economy and society; nor would it put the environment into jeopardy.

Finally, it must be reiterated that the margin of safety in the relationship between growing population and the extent of physical resources and their ultimate potentials is very slim. If we succeed in closing the widening gap between food production and requirement on the one hand and the present production level and the future production potentialities on the other before the end of the century, following the method and technique of production indicated, we may hope to keep pace in the following period. Our only key to survival lies in the creation of a rationally tailored system of production wherein the components are in a self-monitored equilibrium. Between now and the end of the century is therefore the period to carry out the basic efforts towards the creation of the fundamental conditions of such a self-sustaining system. Failure in this period is likely to have disastrous consequences at the turn of the century.
The context

During the 1920s Vera Anstey and her associate workers were prognosticating that the economic problems of the Indian sub-continent can never be solved by the mere adaptation of this or that specific policy/technique. Obstacles to progress were found to be indeed deep-rooted in the social organization. It was noted then that the pattern of land holding, the level of rents, rates of wages paid to hired labour, all depended more on the traditional social relations between the classes and castes rather than upon economic factors. After a lapse of half a century things have not changed - the problems are still the same. Once again it is concluded in the context of India that the political slogan of 'Garibi Hatao' by Mrs Gandhi will not materialize unless it is accompanied by a thorough transformation in the socio-political system entailing a drastic redistribution of assets, incomes and control over institutions (Chapter 12).

The socio-political legacy of the present day Bangladesh is in no way different from what obtains in India. We have observed earlier (Chapters 9 and 13) that one of the major bottle-necks in agricultural development in the country is the existing tenurial arrangements and the basic social inequality which has resulted in unequal access to resources and institutions as well as
disproportionate distribution of returns. We have also suggested that unless social relations are changed by drastic redistribution of land and other assets, no sustained development of agriculture is possible. Such a process of social levelling is also the egalitarian goal of socialism whereby the differences among the participants of development are minimized and their social energies are brought out to the fullest interplay.

It follows therefore that land reform in Bangladesh is as much a social imperative as an economic one. Land reform is to be viewed as a social mechanism which will ensure increased productivity and distributive justice. Obviously the regulations of any reform themselves would not increase productivity or distribute goods and services, but they will create an institutional framework which will facilitate higher productivity and equitable distribution.

It is believed in certain corners that land reform reduces a substantial portion of agriculture into an area of subsistence activities due to the splitting up of holdings, and thus reduces investible surpluses. This is a mal-observation - the argument is not borne out by statistical evidence (see Figure 17.1). Using the results of a number of recent studies on the relationship of farm size and output per unit of land, Dorner and Kanel* have very clearly demonstrated that output per unit of land

Fig. 17.1  Output per hectare for farm size-groups. For each country, bar at left represents output per hectare for smallest farm size-group; bars to the right represent successively larger farms with their output expressed as a percent of that of the smallest size-group.

is inversely related to farm size. This observation is supported by evidence coming from many other countries where big holdings were considered wasteful from the point of view of national interest and hence big estates were split up in order to create economic holding as well as to secure equitable distribution of land. In countries like China, Japan and Taiwan, such redistribution has been carried out with no adverse effect on productivity, rather on the contrary. The actual reason why land reform has failed to lead to increased land productivity in some countries lies in the fact that the other complementary measures of the 'package deal' were absent. The 'Ejido' system of Mexico is a case in point where many peasants received a substantial amount of land but still could produce very little because a vast proportion of their land was barren without the inputs of water, good seeds and manures. As a result such peasants hovered over the margins of subsistence and hunger and eventually left for cities.

What appears to be of critical importance in relation to land productivity is the proportionality of factors. There is little doubt that the size of holding has direct bearing on the efficiency of agriculture, and hence the

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* In a study of rural Mexico it was revealed by N.L. Whetten that by 1945 about 1.7 million families had received land at an average rate of 17.6 hectares per family which was mostly marginal land such that only 26% of the total land received was crop land of which only 4% was irrigated. Cf. Carrillo-Arronte, R.; An Empirical Test on Inter-regional Planning, Rotterdam University Press, 1970, pp. 34 and 161.
concept of 'economic holding'. But surely 'economic holding' is the function of a given technology and other inputs, and the soil fertility. Particularly, in land-hungry countries like Bangladesh which is under severe demographic pressure at the same time, labour absorption needs to be taken as a paramount criterion for economic holdings. Clearly, when land resources are meagre and fixed, economic holding must be determined by the production requirement, the acceptable technology and the labour force, in addition to the conditions of tenancy, availability of other complementary inputs, etc.

From the technical point of view the concept of economic holding needs a little more clarification on its physical configuration. Here an 'economic holding' should not mean the total area of any number of physically separate holdings taken together. It should rather mean a composite area of land which is in an optimum relationship with other factors of production. And that the critical size must in any way be maintained. From this consideration, the issue of economic holding assumes a very serious importance indeed. Given the law of inheritance existing in the country, the process of fragmentation can continue endlessly causing serious problems of productivity. Therefore the size of economic holdings must rule out the possibility of fragmentation after a certain point.

Often it is argued that land being a social asset whose quantum is fixed, should not be allowed to be
purchased and sold under the free play of the laws of demand and supply.\footnote{Singh, G.C.; Recent Trends in Agrarian Reforms, Atma Ram & Sons, Kashmere Gate, Delhi, 1952, p. 65.} If capitalistic rights are allowed in land, serious adverse consequences of alienation by sales, mortgages and leases follow, particularly when land is scarce in supply. In physical terms, there follows an uninterrupted process of fragmentation, and socially a sense of panic pervades the entire society. W. Klatt observes:

"There is no country in Asia in which unsolved land questions have not caused internal conflicts, led to insurrections, and, on occasion, as in West Bengal and Kerala, brought down a government."\footnote{Klatt, W.; Agrarian Issues in Asia; II. Reform and Insurgency, International Affairs, July 1972, p. 395.}

The operative forces of free land market are no less alarming in Bangladesh where land hunger is in its acutest form associated with mal-distribution which together is working towards rising land prices and rising social tension.

Therefore, to prevent land from falling into the vicious process of fragmentation as well as to forestall productivity problems, land must be withheld from the free market, and during a particular technological regime economic holdings may be frozen in perpetuity. Another reason why land should not be allowed to fall under the individual proprietary right is that conventionally the legal title-holder may wish to keep the land fallow without having to be penalized. Or he may use the land...
according to his concept of convenience and necessity and not according to the needs of the community and/or the nation. Fallowing and neglect in land husbandry most frequently results from the fact that the landholder has land in excess of what he and his family can effectively cultivate or need to cultivate. His concept of need is again defined by his short life perspective and lack of national or communal concern.

The convention of individual proprietary rights gives birth to the evils of absenteeism, namely sub-letting, share-cropping, rack-renting and neglected husbandry. All of these are unjustifiable practices in a country where land is limited and the number of peasants is expanding. Viewed in the historical context land becomes a marketable/profitable commodity when its availability becomes scarce in relation to the expanding demand resulting from demographic pressure. Obviously absenteeism is a positive mechanism which intensifies land scarcity in an artificial way by withholding substantial amounts of land from being circulated amongst the more needy peasants. In Bangladesh the supply of land cannot be expanded in response to ever increasing demand, and hence land should be withdrawn from the profiteering market and capricious individual control.

One of the fundamental objectives of land reform is to break the socio-economic base whereby only a few gain access to institutions of control and resources by virtue of their title to substantial land and the associated
social surplus. The conclusion of Trotsky that those who control the social surplus product ultimately control the entire society, has been evidenced in toto in the Indian situation where increased productivity in the recent years has not improved the lives of the great masses of peasants due to the greatly unequal tenurial structure (see Chapter 12). Under the circumstances, land reform should be meant to liquidate the power base, i.e. abolish feudal or semi-feudal tenure system and re-distribute title to the tillers sealing off all the possibilities of any accumulation at any future date.

Land reform of this kind involving the abolition of titles of feudal and semi-feudal type land owners was attempted in Bangladesh through the East Bengal State Acquisition and Tenancy Act of 1950. By virtue of this Act the government was to acquire the interests of all rent-receiving intermediaries, that is, the Nawabs, the Zamindars and the like in the echelon above that of the cultivator. But the provisions for the maximum permitted holding were too liberal in the context of the total available land in the country. The Act provided that land holding should not exceed 100 Bighas (33 acres) per family or 10 Bighas (3.3 acres) per family member whichever was the larger. However, the provisions in the Act had many loopholes - for instance, it could not ensure that the deserving peasants would get land. On the contrary, the peasants were called upon to bear the full cost of removing the burden of the Zamindari
system. Besides, since tenure holders who would cultivate with the help of a labourer or bargadar (share-cropper) were to be regarded as cultivators as defined in the Act, the old interests remained entrenched in a new guise. Many of the old large holdings were divided into parcels of 100 Bighas or less and distributed under the names of sons, daughters or even fictitious persons. There was no change in the mode of operation of many of the previous owners. In terms of transfer the regulation did not help the landless or near landless peasants - if at all, it helped the occupier-holder, the one who cultivated with the help of the labourer, share-cropper or renter, as well as the previous tenants who now were given the titles. As a result local politics and the exercise of power at the local level continued to be dominated by the affluent group.

Thus the main purpose


* Documentary evidence of such a social process comes from the microscopic study of a village in West Bengal by Tara Krishna Basu. Employing a painstaking multi-historical approach covering a period of 85 years, T.K. Basu has revealed that the Zamindar still remains the wealthiest and hence most influential person in the village. Social relations in the village have remained unaltered because of the economic superiority of the former Zamindars. Yet worse land has become an object of profitable private investment and has been concentrated in the hands of the rich people. Consequently there has been a sharp rise in the ratio of land-less agricultural labourers. The landless persons are not allowed to have any say in the affairs of the landowners' cooperatives. The legally approved proportions in share-cropping are not adhered to by the owner and the share-croppers do not insist in the fear of losing the land altogether. - Basu, T.K.; The Bengal Peasant from Time to Time, Asia Publishing House, Calcutta, 1962.
of land reform was defeated.

It follows from the foregoing discussions that it is too risky to leave the scarce and non-expandable national resource at the disposal of individual proprietorship in the conventional manner. On the other hand, full socialist collectivization (nationalization) at this stage does not appear to be the most desirable solution either. We must remind ourselves that one requirement any type of land reform should meet is that it should create a relationship between man and land that would not thwart his incentives to work and to invest his own labour if not anything else. A sensible compromise between the concept of individual proprietorship and that of nationalization seems to lie in placing land in a sacred trust and allowing the individual the use right but not the right to transfer, that is, an individual will be allowed to own a piece of land and enjoy the fruits which he can produce out of the land but will not be allowed to transfer the rights to others by sale or such other acts. Good land husbandry must be an explicit condition of such ownership, any violation of which should lead to forfeiture, with the ownership to revert back to the community trust to be reassigned to a more promising candidate. In this way the ultimate control of land resources is to be vested with the community and not with the individuals. One's right to land would depend not

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on the convention of patrimony but on the use made of it. Thus land would cease to be a marketable, commercial merchandise.

The principles borne out here are not new - they are very ancient indeed, but the benefits that may accrue now are sure to be much more significant than that of any other period in the past simply because the present demographic pressure is unprecedented. If the village community is interposed as the ultimate owner of the land, it will not only revive the classical village republic, it will release the fullest social energies of all the groups and individuals into the productive process and thus expand the potentials of land to absorb larger population. Alternatively if land is nationalized as state property, there is an inherent danger that bureaucracy will have to come to stay as a permanent exogenous agency of control. Besides, the lack of incentives for individual effort will have disastrous consequences in national production. The prolonged experiment of collectivisation and de-collectivisation in national agriculture in the USSR bears testimony to the fact that without creating some sense of ownership for all full labour participation cannot be ensured. The recent success story of China also suggests that a sense of individual participation in ownership must be allowed.

What is envisaged in the land reform strategy in question is to evolve a mechanism by which access to land may be created for as many people as available
technology permits at one time, allowing those people to enjoy the full return of their labour all by themselves except the amount that is to be retained for the taxes. And at the same time prevent land from being concentrated in fewer hands or becoming a marketable, profitable commodity. Thus land would be able to support many more people than would otherwise be possible. This is in total conformity with the economic goal (in terms of employment creation) that Dr A.R. Khan has solely aimed at in his approach towards the land reform measures in Bangladesh.*

**Size of land distribution parcels**

So long as the objective is to create access to land for an optimum number of people, the question of size of such parcels is indispensable. In this connection the biggest bottleneck at the conceptual level is the prevailing notion of upper ceiling. If land is to be viewed as a social asset, obviously we should not be concerned primarily with the question of upper ceiling. Our fundamental obligation should rather be to ensure the minimum size to which everybody must have access.

* Dr A.R. Khan argues that to be able to tackle the problem of employment creation, it is of great importance that flooding of the labour market through increased proletarianisation of peasants is avoided. Dr Khan suggests that a redistribution of ownership is highly desirable so that a greater proportion of farms can be entirely family based, raising both visible and effective employment. For further discussion see Khan, A.R.; Economy of Bangladesh, Macmillan Co., London, 1972, p. 132.
This is where the greatest flaw and shortcoming in the conventional thinking lies. No land reform law conceived in the conventional framework has ever been bold enough to suggest anything which would take care of the lower minimum essential for survival of the individual and his family. Therefore any land reform measure intended to achieve a dramatic result must be approached from the bottom end. It must be reiterated that the upper ceiling approach is divorced of the existing realities. It is not at all geared to the demand of the circumstances. For instance, in Bangladesh the ceiling is already quite low (100 acres = 40 Ha) in international standard, yet all the land can be taken up by only 7.5% of the population according to the existing ceiling regulation. Obviously, the more land that is trapped at the upper end the less people can be accommodated at the lower end. And since unfair mechanism of voluntary division of land under different names is known to the vested interest group in Bangladesh, the upper ceiling regulation will not be able to achieve anything at all.

The imperative is clear: land should be apportioned, starting from the bottom end, on the basis of 'minimum necessary' for the survival of the basic social unit, the family. The loudest economic argument that would be raised against such a policy of creating a regiment of small holding for family survival is that farm efficiency will drastically fall and agricultural productivity will be in serious jeopardy. Such an
assumption in the case of Bangladesh is totally invalid for we have seen (in Chapter 9) that the small farms, i.e. smaller than 2.5 acres, are the most efficient in terms of cropping intensity. We have also noted that the big farms employ highly undesirable techniques like share-cropping and/or renting which, according to Dr Khan, is a serious cost imposed on agriculture by the rural gentry in their high consumption and absenteeism.5 The reasons behind the phenomenon are obvious: the bigger farms are well-off and have other sources of income, and hence they are indifferent towards productivity from the land, whereas the small farmer is compelled to eke out sustenance for himself and the family. Dr Khan has made it evident through his economic analysis that in the case of Bangladesh the big farms have in no way proved more efficient than the small ones — neither in terms of static efficiency nor in terms of dynamic efficiency.6

Yet no less audible will be the socio-political outcry of the landed gentry whose interest will have to be sacrificed for the creation of the vast number of 'minimum necessary' size of holdings which do not exist at present. Obviously the small holdings envisaged will have to be carved out from the big ones. And this is what the land-owning group will resist on the basis of their archaic concept of private property. Luckily, the concept of private property has undergone significant

5 Khan, A.R., op. cit., p. 131.
6 Ibid., pp. 133-135.
changes in the contemporary world environment, and the reformer in Bangladesh will find enough strength in emphasizing that enjoyment of ownership is subject to the rules of general welfare of the nation. This illuminates the ideals of nationalism and nationalistic socialism in Bangladesh.

Returning to the question of size of the 'minimum necessary' we can refer to the subsistence unit of 2.2 acres per family as worked out in Chapter 14. This is the minimum to which access must be created for the crop-producing families. It has been estimated in Chapter 5 that agricultural labour force will be 24.78 million in 1975. If we assume that 20% of these would be engaged in rural industries and trade, we are left with a labour force of 19.82 million to be engaged in crop production. Again, assuming two workers per family, we find 9.91 million families to be assigned to crop production. Thus, on the basis of 2.2 acres per family 21.8 million acres of land will have to be earmarked for the crop-producing families. The rest may be allowed to be held in absentia or in multiple units by the cultivating families in addition to their own original assignment. Of course, as technology progresses and productivity increases, the same area should and must accommodate more families directly in relation to the rise in productivity.

This strategy of land reform may appear prima facie to have been inspired by the slogan "land to the tiller", but in reality it is a strategy of proportioning
population to potential in its down-to-earth form. When capital is so scarce in the country, there is no point in pretending that capital will be available to create urban employments and urban facilities at the rate of 12% or even 6% p.a. to take care of 25% of the annual increment in population/labour force. There is simply no way out but to go for a land redistribution pattern of the kind suggested above. It is also a strategy of bringing the potentials of man and land to its full bloom, for the system of peasant ownership envisaged here will set free the essentials of productive forces in agriculture and thereby ensure a sustained agricultural development.

It must also be reiterated that anything short of this strategy would not be able to succeed from the social point of view. The demands in the transformation of social structure are too pressing to permit anything less. On this aspect Dr Khan's simple arithmetic is quite illuminating: that even if the ceiling is drastically reduced to 5 acres, the surplus land will be just over 5 million acres, or just enough to bring the average size of the holdings of the smallest 64% of farms up to 2.5 acres...to try to distribute land among the landless

* In a recent interview Professor Myrdal asserted that greater equality is almost a condition for rapid development. To the Indian interviewer he said, "You will be able to lift yourself out of poverty only if you promote more equality and this can be done only in relation to concrete policy issue." See 'India Remains a Soft State' - Anil Agarwal talks to Gunner Myrdal, Hindustan Times, New Delhi, Jan. 14, 1973.
households would be impossible.\textsuperscript{7} An even lower ceiling is therefore unavoidable. A further social imperative is to create a system whereby egalitarian principles will be instilled in the feudalistic heritage of the country and farming would be accepted both as a way of life in the manual sense and an entrepreneurial activity in the economic sense. The built-in inequalities in social relations on the one hand and the evils of absenteeism and share-cropping/renting have been allowed too long to jeopardise agricultural production. There is no room for inaction or complacency in small actions. When the situation demands radical surgery, piecemeal medication will only prolong the miseries and harden the agents of the malady. There is no slow way out of this impasse. The experience of soft statism from the neighbouring country is fairly educative at this point. After twenty-seven years of futile efforts to bring about a peaceful evolution in the relationship of man and land, 'violence in the offing' is a social constant. The Gandhian method of 'Bhoodan' and 'Gramdan', although securing more land for distribution than the government programmes seen, success has turned into something of a mirage even by Vinoba.\textsuperscript{8}

The suggestions outlined above may not look as radical as they might at first appear when seen in the

\textsuperscript{7} Khan, A.R., op. cit., p. 138.

light of what has already been achieved in some other Asian countries. For instance, the Owner Farmer Law of Japan empowers its government to purchase (a) all tenanted lands owned by absentee owners and (b) tenanted land owned by resident landlords exceeding one cho (2.45 acres). The total of tenanted land and of self-cultivated lands owned by any one party shall not exceed an average of three chos (7.35 acres). More radical experience comes from China where under the Agrarian Reform Law (1950) land, draught animals, farm tools and implements, and surplus grains of the landlords and their surplus houses in the countryside have been confiscated. All land and other means of production thus confiscated and requisitioned have been taken over by the Hsiang for unified, equitable and rational distribution to poor peasants with little or no land and without any other means of production. Landlords were to be given an equal share so that they could make their living by their own labour and thus reform themselves. The land of all the absentee owners has been confiscated, but the middle peasants have been protected. Land belonging to ancestral shrines, temples, monasteries, churches, schools, organisations and other land owned by the public bodies has been requisitioned and the local government has taken the responsibility of maintaining those dependent on such properties. In both of these two

systems the new user-owner is not allowed free rights to dispose or transfer such lands. Another example of straightforward land regulation comes from Sweden where only those who cultivate land with their own hands can own land.

Tanzania has adopted a land tenure structure in which the village land is under the control of the villagers themselves through their representatives who are bound by trusteeship principles. Generally land planted with chief crops remains communal, so do the pastures. Members, however, retain ownership in a share of the collective farm equal in size and quality to the land he contributed. They are entitled to personal allotment for a homestead and a home lot which is meant to be supplementary in satisfying the needs of the farmers and their families through their personal effort. Cooperative husbandry is by and large the main source of livelihood. There is no succession to property rights. Property rights are to be held by the family as a corporate unit.\textsuperscript{10} However, Tanzania has another sub-system, a divided scheme, wherein members are granted holdings which they farm individually, but this type is only a prelude to the undivided socialized schemes.

Experiments in Israel led to the development of Moshav Ovdim or cooperative village. Land in a Moshav is divided into small holdings and leased to individual

holders for 49 years. A general cropping plan is adopted by the Moshav while individual farmers are free to carry on the work of their own holdings within that plan. Mixed farming is generally practised with emphasis on the production of the members' own food.\textsuperscript{11} It must be pointed out, however, that, in spite of the unique success of the Moshavs, the model need not inspire the Third World countries mainly for one reason that they had financial resources coming to them from very wealthy external sources, i.e. the Zionist sympathisers all over the world. The second point of dissimilarity is that in the Moshav making a living from the land was not the sole or even the central motive.

A common lesson which emerges from all types of land management system is that a sense of ownership and a community feeling is essential for the maintenance of enthusiasm and to effect the strict discipline without which the system would collapse. It is also important that the peasants be assured that they are the sole beneficiaries of their labour even if for organizational purposes of better production they may have to pool their land. In other words, the man-land relationship in the envisaged system should be one which would make it more remunerative to work harder.\textsuperscript{12}

\textsuperscript{11} Digby, Margaret; Cooperatives and Landuse, UN/FAO: Agricultural Development Paper No. 61, 1957, p. 26.
\textsuperscript{12} Engelmann, K.; Cooperative Movements in Developing Countries, Praeger Special Studies in International Economics, Frederick A. Praeger, New York, 1968.
To this end what is imperative is to create small holdings of 2.2-acre size parcels and assign them to individual peasant families, but without securing any right to sell or to transfer titles. Family inheritance will be ruled out and after the death of the original assignee the parcel will revert back to the village trust from where such parcel was dispensed. Land utilization will have to be in accordance with the landuse plan formulated by the village community. Negligence or non-use will lead to penalty and forfeiture, except where non-use results from continued sickness. Where a family is small, two such families may be assigned to share one parcel - their rights to be expressed and acknowledged in terms of percentages. Luckily the suggestion is not completely alien in the cultural tradition of Bangladesh - there are innumerable examples in the country where ponds and orchards and such other assets, which cannot be physically divided, are shared between families, their shares being expressed in terms of percentages. It follows therefore that cooperation is impelled when the parties concerned realize that there is no other workable alternative. Such cooperation is also imperative from the standpoint of optimal use of animal draught power.

Yet, for purely technical reasons, the ownership rights of the peasants may have to cease to adhere to any precise physical area. Such rights will have to be transformed into shares in a pool corresponding to the
size originally assigned. Therefore, the statutory provision for such pooling of land must be created beforehand, although the possibility is not visualized within the technological framework outlined in this study. It is precisely on the strength of this technological background that major objections cannot be raised against the creation of small holdings. As a matter of fact smaller holdings do exist in far-flung fragments taxing the peasants of unnecessary walking to and from those small plots. In a consolidated holding the peasant will not have to run from one field to another to look after his crops. This will rather be an improvement on the existing pattern of small holdings.

However, for the sake of protecting the environment from the ravages of 'Raubwirtschaft' economics (rape of the world resources), and subsequently for the purpose of environmental stabilization and perhaps cosmetization some community control is indispensable. The common interest of all the members of the present and the future generations can be ensured only through collectivized management of land and the related resources. From this standpoint cooperative land management system is unavoidable. Long experience throughout the subcontinent

* The type of technology that has been advocated for increased productivity such as the use of compost or Harvey Pump or intense manual care of plants supported by biological control, etc., will not make any difference whether agriculture is carried out on 2-acre farms or 20-acre farms. As Dr Khan correctly observes: "Mechanization is the only process that would encounter a serious obstacle."
has proved beyond any doubts that without any collective responsibility at the grass-root level, village forests, trees, paths, tanks and minor/local irrigation works, etc., cannot be saved from dereliction. With local management responsibility, as opposed to centralized administration, the defaulters can easily be isolated and penalized. Community discipline which is so vitally important for the attainment of national production target as well as for a sustained productivity, cannot be instilled without existence of a collective management body. When millions of small producers are involved, the national production requirements cannot be guaranteed without responsibilities being grouped and community discipline being enforced at local levels. These are the rationales behind suggesting cooperatives for production management and environmental security. In the cultural context of Bangladesh these cooperatives may be called Gram sabha, or Panchayet in more traditional lines. According to such management system the individual will be free to enjoy the produce of his basic share (2.2 acres) less the community taxes, but will be subjected to community (Gram sabha) decision in respect of land use, including cropping, and land care. So far as the land for the residence and home lot is concerned an area not exceeding half an acre may be permitted for each family.* Ponds may be put under joint ownership

* This is a standard which has been prescribed in Sri Lanka's latest land reform. See Sanderatne, Nimal; Sri Lanka's New Land Reform, South Asian Review, Vol. 6, No. 1, October 1972, pp. 7-21.
of several families for the sake of production efficiency as pointed out in Chapter 14.

No land reform measure can be judged in vacuo. Land reform measures are to make the land management system consistent with the overall requirements of national development. Hence any judgement concerning a particular system must take note of the man-land ratio, the organization of agricultural production, institutional and technological requirements, the stage at which the society lies in the transformation from an agrarian to an industrial economy, and the goals which specific groups and organizations are attempting to achieve. Quite often a great deal of incompatibility arises between the criteria of test. That is why the issue of land reform is always so thorny, so cloudy with endless debates. One set of reform measures may be tailored so as to meet the demographic, economic, technological and social requirements, but the same may be viewed as unacceptable on the grounds of political ideology. On this ground many tenure systems are worked out where predominant socio-economic purposes are compromised with political philosophy. As a result the basic purposes of the reform are frustrated outright or by-passed; and the malady remains uncured. Under such circumstances, a fundamental question must be asked: are socio-economic priorities to be made subservient to political ideology

13 Dorner, Peter; Land Reform and Economic Development, Penguin Modern Economics Texts, Middlesex, 1972, p. 34.
or the other way round?

The land reform measures recommended in this work are perhaps not immune from the 'drawback' discussed above. The proposed system would hopefully meet the requirements of employment creation, increased agricultural productivity, technological compatibility and social distribution. But whether the same can be implemented within the political framework now prevailing in the country is the key question. It is to this question that we now turn.

**Implementing the Land Management System**

Since geographical expansion of agricultural land is not feasible in Bangladesh, the new holdings will have to be carved out of the existing holdings. This will unavoidably affect, in varying degrees, a little less than half of the land-owning families. However, a little over half (51%) of the owner families will not have to be touched, rather a significant number of them will gain considerably by being lifted above their present position of near landlessness. In addition, the vast mass of landless labourers, who constitute about 40% of the total agricultural labour force will be profoundly benefitted. On paper the redistribution and readjustment looks simple and sensible. But the task of actual redistribution of land and the formulation of policy to support such distribution is the most delicate part in the implementation of any land reform.
In a policy alternative of (i) hurting fewer families and mopping up less land for redistribution, and (ii) affecting more families to derive wider social benefits, Dr Khan seems to have favoured the first alternative. Instead of affecting 20% of families whereby many more opportunities could be opened up, he has suggested to hit only 8% of the owner families even though the benefit would be smaller. Admittedly the relative weight of potential resistance has been allowed to determine the extent of redistribution.\textsuperscript{14} Apparently, this seems to be a very weak stand in that it lacks an objective basis of defining a level above which all land could be labelled as surplus and mopped up for reallocation.\textsuperscript{x} At the bottom, however, there seems to have been an assumed level above which holdings were considered surplus and where the alternatives were evaluated. If, on the other hand, there was an objective basis of defining surplus then all the surpluses could be rendered equally liable to be requisitioned. There is no theoretical basis of making

\textsuperscript{14} Khan, A.R., \textit{op. cit.}, pp. 137-138.

\textsuperscript{x} To arrive at an objective basis the subsistence unit of 2.2 acres has been used in the present work (see Chapter 14). It is worth mentioning here that in early 1950s in India it was considered that the maximum size that can be owned by a person was the amount of land which it was possible for a person to cultivate personally or the amount required to produce a minimum standard of healthy living under most favourable condition. It was believed that this measure would encourage owner-cultivator, kill social parasitism and create a social cultural environment where hard work, honesty and a level of content would be the dynamic of life rather than ancestry and dislike for manual work. Singh, G.C., \textit{op. cit.}
a discrimination between holdings with small margin of surplus and those with big margin of surplus. Viewed from standpoints of the dangers of accumulation, any surplus, no matter how small, is a potential source of large surplus accumulation. There is another weakness to be identified here, that is, if the cooperation of $8\%$ of the owner-families could be enlisted, there is no reason why $50\%$ or more could not be mobilized with more energetic and committed efforts.

What is in fact more problematic is whether to go for a policy of requisition on the basis of compensation or outright confiscation. The case of confiscation may be advocated on the ground that if the absentee owners are like parasites and if their ownership is only circumstantial and non-functional, they are not entitled to any compensation at all. And if land is a social/community asset, the so-called owners should have no legal rights to obstruct its social distribution. But there are obvious snags. The definition of 'absentee owner' in the context of present-day Bangladesh may very well be tortuous and subjected to endless debate and interpretation. Besides, the present government, which is at best social-democratic, cannot be expected to endorse any proposal of confiscation except, perhaps, in relation to those holdings which stand as evacuee/enemy property, abandoned by those

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* Guru Charan Singh reckons that the entrepreneurial and supervisory function of the absentee owner is nil or nearly so. Hence the superior position of such owners is artificial, circumstantial and untenable. See Singh, G.C., *op. cit.*
who have left the country recently for political reasons.

On the other hand, requisition on the basis of compensation is not a straightforward solution either. Supposedly, the compensation money is to be realized from the new recipients one way or the other. But obviously they do not have the money now. Hence such payments have to be deferred. Still, the question of 'price' needs to be solved. In a situation where an extraordinary man–land ratio has shot up land prices, does the market price serve as the criterion of compensation price to be paid? It is surely arguable that the conventional concept of a price for the land is to be reduced to a mere obligation to reimburse the old holder for improvements existing on the land requisitioned. If such arguments are rejected as unacceptable, there will be no way to avoid the unmanageable drainage from the national treasury. Even if the payment is staggered over a period of years, conceivably the total amount could be quite substantial such that the annual savings mopped up from agriculture either at the individual level or the national level would continually be washed away for those number of years. Here a critical variable will of course be the total number of years over which the payment is to be spread. For instance, if a period of 15 years is taken into consideration, as suggested by Dr Khan, as much as one-third of the standard annual output is to be set aside for the purpose of payment to the previous owner.

15 James, R.W., op. cit.
A new owner-peasant will not evidently have much margin of savings as compared to his position as share-cropper, having to pay half of his annual yield.

Therefore, if exhaustion of the national treasury is to be avoided and/or if a comfortable position of the new owner-peasants is to be ensured, either of the following measures may be adopted:

(i) pay the 'compensation price on the basis of any investment made on the land by the previous owner for its improvement. (In the agrarian context of Bangladesh the cost of such improvement would be very little, and hence the total compensation money is likely to be very small indeed.)

(ii) pay the 'market price' through a cooperative arrangement whereby land brought in surplus of family apportionment will be paid for by the cooperative, from a fund where the new participating owner-peasants would be required to contribute one-sixth* of their annual produce as payments towards their newly acquired 'rights on land'. There will be no fixed period of payment to the former owners who will receive annual payments till the initially settled price is fully paid off. There will be no interest.

* This is in line with the 'limits to maximum rents' legislated for Ganjam and Korapat area in Orissa in the post-independence waves of land reform legislation in India. For similar other measures see Singh, G.C., op. cit., pp. 50-52.
on the amount staggered over the required period. However, as an incentive towards agriculture as a vocation as well as a prize for manual labour, those former owner-families who choose to join the cooperative as a participating (in the manual sense) new owner-peasant may be granted a nominal rate of interest.

In the latter arrangement several benefits will be accomplished simultaneously: (a) the convulsion normally associated with the idea of confiscation will be reduced to a minimum, if not eliminated altogether, (b) the new owners will not be under any direct control or obligation of the former landowners, and hence the pattern of social relations will be revolutionized, (c) the new owner-peasants will also get a feeling of satisfaction of having earned what they deserve and a sense of participation in the process of agrarian transformation of the country, (d) agriculture and related manual labour will be encouraged, and (e) the national source of revenue will not be thwarted nor the peasants' savings neutralized, while the national treasury will be saved from a vast monetary expenditure and the inflation that would inevitably follow.

The greatest objective that will be achieved under the proposed system is elimination of any scope of absenteeism to revert, a possibility of which Dr Khan
is apprehensive in his own recommendations. The proposed system will ensure what the various state Governments of India unsuccessfully tried to achieve in the early years by putting maximum and minimum limits to the size of holding: that a person should not own more than what he could cultivate personally.

The last but very important aspect of the implementation of land reform is the role of administrative machinery for the efficient, honest and speedy execution of the reform policies and regulations. The most essential pre-requisite for the successful implementation of any reform law is an incorruptible, capable and dedicated administrative and revenue machinery. A comparison of implementation of land reform in India on the one hand and Japan and China on the other tells us that the main reason that India lagged behind is the absence of a speedy and honest machinery of government and the courage and will to do the job. After more than a quarter of a century of stalemate, it is now being suggested by many concerned authorities in India that the existing legislative measures, no matter what their present limitations are, must be enforced firmly and rapidly.

The foremost obligation of the administrative machinery is to change the prevailing 'soft-statism' which favours the owning class, into a new nationalism which would treat all alike and straightforwardly. Towards such ends initiative must be taken by the
Government to create new democratic institutions rooted in the soil and with ample power of execution so that conservative social forces are overcome and the mass aspirations brought to fruition. Democracy must be taken down to the lowest level of people. Since the ordinary citizen does not know his rights, duties, privileges and obligations, the initial lead must be provided by the central Government. But if in the process the self-importance of the bureaucrat incites him to lord over the people instead of serving them, the whole objective will be vitiated. Once a good lead and an equanimous organization is created and the dynamic of the people aroused, the wind of change will be seen to blow - people will no longer have to look for a violent revolution for their emancipation, as well as for the enjoyment of their basic rights. No government of serious intent can afford to lose sight of this aspect of the implementation of reform. If truly effective steps are not taken, the goals of reform will inevitably fall into disrepute, as has happened in many parts of Asia during the last two decades, and the not-too-distant future history will record a new round of insurgency and revolution. It is well to remind all of us ahead of time that in a situation where it might be possible to bring about social change by democratic means, it would be counter-revolutionary to create
conditions for violence.\textsuperscript{16} There is no wisdom in letting the worst happen in order to justify drastic action. Resolute action here and now is demanded from politicians, administrators and intellectuals alike. Any delay - and we all may have to repent.

\textsuperscript{16} Narayan, J.P.; From Socialism to Sarvodaya, Akhil Bharat Sarva Seva Sangha, Rajghat, Kashi, 1958, p. 13.
Economic operations and the related social activities are carried out on space. Any system of production, distribution and consumption as well as the associated social living has an inseparable component of a spatial system corresponding to it. The spatial system thus identifiable is referred to as the settlement system or, plainly, the settlements. The physical type of settlements and their internal structures vary according to the nature of economic activities. The level of performance of the economic and social activities depends on the appropriateness and congeniality of the corresponding settlements. Therefore, the design of any system of production, distribution and consumption must at once take care of the settlement aspect. Admittedly, this is the ultimate task which the 'physical planners' set out to do. But having been conceived and developed in the high level of urbanism of the western hemisphere, 'physical planning' has remained preoccupied with the problems of urban/industrial settlements alone; and perhaps rightly so, because there in the highly industrialized/urbanized countries urban settlements represent the arena of major economic activities as well as the habitat for the overwhelming majority of the population. Hence, under those circumstances the physical planning professionals' predominant concern for the cities and city regions is
perhaps justifiable. But the profession of physical planning, on being transplanted into the soils of the developing countries, has continued to show a quite unwarrantable concern for the urban areas. Thus physical planning has ironically come to mean largely urban planning/town planning even in the context where the majority of the population and the dominant sector of the economy lie in the rural area.

Under the influence of such a partial approach, the scope of settlement planning for the planned development of Bangladesh would remain either too vague at the national level due to the lack of proper orientation; or at least it would tend to be a kind of settlement planning within the confines of narrow architectural or urban design concepts expressed in housing/residential area designs, new layout standards, new amenity standards or perhaps new density standards - in relation to the existing or potential urban centres.

Perhaps from such partial conceptualization of settlement planning Professor J.R. James has concluded apparently that the control of physical planning is not among the first priorities in Bangladesh which is struggling with more fundamental problems of improving its agricultural output for a rapidly rising population, creating wider opportunities for employment, making good the deficiencies in education, public health and utility
supplies and transport.\textsuperscript{1} This clearly is a mistaken view. Surely it is not physical planning \textit{per se} which ought to wait for the time being but perhaps it is urban physical planning (urban design and city planning) which may have to be deferred. The current production situation in the country and the associated landuse problem is all the more reason why widespread comprehensive planning must be taken up at the earliest. In the field of physical planning policy for Bangladesh the contribution of Professor James is not however immune from shortcomings. In an otherwise sensible set of proposals he has tended to overlook the basic unit of settlement structure, the village, which is at once the basic unit of production as well as that of social groupings.

In our analysis of the country's basic problems throughout Chapters 8, 9 and 10 it should be sufficiently clear that physical planning of the entire rural sector is of utmost urgency simply for the sake of survival. For instance, in the light of the current problems in productivity we have concluded that land reform is an essential pre-requisite for increased production in agriculture - a task of paramount national urgency. Obviously the institutional measures for the implementation of land reform must find their complementary physical mechanisms. How then can the role of physical planning be relegated for the time being to a secondary

position in Bangladesh?

We have also noted that no other country of comparable size and importance in the world suffers such an acute land hunger. And since the area cannot be expanded, its use must be optimized. Landuse and settlement control is a clear imperative when landuse optimization is the goal. Further, we have noted with due alarm that environmental protection and stabilization is of immediate concern if a sustained source of livelihood and survival for the present as well as future generations is to be ensured. Since there is hardly any popular consciousness about the value of land and how it is to be used in the course of living, environmental stabilization cannot be achieved without effective physical planning controls.

All told, the existing reality in Bangladesh is such that the largest sector of economic and social activities must be arranged on the given limited space in such a way that the overall effect be economically fulfilling (from the standpoint of national production requirement), socially satisfying (so that the basic producers could contribute more effectively and fully), environmentally positive (as opposed to negative, detrimental effects) and politically educative. This approach is at once in agreement with our previous recommendation in respect of sequence of development and priority over time that enough surpluses must be generated before any large scale urban type development may be undertaken. It is also
quite clear that urban/industrial development would become absolutely indispensable in a generation from now when conceivably there will be no room whatsoever in the rural sector for the absorption and accommodation of any more incremental population. Between now and then is therefore the breathing space and accumulative period for activating a large-scale urbanization process before the worst crisis appears.

Also, in view of the existing preponderance of agriculture in the economy and society, the agrarian settlement system must be treated as the key to the national habitat system. The grand structure of the national settlement system ought to be worked out from the base stratum of villages to the top stratum of metropolis and not conversely - each higher stratum taking the surplus of resources as well as of burdens from its lower echelon. In this way an interlocking chain of interdependence will be established from the top to the bottom of the national settlement system. At the same time this strategy would ensure a sustained long-term distribution of population which will bring about a smooth and functional complementarity between the rural and urban areas and still satisfy the social and economic needs of individuals as well as the nation.

Village Agglomeration

It follows from the above discussion that the chief goal of settlement reorganization should be to rectify
and rearrange first the lowest order in the settlement hierarchy, the village, which is at once the most numerous and involves the largest sector of the economy and society. We have noted (in Chapter 6) that the most dominant pattern of village settlements is that of separate homesteads or small clusters of homesteads on natural or man-made elevations. It has also been said that the homesteads take up more area than would otherwise be necessary. In a wasteful manner every parcel of high ground is being covered by homesteads alone. As a result any room for the incremental population is being provided by encroaching upon the cropland or upon the area under orchards and trees. As new tanks are being dug in order to raise platforms to accommodate new homesteads, old tanks are falling derelict. There exist no playgrounds, nor any road in the proper sense.

On the other hand, the quantitative framework for the settlement system in Bangladesh is such that the rural sector must make room for 73 million people in 1975 and at least 97 million at the turn of the century. We have estimated earlier that 57 million people (10.22 million families) can be accommodated in pure agricultural activity on the basis of a land-support standard of 2.2 acres per family. The remaining 16 million people (2.86 million families) are to be provided with non-agricultural vocations in the rural sector; nevertheless their residential accommodation must be provided in the villages. In view of these requirements, it is of
utmost importance that wasteful use of land be curtailed and provision be made for the expansion in economic and social activities for the present as well as for the future. The first and the foremost task in settlement reorganization therefore is to stop the existing scattering of homesteads and initiate a process of agglomeration into compact settlement units and thus maximize the availability of land. At once, it must not be forgotten that on principle settlement reorganization must bring about a space structure, a relationship of man and land which should reflect the social and economic aspirations of the new Bangalee nation.

According to the 1961 census the rural population lived in about 64,000 villages of less than 200 families each. On the principle of settlement compaction indicated above the scope of establishing new village settlements is ruled out. The increments in rural population must therefore be contained within the existing villages. From the national framework of urban-rural population distribution it follows that by 1975 the existing villages must contain a total of 73 million people of which 57 million (72%) are to be provided with crop land as well as dwelling area, and the rest with residential accommodation only. In addition both the groups must be provided with some minimal community facilities. That means by 1975 an average village will have to contain about 1140 persons or 204 families. Following the average density pattern of 1400 persons per square mile, (540 per square
kilometre), it may be deduced that an average village would encompass an area of 0.78 square mile or 500 acres (200 Ha).

So far as the socio-economic and demographic characteristics of the prospective village population is concerned, it follows from the national level parameter that on the average 72% of the 204 families, i.e. 147 families, would be agricultural families who will have to be provided with crop land and dwelling area, and the remaining 57 families would be non-agricultural families needing only dwelling space. Together they will need some basic community facilities such as roads, market place, primary school, playgrounds and water distribution canals. So far as land for the primary school and playgrounds is concerned, some information on the demographic composition of the village population is also necessary. The profile of the indicative demographic structure (Chapter 5) suggests that by 1975 about 20% of the population (228 children) will be in the primary school age, while another 25%, i.e. 285, will be of secondary school age.

Within the quantitative parameters outlined above landuse apportionment for an average village settlement may be arrived at in the following way:
Crop land @ 2.5 acres per family \( (147 \times 2.5) = 367.50 \) acres

Dwelling area for farm families @ 0.5 acre/ family

Dwelling area for non-farm families @ 0.25 acre/ family

Pond area for the farm families @ 0.5 acre/ 10 families

Area under roads @ 1\% of the surface

Area for market place and central place of worship

Play fields plus Primary School

\[
\begin{align*}
\text{Total} & = 473.50 \\
\end{align*}
\]

In addition to these, if we assume a system of water distribution canals (approximately 30 ft. wide) around the cropland (totalling about 14,000 ft. long), another 9 or 10 acres of land would be required for the canal system. Thus about 484 acres in each 500 acre units will be used up by 1975. The remaining 16 acres in each unit would, however, be able to accommodate another 64 non-farm families at any future date; which means that the projected (33\%) increase in rural population in the year 2000 can just barely be taken care of in terms of residential accommodation. In terms of livelihood, however, the incremental population will have to be absorbed through increased land productivity. That means the same crop and pond area which is envisaged to provide livelihood for 147 families in 1975, will have to accommodate additional families in response to its
increased yield in 1995 or 2000. The scheme could thus make up for a density of about 1900 people per square mile (730 per square kilometre) of rural area.

Having solved the problem of landuse apportionment arithmetically, a conceptual spatial model of village agglomeration may now be tried on a modular size of 500 acres with a view to making spatial provision for 204 families in 1975 and 270 families in the year 2000. In respect of homestead consolidation and ordering some conceptualization of settlement form is essential. In functional design it is widely held that form has a definite relationship with function and as such the conceptual form should flow from functional considerations. Viewing settlements from this angle, their physical arrangement is generally accomplished assuming, though apparently inarticulately, a conventional form. Some examples of these general forms are the concentric peak, the radial star, the ring, the constellation of clusters, the axis, the checker-board and so on. By virtue of their physical shape and character, these forms have corresponding functional implications such as rigidity or flexibility, dispersal or progressive concentration, distinction or repetition of components, accessibility between many or few units and overall spatial organization amongst the units or the negation of it (see Fig. 18.1).

In close juxtaposition with the spatial form, is a corresponding set of patterned systems of circulation
Fig. 18.1 Spatial Forms (settlements)

Fig. 18.2 Circulation Forms (roads & communication network)

Fig. 18.3 Bionic Forms (on biomorphic analogy)

Fig. 18.4 Village agglomeration concept
(communication lines and networks) such as the radial, the radio-concentric, the branching radials, the rectangular grids, the hexagonal or triangular grids, the spiral or linear, etc. (see Fig. 18.2). A spatial form thus is always conceptualized in relation to a circulation pattern. All told, it is quite conceivable that the conventional forms will best conform to one given situation or the other; but that cannot be ascertained without alternative assessments. However, before testing the alternative forms certain observed principles of spatial behaviour must also be reviewed.

In a well-researched article B.J. Garner has put forward that the spatial distribution of human activity reflects an ordered adjustment to the factor of distance; and that location decisions are taken, in general, so as to minimize the frictional effects of distance. Minimizing the friction of distance appears to be the chief goal of spatial behaviour. The theoretical postulations on location of agriculture or industry or urban centres or even the internal patterns of city all suggest and testify to the validity of the principle of minimizing distance on a uniform plane. Minimizing distance is not only spatial it is at once economic and psychological too. Clustering of houses in the earliest forms of human settlement and that of the shops at modern times stand.

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for the same purpose: economic efficiency and social satisfaction. Another order in spatial behaviour which has been identified by Garner in virtually all models of settlement location and urban structure is that human occupancy is focal in character - a notion which in fact underlies the concept of the node.

It is no wonder then that amongst the professionals concerned with the ordering of space, the radial star in conjunction with the radial circulation pattern is a popular conceptual form particularly in circumstances where flows have a common destination or conversely a common origin. The radial system gives the most direct line of travel for centripetal or centrifugal flows in many directions. The rectangular grid on the other hand may provide a number of advantages such as simplicity, convenient access, good orientation and suitability for complex distribution of flows but lacks nodality. In a large scale involving several units the radials constitute hexagonal or triangular grids which facilitate straight travel in many directions instead of two as implied in the expansion of a rectangular grid system. Clearly, the radial-star form is more dynamic in so far that it combines some elements of linearity (along the wedges) and that of focality.

It is not irrelevant to point out in the passing that man has always derived ideas from the operative patterns in nature to the extent that now the use of biological prototypes for the design of man-made systems
(bionomics) has become very much the order of the day. From this standpoint one further observation may be cited here very appropriately that a variation of the radial, i.e. the branching out radial system, is the classic pattern in nature, and as such the pattern has been adopted popularly in the design of central distribution and collection (see Fig. 18.3). Obviously the radial star form is in accord with the principles of bionomics.

In the light of the reality of Bangladesh we have already established that the chief goal of settlement ordering is to remedy the existing dispersal into an agglomerated form. Agglomeration, however, implies a centre, for it is in relation to a centre that the activities would be agglomerated, and convenient connections be planned. Such centrality-radiality is also important for collection of agricultural commodities and distribution of simple industrial goods to the individual peasants. Above all, the settlement units must express the fundamental man-man and man-land relationship. So long as there are agricultural chores to be performed jointly (as envisaged in Chapters 14, 16 and 17), a settlement at the centre of the group-owned cropland would minimize distance to the fields or to meet one another. Thus the choice of conceptual form

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3 Papanek, Victor; Design for the Real World: making to measure; Thames and Hudson Ltd., London, 1971, Chap. 9, pp. 185-211.

for the village settlements in Bangladesh falls on a simplified radial star surrounded by cropland (see Fig. 18.4).

It has been said already that form has relevance to overall spatial organization. Since settlements are inevitably separated from one another, linkages between them are essential for the sake of economic efficiency and social satisfaction. This linkage has two aspects: one is horizontal/spatial, and the other organizational/vertical. They are inter-related and together they bring about spatial organization.

In relation to the horizontal arrangement, Christaller started investigating (1933) into the ordering of settlements under the assumption that there is a definite principle which governs the distribution of settlements. He subsequently identified (in southern Germany) hexagonal shapes of spaces as the functional area of cities (central places). He further postulated that under isotropic conditions the horizontal arrangement of settlements would be such that they would be regularly spaced to form a triangular lattice and they will be centrally located within hexagonal shaped trade areas.*

It is necessary to point out here that Christaller's theory has had profound influence on the geographical/spatial models since then. One of the most common criticisms against the hexagonal ordering of spatial

system, however, is that it is too rigid and as such could not be adapted to reality. But then we must not forget that the hexagonal shape is a concept, and it is not necessary to find it in its geometric precision. This point is well illustrated in Professor Peter Haggett's studies of the shape patterns of the munícipios (political division) in Brazil where elongated hexagonal pattern has been identified in the territorial arrangement (see Figs. 18.8). On the basis of his findings Professor Haggett comments that:

"criticism of the hexagonal system as being over-theoretical may have been too hasty."5

Another illustration is provided by G.W. Skinner's study6 of market radii and social structure in Szechwan province of rural China where the basic features of Christaller's postulations are clearly identifiable though not with geometric precision (see Figs. 18.7, 18.8, 18.9, 18.10 and 18.11).

The findings mentioned above testify that the basic elements of Christaller's model are not as abstract as they might appear, but exist in reality also. Although the implicit ideas contained in the theory are still to be reviewed thoroughly and although the model needs much


Fig. 18.5 Evolution of Central Places (source: John Glasson, 1974, p130, and Richard L. Morrill, 1970, p66)

Fig. 18.6 System of Central Places (source B. J. L. Berry and A. Pred, Central Place Studies: a bibliography of theory and applications; Regional Science Research Association,
Fig. 18.7 Market Circuit and Catchment Area in part of Szechwan province, China depicting natural pattern of trade areas (abstracted diagram).


Fig. 18.8 Randomly Generated Polygons showing the natural agglomeration pattern.

source: Haggett, P. & Chorley, R.J.; Network Analysis in Geography, Edward Arnold's, London, 1969, p19
Fig. 18.9 Rural Settlements in Israel existing in 1961

Fig. 18.10 Robert Sarlo's Hypothetical Plan of the Rural Settlements in Israel (1972)

(source: Robert Sarlo, A Model for the Location of Rural Settlement; Papers of the Regional Science Association, vol. 29, 1972, pp 100-101)
Fig. 18.11 Layout of an existing Cooperative Village in the Moshav-Ovdim, Israel.

(This village contains a population of 180 agro-families each one with a farmlot of 9000 sq. metres around their houses. There are 52 families of artisans/service people outside the village with home-lots of 2500 sq. metres each.)

source: Baumeister, No. 10, October, 1962 Verlag Callway, Munchen.
more empirical testing, the spatial aspects of the model upheld so far could not yet be refuted. As a matter of fact the deviations in spatial behaviour which have been observed in some studies of central places and their areas of influence have taken place in circumstances where the isotropic conditions were not present – so goes the argument by B.J. Garner.  

In support and continuation of Christaller's model Losch's theory purports that the structure of space is based on the principles of minimizing distance and maximizing the utility of points and areas within the structure. Thus Losch has attempted to establish that hexagons exist in several tiers because on the principles of minimizing distance it is the hexagon which has the shortest perimeter of a given area of any regular figures which can exhaust space; and as such the hexagonal area minimizes the energy losses in transporting material from the periphery to a central point.  

Richard L. Morrill points out that the observable regularity of structure in spatial behaviour results from the principles of efficiently using territory of uniform character. This principle also is to be fulfilled in the hexagonal framework because this geometric form is capable of filling

7 Garner, B.J., op. cit., p. 312.

* For details see Woglom, W. and Stolper, W. (trans.); The Economics of Location by August Losch, New Haven, Conn., USA, 1954.

regular spaces, when repeated, without leaving areas in between, as happens in the case of a circle.

The major theories of spatial organization also purport that the spatial aspect of human activity is organized in a hierarchical order. A.K. Philbrick points out that a number of hierarchically 'nested' orders of functional spatial organization exist in the areal structure of space. In this connection Michael Woldenberg has shown that the area served by the subsystems (branching networks) in the hierarchy should be hexagonal too by some spatial transformation. Robert Sarly argues that since the agricultural region is assumed to be composed of only discrete and homogeneous agricultural settlement production units (i.e. the villages), these same units must be the quanta by which 'market areas' of Christaller's and Losch's model are delineated. Thus the market area pattern will

* An isolated circle may be more efficient than a single hexagon, but a set of circles is not as efficient as a set of hexagons; and as such in the evolution of space structure the circular market areas collapse into hexagons such that the overlap of the circles equals the unserved areas and the total distance from the centre is minimized and all persons are as close to the centre as is possible.


10 Woldenberg, M.; A Structural Taxonomy of Spatial Hierarchies, Proceedings of the Twenty-second Symposium of the Colston Research Society, Bristol, 1971, p. 150. Using the Hill Order Model of Warntz, Woldenberg has suggested that the converse of Losch's theory is also true that the hexagon minimizes the energy losses in transporting materials from a point to the perimeter.
correspond to the assumed pattern of agricultural settlement production units. All these studies suggest that hexagonal module may be chosen as the basic block in order to fit into the supra-scheme of central places.

All told, Christaller's assumption of isotropic surface, i.e. a uniform distribution of population, uniform terrain and resource localization, has great relevance for the situation in Bangladesh: first, the pre-conditions are obtainable in the densely populated deltaic landscape of the country; second, given this condition, the horizontal arrangements of the settlements will be regularly spaced within hexagonal shaped areas which will progressively fill up the national territory and thereby optimize the usability of space. Such an ordering of settlements is not only the desired goal in Bangladesh but virtually of all planned settlement models, for any irregular shape may foster regionalism, diversity and multiplicity of control and the related cost.


* The use of hexagon as the optimal structure is demonstrated over and over again in nature. Studying the spatial order of fluvial systems Michael Woldenberg suggests that the hexagonal area is the best shape for a river basin since flows are concentrated in a short channel by the rotund hexagonal shape. For details see Woldenberg, M.J.; Spatial Order in Fluvial Systems: Horton's Laws derived from mixed hexagonal hierarchies of drainage basin areas; Geological Society of America Bulletin, No. 80, 1969, pp. 97-111.

Besides, since maximizing productivity is the chief objective and since the goal of intensifying production is to support more people at the grass root level on the principle of self-sufficiency rather than to release population, any prototype system must be capable of widespread repetition throughout the national territory. Obviously hexagonal areas are capable of being repeated in a synchromeshed manner.

As a theoretical exercise, therefore, the conceptual form may be superimposed on a hexagonal area of 500 acres (the basic unit) and the quantitative landuse apportionment vis-a-vis the envisaged population density may be tested and shown graphically (see Fig. 18.12). The hexagonal module, representing a unit of true space, may then be considered as the schematic prototype of village settlements in Bangladesh.

Now, in order to derive guidelines on action policies, the schematic prototype must be seen in juxtaposition with the situation in reality. In quantitative terms it is generally assumed that on the average about 25% of the total land is now carved out for dwelling purposes. This seems to be a very high statistical average because information based on empirical investigation suggests (see Table 6.1) that even in the densest part of the country homestead area together with the area under orchards and perennial trees cover about 18% of the land. In the less dense regions homestead areas cover less than 10% of the land. It appears to be more realistic to assume 20% of
crop land
village road
canals
ponds
play grounds
low density dwellings
high density dwellings
village centre

Fig. 18.12 Schematic Proto-type of Village Settlement Units
the total land as available for dwelling purposes. That means in the average unit of 500 acres, 100 acres may be found for rearranging residential accommodation and the related use. Available information also tells us that about 15% of the land is under water bodies, which means that about 75 acres of land in every 500 acres may be found blocked out. It follows therefore that land requirement for dwelling purposes together with that for the minimum community facilities as worked out above, may be met for the present. But there appears to be shortage of usable land for current cropping as well as for the future residential purposes. However, the shortage can be made up by reclaiming land from the derelict pond and water areas. Luckily we have seen that much less pond areas are actually needed than already exist. Altogether about 42 acres of land need to be reclaimed now per unit, and another 16 acres between now and the year 2000 in order to conform to the recommended standard of land requirement. Alternatively, much area will have to be sacrificed from the allocation for home-lots, in which case the production pattern outlined will be rendered unfeasible. Another theoretical possibility of squeezing out land is by stacking up dwelling units in multi-storied structures. But that possibility is ruled out in the context of Bangladesh where local resources do not yield strong building materials like steel or substantial timber; and large-scale import of such building materials is inconceivable in the light of the country's present
and future economic prospects. Reclamation of land by filling up the derelict/unnecessary ponds and water bodies is therefore the inevitable choice.

So far as the agglomeration pattern (purported in the prototype) is concerned, a formidable challenge is thrown up by the existing physical set-up of villages. Yet this is the basic task which we have set out to fulfil. However, in view of the importance of the problem and the associated complexities, this applied aspect of the envisaged agglomeration pattern needs to be treated in a separate chapter. Nevertheless, since agglomeration is the key issue certain principles of consolidation of holdings and landuse optimization may be discussed here.

Landuse Optimization and Consolidation of Holdings

We have concluded earlier that in the context of land-hungry Bangladesh such practices as private ownership of land, fraudulent alienation and private land marketing can be allowed to continue only at the imminent danger of social, economic and environmental collapse. Unlike the industrialized countries where accumulated capital and progressive technology determines societal life, in Bangladesh social and economic life of the vast majority revolves around the use of land and water – the two main social assets. Development plans must therefore provide safeguards against the spoliation of land.

Evils of fragmentation resulting from the land tenure system of private ownership is well established. The
dispersal of crop fields gives rise to technical difficulties such as wastage of time and effort travelling from plot to plot, unnecessary demarcation and the associated spoliation of land, unnecessary length of pathways, unnecessary fencing, difficulties in making permanent improvements in soil conservation, drainage and water distribution systems, and the impossibility of implementing any system of crop rotation which may be needed for community purposes. Cultivation of fodder and grazing of the community animals is rendered exceedingly difficult under fragmented individual ownership. Agricultural operations in weed and pest control cannot be performed either under conditions of fragmentation. Moreover, in the event of land distribution, the problem of equating land of varying shape, site and quality cannot be resolved in the framework of fragmented holdings. This particular problem is often solved by dividing land in long and narrow strips running through several qualities of land, but only at the perpetual risk of erosion.

The policies enunciated in the chapter on land reform will hopefully prevent any further fragmentation but those in themselves will not be able to remedy the existing evils. On the other hand, the production organization outlined in Chapter 14 will require a number of cooperative operations in land and animal husbandry. Obviously such operations are impossible without collectivizing the small plots into consolidated cooperative farms. Collectivization must therefore be achieved by similar
legislative action as that of land reform. This position may appear to be loaded heavily with ideological content but on deeper analysis it has been accepted by many authorities including FAO that land collectivization and collective farming is a possible solution to the old problem of progressive split of land. More often than not the idea of collectivization is rejected in the apprehension of certain psychological reactions against the proposal of land pooling. But surely the psychological problem can be overcome - what is really needed is to create a sense of ownership/possession and at the same time a community feeling which is essential for the maintenance of enthusiasm and to effect strict discipline without which the production scheme would collapse. It is obviously not necessary to draw sharp lines between private ownership and communal ownership. Land parcels may be collectivized and the right of the cooperators may still be acknowledged in the way of unit share in the cooperative production.

Once consolidated, provision must also be made in

13 Binns, Sir Bernard O.; The Consolidation of Fragmented Agricultural Holdings; FAO Agricultural Studies No. 11, Rome, 1950, pp. 16, 17.

Such fears and apprehensions were registered in an international workshop on co-op farming in Lahore in 1962. Whereas in the same year the German Foundation for Developing Countries in a seminar in Berlin recorded one common theme conveyed by the Asian Delegates that "it is desirable to suppress individualistic tendencies that hamper social and economic progress". See Engelmann, K.; Cooperative Movements in Developing Countries, Frederick A. Praeger, New York, 1968, pp. 67 and 74.
order to safeguard against any future fragmentation. Past experience in many countries has shown that the recipients who had so long been tenants or labourers do at first eagerly cooperate in land pooling but later on tend to develop traditional peasant attitudes and demand division of land into individual holdings. While cultural education must be emphasized so as to uproot the traditional concept of property and traditional attitude, cooperative farming of consolidated field under local leadership must bring about a new value system, a new attitude towards life and living; otherwise intermittent strife will always threaten the system. The thesis here is an answer to the popular axiom that sociological conditions at a particular stage of development together with the prevailing attitude of the people must determine whether collective production can be introduced without permanently damaging cooperative goals. When sociological preconditions are not present, those must be created by arousing the consciousness of the people. Experience also tells us that cooperative farming is accepted by people only when they are made to realize that there are no other workable alternatives.

Collectivized holdings must be held in perpetuity for other reasons also. As population increases and, hopefully, land productivity improves, more and more people must be absorbed until alternative avenues for absorption are available. Land sharing arrangements have to be altered, therefore, from time to time.
Obviously this will not be possible unless collectivized holdings are held in perpetuity.

It is also important to remind ourselves that land-use parcels under different crops will vary from crop to crop and from one cropping season to another. Certain amount of area suited to grain production might be either too small or too big for fodder or fibre production. Parcelling (demarcation) will thus depend on local conditions and local agricultural requirements. Hence collectivized holdings must be maintained so that landuse may be ordered and re-ordered according to the changing requirements of the local community concerned in relation to crop rotation, extent of necessary fallowing, intensity of manuring and water distribution, etc.

Above all, there is hardly any doubt that the collectivized holdings will reflect the declared aspirations of the new-born nation more truly than any other system of land management. If Bangladesh is not to repeat the failures of India, in keeping the socialistic promises, the physical aspect of the declared social policy must be reflected in the system of land management where consolidation is to be achieved under the principles of collectivization. Once the principle is accepted, the physical and technical aspects of such consolidation, it must be assured, will prove to be simpler over a period of time.

The more obstinate difficulties will, however, arise from the reactionary elements in the social structure
including the existing values and attitudes as referred to earlier. It has been argued already that the social pride or in the worst cases the sense of security (as against fear of hunger) which are associated with the possession of land may be accomplished by ensuring an equitable share in the collectivized production. But still there is a strong human factor to contend against. The owner farmers of the present are likely to have developed an attachment to their respective holdings which they think are best understood by themselves. Under the circumstances the collective decision may very well be against the 'experienced' judgement of the individual farmers. Besides, working and cooperating with people not in association before may be exceedingly difficult.

All these and many other complex problems of production organization and community relations will have to be tackled through a vigorous programme of down-to-earth social education whereby people would be transformed into voluntary cooperators and their individual energies would be galvanized into communal social energy. In the light of the evidence of China and other countries, the practical possibility of such cooperation can hardly be doubted. Success stories in cooperative movements also suggest that while voluntary cooperation is facilitated by education, governmental action must take a form which will assist and encourage the voluntary efforts, rather than for such efforts to take an entirely new
direction. This means introducing a befitting organizational pattern. Given the pre-requisites, i.e. education and organization, the physical aspects of the problem will become much simpler.

Spatial Organization

We have noted earlier that the spatial aspect of human activity is organized in a hierarchical order. It follows that since some functions and/or services require larger population support they cannot be located in each and every small settlement unit. On the other hand, the consumers of such services do not want to travel to different places to receive different services (principle of minimum effort). Hence such functions agglomerate in one central village signifying the emergence of a central place.

Obviously for the sake of spatial efficiency certain activities/services should be grouped. But how many services should be grouped? How much area can one centre serve? Besides, there is a hierarchy of activities and services as well. Each service activity has a threshold population and market. Answers to many of these vexing questions may be found in the analysis of the central place theories. According to Christaller's model central places could be organized on the basis of any one of the following principles:

13A Binns, Sir Bernard O., op. cit., p. 25.
a) Marketing Principle;
b) Transportation Principle;
c) Administrative Principle.

According to the marketing principle one place (say X in Fig. 18.5) may start agglomerating activities that would require greater support than is available from its own area. The activities will then need support from six surrounding places in order to reach threshold levels. The closest centres that could effectively offer services up to a level of saturation would be an array of another six centres (labelled Y1 to Y6 in Fig. 18.5) located equidistant from one another as well as from the centre X; such that each centre would serve one-third of each of their surrounding six areas as well as their own areas. In other words, the total area and population served by each centre is three times that of its own. Christaller designated this 'three times' area of influence as the K-value, which is in fact the total number of settlements of a lower order served by a central place.*

It may be noted here that the transport network to serve such a system is not optimal in the sense that only the higher orders are linked. In response to this inadequacy the hierarchy may be arranged on the principle of ease of transport which would minimize the distance as

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much as possible between the lower orders as well as between the lower orders and the higher orders. Since the lower order places would lie along the routes between higher orders they would develop dual allegiance. As a result the area of influence of each higher order would turn out to be four times larger than that of the smaller order. This pattern is referred to as the K-value four system, which was found to be closer to reality in the studies made by Losch.

Obviously in the system where K-value is three or four, smaller areas are divided; and hence a lot of inconvenience follows in the field of administration. Spatial arrangement on administrative principle, therefore, requires each centre to have complete coverage of its surrounding six areas thus curing the problem of divided loyalty. Under this spatial arrangement the area of command of the higher order is seven times as large as that of the smaller order (K-value seven). Nesting is rendered automatic in this system.

It is of utmost importance to point out here that in a planned economy the central places should not be looked upon as spatial monopoly centres of gravity. In a free-market situation these central places would tend to be distributed according to the forces of market which are often spatially uneven. But in the context of Bangladesh the smallest order central places must be considered as the centres of social/communal services. Since most of the services for the comprehensive rural
development have to be provided by the public sector, an administrative structure would seem to be an essential pre-requisite. It can hardly be over-emphasized that "during a period when economic exchange is limited but government strong, goals of administrative efficiency would be expected to affect arrangements most."14

From this point of view, and most relevantly so, the administrative principle offers the ideal arrangements of service centres. It is surely not redundant to stress the point that administrative sub-division and fragmentation help as instruments of political control and national development by easing the burden on the centre and allowing it to deal with more important policy matters, although the transportation system may not be too efficient.

Environmental Stabilization

Achieving environmental values have sometimes been attacked by some quarters as meaning stopping progress, but in the context of Bangladesh environmental management and stabilization should unequivocally mean the key to survival and any progress at all. For instance, if we lose one million acres of crop area in any one year, three million people (e.g. the population of Israel) will starve to death. If we lose the same area permanently due to fluvial action of the rivers, or due to the uninterrupted process of settlement expansion, the

14 Morrill, R.L., op. cit., p. 69.
implications are obvious. If the rivers are chemically polluted, the entire population will be exposed not only to protein starvation but to eventual death, because contact or even consumption of river water in its raw form is unavoidable for the vast majority of the population.

In relation to environmental stabilization it is important to recall here certain valid observations. History of human social evolution has witnessed that the most stable societies have been those which represented an equilibrium in their social structure as well as an equilibrium between their social culture and the environment. In other words, such societies were based on as much a harmonious relationship between man and man as between man and his environment and fundamental resources. Past evidence has permitted theorizing that the form of societal living which has been able to survive over the longest period in the whole of human history is the one in which the communal life, its economic, social, cultural and physical aspects - all revolved around and emanated from the rational use of land. In such societies earth was regarded as communal property and the members of the society collectively conformed to the laws of land and nature. A secured livelihood was thus ensured and a stable culture maintained for thousands of years mainly by taking care of the problems of land cultivation and the maintenance of a befitting production technology and system. Also, few cities existed which served as
cultural and economic centres, but the social centre of gravity remained in the village communities.15

Territorial/administrative units from the national or regional level to local areas are an integral part of a complex eco-system comprising man, society and environment. Living creatures and their habitats function together as inseparable components of the ecological system. It is through this system that essential life-sustaining processes are maintained - processes on which man depends for his ultimate well-being. But our biological counterpart species, fish and wild life for example, can continue to be with us only through protection and improvement of their habitat. Obviously, the task becomes increasingly difficult as population grows and places ever greater demand on land and water. Similarly, the various natural resources are not

15 Glikson, Arthur; Regional Planning and Development, Lieden, Netherlands, 1955, pp. 13-14. Glikson referred to the form of settlement known as 'Savah' which still exists in certain parts of Indonesia as a reminiscence of the golden epoch of a stable agricultural civilization of not only Indonesia but the whole of Asia. The land system, it is suggested, was that of an irrigated and terraced field, growing cultivated plants. The fields were the common property of the village. The system was magnificently organized in the way of terracing, irrigation, maintaining irrigation time table, calculated preservation of natural cycle of vegetation.

It is of great significance to note that after a lapse of centuries modern China has successfully revived the timeless Asian system in the way of communes and the eight point charter of agricultural techniques. The results are phenomenal and profoundly encouraging - the foundation of the economy has been stabilized, the core of the society reinforced, moral and ethical fibre of the society cleansed, ills of urbanization liquidated and the rural urban conflict resolved.
independent of one another: they are inter-related and changes introduced in one can have repercussions on the others. In the case of deforestation, for example, the repercussions may affect the climate, the hydrological cycle and other plants and animals.

Conservationists and others equally agree that the quality of life in future depends on establishing a sensible balance between population and resources. This implies that the goal of environmental management is to bring about a compromise between development needs and environmental hazards. Environmental actions, therefore, will have to be tailored to achieve a balance between man-made systems and natural systems so that at any time the resources of land, water, trees and animal species and other non-renewable resources are utilized to match as closely as possible the needs of the population yet ensure their long-term preservation.

Conventional thought on developmental planning has hardly taken into account the environmental factors and their integration with other elements of the development programme. It must be realized now that environmental consequences may be ignored only at the risk of ecological disaster. Production organization and the corresponding settlement reorganization envisaged in this work is likely to entail a major environmental dislocation in the way of new irrigation works, filling up of ponds, clearing up of untidy bushes, agglomeration of homesteads, multiple cropping, etc. Although in the preceding two
chapters we have persistently tried to respect the axiom that only environmentally sound programmes need to be linked with rural resource development and socio-economic reconstruction, purely in terms of settlements some more guidelines for local implementation must also be provided.

The components of the natural system that need to be closely guarded and protected are soil, water and vegetation. Of these, vegetation has perhaps the most complex and widespread role. For example, bushes, groves and strips of other perennial trees will protect water courses, assist minimization of pests and fertilization of the soil, and at the same time will serve as the sanctuaries of all varieties of plants, birds, and animals necessary for the ecological equilibrium of the area; and still supply fruits, fuel, wood and building materials. Trees will also act as wind-breaks and provide shades, thus improving the micro-climate in favour of human habitation. A continuous programme of regeneration of trees is of fundamental necessity. The type of land consolidation and village agglomeration suggested in this chapter will entail substantial felling of trees. It must be warned, therefore, that at no point in time should the deficit in vegetation be allowed to become critical. Rate of cutting should depend on the age of the trees in question such that the older trees which have served their lives may be felled first. In any case the programme of cutting must be preceded by a wider and more vigorous programme of planting.
The entire length of the banks of existing water courses and of those to be dug in future must be planted intensively. It is hardly any more than common sense that planting will protect the banks from being eroded and the water courses will thus be conserved.

Extensive planting of trees is required for the sake of improving soil fertility in an indirect way. It is well known how a major agent of soil fertilization, i.e. animal manure, is destroyed as fuel. Therefore the provision of fuel trees is intricately linked with the problem of maintaining soil fertility. Since the provision of fuel wood is an urgent need, every settlement unit must grow its own fuel and thus help conservation of soil. Due to the extreme scarcity of land no land could exclusively be delineated for growing fuel wood. This has to be combined with other forms of land-use. For example, entire length of the village roadside could be planted with very fast growing trees which would yield fuel wood for the local community. The same principles should be observed when planting the banks of the water courses.

Another pressing need, related with the improvement of the rural environment, which can be gainfully combined with the goal of environmental stabilization is the production of the most versatile local building material, bamboo, in quality and quantity. Production of bamboo could be and must be integrated with the general planting programme in view of its widespread necessity.
Still the need for planting trees at the domestic level in and around the individual dwelling premises is not reduced at all. We have said in Chapter 14 that for the sake of round the year supply of vitamins, round the year production of fruits must be ensured. Planting fruit trees is a popular cultural trait in the country but it is not pursued with due earnestness nor is its true significance and importance realized. May it be pointed out here that

"every green plant, great or small, is a living fountain, pouring daily into the air vast volumes of water its roots are sucking from the ground."16

Clearly, environmental values and nutritional goals can be combined very easily and effectively by vigorous and sustained planting of excellent tropical fruit trees such as mango, guava, jack-fruit, banana, papaya and the like. One simple principle of planting may also be cited here in passing that small trees and vegetable gardens should be nearest to the dwelling quarters, and large foliage trees in thick continuous masses should be placed at the

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16 Geddes, Sir Patrick; Town Planning in Lucknow: A Report to the Municipal Council, Lucknow, 1916, p. 58. Professor Geddes termed the plantain (banana plant) as the poor man's fountain and an effective one. He reckoned that a patch of plantain yields the largest proportion of wholesome and nourishing food of any plant. Papayas are probably the most wholesome and digestive fruit of the world and also one of the most easily grown. Each of the two has further the merit of absorbing and assimilating a large proportion of sullage water and organic refuse of every house with corresponding abundance and increase of return with diminished work of clearing. It is needless to say that in the past sixty years no son of the soil has had the earnestness to pursue the obvious but simple lesson in its true perspective.
background. This principle is based on simple laws of air movement: by planting a dense foliage mass we increase the breeze on each side of it and beyond it so that if large foliage trees are placed right in front of the dwelling structures, breeze will by-pass the structure instead of cooling it.  

It is well known that the most deadly diseases in Bangladesh are caused by environmental deficiencies and are communicated by dust and water. The traditional method of disposal of human excreta and garbage in the densely populated rural communities at present constitute the main health hazard, and is a matter of despair for sanitary planners. Most of the latrines are erected on slopes adjoining water courses so that excretions easily roll down into running streams or canals. The conventional alternative solutions are usually expensive.

Here, again, there is a fortunate possibility of combining environmental imperatives and the developmental goal. It is not difficult to foresee how much profitable and healthier it would be to have the daily human contributions absorbed by the crop land, than to let it pollute the environment. As an alternative to composting technique indicated in Chapter 16 (Appendix VIII) wherein handling of the excreta is involved which is culturally non-permissible, a simpler method may be adopted compromising the cultural habits on the one hand and environmental and economic goals on the other. Since

17 Geddes, Sir Patrick, op. cit., p. 59.
the latrines are temporary improvisations, those can be erected on the compost pit itself. A workable arrangement would be to dig three trenches (5 ft. by 8 ft. and no deeper than 2 to 3 feet) in a line to be used in a cyclic sequence. Trench No. 1, for example, may be used for the first six weeks. Every day the deposited excreta will have to be covered with a layer of animal waste and other vegetable materials or straw, etc. At the end of the sixth week the trench will have to be abandoned for defecation purposes, and then onwards treated as a compost pit with all the standard procedures of charging and recharging. The latrine in the meantime will have to be moved forward over to the next trench. In this way the third pit will be abandoned at the end of the eighteenth month when the first pit will have matured and be ready to be emptied and re-used as a latrine; and the cycle goes on. When the pit is emptied the manures may go to the field directly if it happens to be the time of field preparation, or those may be taken to the central compost storage area to be preserved according to the standard methods until the next field preparation time. Following this method, the risks of water pollution will be greatly reduced, odour minimized and land productivity enhanced.

It is surprising that no principle of environmental hygiene and economics is more obvious, more notorious yet so flagrantly forgotten in the whole of the subcontinent of India than that the human waste can be transformed into an agent of environmental and economic improvement.
It is an irony that the great socio-religious systems of classical India did not appreciate the wealth and permanence of manurial waste including human waste, while the Romans of the olden days went so far as to create a god of manure and manuring which profoundly enriched agriculture. In China a nation of observant peasants has worked out for itself simple techniques for returning to the soil all the vegetable, animal and human wastes that are available; a dense population has thus been maintained without any falling off in fertility and the environment protected.

In view of the ultra-conservative socio-cultural background of Bangalee society, it must be admitted that no immediate revolution can be expected by the proposal outlined above. But it is a solution which must be respected in its own right in order to achieve economic goals and environmental values conjointly; and towards that end immediate beginning must be made somewhere.

To achieve composite environmental goals, the foremost necessity is the full awareness and understanding of the environmental effects of our actions on present and future generations – that there are cycles in our actions that affect other cycles, and indeed the entire 'eco-system' is a part of the total bio-system upon which we are utterly dependent, but to which we ourselves might inadvertently become the greatest threat.

First, we must strive to instil an understanding, for when people gain that, they will see their environment,
their habitat as being the foundation of life and well-being, of food, fibre and shelter.

Self-discipline is another requirement. Self-discipline by the individual to stop his wastefulness in using land and other potential resources such as human/animal/domestic refuse. Self-discipline by society to reject the conventional way, the easy way. (It is certainly easier to have one hundred septic tank latrines built with borrowed foreign capital than to convince one hundred people to construct composting pits which are at once economically sensible and environmentally sound.)

A new ethical and moral code is needed at the societal level towards a new concept of resource exploitation, investment and growth; towards permanent visible progress and long-term gain — the ultimate survival factor.

Above all, the practice of democratic planning at the local level is essential as it is the chief mechanism of the grass-root environmental and development planning. Yet it is necessary to develop and strengthen regulatory services including administration, management and legislation. There is no time for Bangladesh to wait for the voluntary growth of local indigenous institutions. Deliberate action must create the requisite institutional infrastructure, and so far as the national environmental policy is concerned, it must be considered in conjunction with complementary policies in population, industrialization and urbanization. On the national scale one over-
whelming environmental problem persists in the form of floods and tidal waves. Damage to the environment due to floods and tidal waves is very extensive and causes extensive misery and destruction of property. This is the area, and perhaps the only area, where the country cannot be expected to achieve much in spite of her best efforts, unless international cooperation and technical aid, particularly from India, is obtained.
Chapter 19

SOCIO-ECONOMIC OVERHEADS AND INFRASTRUCTURE

Following the principles of settlement reorganization discussed in the previous chapter, many of the flaws in village lay-outs and micro-landuse patterns may be ameliorated. But one must not lose sight of the unequivocal lesson in development planning that development should be the function of a comprehensive process – anything short of it will not be able to solve the problem. Obviously the settlements will not be able to function productively unless some minimum facilities in the form of overheads are provided. A list of minimum overhead facilities may be comprised of the following identifiable components:

(i) Housing and/or Building Materials;
(ii) Roads, Culverts and Waterways;
(iii) Primary Schools and Playgrounds;
(iv) Medical/Family Planning Services;
(v) Market Places and Community Centres;
(vi) Potable water;
(vii) Electricity.

Housing

Housing as such is not a top priority problem in rural Bangladesh. Although in terms of standards the situation is far from adequate, street sleeping or sleeping under trees is not yet reported. By and large
even the poorest peasants do have some kind of shelter.

The main problem is in the increasing scarcity of building materials from the constructional point of view and in layout from a planning point of view. Although bamboo and thatch have been in use as the chief building materials in the villages from time immemorial, structures built with such materials are quite vulnerable against the risks of storms and floods. As a result the necessity of replacing materials is more frequent than it would otherwise be, and the cost of repair and maintenance is comparatively high. On the other hand, the supply of such local building materials is static against a population explosion. Subsequently the gap between supply and demand of traditional building material is widening fast and the price soaring.

Over the recent past corrugated iron sheets have become popular to those who could afford them, partly as an answer to the need for recurring repair and maintenance cost, and partly as a status symbol. There is, however, no conceivable chance of c.i. sheets being cheaply available for mass use. Although c.i. sheets have been manufactured in the country for the last five or six years, the price is non-competitive because such sheets are made out of imported scrap. Particularly from now onwards the situation will be much more unmanageable. Since there is a widespread concern for fast diminishing metal reserves, even the rich countries are adopting a policy of recycling metals. Obviously
less and less scrap will be available and the cost will inevitably go up - a situation about which the country will not be able to do anything. Evidently, cheap availability of c.i. sheets cannot be expected at all in the future.

Under the circumstances the over-riding imperative in relation to rural housing is to concentrate efforts on the rapid and widespread production of local building materials such as bamboo (particularly the Barak type), thatch and timber. Ironically this is a very neglected area although such materials have been in use since antiquity. But now a warning must be given that the question of building material has entered into such a critical era that it can no longer be left to take care of itself. Vigorous public action programmes must be taken up as a matter of urgency. Otherwise a housing problem of such staggering magnitude will develop that any solution will be impossible.

In the foreseeable non-availability of c.i. sheets a major difficulty would still persist, that is, roofing. Roofing is notoriously the most difficult part in any housing scheme, public or private. Although it is an effective and cheap roofing material, thatch has many disadvantages. It is highly susceptible to fire and harbours rodents and often snakes. Besides, under heavy monsoon rain thatch may have to be replaced every other year. Growing thatching materials in the required quantities would be an additional problem. In view of
the land crisis obviously no substantial amount of land could be allocated for growing thatch at the expense of foodstuffs.

One sensible alternative would be to revive the use of pottery tiles as roofing material. Such tiles were abundantly used in the past but in recent years their use has dwindled rapidly. Like many other old cultural traits the use of tiles has been relegated to an inferior position in favour of more 'sophisticated' industrial products regardless of the values of the former. As a result, the craft and trade behind the production of tiles has also been dying.

A revival of the use of this roofing material will bring in its wake several obvious economic and social benefits. It would be a substitute for the increasing import requirements of scrap iron and/or corrugated iron sheets which would otherwise be necessary, and would help revitalize the social and economic fabric on new principles of organization. However, the potter's skill and knowledge must be supplemented with an input of modern scientific information and equipment so that the design of such tiles is improved and their durability enhanced. The tiles made by traditional techniques are heavy in weight and as such are not very suitable for bamboo trusses. Since bamboo is the only readily available material for the main structural members and must continue, the widespread use of pottery tiles as roofing material will be facilitated only if the weight is
reduced without seriously affecting the durability. This is precisely the area where traditional techniques need to be bolstered by modern knowledge. It is regrettable that while wood-veneering and decorative ceramic brick manufacturing have been encouraged by the Government in recent years, pottery tiles have either been ignored or their use neglected. If the country is to be self-reliant in as many fields as possible, indigenous building materials are undoubtedly a vital area where vigorous attention is imperative. This is surely justifiable from the point of view of both economic sense and social desirability.

Another important but neglected area in rural housing which can be improved a great deal with minimum expense is that of comfort levels. It is beyond doubt that given a particular mix of building materials, the level of comfort of the inmates in a house may be raised within the criteria of shape, siting, spacing and orienting.* Unfortunately the efficiency aspect of vernacular architecture has never caught the imagination of the architects in Bangladesh. Instead, their professional energies have been diverted towards designing handsome buildings and preparing pretty drawings in the belief that 'architecture is first an art'.** The present role of

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* Architectural research in this direction is on going in the department of architecture, University of Edinburgh.

** This is the first lesson that the incoming students in architecture receive at the architecture department of the University of Engineering and Technology at Dacca.
architects in the country, that of designing only artistic buildings, must be challenged. If their talent and expertise is not harnessed to the cause of the vast majority of the population, their right to exist in society may be questioned.

A complete conceptual reorientation of the architects and construction engineers of the country is necessary so that the most efficient design criteria and standards are evolved in order to get the most efficient solution using only local materials, and still minimizing their use.

From the planning point of view the over-riding concern should be to minimize the use of land. The same principle of agglomeration as used in village layout should guide the layout of individual houses as well as groups of houses. Land for dwelling units must be considered with the same assiduousness as that of urban residences. The existing pattern of (see Fig. 6.1a) scattered dwelling structures must be compacted as far as possible. Since the construction materials available will not permit vertical stacking, horizontal juxtaposition of structures must be the goal. This will at once minimize the use of construction materials also. The overall layout of houses must be orderly and straightforward so that if, and when, resources permit, the installation of utilities such as water and electricity will not face any geometrical complications. The approach suggested here is modest and simple but free of pretentious ideas. It is necessary to be aware of the
present capabilities and limitations, yet give possibilities for future potentialities and aspirations.

Roads, Culverts and Waterways

It is a valid observation that in situations where other conditions of progress were present, the lack of transportation acted as a crucial factor restraining development. In such cases improvements in transport resulted in dramatic improvements in overall development. There is little doubt that adequate transportation stimulates economic transactions and thus facilitates development on a horizontal scale.

Planners, economists and engineers in Bangladesh, both in the past and at present, realized that a regional transportation system and the corresponding facilities are necessary in order to facilitate the movement of goods and people. And as such the five-year plans placed considerable emphasis on this aspect of transportation planning. While the regional aspect of planning is a pre-requisite in itself, the crucial importance of its complementary part, i.e. local transportation to link up with the regional network, was not given due attention. Production of crops in excess of what would be immediately and locally consumed, or the manufacture of products in excess of local requirements, would add nothing to the national economy in general and urban sector in particular unless those products are moved in time. Similarly seeds and other agricultural
inputs as well as simple industrial goods must be transported to the millions of end users. Dissemination of information and services as well as the unity of spirit necessary to release the dynamic of the people - all demand a ready accessible network of channels to each and every member of the society.

In spite of such obvious implications for the local transportation system, the responsibility for planning and constructing village roads was relegated to the Rural Works Programme, which, all too often, were led at the local level by individuals highly motivated towards personal gains. As a result urgently needed village roads remained largely neglected. In many instances where roads were built, they were found to lead to the houses of the village leaders and their associates.

Since the earliest times movement of commodities and people has depended primarily on inland water transport. The intricate network of rivers and their tributaries and distributaries have rendered inland water transport by far the most popular and the cheapest means of transport. While the large rivers provide the regional waterways system by virtue of their navigability round the year, the smaller river courses serve as sub-regional systems. The smallest order of streams and canals serve the lowest order function, i.e. localized movements and hence are most intensively used. But for obvious reasons these streams are not navigable even by country boats during the dry months of the year.
In the context of rural transportation development, these smallest order waterways must be taken into consideration as existing resources. Fortunately once more two development goals coincide. We have noted earlier that for the need of water management for the sake of higher land productivity as well as for the sake of environmental protection, all the water courses, big or small, must be managed in such a way that they have neither too much water nor too little at any particular time of the year. As a matter of fact the problems are interlinked. If we are to minimize the flows in the higher order system, the capacity of the lower order system must be expanded. Obviously by the same effort the lowest order streams could be kept navigable the year round. It may be noted here that in China man-made aqueducts (elevated type) for irrigation are also used for local transportation. In Bangladesh there is no compelling reason to ignore the natural system and go for a highly expensive and sophisticated rural road network which would perhaps only duplicate the existing network. Obviously the existing system of waterways can be made to operate in a more effective and profitable manner.

On the other hand, an ambitious programme of elaborate rural road construction is bound to be frustrated by financial limitations, as well as by unfavourable topographic, hydrological, climatic and soil conditions. On the average 50 to 60 culverts may be
required per mile of village road construction.\(^1\) Road lengths, therefore, must be kept at a minimum and the cost saved and the money so saved used for other purposes. Village roads may be developed only up to such lengths as may be necessary to connect them to the nearest waterways. Nevertheless, the usability of such roads must be guaranteed. It is surely more sensible to have fewer 'more usable' than to have more of 'less usable' ones. At the same time the development of road and waterway systems must be complementary.

The cost of village roads is not only limited to the construction aspects, it further implies the use of powered road vehicles for economic viability. In view of increasing fuel and material costs on the one hand and the country's future economic prospects on the other, the use of powered vehicles, such as country wagons, is a remote prospect. Therefore the choice for short-distance haulage is limited to bullock-carts or country boats - both are equally slow but the former demand extensive length of hard surfaced road. Evidently, the development of local waterways is the only reasonable choice.

It is frequently alleged, however, that a visit to market by boat even at a distance of 10-15 miles may be a day long journey; and as such production may have to be sold at nearer markets where buyers may be fewer and consequently prices lower. Also the goods displayed for

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purchase are less varied and more expensive simply because the means of reaching the better markets are not available. Clearly this is so as those 'nearer' local markets are neither operationally integrated nor physically linked with sub-regional or regional markets. Nor is there any integration between the regional markets themselves. While the transportation planners remained preoccupied with the planning of the regional system, there was no one responsible for planning of the local system. It may be re-emphasized here that both the components, regional and local, are equally important for a comprehensive development in transportation. One is meaningless and ineffective without the other.

We have seen in Chapter 6 that the higher order Hats, which are in fact the lowest order centres for the collection of agricultural produce and the distribution of simple industrial goods, serve a radius of 5 to 10 miles. This radius may then be viewed as the uppermost limit of local activities. For the reasons indicated above the planning and development of the local system should emphasize minimum effort on roads and maximum on waterways. For distances between 5 and 10 miles, powered vehicles or metalled roads in spite of their heavy expense, would not be able to make any significant difference. From the point of collection onwards it may be either road or water or rail, depending on the result of alternative cost benefit analysis, which will facilitate faster movements via powered vehicles/vessels.
So far waterways have been preferred by the transport planners for regional transportation but the major bottleneck which persists is the predominance of country boats and the lack of faster craft.

In relation to water transportation at the local scale the same handicap of slow moving craft and vessels must be faced. The archaic country boat of Bangladesh is yet to be blessed with benefits of modern knowledge in hydrodynamics. The engineers in the country have in the past thought of the easy solution of mechanizing the country boats with the help of fuel consuming motors but never cared to improve their existing performance through design innovations. It is considered that the engineers should give urgent attention to this problem.

The other difficulty in relation to country boats is that of construction materials. While wood is the traditional material, good quality timber is in short supply and hence very expensive. Ferro-cement boats are a possible answer to this problem. Ferro-cement (a form of wire-mesh reinforced cement) may be produced in thin sheets that are tough and flexible. As it is easy to handle, do-it-yourself hulls can be made by anyone with a modest range of skills. A ferro-cement vessel is markedly cheaper than its equivalent in timber, steel, aluminium or fibre glass. It is light in weight, buoyant (by virtue of sealed buoyancy tanks) and shapely.²

² Dickinson, H. and Winnington, T.L.; Ferro-Cement for Boat Building, Papers on the Kumasi Technology Consultancy Centre /
The most remarkable example of success in switching over from wood to ferro-cement comes from China where the boat building industry was severely constrained by the lack of timber immediately after liberation.

"China has now achieved an annual production of about one million tons of ferro-cement boats, ranging from two ton sampans to 40 ton passenger vessels and trawlers."\(^3\)

So far as the construction of intra-regional roads is concerned, it must be noted that the conventional parameters of population and vehicle ownership are totally irrelevant in evolving planning tools and standards.\(^4\)

This is because of the characteristic differences in landscape, economic activity and per capita income; and because no direct link can be established with the conventional economic indicators. Nevertheless, the implications of intra-regional roads are of sufficient importance to consider them as national imperatives.

However, since any road development in the conditions of Bangladesh would require disproportionate capital investment, and since capital is scarce in the country, only the most indispensable part of road development should be undertaken, such as might be justifiable as pre-

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(Footnote contd. from previous page)

Centre and other aspects of Appropriate Technology, School of Engineering Science, University of Edinburgh, October 1973.

3 Dickinson, H. and Winnington, T.L., *op. cit.*

requisites for basic production and distribution, and the provision of priority public services. Even then the initial investment must be the minimum consistent with the basic purpose of all-weather usability.

It follows from the given constraints that even in the context of limited road development the technical features that have to be resolved are the limitations imposed by the use of local materials on the one hand and the high cost of imported materials. However, the situation is not perhaps as hopeless as it might first appear. Available information suggests that for light traffic properly designed laterite roads sealed and surfaced with bitumen can give reasonable service though uncertain life, provided competent maintenance is ensured. As an example it may be noted that this technique for road building and reconstruction has been used effectively in Uganda since 1946. But the problem in Bangladesh is that lateritic soil is not available in all parts of the country - it will have to be transported about from the north-western, central and eastern parts of the country, or local road consolidation techniques will have to be developed.

In view of the climatic and hydrological conditions of Bangladesh soils are inherently weak; soil stabilization may be undertaken in order to ensure a reliable permanence of roads. Soil stabilization involves

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strengthening the road foundation soil by treatment with an additive such as cement, lime, bitumen or tar. Some costs are unavoidable here, but it may have to be accepted as part of the price for national development.

Only on such lines of action can the country enter into a more rational era of production and distribution where the production and services of both urban and rural sectors will be combined so as to optimize national objectives.

Primary Schooling

It is universally accepted that human development is the key to overall development. It is also agreed, equally, that education is the basic ingredient of human development. While the content of education needs to be discussed separately in view of its crucial importance as a non-material input of development, the issue of physical facilities must also be settled.

A crucial concern of the 1965-70 plan period was to widen the bases of primary education. Accordingly funds were utilized for the construction of primary schools and for the improvement of the physical condition of the existing schools. Everywhere the work of construction was done by contractors and, as expected, the achievement of physical targets during the plan period remained far behind the achievement of the expenditure targets. It

6 Maclean, D.J. and Clare, K.E.; The Use of Stabilized Soils in road construction, Road International, No. 27, 1957-58, p. 33.
is a matter of record that the allocated fund was exhausted before educational provisions had been made for more than 53% of the age group in question. This had a backlash on teachers' salaries as a result of which teacher-pupil ratio deteriorated.

In view of the escalating costs of conventional building materials (cement, iron rod, timber) in the past few years, it is inconceivable that the country will achieve the goal of universal education even by 1985 when there will be an additional 3 to 4 million children of primary school age. Certainly the conventional approach will not be able to provide adequate schooling facilities. Only if building methods are initiated which utilize community labour and improvised local materials, is there any possibility that schools will be constructed at sufficiently low cost and fast enough to catch up with the expanding requirement.

However, self-help school building can be started only in situations where the need for education is well realized by a concerned community, and the desire for education is such that people are prepared to contribute time and effort. Obviously such awareness will come about only when the community itself is enlightened and the need felt from within. The principle here is in complete accord with the national ideals of self-sufficiency and self-reliance. It is unnecessary to

point out here that injection of outside capital causes distortion in the local economy (albeit temporary), nurtures dependence and heightens expectations dependent on aid from outside. An added advantage of self-help projects, on the other hand, is that it creates a sense of responsibility not only in respect of construction of facilities but also towards the maintenance - people who build a school by their own freely given labour are unlikely to sit back and see their work ruined.

Procurement of labour is one half of the task, the other half is materials. School buildings demand more permanence and durability than average rural housing, particularly if they are to accommodate other community activities as well. So long conventional recommendations were for buildings with brick and cement walls and corrugated iron sheets or concrete roofs. Although bricks can be locally made, the supply of cement in Bangladesh is 'historically' uncertain; and the cost now is extremely high. The supply of corrugated iron sheets and iron rods is even more uncertain, and as indicated earlier their prices are bound to increase at a very rapid rate.

The inevitable choice therefore is to improvise cheap but reasonably durable building materials. Although the idea of soil stabilization in respect of earth wall construction was put forward as early as 1952, *

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if not earlier, it did not catch the imagination of
building engineers in Bangladesh in spite of the desperate
needs. Soil stabilization for building is a process of
adding a small proportion of cement to soil so that a
hard material is produced which is water resistant and
free from the risks of volume changes such as shrinkage
or swelling. It is well known that a stabilizing agent
such as cement will enable a soil to retain its shape and
a significant proportion of its strength even when wetted
to saturation.®

The idea of soil-cement block was however introduced
first in the country by CARE/UNESCO in 1970 when a
disastrous cyclone and tidal wave killed about half a
million people; and destroyed an unknown number of
dwelling structures in the coastal areas of the country.
It was demonstrated then that the use of a simple hand-
operated block making machine, the CINVA-Ram, for making
regular rectangular compact blocks has the advantage of
reducing moisture absorption of the block while
increasing its strength. The method is labour intensive
and well suited to utilizing community labour. And the
blocks have a cost advantage over burnt bricks and are
superior to sun-dried bricks. It is surprising, there¬
fore, that the method has not been considered as a
desirable solution to the difficult and extensive problem
of rural public building construction. It is surely
time that the merits of such a humble solution be

8 Ibid.
recognized. In the context of the realities in Bangladesh there is nothing possible without such a humble, down to earth, approach; to put it more bluntly, there is no other way out.

It must, however, be reminded that the mixing is critical. Fitzmaurice estimated that soil-cement ratio between 17:1 and 40:1 are suitable depending on the nature of the soil. Experiments in India have shown that performance of a mixture with 2% cement and 2% lime is almost as good as 4% or 5% cement alone. Since lime is cheaper than cement, this would further reduce the cost of blocks. M.M. Bajwa, on the other hand, concludes that 2% of cement provides soil with sufficient stabilization for rural housing in Pakistan. In view of the varying estimates it will be only wise to make bricks with a variety of proportional mixes at each site and have them tested to find out the optimum ratio of mixes. For mortaring, however, clay is to be avoided. While sand cement mortar may be unnecessarily strong, sand-lime-cement mixtures are generally considered to be appropriate.

A mix of 1 portion of cement, 3 portions of lime and

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18 portions of sand was found to be adequate in a hot and dry part of the Sudan.\textsuperscript{12} For a hot and moist country like Bangladesh the proportion has to be determined by trial and error.

So far as roofing is concerned the earlier suggestion of clay tiles is applicable here also. Alternatively, Charles Hooper's solution of vaulted structures\textsuperscript{13} of soil-cement blocks should be tried. Since we are concerned here with primary schools which would presumably have relatively small class-rooms, vaulted structure appears to be a workable solution and worth trying. As for the waterproofing of the vaulted roof, bituminous emulsion plasters may be used. Experiments in Ghana have shown that soil and sand mixtures, when stabilized with 5\% bituminous cut-backs, give a durable waterproof plaster which could effectively be used as a rendering for mud walls. The same mixture is recommended for covering surfaces made of stabilized blocks where the cement content is less than 5\%.\textsuperscript{14} Bitumen emulsion plasters have also been used successfully in India and Egypt. However, construction of vault structures will need constant expert supervision since erecting such structures is outwith the traditional skills of the rural

\begin{footnotesize}

\textsuperscript{13} Ibid.

\textsuperscript{14} Bawa, N.S. and Homsby, O.; Waterproof Plasters for Mud Walls in Rural Housing, Building Research Institute, Research Note No. 19, Kumasi, Ghana, 1965.
\end{footnotesize}
communities of Bangladesh.

A considerable degree of material substitution is also possible in the provision of school furniture. The idea of soil-cement block may be extended into the design and construction of permanent stools or benches. Similarly, desks may be designed with wooden tops resting on support of blocks. Such solutions may not appear glamorous and prestigious but certainly they are workable and better by far than nothing at all.

It is evident now that a great deal of material substitution is feasible and a great deal of saving may be effected by utilizing community labour and improvised materials. Nevertheless, community effort alone cannot achieve the desired goal. Government contributions must play a complementary part by providing materials which cannot be obtained from local resources. And this part must be performed promptly by the Government whenever the need arises. Otherwise the spirit of the community will be dampened, the tempo interrupted and the resulting apathy and frustration will spoil not only the project in question but also those to be taken up in future. If the Government shows any reluctance in discharging this minimal responsibility, a much larger burden will inevitably fall back on it later, and the cumulative back-log will remain beyond the capacity of any government. Thus the national goal will remain ever unfulfilled.
Various publications from the WHO have made it sufficiently clear that a country cannot gain from the full potentialities of its population unless and until such potentialities are released through building up healthy minds and healthy bodies. While the task of moulding healthy minds lies within the educational programme, healthy bodies must be ensured through adequate diet and medical care. One further point to emphasize here is that without a healthy body, the mind would not be receptive to education and training. Therefore education and health must go hand in hand.

The wastage of human and social energies due to the deplorable health conditions is so obtrusive in Bangladesh that it should not need special emphasis. A high proportion of the most common illnesses, such as dysentery, intestinal parasite infestations, cholera, smallpox and typhoid, could be reduced to a minimum by known preventive measures. In this respect it is generally recognized that when the numbers of medical personnel are severely limited, more can be accomplished by prevention than by treatment, and that a great deal of preventive measures depend upon health education. But a basic problem still remains: how to bring the relevant information and skills of medical self-help to millions of peasants. This obviously calls for trained manpower able to disseminate information and to provide basic health services in each and every village.
The situation in Bangladesh is, perhaps, not unique – there are other poor countries in Asia, Africa and Latin America where the same problem persists. The immediate problem is how to obtain the best results when available resources are scanty. In this the developing world has a great deal to learn from China and her unique approach to medical and health care. Through an army of para-medical personnel called "bare-foot doctors", China, in two decades, has successfully eliminated her pests, has established a reasonable distribution of medical care to her population and has made some significant contributions to world medicine.  

Although the bare-foot doctors are neither barefoot nor doctors in the conventional sense of the term, they have the basic understanding of medical treatment and have been trained to make medical examinations, to use stethoscopes and to give injections. They know how to differentiate between serious and minor illness, how to treat the more common illnesses and the action to take when serious cases occur. On the basis of such a down-to-earth approach China has been able to expand the most frequently needed medical services to the doorsteps of hundreds of millions of her people.

The relevance of the Chinese example is apparent when it is realised that the health services in Bangladesh


today are similar to those of China twenty years ago. Obviously it is impossible for Bangladesh to provide specialized medical services in each and every village in the foreseeable future although the population is much smaller than that of China and the national territory more compact. What is feasible, however, is to create the nucleus of an effective hierarchy of services and a corresponding cadre of health personnel. At the lowest level the services will have to be that of a Village Health Worker, who will have to be given rudimentary but careful instruction on the main principles of medical treatment and the basic techniques of rural public health work.

The next higher level would consist of a small group of generalists in medicine, nursing and public hygiene. The third level would consist of specialists in medicine, surgery and nursing. The second level personnel would visit the villages on periodic basis to provide generalist medical service like routine sessions as well as prescribing treatment and drugs, clinical examinations and diagnoses, and counselling on health matters. At the same time this unit would work as a liaison between the village and the specialist service. In case of emergencies, however, the Village Health Worker should have direct access to the specialist cadre. At the village level a health service should be engaged initially on the following tasks:

a) Establishment of a small but effective health
centre to be used for first-aid and primary treatment, and dispensing against common colds and fevers, diarrhoea, dysentery, as well as the distribution of contraceptives and pills for supplementary nutrition, and mass vaccination and immunization.

b) Training of voluntary auxiliary health workers and organizing health education classes and lectures on family planning especially mothers' classes on domestic hygiene, family nutrition, and child care.

c) Organizing people's cooperative movements towards self-help programmes in sanitation and environmental hygiene, so that people's day-to-day problems of public health are taken care of, most economically, by their own action programmes.

With these ends in view, a modest, centrally located structure must be provided in each village in order to facilitate the health programme envisaged. The physical facilities such as one consultation/examination/dispensing room with simple equipment, and one reception area with simple furniture are best accommodated in the community centre or other place where people gather naturally. The primary school may well be used for conducting mothers' classes, family planning and other health educational activities.

Physical facilities for the health centre are no doubt essential but the actual performance and effectiveness of the centre will depend on the level of
organization and the vitality of the agency itself. This in turn will depend upon the sense of dedication and personal dynamism of the person in charge of the centre. Through his personal qualities and a demonstrated spirit of dedication, the public health leader will have to win the confidence of the people and become one of them. Better still if he is selected from the locality by dint of his expressed concern for the locality and then sent for the training. His training for the skilled service and the gospel of serving the people and freeing them from the superstitious beliefs must be received in one central organization so that he gets the same message and training as his professional colleagues all over the country.

The responsibility involved surely demands individuals of more than average calibre. It is conceivable that young men of above average qualities will not be easily attracted to the task even if they have a spirit of serving the people unless there are some incentives built into the programme. Perhaps further medical educational opportunities to qualify for higher levels in service is the most effective and fruitful incentive.

Like many other countries, medical education in Bangladesh requires a lengthy theoretical training - often taking 7 or 8 years before the theory is linked to practice. Much time, money and energy is spent on a system of rigorous theoretical examinations, and the
outcome is an elitist medical practitioner interested only in money, prestige and an urban market in which to sell his skills. This can be changed by a programme of punctuated courses requiring the students to return to the field where the diseases are, after every part of the theoretical course; thus linking theory with reality of practice and at the same time serving the people. Thus medical students should be the Village Health Workers themselves. From the pool of VHWs will come the students for full fledged medical education. After an initial education for a specified period, all students should be required to go to the villages and serve as the Village Health Worker. After a specified period of field service the student-cum-village health worker must earn a certificate from the people by dint of his service to them. Without such a certificate no one may be admitted into the full-fledged medical course. The prospect of full-fledged medical education will then work as the incentive to attract bright young men. There must still be further incentives to bring back the full-fledged medical graduate to the village. His official status and material remuneration must be made favourably comparable to those in other fields with equivalent educational achievements.

The solution envisaged here will not work so long as a system of elitist doctors persists. Obviously the young apprentice doctors in the role of VHWs would require guidance from the senior men in the profession.
This means that the senior doctors and teachers in medicine must also go to the village and stay there from time to time. The ideals of serving the people must also be exemplified by the seniors. Instead, if they are seen to hanker after the city life of Dacca, the young men will inevitably follow them. This is one fundamental reason why Indira Gandhi’s call for 'Doctors in the villages' failed to make any serious impact. Unless and until the motivational factors towards personal enrichment, material and non-material, are neutralized, no real village health services will be established.

The first major step lies in the nationalization of all health services. If this is acceptable to a country like Great Britain, why should not Bangladesh do the same at a time of national emergency which can be resolved only in the rural areas. In the event of nationalization of health services an exodus of doctors may be feared. In this respect an appeal must be made to the rich countries, particularly Great Britain, the largest single employer of Bangalee doctors, to stop employing emigre doctors from Bangladesh and other poor countries. The richer countries can render greater service and help to the poor countries by stopping recruitment of doctors from poor countries as well as by returning the ones already employed (if possible) than by advising those countries that health and family planning are essential pre-requisites of development.

The numerical requirements are at first sight
overwhelming – 64,000 VHWs to be found, perhaps at the expense of the vast army of peons and orderlies engaged in catering for the bureaucracies – carrying files from one table to another, making tea for the superiors and often helping the wives of officials in their domestic chores. If such unproductive bureaucratic paraphernalia can be justified, why not 64,000 VHWs for a more pressing cause. It is a pity that while the rest of the contemporary world, both communist and capitalist, have done away with such wasteful luxuries, the poor subcontinent of India is still carrying the burden on the 'broken back' with a naive sense of pride. Is it then unreasonable to suggest that raising a cadre of village health workers would be much more productive than having to pay for the bureaucratic decorum which is both an economic burden and a social disgrace.

In respect of the supply of drugs and medicines, traditional medicine such as Ayurvedic and Tibbi are likely to have much to offer. The value of traditional medicine is not widely recognized because of the conventional assumption that they are the products of primitive cultures, although village folk have confidence in much traditional medicine. The essence of traditional medicine must be taught to the new generation of health personnel before the valuable facets of such medicine die out completely. If the VHWs are trained to use proven local medicinal herbs, the village population will not have to depend completely on factory-made drugs
which must be brought from long distances often, under difficult conditions, and at a price.

The policy outlined above will enable the country to serve the maximum number of people with least expense in time and money. But for the total success of such a humble but well-intended approach it must be impressed upon the people that specialist doctors are not all-powerful nor indispensable for common ailments. And that epidemic diseases are not necessarily divine curses but are phenomena which can be prevented greatly by mass cooperation in the field of hygiene.

Market Places and Community Centres

In Chapter 6 we have seen that market places are not found in each and every village as an integral component of the settlement. In the more fortunate villages market places may be found to exist but their physical condition may be such as to cause great hardship to people and damage to commodities. These inconveniences cannot be ameliorated without the provision of some minimal facilities.

Lack of finance is usually stated to be the reason why facilities cannot be provided. But the market place is one area where the lack of finance cannot be made the scapegoat. Any expenditure incurred in providing market facilities can be recovered more rapidly than for any other form of investment, through a system of toll/rent collection, provided that the mechanism is honest and
efficient. A system of toll collection exists already, but, as mentioned earlier, the proceeds go to individual profit.

Nevertheless, the cost of such projects must be minimized in order to keep the burden of repayment low on the part of the toll/rent payers. One obvious way of keeping the cost down, as has been argued earlier, is to deploy community labour instead of construction through contractors. The local community must be helped through central government loans and prompt help in the procurement of essential non-local materials. The local community will have to bear the responsibility of collecting tolls/rents, maintaining the facility and repaying the loans. Any profit beyond the repayment should be spent on the improvement of the facilities. The project may be initiated with basic facilities such as long sheds on paved platforms of soil-cement blocks and paved areas of stabilized soils for the movement of shoppers, and a communal 'godown' for overnight storage of dry commodities. Such facilities must be erected on a planned layout so that with relative capital accumulation those could be improved later on.

A balance of activities is an essential condition for the wholesome development of life. Pure economic activities in the village life must also be supplemented by cultural, social and recreational activities. More often than not, it is forgotten that the vast rural population of Bangladesh has enormous cultural needs and
There is little doubt that the drabness and boredom of the contemporary rural life has profound demoralizing and dispiriting consequences on productivity. Unless the civic inertness of the population is removed through dynamic socio-cultural activities, it is difficult to see how the full social energies of people can be directed towards the achievement of even modest production goals. Further, it has long been known that the absolute lack of recreational activities in rural social life is compensated, consciously or unconsciously, by sexual overindulgence and hence plays some part in the unabated growth of population. It is not unreasonable therefore to assume that with adequate cultural and recreational facilities productivity will be increased and perhaps the rate of reproduction will decrease. There is no advantage therefore in deferring the promotion of cultural and recreational activities until a higher material standard of living is achieved.

Presumably cost should not be the inhibiting factor here either. Recreation and entertainment is the area where cooperation can be enlisted from the widest cross-section of the population. The Bangalees' love of melody and rhythm, ballads and dramas is well known. If and when people are made to realize that their lives can be extricated from boredom and monotony, they are sure to assume active roles in cultural activities and entertainment. The major pre-requisite here is organization.
Cultural activities should include games and sports particularly water sports such as swimming and rowing - the 'aquatic' Bangalee must have some inherent talent to use water which ought to be nurtured and upheld before the world. The programme must also facilitate cultivation and patronization of individual talents, skills and hobbies. There is hardly any doubt that the traditional and modern elements in society, like those in medicine, can be carefully blended in order to add vitality, vigour and dynamism, to the cultural events and thus find cultural enrichment from new activities.

It is also important to ensure that cultural and entertainment activities should have educational, moral and ideological content. Admittedly, identity crises and confusion in values and morals have now become an overwhelming problem engrossing the entire nation. A sense of nationalism and unity, fellow-feeling and co-operation must be revived through organized cultural activities. This ever-neglected aspect of development planning has become so crucially important now that without it all mass development efforts are bound to fail. Careful organization is essential, and must be provided by the Government agencies, if the national poets, writers, teachers and educationists from all corners of the country are to participate in the building of the nation.

In terms of physical facilities little more is required than perhaps a centrally located multi-purpose
structure - the school or the community centre may serve as the place for public meetings, group discussions and cultural functions from time to time, as well as a centre for the day-to-day social life of the village. Provision of popular and inexpensive indoor games, such as draughts, chess, cards and a wall-newspaper, and a tea-shop, may work as the catalytic element for the daily recreational congregation of adults and older people. A transistor radio could be an added communal attraction. Alternatively, the tea-shop owner could be encouraged and perhaps subsidized to maintain a transistor radio. The younger members of the village would become engaged in the exercise of arts and sports as a normal part of school activities.

Experience in other countries where self-help building projects for community social activities have been successful suggests that people's labour and cooperation can be utilized only after due motivation has been aroused. And this depends on dedicated and sustained organization.

Throughout the foregoing discussion on the provision of infra-structure and social overheads, the lack of cheap building materials has been mentioned repeatedly as the major bottle-neck. Available information suggests, as was argued above, that soil-cement blocks are a feasible answer. Therefore a block-making project may well be the first practical step to community construction as
soon as the motivational work is accomplished. Since a period of two to three months of sun drying is necessary for curing the soil-cement blocks. A system of production and accumulation of blocks (analogous to a system of banking) may be introduced whereby each cooperator will be issued with a certificate in acknowledgement of his proportional contribution in block making. Once a sufficient number of blocks have been made, construction work could be undertaken. The block-making project can still be continued so that individuals may go on making and saving their rights to blocks towards the improvement of their own houses at a later date after the completion of the more urgent communal projects.

Potable Water

The public health situation will remain vulnerable to water-borne diseases unless and until some arrangements are made for the provision of adequate supplies of potable water. In view of the economic prospects of the country, provision of piped water to 64,000 villages must remain a distant dream. Provision of tube-wells is not a panacea either; past experience from pilot schemes is not encouraging on several counts. First, in a region subject to annual inundation, tube-wells are inescapably exposed to surface water contamination. Second, even in the villages where such wells were installed, not all people were found to use tube-well water; many people abhor the taste of tube-well water. In many places
tube-wells were found to be used by children as their play-pieces, as a result of which they were made inoperable long before their expected service period had expired, and were never repaired due to shortage of spares as well as to the absence of repair-workmen.

Provision of potable water must be seen more as a sociological problem than a physical one. Since physical solutions such as widespread provision of tube-wells or piped water are not of much avail, and are unattainable at present, the problem must be tackled through sociological approach, that is, through public health education directed towards changes in habits and attitudes, emphasizing the importance of drinking boiled water and making a habit of it. In addition, provision must also be made for distribution of disinfectant chemicals (tablets) for water purification under the supervision of the Village Health Workers. In this way one can hope to keep the incidence of water-borne diseases under control.

Rural Electrification

Providing rural areas with electricity under present circumstances appears to be another unsurmountable task. Although the existing generating capacity of the large hydro-electric project at Kaptai is far from being fully utilized, widespread rural electrification programmes cannot be implemented because of the obvious financial constraints; particularly in respect of the primary
power transmission system. On the other hand, the flat terrain of the most populated parts of the country is not suited to the generation of hydro-power at the local scale. Therefore, it will take quite some time before the villages in Bangladesh can be illuminated or powered electrically. Nevertheless, it is undeniable that rural electrification is the most flexible form of power supply and offers the widest range of productive alternatives for rural development. Much needed humidity controlled stores, cold storages, rice mills, fish and fruit canning plants, and other rural development industries, especially the processing of primary agricultural products, can most readily be operated when an electricity supply is available. On this account rural electrification must be conceived as a pre-investment mainly for rural productive purposes that would put electricity within reasonable reach of the rural population.

So far as power distribution is concerned, a great deal of cost minimization is possible through the use of local materials such as wooden poles. Responsibility of repairs and maintenance of distribution lines may be given to local communities themselves. This will reduce the burden on the part of the central or regional authorities. Yet many transmission and distribution lines may not pay for themselves for a considerable number of years from the start of rural electrification. This, however, is a community cost which the country must prepare to pay as an essential feature of development.
after all primary reorganization and 'rescue' operations have been completed and the bare survival of the nation has been assured.

It must be admitted that the solutions outlined above are not superficially glamorous, nor are they easy to achieve. But provided the will, these are the best that can be done under the given constraints. There is no point in making more pretentious and unachievable plans to add to those that exist already. Effective plans for the development of Bangladesh must involve available resources including people and not call for large inputs of unavailable resources including capital.

Once again the fundamental principle observed in the development process must be reiterated: investments in social overheads are in fact development inputs, a kind of pre-investment for future collective gains, and as such must be judged on their own merits although the outputs may not be calculable in short term. The demand that is to be made on the public exchequer is to assist economic salvation and not to retard it. It should represent minimum demand based on an attempt to spend less rather than more on public expenditure, to 'prevent' rather than to 'cure', to use more efficiently and more effectively the indigenous resources both material and non-material than to be extravagant, and finally to bring about a more purposeful and productive life for everyone. Clearly, provision of social overheads and infrastructure
must never be looked upon as Fabian distribution or welfare schemes *per se* so far as the participation by the Government is concerned. The costs incurred must be seen as social or national costs to be borne by all, both urban and rural sectors. If such imperatives are misunderstood or underestimated, political lobbying by vested interest in the urban sector who are likely to magnify the short-term cost, is bound to stifle the prospect of long-term survival or any progress for rural development.
Chapter 20

ORGANIZATIONAL INNOVATION

To state that development is a complex function, a kind of package deal, is to repeat the obvious. Development depends as much on social, economic, technological and physical factors as on organizational, administrative, political and educational improvements. It can hardly be overemphasized that the plan of a system of production, distribution and consumption must depend on the inter-relationship of all the separate components. In view of the fact that the development plan envisaged in this work depends heavily on the utilization of human and social resources, rather than on financial resources, organizational and administrative aspects demand more than ordinary emphasis. It is to this problem that we turn now.

Agricultural development in general is admittedly a difficult task. Due to the difficulties involved in the development of peasant agriculture, there is an observable tendency amongst the authorities concerned to veer away from this area and to concentrate on easier areas like mechanized and chemical agriculture where the responsibilities are usually assumed by those private entrepreneurs who happen to be the more resourceful and better educated farmers. As a result the most undesirable economic dualism of accumulated profits and affluence for a small group and deeper poverty for the rest follows. This is
one mistake that must be guarded against in Bangladesh. In the existing reality of man-land ratio and employment in the country, only a labour extensive agriculture based on an improvised technology can provide a sustained livelihood for the expanding population.

One of the most popular tools used in the aid of agricultural development is the use of Agricultural Extension Services. While much has been publicized on the necessity of training personnel in extension services, the goal of development has not been achieved in many countries. The main bottle-necks identified are as follows:

- a) Structural obstacles (systemic);
- b) Financial obstacles;
- c) Human obstacles.

The structural obstacles consist of the lack of effective machinery for village level planning. All planning decisions flow from the top and from different sectoral head offices. And since there are no effective grass-root agencies, there is no feedback in relation to people's needs and reactions. For the same reason the works of various departments remain uncoordinated. Another handicap at the local level is the absence of high-calibre staff due to the unattractive service conditions and an unrespectable job status image of those

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*These were reported at the Fourth Cambridge Conference. For details see Ronald Robinson (ed.); Developing the Third World - the experience of the nineteen sixties, Cambridge Commonwealth Studies, Cambridge University Press, 1971, pp. 194-206.*
officials permanently based in rural communities. This is, allegedly, due to financial limitations but perhaps largely due to the archaic (feudal, colonial) structure of public services where law and order, and revenue and administration enjoy pride of place instead of agricultural and rural development.

The financial limitations are not unreal however. Since local authorities are not allowed to draw substantially from their own resources, they have to depend too heavily upon allocations from the central government which usually happens to be inadequate on the plea that the revenue yield from the individual local units was small. This in turn is due to the fact that the remotely controlled revenue agency is likely to be inefficient if not dishonest.

Such structural inadequacies and financial limitations are often reinforced by human obstacles. The major shortcomings arise from the lack of realization of the responsibilities of the public service personnel towards the provision of services for the people of a particular locality. It is also reported that misunderstandings occur between people's representatives and the local government officials who often encounter undue interference in the discharge of their duties. This is largely due to the misappreciation of the relationship between central and local governments. The most stupendous human short-fall is the failure of the public and their leaders alike and the connivance of the
government personnel to realize what could be achieved by community efforts in spite of the very real financial limitations.

All these problems, and many more, are manifest in Bangladesh. We have noted in Chapter 9 that there is no mechanism of breaking down the national plan targets into components small enough to fit the basic units of production. Nor is there any mechanism of relaying the needs and potentialities of such units to the centre. Although the system of Union councils (groups of 10/12 villages) is claimed as the agency of local planning and implementation, in operation it is over-bureaucratic and political. Since it is an extra-territorial agency, there is no guarantee that all the villages in the Union will be equally represented. Besides, the elected councillors represent entrenched interest rather than the public at large. Hence they are more concerned with upward linkage than downward bondage. At best they are agents of periodic public expenditure in relation to sporadic and un-coordinated infra-structure development. In addition they serve as the lowest order of authority for maintaining law and order in the villages as well as for trying petty civil and criminal cases. Thus individual needs and potentialities in respect of production remain un-registered; the linkage between national production plan and local production requirements unaccomplished.

So far as extension services are concerned, we have
noted that such services stop short of the basic unit of production (see Fig. 20.1). The lowest level of agricultural services, the Thana, has one officer, who is an agricultural graduate, and about 10 extension workers to serve more than 30,000 agricultural families. Each extension worker (called Union Agricultural Assistant) with some secondary education and a smattering of agricultural training has to visit 3,000 families, spread over several square miles, mostly on foot or dinghy. Besides, such agricultural personnel consider themselves the servants of the central government rather than the local people since they receive their salaries from the centre. As a result home and farm visits are minimal despite the fact that agricultural information services are even farther away. The agricultural information services have technical personnel only at the divisional level - three levels up from the Union. Their information media is not supported by audio-visual or other aids to bridge the gap to the agricultural family.

It is evident therefore that on technical matters the agricultural producers, illiterate as they are, get little help. A basic bottle-neck in productivity will perhaps be removed by land reform but the whole range of technical

* For administrative and public service purposes the country is divided into 19 Districts. The Districts are divided into Sub-divisions, which are further sub-divided into Thanas (meaning Police Stations). Thus there are 19 Districts, 59 Sub-divisions and 410 Thanas. Each Thana, again, consists of about 10 Union Councils (local bodies), each Union Council covering about 15 villages.
improvisations, as argued in this work, show the inadequacies of existing services to be more serious than ever before. Ignorant and powerless in respect of supplies, credits and market prices, the peasants need help in these areas as well. Education, advice and help is needed in every step. But the government apparently is unable, unwilling or perhaps is prevailed upon not to grant resources to support such purposes. Nor is there any real agreement as to the best means of providing agricultural development services and administration should the will be there.

Under the circumstances the basic conceptual issues are: to find the best type of organizational effort that can be applied to suit a cooperative production arrangement as envisaged earlier, and what type of framework for spatial organization, overall administration and democratization can be evolved.

At the conceptual level it is also necessary to take note of certain fundamental principles of democratic organization. Foremost of these is that if development planning is to be democratic every citizen must be made conscious of the part he has to play in the whole process. As it is, the world of the small peasants for all practical purposes ends in his own village. It is clearly imperative that the peasant should get a taste and a feel of the wider world of which he is asked to be an integral part and for the welfare of which he is asked to toil. The first task, therefore, is to
mobilize them to a common purpose, i.e. to feed a vast nation with limited wealth and resources.

Development experience from Tanzania tells us that the most successful Ujamaa village settlements are those which are substantially self-administered. There it has been well proven that excessive central planning and too much external control both destroyed local initiative. Therefore a democratic system of self-administration is needed where the people will make their own decisions on the things which affect them most directly. In this way they are able to recognize their own control over community decisions and their own responsibility for carrying them out.

Finally in relation to organization, the word 'democracy' itself needs to be defined. Obviously there is no common consensus about the meaning of the word itself. It is the operational pattern of any system which reveals whether or not it is democratic. Since there is no one set of ideal constitutional arrangements that can be called uniquely democratic, a country's closeness to democracy is more accurately measurable by the working of its organs rather than by their form. There are countries which appear totalitarian in form but are much more egalitarian in operation than many

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professedly democratic states. Democracy is thus to be measured by the extent to which the interest of the mass of the people is taken into consideration. The appeal of democracy is the appeal of its egalitarianism. There is no reason to be obsessed with this or that form of democracy. What serves the people most and responds to their needs is the best form of democracy.

In the existing realities of Bangladesh it is understandable that at least initially a kind of technical service on the line of direct intervention will be required at the grass-root level (the individual villages) where the basic producer is still in the grip of traditional cultural patterns and practices. A simple fact must be recognized that if a factory of 100 workers or so needs careful management, how can four times as many agricultural producers in each village be left alone to produce on their own following a new set of cultural practices? At the same time it must also be realized that asking for specialized technical services in all the areas of rural production in every village is unattainable in the short run.

In order to overcome the extreme difficulty of providing an individual extension service to a large number of small farmers in agriculture or animal husbandry as well as to achieve the goals of cooperation and democratization it is necessary to organize a pre-cooperative in the form of a peasants' guild (mutual aid cooperative) whereby the whole village would become one farm unit
requiring technical, managerial, marketing and supply services. Each village would thus become one Service Recipient Unit. (It is needless to say that serving a collective unit is a lot easier than serving hundreds of individual units. But the service must be much more intensive and careful because any negligence is liable to bring disaster not to one family but hundreds.) The village guild should consist of the entire adult population of the village, and should work as the primary instrument for planning and development at the village level. The general assembly of the villagers will be the supreme organ with exclusive authority and should have the right to expel members from the village or confiscate his shares on proven grounds of negligence to duties. There will be a management committee elected on the basis of one member one vote, and accountable to the village assembly. The main functions of such a committee will be arbitration, auditing and accounting with the help of a development organizer.

To participate in collective work should be both a statutory right and duty* of every member of the village guild. For day-to-day work of the unified farms the

* Professor Bhagwati has purported to suggest (see Bhagwati, J.; The Economics of Underdeveloped Countries, World University Library, 1966, Ch. 11) that such communal work is in conflict with non-economic objective such as the freedom of labour. Professor Bhagwati's social polemics may be frankly questioned as to what freedom there is when an individual has the will to work but there is no work available - a situation so characteristic of not only Bangladesh but also all the countries struggling against poverty and underdevelopment.
members may be divided into production teams, such as cereal crops, vegetables, fibre crops, dairy, livestock and fishery, on the basis of individual members' knowledge and skill. All the members would share in the profits after deducting the communal requirements. A system of measuring, evaluating, equivalence and distribution could be worked out in general meeting which should also make provision for reserve and taxes. Distribution of communal produce or of profits may be in kind or cash depending on circumstances but on the basis of work performed by individuals and not according to the needs of the families. Cooperative work may be initiated in phases. The first phase may consist of a single crop for food or cash. Gradually as the peasants began to appreciate the value of cooperation or, conversely, the disadvantages of non-cooperation resulting from the non-support of services, they would be expected to cooperate on other crops as well.

It is pretty obvious that unless there is someone in every village exclusively to provide management function there is little hope of any success. Therefore the existing cadre of Union Agricultural Assistants, which is neither adequate nor efficient, should be wound up and replaced by a much wider and effective cadre providing a Multipurpose Development Organizer for each village who would provide technical advice as well as management services in supply, marketing, credit and accounting. The MDO will have to have access to a chain of higher
technical and administrative cadre to call on and demand specialized services as often as might be necessary. In order to facilitate this the lowest echelon of central government services must be reinforced and strengthened so that the MDO could obtain all the specialized services required to meet the changing needs of the village under his responsibility.

The cadre of development organizers suggested above should not be identifiable with the normal civil service cadre whose livelihood does not, apparently, depend on the success of the village. The development organizer should be trained to see himself not as a typical government servant but as a villager. A compromise is to be aimed at between his role as an executor of state policy and his loyalty to the locality. In order to be able to arouse the dynamic of the people his role as a semi-professional worker will have to be integrated into the

* Pioneering experience is already provided by the Comilla experiment where the manager of each small primary cooperative is in constant training and supervision by the Academy of Rural Development and the management of the Thana level cooperative. Union is strongly staffed and again closely watched and supported by the government officials. The lesson that follows is simply that the role of the Academy and that of the Thana must be fulfilled by a system of government services at the Thana level if not further down. For further information on the Comilla experiment see: (a) Choldin, Harvey, M.; The Development Project as Natural Experiment: The Comilla, Pakistan Projects; Economic Development and Cultural Change, Vol. 17, No. 4, July 1969, pp. 483-500. (b) Choldin, Harvey M.; An Organizational Analysis of Rural Development Projects at Comilla, East Pakistan; Economic Development and Cultural Change, Vol. 20, No. 4, July 1972, pp. 671-690. (c) Raper, Arthur F. et al.; Rural Development in Action: the Comprehensive Experiment at Comilla, East Pakistan, Cornell University Press, Ithaca, New York, 1970.
village leadership structure. * Therefore his training should be such that a deep sense of dedication to the promotion of plebeian villages is cultivated. His training should be comprehensive so that he could help the people while working and living amongst them, both as a technical and an ideological cadre. In other words, the organizers should be sufficiently politicised to enable them to understand the need for commitment to the transformation of the society from the grass-root level. Since coercion is admittedly less fruitful than persuasion in the pursuit of social transformation, the primary task of the organizers will be to initiate an effective process of communalization where the urge will be to minimize control and maximize commitment and participation on the part of the villagers in mutual aid activities.

The system of 'extension work' envisaged above emphasizes the principles of involvement of the peasant in the evolution of tools and techniques, as well as in thoughts and motivations, to help towards obtaining a higher standard of living through increased production in agriculture, livestock, horticulture and crafts. It also implies the integration of the rural community in the national development effort. If peasants' committees are organized on a village basis such that

* This is an unmistakeable lesson gathered from the experimental work in social change now being carried out in Tanzania. For further information see Mashauri, R.K.; Leadership Structure and Functions in Ujamaa Village in Proctor, J.H. (ed.); Building Ujamaa Villages in Tanzania, Tanzania Publishing House, Dar-es-Salem, 1971, pp. 55-63.
each village will have to be represented individually, a channel could thus be organized through which local needs could be expressed. It may be emphasized here that experience of the delegation of development function to politically representative local government at this stage has proved singularly ineffectiveness in many developing countries. On the basis of experience in Africa and Asia, Guy Hunter has expressed his scepticism and doubts about the use of elected councils for development purposes.\(^1\) In the light of the experience in Bangladesh, also, his fears are well founded - the system of Basic Democracy vis-a-vis Rural Works Programme was a sham; it tended to perpetuate the vesting of political power in the hands of the entrenched interest groups and, as a consequence, bred corruption and social deprivation.

A closely guided system of community enablement as suggested above will be necessary in the early stages of any grass-roots development programme. At a later stage when the system of social production is stabilized, local communal leadership would automatically emerge. This is the ultimate goal of the social economy advocated in this work, and the final task that the MDO will have to achieve. This is also the lesson of the Ting Hsien experiment in rural reconstruction in pre-communist China which found a parallel later on in the Philippines.

Rural Reconstruction Movement.  

Evidently, if the village assembly itself is allowed to grow as the primary institution rather than the elected body, the 'privileged' will cease to dominate the 'underprivileged' and popular democracy is likely to permit the exercise of power by the representatives of the 'underprivileged' without turning them into a dominating group.

The MDOs will face great problems and they will have to be mentally able, have organizing ability and physical stamina. In order to attract good calibre personnel into positions charged with such grave responsibilities and with the executive authority, the service status of the MDO must be made equivalent to that of a medium size factory manager in the non-agricultural sector. Obviously the entire requirement in manpower cannot be met overnight - the programme will have to be phased to achieve a balance between skilled manpower resources and village achievements. As time progresses some communities will become self-sustaining and demand fewer outside resources.

The initial budgeting requirement for any development programme not limited to directly productive investment is

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2 Yen, Y.C. James et al.; Rural Reconstruction and Development, Praeger Special Studies in International Economics and Development, Frederick A. Praeger, New York, 1967, Ch. 17. - James Yen points out that in pre-communist China even after vigorous and successful efforts had been made in a village in the fields of livelihood, education and health, reconstruction programme was incomplete. Self-government was needed for the removal of serious political obstacles to progress and for the creation of truly balanced programme of development. But before a rural community can be fully ready for self-government, the experience suggests, the people must acquire some practical experience in working together. With even a limited background of experience, village leaders may show a surprising capacity to assume responsibility of self-government at local level.
unlikely to attract the sympathy of orthodox budgetary planners. But in pressing the argument for popular participation development one must never lose sight of the incredible social diseconomies to be seen in Bangladesh which, like many other Third World countries, has an alarming surplus of educated manpower. The opportunity cost of these unemployed youths is very low. Many of them are to be seen wandering in search of office jobs which are not there, or are taking up jobs which require less educational qualifications, and thus are only replacing the less qualified people. The number of university and college graduates, particularly in the field of liberal arts, is increasing at an alarming rate. The social cost already incurred in the education of these graduates can be paid off only if their general enlightenment could be utilized for the most urgently pressing problem of the country, i.e. agricultural development.

It must also be realized that the urgency of the challenge of agricultural development in Bangladesh is no less than that of a war and as such must be taken up with the exigency of a war. It is the war on basic poverty and want that the country has at hand, not a war against an imaginary enemy force. It is also a war where failure to provide food leads to casualties. The futility of army-build-up and military pacts has been demonstrated once again in the struggle for Bangladesh. It has been clearly shown that the real cause of national insecurity arises from non-military sources;
hunger, poverty, deprivation and social injustice. There could be no stronger logic, therefore, to replace any military budget with that of agricultural development in Bangladesh. Revenue expenditure on this account will be well spent because the attainable rise in agricultural productivity will take us a long way towards solving the food problem. At the same time the strategy of creating employment will offset the inflationary tendencies which would otherwise become inevitable through the expansion of non-productive jobs, for example, in the government sector.*

There is still another socio-political imperative at present which may be combined very profitably with that in agricultural production. We have noted in Chapter 3 that the exigencies of the liberation struggle have radicalized a group of youth many of whom are university or college graduates. These young men have enormous potentialities and are energetically demanding recognition and responsibilities. Often they are driven to destructive activity but there is the possibility of channelling this volatile resource towards agrarian renewal. If the government or the party in power fails to harness such potential social energy, it is ignoring one of the few social assets - the contribution of youth.

* Guy Hunter points out that perhaps the most common form of inflation in the developing countries is a large growth of government staff accompanied by little or no growth in physical output. As an example he cites the case of Indonesia where in 1963 there were over 600,000 public employees while domestic production was falling rapidly. See Hunter, G., op. cit., p. 140.
mobilization in the development of rural China is a significant lesson in itself regardless of its political ideology.

So far we have been discussing the problem of organization and management at the grass-root level. The rest of the problem lies in the coordination of the different government agencies and their programmes in order to provide a complex service of information, technical help, investment, supply, marketing and credit. A major first step in this regard is simplification and effective coordination amongst the technical services. For this purpose the most related services such as agriculture, animal husbandry and fishery, should be grouped together. Similarly engineering services such as hydro-logical engineering, public health engineering, civil engineering and mechanical (tools) engineering should be unified into a single local agency of Agricultural Engineering Services. The third group of services may be comprised of the agricultural supplies such as seeds, supplementary chemical fertilizers, credits and marketing; the fourth group will consist of social services including health, education, cultural affairs, crafts and the community development services.

A major obstacle in the way of effective functioning of the technical departments, however, lies in the super-structure of the government service departments and their inter-relations. For sociological-historical reasons the cream of government personnel has been concentrated
in prestigious civil and revenue administrative services, which has made these services structurally top-heavy. The civil and revenue administrator particularly at the district and sub-division level exercises an overlordship on all matters, and technical personnel suffer from a subordinate status.

In this regard Indian experience, which is apparently quite comprehensive though experimental, suggests that a lower focus in services, as opposed to top-heaviness, is crucially important if a service is to be accessible to people, and to have knowledge of them. It also suggests that direct administrative control by a single officer of all technical staff and the over-riding authority of administrative operations at the lower levels causes increasing friction as the development programme gains momentum and complexity. To put administrative and revenue officers at this level as coordinators offends against the increasingly technical emphasis on development.³

The imperatives are clear — from the Thana level upwards the stultifying interference of revenue and civil administration staff must be reduced or eliminated, and the existing subordinate status of technical officers must be upgraded and put at par with the revenue and civil administrative counterparts. At the Thana level the agency heads, as project officers, could have direct lines of communication with their respective heads of departments at the district level. At this level the

³ Hunter, G., op. cit., p. 145.
District Commissioner may act as the coordinator of projects under the different departments, and may work as a liaison link with the central government (see Fig. 20.2).

For reasons stated earlier the administrative hierarchy for the initial period should terminate at the Thana level. But obviously this is not enough in view of thorough democratization in organization. People's participation in democratic development must travel upwards. As soon as true universalist (as opposed to select group), secularist leadership is identifiable at the village level, sub-regional development bodies may be formed at the Thana level consisting of the elected development leaders from the village assemblies, with one of them elected as the Chairman of the Thana Development Council. Further up, regional development committees should be formed at the District level comprising all the Chairmen of the Thana Development Councils, all Members of the Parliament elected from the District, representatives from the municipalities and town committees as well as those from other voluntary agencies in the District. The President of the District Development Board may be

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* This incidentally is the original tradition of Bengal. Inscriptions from early Bengal refer to Dasha-gramik, meaning head of ten villages. Villages were basic administrative units during the Guptas of 5th and 6th centuries A.D. Later on centralized administration was introduced by the British, and the autonomous 'gram' (village) lost its characteristic social organizational features. The Union Councillors during Pakistan period were local representatives and were vested with substantial power; but they were not answerable to people. This led to corruption and the structure failed to develop the village at the grass-root level as was promised.
elected directly from the district on the basis of adult franchise. The District Development Board will draw up regional development plans in the framework of the national plan. For an easy transition from the bureaucracy oriented administration to people's self-management, as well as for efficient functioning all through, the Deputy Commissioner (head of the district administration) as well as all other district head officials will have to serve as the secretaries to the Board. In other words the central cabinet will be reproduced at the regional level in a miniature scale.

Apparently there may seem to be an inherent danger of the regional centres usurping powers and prerogatives of the centre, leaving the centre impotent. But it has to be noted that the balance could be achieved by a planning process in which the central government lays down the general policy guidelines, sets the national targets, allocates the shares to the districts, and outlines the financial and budgetary plan. The regional authorities could be responsible for fixing quotas in production and resource allocation for the local units, collating district production plans and bids for resources which might be ear-marked for other agencies, and for receiving feedback from the local bodies and passing them on in a unified form to the central government. The central plan could then be modified and adjusted accordingly.

Democratic centralism would thus be manifest in a
Fig. 20.1 Previous Services Structure for Rural Development
Fig. 20.2 Proposed Structure of Services & Organization
system of three-tier planning - the central, the regional, and the local. Each tier would have its own resource plan as well as an outlay plan integrated and evaluated at the next higher level based on a system of continuous feedback.

In the proposed system it is apparent that the operation of the cardinal principles of democracy, devolution and delegation, is a central theme; the most immediate manifestations of which will be seen in the transformation of the role of the D.C., the top representative of central power in a district, into that of a local chief executive officer under a statutory institution manned by the representatives of the people. Democratization of social organization will also be seen in the abolition of the existing intermediate level of Sub-division, an hierarchy between the Thana and the District which only represented tighter control.

The system of wider social organization envisaged above (call it democratic, rationalistic, nationalistic or socialistic) which will hopefully create conditions to release the creative social energy of every human being, the mass of the people, is no doubt the key to success. Nevertheless, the system needs to be protected from degenerating into either an over-decentralized regionalism or centralized totalitarianism. This demands technical competence and administrative efficiency on the part of the civil servants, and integrity on the part of the people's representatives. In the final
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analysis it must be acknowledged that self-government is not a substitute for technical and administrative efficiency. People's representatives can succeed only if the technical and administrative services are performed with efficiency, honesty and sincerity. And people's representatives on the other hand can discharge their responsibilities diligently only if they keep themselves above the idiosyncrasies of the career politicians who practise amoralism no matter how much they may denounce it in words. One obvious safeguard against this would be to issue a mandate from the national legislature that no member of the parliament should hold any position in the development bodies at the Village, Thana or District level. At the District level, the MPs would be *ex officio* members of the Board only to the extent of conveying legislative information to the Board and taking the views of the Board back to the House.

Finally, a watch-dog agency will be needed to review the progress of the system from time to time and report to the general public. Obviously such an agency should comprise not only the party intellectuals and academicians but also those creative thinkers and wise men without party allegiance who have had difficulty so far in being heard. This proposal is of particular importance to the current situation in Bangladesh where an unconditional emphasis is needed on the creation of a unified national front for development. The political dynamics of today provide no outlet for the silent minority whose potential
contribution to society remains untapped. Unless there is an integrated development forum in which everybody may play a part, it is difficult to see how much-needed nationalistic unity can be achieved.
Chapter 21

EDUCATION AND SOCIAL REFORM

In the theory of complementary changes (the 'package deal' of Professor Myrdal) emphasized throughout the preceding chapters, the task of preparing people to undertake development efforts occupies a pre-emptive position. Sustained progress of society cannot be ensured by merely achieving an integration of administrative services and improving coordinative mechanism, but

"requires strengthening the capacity of man as a productive agent, investor, innovator, developer, increasing his capacity to participate effectively in economic activity and in this way contribute to the improvement of society."¹

The essential message here is not new. More than two thousand years ago a Chinese philosopher taught:

If you give a man a fish, he will eat at once
If you teach a man to fish, he will eat for the rest of his life

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By sowing seed, you will harvest once
By planting a tree you will harvest ten-fold
By educating the people you will harvest one hundred-fold

Kuan-tsu

(4th - 3rd century B.C.)²


After more than two thousand years, it is now being realized that underdevelopment is due, to a large extent, to a failure to develop human potentialities. The typical argument now put forward is that if human resources are underdeveloped, the natural resources are underdeveloped; and if the natural resources are underdeveloped the country is underdeveloped. On the other hand, evidence is readily available to demonstrate the reverse case. It has been widely observed in the developed economies that increases in national output is often more than the sum of the increases in the inputs of land, labour or capital. The missing factor of increased production that might account for the unexplained residual in modern growth is assumed to be the development of human potentialities — his knowledge, skills, techniques and initiative.

It is also acknowledged now that underdevelopment is as much a consequence of social, political and psychological interactions as of economic components. Education has proved to be a force capable of not merely transforming illiteracy into countless competences that are required for economic development but also of influencing effectively various social handicaps such as superstitious conservatism and extreme inequalities in human relations


which are inextricably linked up with underdevelopment. The evidence has become so convincing that development planners are now compelled to accept that the concept of poverty should be widened so as to include the poverty of the mind through which effort is automatically dismissed, and that the concept of wealth should include the creative spirit without which no development is possible; and finally that development is a human problem and planning should set out to improve man.⁵

That education is the backbone of a nation is not a new gospel in Bangladesh. There exist substantial numbers of schools, colleges and universities. But the products of these educational institutions do not meet the country's needs for development. This situation has come to pass because, on the one hand, there has been an absolute lack of understanding by the planners of what development involves; and on the other, the school represents above all a means of entering the elite. Everyone grasped the ironical fact of the colonial legacy such that a person sitting behind a desk with clean hands and a clean shirt earns a better and easier living, and

⁵ Myrdal, G.; The Challenge of World Poverty: a world anti-poverty programme in outline, Penguin Books, 1970, Chs. 1, 2 and 3. See also:
  i) Curle, Adam; Educational Strategy for Developing Countries: a study of educational and social factors in relation to economic growth; social science paper¬back, Tavistock Publications, 2nd edition, 1970, Chs. I to V.
is more powerful. Hence the enthusiasm for white collar jobs and the bid for high-sounding degrees. Available statistical information reveals that during the preceding decade there has been a consistent improvement in all school enrolment ratios. But it is alarming to note the rapid increase in the enrolment for all forms of higher education, regardless of the context of national development requirement. This has come about because the system of recruitment into jobs and service rules, in respect of career advancement and promotion, unduly emphasize higher academic qualifications. Hence the sole purpose of education has become degree oriented rather than learning.

The trend of degree oriented education has been reinforced by another sad feature of the educational method, that is the bookish emphasis where the book itself has to be read, memorized and regurgitated in order to pass the written examination. The process of education thus involves the acquisition of lecture notes and/or commercial question-answer books, speculation on probable examination questions and memorizing all the answers to the speculated questions. The scope of critical and inventive thinking, self-education through assimilation of knowledge is ruled out. Bookish education does not seek to make young minds understand problems in the real

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* Between 1965-66 and 1968-69 enrolment in primary education increased from 4,175,000 to 5,500,000, that in secondary education from 847,550 to 1,150,000 and that in degree awarding colleges from 32,290 to 60,160. Enrolment in Dacca University alone increased from 5,430 in 1966-67 to 7,800 in 1969-70.
world or their future occupational responsibilities. It also helps to develop an absurd antipathy towards manual labour because learning through doing is never experienced.

Equally disturbing is the practice of channelling youths in different disciplines guided mainly by a factor based on a subjective notion of prestige scale. In a prestige conscious society youths seeking education naturally combine job prospects with prestige. Since social prestige in agriculture is low and people are incessantly trying to escape from such activity, commonly considered backward, it is not surprising that most prospective students are automatically dissuaded from taking up work in the agricultural profession or services as a career. For the same reason their parents and 'well-wishers' also do not advise agricultural education. As a result only a few relatively 'unambitious' and perhaps unintelligent boys take training for a professional agricultural career. The vast majority of young men are simply misguided by the socially defined concepts of prestige, honour and monetary success. In the process many excellent brains are directed in the studies of English literature or architecture, arabic or nuclear technology. At the same time agriculture, the mainstay of the economy, is served only indirectly by a small part of a very general education at an early age which is forgotten almost immediately afterwards.

Research workers and scientists are affected with
the same malady - their work is oriented towards publication of papers and books whereby their own personal position may be enhanced and their economic footing reinforced. Research programmes are rarely geared to the needs of the country. In the unceasing race for prestige and position, there is a continuous upgrading process which leaves a vacuum in the lower strata. Eventually there are more engineers than draughtsmen, more doctors than nurses, more university and college teachers than good school teachers who are more crucially needed to build up the base of society. The whole educational system is thus loaded with a pervading sense of prestige and vanity and the structure has become unbearably top-heavy.

Under the circumstances, the issue with which many would perhaps tend to be concerned is that most popular question of a strategic choice: whether the country needs more 'investment' education or 'consumption' education. In other words they will address themselves to the conventional dilemma, that is, choice of more vocational training, for immediate return, or comprehensive education, for overall enrichment of the individual. Many people have argued that humanizing education alone is a luxury before any satisfactory level of economic

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*This in itself appears to be a symptom of underdevelopment in the sense that in most mature countries the technical profession constitute a pyramid with a few most highly trained group at the apex. In the developing countries the pyramid appears to be upside down. For example, in the U.K. there are three nurses to every doctor whereas in India there are seven doctors to every nurse.*
development is achieved, on the ground that consumer education does not add anything to an individual's professional knowledge; and also on the strength of the example that the great Japanese economic growth was the result of emphasis on technical education. But it must never be overlooked that the Japanese education of the Meiji Restoration has been an overwhelmingly important factor in Japan's economic 'take-off'. It is also admitted that much of the ground work for fast development had been laid before modern industrialization began; and the ground work, in addition to physical infrastructure, consisted of education, with major emphasis on morals, values of nationalism and patriotism, and the dignity of labour and self-enterprise. Such contents of education provided great stimuli for the prompt implementation of land reform as part of the national purpose, breaking of class barriers, instilling great enthusiasm in a nationalist framework and an overwhelming sense of discipline.

A variant of the conventional 'consumer' versus 'investment' education approach has been put forward, by other expert groups, with 'short-term strategy' element of producing technicians, apprentices and professionals, and 'long-term strategy' element of broad education to direct the course of social and economic change; both apparently mutually exclusive. In such an event we

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shall obviously be creating at the end two irreconcilable groups of professionals unable to recognize each other's merits let alone able to cooperate on national planning. Such a situation would be little different from that now prevailing.

The existing realities in Bangladesh demand a broadly based system of education. As there are already plenty of specialists the need now is for a generalist education with as much emphasis on simple techniques and fundamental sciences as on moral philosophy and nationalism. Education in Bangladesh must make a man adaptable and able to free himself from traditional social restraints. For example, for the basic task of achieving higher productivity the first task will be to induce millions of peasants to use the improved technology - not just one specific technical panacea but a whole range of new practices. This obviously will require a non-conventional approach to education. Secondly, it is not difficult to see that the social structure as a whole is retarding development. The gross inequalities and absurd stratification which smother talent and stifle initiative will not be eradicated by producing more highly qualified engineers and technicians, agronomists or extension workers. Education as a means of altering the attitude of people is needed in order to rectify the restrictive social and agricultural structures. Thirdly, democratic management of the social economy cannot be ensured unless people are socially educated and politically enlightened.
Evidently it is not the question of only building more schools and getting more pupils enrolled, but that of changing the system of education. The crux of the matter is the content of education much of which at present is anti-developmental and anti-socially elitist. The golden tower of elitist education must be dismantled and a fresh beginning from the grass-roots must be made.

The realities in Bangladesh in terms of productivity, environment and demography is such that a 'new generation' must be raised able to comprehend the wider significance of a shrinking man-land ratio, realize the fragility of the environment and the long-term necessity of ecological equilibrium, appreciate the urgency of population control, understand the value of democratic social management and place a high value on manual work. Obviously the task of raising the 'new man' will demand sustained efforts over the period of a generation at least. But the atmosphere must be created beforehand so that the up-bringing of the 'new generation' is not stifled in any way. Preparations, therefore, must start now.

The primary vehicle of formal learning is the knowledge of letters. Literacy is the starting point for all other education and learning. Inability to read and write is the greatest handicap in the participation in civic life of the community. Therefore the initial target is to widen the base of primary education, to impart literacy education to all. A truly universal literacy and not partial should be the target - partial
literacy will only prolong the status quo of division between the privileged and the under-privileged. When being literate will no longer be a monopoly of a 'blessed few', it will be easier to reduce gradually that class distinction based on the premise that he who cannot read performs manual work. With the key of literacy an individual will be able to enter the world of rational attitude, information and knowledge, and thereby participate in all social and economic activities more effectively.

On the theoretical plane it is apparently well realized that widespread literacy is essential in order to create an integrated nation with the fullest participation of the people. And hence the commitment for universal literacy is so documented in the text of the previous Five Year plans. But in reality a high rate of illiteracy has persisted up to now. The reasons for this are many, the most forceful of which is perhaps the influence of the rich and the elite who are very much instrumental in carving out resources for education in favour of their own children whom they want to rise to positions of power, influence and material success. It is quite conceivable that the group in power does not want its unchallengeable influential position to be altered by any act of self-abnegation which may be implied in their support of a policy of universal, free and compulsory literacy education. In their heart of hearts people in power and position do not perhaps want a universal literacy no matter how much they may express
a willingness for it in words. *

Another visible deterrent to the spread of literacy has been, in recent years, the underplaying of the role of adult education. With an apparent commitment to free and compulsory primary education as the way ahead, the movement against adult illiteracy has been neglected. The vast number of adult illiterates who have not had any education in their earlier life, and those relapsed into illiteracy, still constitute the bulk of the human resources with which the immediate future must be reconstructed. Besides, in order to create a congenial atmosphere at home where the literacy education of children will also not relapse into illiteracy, education of the parents will have to be ensured. ** It can hardly be overemphasized that the first lessons in regular habits, inquisitiveness and discipline as well as that of the level of content come from the mother. Unless the mother is enlightened, the re-shaping of the new generation will be difficult if not impossible — Napoleon was never wrong in this respect. The role of mothers in

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* This has been very much the case in India where education has come to serve the middle and the upper class. Observations by P.C. Mahalanobis and J.P. Naik, as quoted by Gunner Myrdal, bear testimony to the truth in India. — Myrdal, G., op. cit., p. 184.

The report of the Education Commission of India, 1966, also reflects sufficiently on this problem of class bias in education and its disastrous social consequences.

** In China school children have been encouraged to teach parents and grandparents to read and write. In Cuba similar measures were successful in achieving virtually complete literacy in less than ten years.
Bangladesh is even more fundamental. They have to understand the importance of nutrition in the upbringing of a healthy generation and learn how to prepare healthy food. They have to learn the simple rules of domestic hygiene and sanitation, and also the necessity of family planning. They must also know how best to use their time in the interest of the family and the immediate community.

The elimination of adult illiteracy of both sexes is therefore a necessary precondition for success for any national development programme, whether in production, consumption or in population control. This sector of education can be neglected only at the cost of stagnation in all other sectors of development activity. Therefore a large-scale programme for the elimination of illiteracy must be undertaken at the earliest, with, perhaps, a target to be completed in the next five to ten years. The task may appear quite impossible at first sight but, as UNESCO has already based a number of literacy campaigns on annual targets so that a substantial number of illiterate adults are given courses in literacy at any time, there is a good prospect for the eradication of illiteracy within a decade. To this end the thousands of university students could be mobilized to spend their

*It may be pointed out in the passing that the communist countries of all shades have had one strategy in common—that of waging a vigorous campaign of universal literacy. One cannot disagree with Professor Myrdal that there is nothing sinisterly communist about this strategy. Adult education is played down characteristically in the non-communist developing countries—a reactionary tendency of great significance.*
vacations in teaching the illiterate adults. Or, alternatively, the bulk of the retired personnel who feel uselessly rejected could be encouraged to do the 'missionary' job of adult education in recognition of which they may be paid a small honorarium. The recipients of adult education would perhaps feel more comfortable under an elderly person than under a young man. But in any case a fundamental change is needed in the attitude of those who are already men of letters in the society.

"Young intellectuals of India and in most of the rest of the non-communist underdeveloped world," remarks Professor Myrdal, "have been so conditioned by the rigid elite and class structure in which they have been brought up that they do not feel the deep identification with the poor in their nation, which the Russian intellectuals felt."  

Evidently, education (purification) of the educated and mobilizing the youth is of paramount importance, an issue to which we will return later in the chapter.

The purpose of literacy education is to prepare the individual to be able to acquire knowledge — obviously including knowledge for productive pursuits. In the realm of impartation of knowledge, therefore, one must bear in mind that such knowledge must be of "social and situational relevance".  

A vague recognition of social facts and aspirations is not enough — the implications in educational programming must be spelled out in rigorous

7 Myrdal, G., op. cit., p. 186.
details.

Since agriculture is the predominant mode of production, the foundation of an objective approach to nature must be laid at the primary level. The malleability of the young mind must no more be vitiated with the hard task of 'parroting' unnecessary foreign languages like Arabic, Urdu or English, or the incredible task of memorizing the Holy Book comprised of thirty chapters in an unintelligible language. Instead, the plasticity of the young should be utilized towards understanding and grasping of the simple laws of nature particularly in biology and the soil. Social and spiritual virtues such as regular and constructive habits, inquisitive and experimental outlook, delight in imagination, respect for accuracy and perfection, a sense of balance between the self, the family and the society, and, above all, respect for manual labour and 'contentment with less' must be cultivated at the primary age. One must also be reminded that no cerebral knowledge is complete without the experience of the five senses including manual dexterity. This means work-experience must be introduced as early as possible as an integral part of knowledge.

Obviously the existing curriculum which is unwarrantedly academic needs to be thoroughly reformed. The ultimate aim is to mould the new mind, the new generation and eventually the new society where pragmatism and egalitarianism will be the two cardinal principles of life and living. But the obstacles to such a reform are
The credulous religious fanatics as well as the reactionary elites will use all their powers to oppose humanizing and rationalizing education. Past experience from India suggests that the most conservative sections of society will succeed in their opposition unless the Government stands firm in the promotion and control of the reformed institutions of education.

As mentioned already, efforts in primary education must be paralleled by a vigorous effort in adult education. The type of adult education needed in Bangladesh is mainly to foster an environment for social, economic and technocultural revolution. Therefore much of the experience in adult education in the developed countries is irrelevant for application in Bangladesh. Adult education here should mean an education of a different type primarily directed towards opening the 'shut mind' of the peasant, who now plays a passive role in society and is the subject of prejudices, superstitions and ignorance, and injecting rationality, objectivity and receptivity. The lack of which is working at present as a complex of obstacles to productivity and economic development.

It must never be forgotten that learning, more precisely adult learning, is facilitated by the presence of motivation. Obviously motivation is aroused when learning has a utilitarian purpose. Therefore adult education in rural Bangladesh should consist of teaching of improved agricultural techniques such as preparation
of the soil, preparation of compost, principles of crop rotation and the like. Simultaneously the rural adult must also be taught the basic principles of simple accounting so that he can keep a record of his own domestic economics as well as understand the bases of communal economic management. Thus fair participation and fair share in the cooperative will be ensured and chances of exploitation or cheating will be much reduced.

Dissemination of information on the relative advantages and disadvantages of different types of crops, livestock, poultry and fish would be of immense value. At the same time knowledge about the national as well as international needs would enable the peasants to plan their patterns of production.

Another important area of imparting utilitarian adult education is rural crafts and industries. Rural crafts and industries such as weaving, pottery making, woodworking and carpentry, blacksmithing, in the past created self-sufficiency in the villages and at the same time provided a rich experience of creativity, self-expression, pride of achievement and a mastery of techniques. But such industries and crafts are in the doldrums at present for various reasons as noted elsewhere in this work. For the sake of national self-sufficiency and self-reliance these crafts and industries must be revived. The main task in this field is to help to increase the efficiency and competence in the techniques involved through the aid of modern knowledge and
perhaps design principles. So far as craft production for the world market is concerned (of which there is great scope), the community should be given information on the current fashions in world demands for handmade items.

Adult education must also include education for social development emphasizing such fundamental areas as nutrition, personal hygiene, public health and family planning. The notorious imbalance in the national diet (that is, too much of rice and grossly disproportionate amount of vegetables which can be had at practically no extra cost) can be and must be rectified at the earliest. This would save the country a substantial amount on curative measures where an individual sense of responsibilities in safeguarding public health is painfully absent. The mass of the people must be delivered out of their credulous belief that epidemics are the scourge of God; and must be educated to understand that epidemics can be controlled and are best controlled by cooperative human efforts.

In family planning programmes the biggest obstacle encountered is that of the people’s religious beliefs. The most common conviction is that family planning is anti-religious because the practice destroys life and that it is tantamount to acting above the supremacy of God. The answer to this is simply to explain to people convincingly that family planning in no way implies the killing of life but that it is an act of preventing too many lives from coming into being so that the limited number of human lives can be raised in the best manner as desired by Him.
And further that there are suggestions in the Holy Book asking one to 'cut his coat according to his cloth'. Unless the 'shut mind' of the millions is unlocked with such simple but convincing reasonings, no technical programme in family planning will succeed however wide and vigorous it may be.

Adult social education is also necessary for promoting an informed responsible citizenry, vis-a-vis the community development movement, together with which they constitute the vehicles of self-sustained development. The implications of disunity, strict individualism and inequality must be unfolded in front of the community and the indispensability of cooperative methods of production explained before any large-scale consolidation and pooling of land is attempted.*

* Communalization of rural China, which in fact was primarily exercises in agrarian socialism, was accomplished in several stages. At first small groups of peasant cultivators were induced to share their tools and draught animals, without involving the pooling of small private agricultural plots. The small groups of peasants, the 'Mutual Aid Teams', ran stock in common and helped each other in their farming chores. Thus they were able to do timely cropping, adopt better crop rotation and land utilization. These mutual aid teams grew into 'Semi-Socialist Co-operatives' which carried out mutual aid in a more integrated manner. The advantages of larger scale cooperation for irrigation and canal building and for water conservation works were soon recognized, and the merger of cooperatives into embryonic communes followed in some areas in the form of 'Advanced Socialist Co-operatives'. Finally, in the 'Great Leap Forward' the old administrative units were changed to executive bodies concerned with planning and production when the advanced cooperatives were regrouped into 'Peoples Communes' which were able to undertake wide ranging programmes of water management, land use rationalization, use of fertilizers, improvement of crops, and to begin social improvements.
Without creating a collective consciousness on the urgency of collective efforts, no significant achievement from the proposed system could be expected, rather the contrary. People must also be told that public immorality can no longer be condoned and that the ruling coterie and their beneficiaries can no longer exploit when the peasants are united and able to manage their own affairs. Only through such education can the grass-roots training ground for democracy be established.

In a newly emerged country like Bangladesh where the common concern for social cohesion and national unity is at its lowest ebb, it must be realized most fundamentally that all development efforts will be stultified unless the nation is truly united. It is important to recall here that community cohesion is maintained by a continuity of social heritage and cultural tradition, and that cultural disintegration is activated by the lack of group activities. In respect of cultural continuity it must however be noted that there are archaic elements in the culture which are no longer meaningful, and are in fact pernicious obstacles to rational development, such as dowry or bride-price direct or indirect, prodigal wedding ceremonies, circumcision and numerous other social festivities which demand ostentatious economic waste. The wastefulness of such practices should be impressed upon the people with strong and clear logic so that such

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anti-development practices are minimized without delay. On the other hand, socially transmitted values like loyalty and obedience, tolerance and sharing, and frugality in domestic living, must be nurtured and protected against the invasion of vulgar and soulless 'modern' values such as high individuation and selfishness, with the acquisition of material possessions and physical comforts as the sole aim of life. At the same time group activities, be it in harvesting or canal digging, folk drama or religious congregation must be encouraged widely as a part of community living.

"Self-reliance and autonomy of community can be maintained," asserts Shrimati Lakshmi Menon, "when they (the people) are knit together by common needs and common participation in group activities."10

It is well established that the 'community development' approach can contribute immeasurably to such ends as the promotion of social education, building up of democratic institutions, improvement of health, nutrition and sanitation, and subsequently the development of agriculture and rural industries. Community development has emerged in many countries as an essential part of overall national plans and there is an increased recognition of the role of community development in national economic development in particular.11 In Bangladesh also this is recognized in the form of Urban Community Development projects. But

10 Menon, Shrimati L., op. cit., p. 139.
11 UN; Community Development and National Development, Department of Economic and Social Affairs, New York, 1963.
obviously if community development approach is to facilitate social change and development, it must start vigorously at the end where it is most needed. The current efforts in community development must be delivered out of the narrow realm of 'urban problem' and must be channelled to the rural world where more than 90% of the population lives.

The issue of universal primary and adult education is followed by a much more complex issue of secondary and higher education. Decisions about the proportion of secondary and tertiary education is no doubt important, but more crucially important is what will be taught at these levels.

First the question of quantity. In relation to quantity the valid observations are that if there is too little, it is bad because it breeds class differentiation. If it is too much too quickly it is bad because it creates unemployment. If it expands leisurely then also it is bad because it delays fast development. The most important axiom to note is that a disproportionate amount of education is more wasteful of human and economic resources than too little.¹²

The first task therefore is to estimate how many people are needed at each stage of development to promote a balanced movement of the economy and society without incurring any large-scale unemployment of educated persons with the wrong sort of expertise. This is obviously a

¹² Curle, Adam, op. cit., ch. IX.
hard task demanding calculations based on unavailable data. The formula devised by Professor W.A. Lewis* for calculating the proportion of population who should be in secondary and tertiary education is not operable in Bangladesh because the required information in the potential or real job sectors (primary, secondary, tertiary) are not carefully worked out in the national plan. Nevertheless, the general principle implied is easy to understand: as the main economic activity (current or future) is agriculture, it is agriculture which must be helped through educated manpower, and it is only in agriculture that there will be the capacity to absorb wide range of educated manpower. Similarly, the relative weight of the different economic sectors (current and future) must be identified and the required manpower raised accordingly. This in itself will require that hard and careful calculations be made by carefully trained personnel.

* Professor Lewis has put forward the following formula:

\[ x = \frac{n(a + b + c)}{m} \]

where \( x \) = proportion of age cohort to be recruited

- \( n \) = ratio of number of secondary type jobs to adult population
- \( m \) = ratio of number of age cohort to adult population
- \( a \) = normal percentage wastage of nationals
- \( b \) = abnormal wastage due to replacement of expatriates
- \( c \) = percentage of rate of growth in number of secondary type jobs.

But the question which will persist is that of how to decide, on a fair basis, who is to go in for what type of education. Given the current values and the goals of schooling, most of the prospective entrants would want to go to the tertiary job sector, for non-productive white collar jobs. This problem can perhaps be solved by a sieving process of less formalized method of evaluating potentials and aptitude test as suggested by Professor Adam Curle. And also by eliminating the returns and security currently offered to the holders of office jobs by making all jobs proportionately remunerative on the basis of their position in relation to urgent national needs. Still other strategies of neutralizing the 'pool factor' for urban jobs may lie in a policy of industrial or urban decentralization and the provision of compensation for rural living. But the actual danger lies in the possibility of having created stultifying cleavages in the process. After all, no education system should ever introduce elements that perpetuate differences among groups. On the contrary the system should forge ever growing bonds of unity, cooperation and understanding. This brings us to the question of what is to be taught, for how long and how effectively.

In the foregoing discussion it is implied that two types of youth training should dominate the realm of secondary education; they are:

(i) training for services for the improvement of agriculture;
(ii) training for services in various non-agricultural crafts, trades and industry (urban and/or rural).

In the context of education in the Latin American countries Thomas Balogh stated very straightforwardly that "the problem is not to produce geniuses capable of extending the frontiers of knowledge...it is rather to have an educated system capable of inculcating people's minds with the simple knowledge of agriculture and biology as of 1910! You could then double, treble and quadruple agricultural output."\(^{13}\)

This principle is equally valid for Bangladesh also. Whether in agriculture or industry, education must be down-to-earth appropriate as opposed to complex and sophisticated. The cardinal principles of secondary education should be not only to impart knowledge of certain relevant skills or techniques but also to prepare the students to grasp the meaning and significance of what they are learning. Young people must be made aware of the main features of the economy and society and awakened as to the contribution that is demanded from them for the sake of national survival and progress.

The biggest evil that the secondary education must set out to eliminate is the bane of existing elitist attitudes. Towards this end the principle of part-work and part-study, as in China, is of particular relevance. In order to enable students to find out relevance of education as well as to share in productive labour, schools may be assigned to farms, factories or workshops

\(^{13}\) As quoted by Livingstone, A., *op. cit.*, p. 23.
whereby students along with their teachers would return to farms or factories from year to year to learn as well as to contribute ideas from their studies. On this basis 'ivory-tower' education may be dismantled and the new education will be brought to the point of application to the problems of national development. In this way participation of peasants and workers would be enlisted in the process of learning and would make their contribution to the education and to the integration of youth into society. Further, local needs and problems would inevitably be incorporated in the revision and up-dating of curricula and text books. Thus a true democratization of the educational system would be achieved and the possibility of creating two incompatible streams greatly minimized.

The curriculum of the secondary school should be so designed that it will be whole and complete in itself without the necessity of complementary university education. At the completion of secondary school all young men, fully equipped with the knowledge both theoretical and practical to do their jobs, should enter professional life in agriculture or in industry. The particular requirements of girls could be taken care of through the provision of courses in home economics, child care, specially in child (primary) education and productively in aspects of agricultural production such as horticulture and fish farming. And perhaps the whole cadre of clerks which demands no physical labour might be raised from amongst girls. But in the process the
scope of their emancipation should in no way be denied. The main streams of secondary education must be kept open to girls as well as to boys. It may be recalled here that the girls in China have succeeded in 'woman's liberation' not by campaigning but by participating in the man's world through competitive competence.

The services of girls are most desperately needed in the field of nursing. At a time when planned development of hospitals in then East Pakistan required 1000 nurses by 1960, there were only about 120 qualified nurses and the rate of training was 10 per year. The most notorious obstacle in raising trained nurses is not the absence of training facilities as such, but the social stigma attached to the profession. The imperatives therefore are clear: glamourize the profession by material incentives and by raising its status in the civil service structure, and make the profession much more respectable by awarding national honours as well as by education of the society itself. Without creating favourable conditions it is difficult to see how more and more intelligent girls could be attracted to this urgently needed service cadre. Another effective way of improving the situation of nursing profession may comprise of measures by which nursing training is made a pre-qualification for the training of doctors. From the pool of nurses selection could be made for the education of doctors, on the basis of individual potentialities, aptitude and sense of dedication.
In relation to quality of secondary education sufficient safeguards must be provided against wastage in the form of student failures, year-repeating or dropping out. This means that the quality of education must be strengthened and intensified. The task is in fact easier than it might appear, at first sight. Curtailment of quantity in secondary education of the literary and academic type would save resources (men and materials) which could be diverted towards the desired channel. There is no reason why the urgently needed professional, vocational and technical training should not be increased substantially by the reorientation of existing resources. More resources could be obtained by stabilizing or even decreasing the resources presently dedicated to tertiary education. There is no reason why urgently needed professional, vocational and technical training should not be expanded as required on a top priority basis, but to be effective a larger share of national resource allocation may be necessary. This is an element of pre-investment which no country aspiring to develop can afford to by-pass.

The policy imperatives in secondary education almost simultaneously delineates the policy in tertiary education. Tertiary (university) education must be de-emphasized and the 'top' of the top-heavy structure must be pruned. This means reducing the size of university enrolment without delay. Obviously the solution of the country's problems is not to be found in an army of B.A.s and M.A.s
particularly those of literary/academic type. Nevertheless, the need for highly competent specialists in agriculture or engineering, administration or social sciences cannot be denied. There must be some knowledgeable and experienced people available at every stage to steer the country through changes to the complex web of social, economic, administrative and diplomatic systems. Such men of wisdom and extraordinary competence are, as yet, unlikely to be trained outwith the university. Obviously the numbers must be kept low and the guiding force must be 'practical relevance and competence'.

Since secondary education is intended to be self-terminating, the selection of students for university education must be based on non-conventional criteria. In any case wisdom and intelligence are hardly tested by the conventional university entry qualifications. Thus recruitment of students for university education must be from those young men who have already served the community for some prescribed length of time and thus have proved their worth in social as well as intellectual terms. Obviously the selection must be carried out within the community in which the prospective entrant has worked - who else could better judge the qualities mentioned than the community itself? Still, in order to make sure that the university entrant does not become alienated from the basic issues of community development, it is prudent in a peasant agriculture dominated society to introduce a
system in which every university student is required to undergo a prescribed period of living-working-earning in the rural areas, without the satisfactory completion of which no degree may be allowed.

University teaching as a system of rigid, didactic, one-way communication of information from the lecturer to the student should be discontinued and replaced by a system wherein mutual enlightenment is to become the only goal, through mutual study, discussion, criticism and synthesis. The conventional competitive examination system should be greatly modified and a new approach towards assessing students' achievements should be developed which does not weigh academic brilliance alone but more to assess synoptic intelligence - the key to wisdom.

In the engineering sciences in particular the students should be required to spend a substantial part of their time in factories and workshops in order to develop familiarity with the problems of scientific appliances and engineering components required by the production systems in the country. It is also imperative to induce more enthusiastic and talented persons to take up the challenges of agricultural engineering and agricultural sciences. Sufficient volume of research, particularly in geology, hydrology, biology and botany, and in sociology, must be encouraged, not akin to the self-promoting activity of western academics but grounded in the problems of the country so that appropriate materials
for teaching at all levels are developed indigenously.

Perhaps the greatest role of the university lies in preparing the teachers who will educate the young who will be concerned with implementing the development works throughout the country. The aim of social, economic and cultural revolution through education will remain ever unfulfilled without teachers who are dedicated, enthusiastic, dynamic and imbued with the zeal to disseminate useful information and practical knowledge towards the solution of the basic national problems. The institutes for teacher training, strategically important as they are for educational reform, are at present static in concept, 'technical' in nature and away from the processes of intellectual fermentation. This isolation of the world of teacher training cannot be allowed to persist any longer. While the university is envisaged (in this present work) to serve as the fountainhead of intellectual ferment for the healthy growth of the entire nation, the teacher training institutes must be brought closer to the university. This means that teacher training should be made a major function of the university which will impart the basic inputs of appropriate knowledge, information and philosophy to the thousands of prospective secondary and primary school teachers, and also offer refresher and reinforcement courses from time to time. The teachers will then be able to generate technical and moral energies among their students who are so vital for the development of the country.
Teacher training demands much more serious and careful attention than is commonly deemed fit, for not only in their role as educators are they of crucial importance but the image they create in the community is of profound significance. Their integrity and social consciousness, their sacrifice and dedication will work as ideals for others in the community to emulate. But obviously such ideals cannot be expected to flow from persons or groups who are victims of a system that awards them low salaries, low status and gross underprivilege. The imperative, therefore, is to educate appropriately, remunerate adequately and provide for continuous updating of their knowledge and values. The teachers who are satisfied with their economic conditions and social status and who are confident in terms of required knowledge and information will be able to contribute most effectively as intellectual and moral leaders of their communities.

By and large, the intellectuals in the country so far have not demonstrated any positive concern for social reconstruction. Many of them appear to have had their conscience compromised in such a way that they have withdrawn from taking up issues which would displease those in power but which are otherwise crucial in relation to social redevelopment. Apparently the intelligentsia and the academicians are bent on being 'successful'. They are not seen to be firm adherents to any principle; nor do they express views on the importance of social
contribution in terms of ideas and ideals. Success in life has come to mean ascent through the ladder of promotions and not the contribution to the solution of the country's problems.

Some of the intellectuals of Bangladesh style themselves as socialists and champions of the poor, but their life style is not in conformity with their professed feelings for the dispossessed. Socialism becomes a slogan - not belief to be enacted in the real life situation. Unless one does what one preaches, such preaching will be ineffective.

Intellectuals are potential galvanizers. They can generate the dynamics of progress and as such they owe a great deal to society in this respect as their return for their intellectual freedom. But in order to be constructive within their society they must first of all de-westernize their conceptual predispositions and be ready to venture from their 'ivory towers' which have for so long isolated them from the rest of society. Still others who are intellectually committed to this or that ideology, must test their ideas in the field of reality and help build up the strategy of survival today and tomorrow. If they do not meet the needs of the situation, they will be seen betraying the society in a unique way.

It can hardly be an exaggeration to assert that the entire future of the country depends on what is done in terms of open social education of the nation. At
present the one-party government of Bangladesh has a unique initial advantage. It can use the entire educational and communication system to preach the urgent gospel - a development war by all for the benefit of all. The task is easier here because the government and the party in their due sincerity and earnestness still can call for the sacrifice and obedience from all corners of society that is necessary for the task of nation building and survival. But before expecting anything from the people or even from the intelligentsia, the leaders in the party must set the example of austerity, self-reliance and hard work. They must also forego their lust for personal power and the comforts of life. Their life styles and those of their families must, before anybody else, reflect the ideals of socialism and nationalism which they so ardently preach. Leaders become worth following only by practising what they preach. The people's level of content will never be set low when they will find their leaders taking more and more from the economic system and dwelling in luxury. The people will never feel united as long as their leaders are immersed in fundamental political conflict. Besides, the constant political bickering and turmoil in leadership in the past should be enough to show that such conditions of social and political instability only kill individual initiative. Therefore for the sake of creating a unified national development front the politicians must resolve their differences and work unitedly.
The charisma of a solid leadership, even with overtones of a cult of personality, has a profound role to play in arousing the dynamism of the people and creating heightened awareness and mass involvement. The thoughts of Chairman Mao, like the words of the Meiji emperor, have been perhaps the most potent sources of building the 'national mind' in Asia. The achievements of Mao re-affirm that even when philosophic dogmas and principles may fail while the words of the charismatic leader produces spectacular results. Bangladesh is fortunate both in having the personality who can ignite the fire, and in having a number of other unifying factors - common written and spoken language, common script and literature, integrative culture, have all helped to prepare the stage for national unity. These integrative elements need to be unified before it is too late. The national leader with his charisma and skill is well qualified to do the job. Through his unique capacity of effective communication (like that of March 7, 1971) to the people he is able to mobilize the people throughout the nation. Only a central monolithic teaching from a charismatic figure like Sheik Mujib can deliver the common message to all equally forcefully.

A down-to-earth analysis of all the problems in Bangladesh leaves no room to doubt that the prospects of

survival and any progress at all in the country depend on what is done in education in the next decade. Education, not only of the formal type, but in its widest connotation as outlined above. The failures of India* in this particular respect is a monumental lesson for not only Bangladesh but all other countries with colonial heritage.

It must also be said, as a warning, that in the field of education, perhaps more than in any other field, foreign advice, and in many respects foreign aid also, is likely to be so inappropriate as to do more harm than good.

* Failures of India in education are many. India's educational system has failed to produce the type of people required for development, hence large scale unemployment of both high school and higher education graduates. This is due to the more fundamental failure to change attitude towards education and the concept of prestige attached to jobs. In India the effective leadership, organization, motivation and mobilization essential for social change on a national scale is largely lacking. As a result Indian society is still characterized by a sense of insecurity, suspicion, apathy, lack of interest, conflicts in interest and so on.

The achievements of China on the other hand prove beyond doubt that a generally literate, enlightened, vigorous and relevantly skilled people may not be spectacular monuments of progress as an atomic reactor but their contribution is infinitely greater and lasting. China has effectively linked up her educational and manpower planning with the requirements of national production. Besides, human forces such as the spirit of nationalism, pride, dedication, loyalty, cooperation, willingness to work, have been galvanized into productive operation on a national scale. Barry Richman has explained the differential rate of success between India and China in the light of the differences in the educational aim, method and accomplishments of these two big countries. See Richman, B., Economic Development in China and India, Pacific Affairs, Vol. 45, No. 1, Spring 1972, pp. 75-88.
All thinking, innovation and planning should then be endogenous. Even so, a plan will be no substitute for action. Despite the proposal of the Indian Education Commission for radical reforms hardly anything has been achieved. Determined action is indispensable without which a plan, however brilliant, will only increase the load on the planners' shelves.
Chapter 22

OVERALL SETTLEMENT POLICY

In Chapter 5 we have seen that the sheer magnitude of population explosion in the face of fixed land resources and static productivity will bring about, in the ensuing future, a problem of unsurmountable dimensions in the form of explosion of the urban population. *Prima facie* the impending phenomenon may appear as typically symptomatic of the Third World countries. But on closer examination the situation in Bangladesh will stand out uniquely dreadful. In a conference on the phenomenon of exploding cities held at Oxford (in April 1974), it was limelighted by Lady Jackson and others that between 1950 and 2000 the towns in the developing countries will go through an explosion - their population will inflate four times from 500 million to 2200 million while their counterpart rural population will increase two-fold. In Bangladesh the future of the towns and cities appears to be inconceivably frightening as indicated by thirty times increase during the same period, at a rate of doubling the size every ten years. Yet at the end of the period cities will contain only 30% of the total population.

Unbelievable though it may sound, the process has already begun and the trend well identifiable. Between 1951–61 urban population had nearly doubled despite the slow tempo of industrial development; and between
1961-74 it has more than doubled again. What is more significant to note is that remarkable growth is taking place in few selected urban centres. In 1951 there were only two urban centres with population of 100,000 or more, namely Dacca and Chittagong; in 1961 the number of such centres increased to four with a rate of growth as high as 203% in Khulna and 123% in Narayanganj, a twin city of Dacca. On the basis of the provisional results of the recent census it is reported that between 1961 and 1974 the population of Khulna Municipal area has erupted by an increase of 439% and that of Dacca-Narayanganj by 353%. Personal reports from these cities are not in disagreement with the census results. If the present trend continues, urban expansion cannot be visualized outside the limits of existing geographical concentrations. This means the major brunt of the impending urban explosion will fall on Dacca-Narayanganj, Chittagong and Khulna. One cannot be far too wrong in suggesting that these three centres will inflate up to a size of about 10 to 15 million each by the turn of the century.

Whether such a pattern of urban growth in general is desirable or not will be examined later. But the state of the economy of Bangladesh makes it impossible to sustain such magnitude of urban growth.  

In a country which is engrossed by the triple spectre of poverty, population explosion and environmental vagaries,

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and where more than 65% of the public expenditure is dependent on foreign aid/loan, conventional urban build-up which is invariably expensive is out of the question. Besides, the resource endowment does not permit urban development of the industrial type. There is hardly any mineral resources in the country with which to build up an urban/industrial base. Moreover, the conventional educational system has contained little that is appropriate to the responsibilities involved in the various aspects of industrial method of production. Lower levels jobs have to be manned largely by unskilled labour migrating from the rural areas. Thus the country has little skilled manpower resources to build an industrial workshop. Nor is there any valid reason to be obsessed with the urban/industrial model of development at this stage.

Nevertheless, the exponential rise of population and the staggering man-land ratio alone warrant the establishment of a coherent, comprehensive and optimal system of landuse and settlements. The question of population size and distribution is important because under any set of circumstances this is a fundamental human influence determining the quality of life at any time or space. Too many people with too little resources result in a number of serious problems such as worsening standard of living, deteriorating environment, falling productivity, all of which affect the national economy. Therefore the question of population-resource distribution vis-a-vis overall settlement development in itself demands the most
urgent attention.

An optimal population distribution will conceivably depend upon a sensibly worked out development strategy and an appropriately corresponding settlement policy. However, before embarking on policy discussions certain conceptual clarification and reorientation are necessary.

In the process of social evolution man's settlement pattern has shown great dependence on the pattern of his economic activities. Archaeology and social anthropology, as well as the history of planning have together yielded enough information to suggest that human habitation has closely followed and responded to his economic pursuits and to the available resources at different stages, such as collection/gathering economies, pastoral/nomadic economies, agricultural/settled village economies, mercantile/town economies and finally the industrial/metropolitan economies. These stages identifiable as they are may not be exclusive in relation to time or space, nor necessarily successive stages but the relevance of these different types of activities to different patterns of habitation is undeniable.

The distinguished works of Henry Pirenne, Lewis Mumford and Gideon Sjoberg and others, clearly suggest that in the social evolution of man, settlement agglomeration of the 'urban' type has been a function of such factors as (a) control of the natural environment in order to obtain the necessities of survival (food, fibre and shelter), (b) a favourable man-land-technology
relationship whereby a surplus in basic necessities could be produced and subsequently a group of people could be released from land to engage in crafts and other trades (division of labour); and (c) a system of economic exchange based on the division of labour between human groups and physical spaces.

Further, the history of industrial cities makes it clear that in addition to the availability of new energy and material resources, the characteristic agglomeration of population and habitation was both an antecedent and a consequence of accelerated surpluses in agriculture. And that the metropolitan city is the outcome of revolutionary technological efficiency in the field of production and distribution both in agriculture and industry.

Having examined the various approaches so far developed in understanding the phenomenon of urbanization, Professor Hauser identifies one aspect in common in both the deductive and empirical approaches, that is, the city as the dependent variable with the forces accounting for the pattern being the independent variables.² It is also implicit in the studies of man's urban revolution that unceasing population concentration has not been the goal, neither in the sense of proliferation of the points of concentration nor in the increase in the size of an

individual concentration point which in either case generated the inordinately complex mechanism of economic and social organization so characteristic of the contemporary western urbanism. Nevertheless, the city in industrial civilization remains a product of economic advance and has become in turn itself a force of further economic advance. However, after having gone through a period of half a century or more of metropolitan/industrial way of life for the majority of the people, the urbanized countries are now feverishly realizing that unregulated urbanism is raising many apparently unsurmountable problems. Of late, the most urbanized countries are admitting that in the process of continuous urbanization, uncontrollable havoc has been unleashed and the world has become a less desirable place in which to live.

"Seldom in the past have crises been as visible as they are now and seldom in the past have the problems of city and environment concerned us as they do now."4

These fears are now expressed in such blunt language as:

"The principal defect of the industrial way of life with its ethos of expansion is that it is not sustainable...its termination within a lifetime of someone born today is inevitable."5

Another clarification needed at the conceptual level is that of the ratio of population and resources. The

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3 Hauser, P.M., op. cit., p. 19.


developing countries of today have a much adverse ratio of population versus resources than that faced by the developed countries in their formative stages. In the developed countries the demographic upsurge began after the economic breakthrough had occurred. Besides, the developing countries today cannot conceive the idea of seeking additional resources from some prospective colonies or of securing unrivalled markets such as in the case of the now developed countries provided a major financial trigger to an urban revolution of the modern type.

On the part of the Third World countries, therefore, what is most crucially important to keep in mind is that the normal and hence most desirable course of development is that when a country's agricultural production, particularly in food, exceeds the consumption requirement of its population. This together with other favourable circumstances such as a promising rate of capital formation, cheap and ensured supply of industrial raw material and energy, and a competitive market for industrial goods, then and then only urban/industrial centres should be encouraged to grow. Still, much of the goods and services which the urban sector would produce, must contribute a good deal to the further productivity of agriculture. Only this normal and complementary urban growth should be permitted and no further. That is, urban growth should be strictly a function of rural surplus, and also should support the rural sector.
In contradistinction to these principles there seems to be a characteristic situation in the Third World countries where the urban population is unceasingly becoming larger than is sustainable by the degree of their resource development. A number of factors are responsible for such a self-destructive imbalance. First the evils of modelism are all too apparent. Clearly the colossal urban explosion has been contingent upon public investments which were undoubtedly inspired by the theory of 'deliberate imbalance' as an hypothetical mechanism of creating increasingly higher levels of regional equilibrium (Albert Hirschman), as well as the theory of 'growth pole' (John Friedman). On the other hand, the process of urbanization and economic development of the west, the conventional model, was mal-observed as being a process of manufacturing, trade and commerce alone. There has been an apparent failure in appreciating that increased productivity in agriculture in the western countries freed growing proportion of resources and labour to be engaged in the manufacturing and service sectors, and that, in this way, the cities in the west have had a strong economic footing: a foundation in industry and commerce and a support from the agricultural surplus resulting from an ever increasing agricultural productivity which in itself was the result of industrial development. Such an incomplete view of the development experience of the west served as the model for Third World countries to follow. Partly due to the obsession towards the
models on the part of the developing countries themselves and partly because of the international political-economic-technological network mechanism, urbanism has come to be adopted in the poor Third World countries regardless of their means and resources.

Under such circumstances neglect of agriculture followed almost automatically. Consequently the burden of stagnant agriculture has put a heavy brake on the advancement of industry. This is particularly the case in Bangladesh where industry is inescapably tied to the agricultural sector. Static agriculture is forcing labour to migrate to towns. This exodus could perhaps be tolerated if the cities had the capacity to draw off enough surplus labour from the rural areas and thus offer a relief to the countryside provided always that the food situation was comfortable.* But obviously the cities are unable to offer unlimited economic opportunities because their economic performance itself is dependent on the surplus of rural production both in terms of food supplies and raw materials. Moreover, the productivity in the incipient industry is taking place at the cost of labour displacement through the adoption of a socially inappropriate capital intensive technology. Thus there is a situation where exists a mutually exclusive dual economy

* Still one would be prudent to take note of the warning sounded by Haswell in the context of India that removal of sizeable numbers of agricultural workers would result in a significant decrease in output. - Haswell, M.R.; Economics of Development in Village India, Routledge & Kegan Paul, London, 1967, p. 70.
both equally static in terms of labour absorption. The inevitable result is unemployable labour both in the urban and the rural sector. In the face of unabated population growth the situation has become a vicious spiral in itself, manifest in the ever falling standard of living in both urban and rural areas, sub-human conditions of living in the urban areas commensurate with a contrasting elite - a situation described by T.G. McGee as "urban involution".6

One more abnormality that has been created in the process is that a so-called tertiary sector has been born (redundant for the present stage)\(^x\) in the form of domestic servants, charwomen, occasional porters, load-bearers and vendors, and at a little higher level the incredible number of peons and junior clerks. Altogether such service people are saving labour and time for only those who have nothing to do with much of their time any way such as the upper income housewives and the senior clerks and their elitist bosses. Unlike the matured urban economies of the industrial societies, the so-called tertiary sector

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6 McGee, T.G.; Urbanization Process in the Third World Countries, G. Bell & Sons Ltd., London, 1971, Ch. 3.

\(^x\) It is necessary to point out that the proportion of primary, secondary and tertiary employment in the developed western economies is a consequence of economic evolution towards maturity, not a condition for maturity itself. In this connection Professor Edmundo Flores suggests that institutions and incentives should be devised, nurtured and patronized in order to anchoring the farm population in rural areas until they can be productively employed elsewhere. See Flores, E.; Priorities in Agricultural Production and Rural Industry, in Robinson, R. (ed.), Developing the Third World, Commonwealth Series, Cambridge University Press, Cambridge, 1971, p. 148.
in the developing countries is largely unproductive and
is fostering elitism for certain social groups. Although
many social researchers have expressed concern over the
situation as being politically volatile, a mechanism of
minuscule distribution is seemingly involved in the
process and as such some urban elites are boastful of
their marginal contribution. The system works
resiliently against any revolutionary change. The
imperceptible distribution involved, in the face of utter
desperation of the deprived however small it may be, is
enough to pacify the forces of major social unrest at
least for the time being and thus maintain the status quo
against appeals for economic sense and social decency.

One school of economic thought (Hirschman and others)
try to offer some comfort with consolatory suggestions.
They suggest that the incipient imbalance will be
liquidated and the lacuna in the field of productive
employment will be filled in with increasing productivity
and wealth in the society which will trickle down all
over and smooth out all the differences both inter-
regionally and intra-regionally, meaning that eventually
the population in the agricultural sector will be drained
off to an optimal minimum and overall urbanization will
expand so as to bring about a new equilibrium in the
space economy. But obviously this prophecy has long
failed in Third World countries and cannot be expected
to work miracles in the future due to the reasons
discussed earlier that stagnant agriculture in these
countries itself acts as a drag on industrial/urban development.

Clearly, therefore, there is an imperative need for full, uninhibited and down-to-earth understanding of the underlying forces for economic development in each individual circumstance, so as to provide an appropriate policy of action for settlement development and/or urbanization. In the event of disregard for such understanding serious diseconomies in planning the settlement pattern, as well as the whole development effort, are bound to result. The first questions to ask are: urbanization for what, with what resources, to what extent and where? In this connection a profound insight can be gained by reviewing Chinese experience which is at once unorthodox, in the light of conventional theories, but starkly meaningful and appropriate to the circumstances of low income countries. Perhaps relevant also to many other similar situations regardless of the political ideology and state of economic development.

In the First Five Year Plan (1953-57) Chinese leaders uncritically adopted the Soviet model of industrialization and emphasized rapid build-up of heavy industry on a large scale using capital intensive techniques. The technological spectrum of such large-scale industries altogether precluded small-scale, labour-intensive options. The result was stunningly disappointing to the Chinese themselves. The insignificant role assigned to small-scale local industry had serious backlash effects in terms of
local labour absorption, mass participation and resources. While the programme required heavy amount of capital outlay in equipment and skilled technical and managerial personnel, it did not generate enough opportunities for mass labour. The most serious consequences were felt in the inadequacy of supplies on the one hand and production of poor quality, high cost goods on the other, which further happened to be incompatible with the demand structure. Moreover, the very nature of the programme brought about urban concentration and cultural and economic inequality, and hence popular rejection followed such an unacceptable programme. It also became apparent that the growth of agriculture lagged behind the needs of the industrial sector. This, the Chinese leaders realized promptly, had to be overcome in order to ensure smooth and rapid development of industry. Quickly a large part of the industrial sector was diverted towards the production of modern agricultural equipment. Thus came the first departure from the Russian model. Small industry was now recognized as the principal activator in economic development on the realization that agriculture is the foundation and industry is the driving force (walking on two legs). With this reorientation the local industrial establishments were engaged in serving the needs of agricultural production and the rural population by making and repairing farm implements and tools, rural transport equipment, craftsmen's tools, processing fodder, seeds and fertilizers and producing
a wide range of everyday consumer goods including an adequate supply of building materials for the central government. 7

Thus the sole task of helping agriculture was assigned to the local industry. Ten years of single-minded practice have testified to the success of walking on two legs strategy. The advantages have been numerous: utilization of dispersed material resources, lower ratio of capital outlay, shorter gestation period, widespread local employment, creation of technological consciousness, skill and innovation at the grass-root level and thereby enhancing future labour productivity with least additional cost on labour training, and, above all, lower cost of urbanization, minimization of rural urban dichotomy and maintaining inter-regional balance and social equilibrium. Neville Maxwell recognizes that as the necessary first step the Chinese communists reconstructed rural society and economy, and thus laid the foundation for defusing the explosion of their cities. 8 Relocation of industries helped the rural economy and at once helped the cities to reduce in size or remain static. Simultaneously, Maxwell observes, the economic and social balance has been achieved by throwing the gravity back to the


8 Further by the use of ration cards for food grains (in adequate supply) and cotton fabrics, population movement has been controlled, and thus cities have been held or perhaps declined in size.
hinterland.

"China's achievements," comments Maxwell, "striking against the standard of her own past, are striking too against what other Third World countries have achieved." 8

China's lesson is of great relevance for those who care for the common good based on collective economic freedom and mutual uplift. It will be a naive gesture and sheer loss if such valuable lesson is scrapped as being "communist". There is no wisdom in not learning from others' experience whosoever that other party may be.

So far as the case of development planning in Bangladesh is concerned, there is an overwhelming outcry, both at home and abroad, regarding the progressive imbalance between her land and people. There are more than enough reasons to be so concerned. But in the theoretical approach towards the problem it is generally assumed that there is no more room in the rural sector to absorb the incremental population - marginal labour productivity is close to zero and hence urban employment must be created. 3

8 Maxwell, N.; The Rebirth of Shanghai, The Sunday Times, April 4, 1974. (Neville Maxwell is a Senior Research Officer at the Institute of Commonwealth Studies, Oxford University. The article referred to above is based on a paper delivered at the Sunday Times-UN Conference on Exploding Cities in April 1974.)

3 This has been the declared stand of many including Professor J.R. James of the University of Sheffield who has personally visited Bangladesh and subsequently has made a contribution towards the solution of the man-land problem in the form of a fifty-page discussion paper entitled 'A Discussion Paper on Some Aspects of Town and Country Planning in Bangladesh' - unpublished mimeo, May 1973.
approach on several counts.

Firstly, though it is true that no other country in the world is in such adverse man-land ratio, it is also true that few countries have such low land productivity. Obviously, therefore, if land productivity is raised by improved agricultural practices, many more people will be absorbed (see Chapter 13).

Secondly, marginal labour productivity is close to zero because an additional manpower does not necessarily mean an additional unit of labour input in the field. If technology is devised and/or adapted with a view to raising productivity through higher labour absorption, the phenomenon of zero marginal productivity will be liquidated. Besides, it is not labour productivity which is strangulating Bangladesh but land productivity. Labour is no constraint in the country, so why worry about labour productivity?

Thirdly, it is not the lack of employment opportunities as such which is haunting the teeming millions in Bangladesh but the pangs of empty bellies which drive them to job hunting. What good would be employment if there was no food in the market to buy? One would perhaps argue that food could be bought from surplus countries with the foreign exchange that is to be earned by selling industrial goods. But obviously in view of the competition and tariffs in the world market, the products of an incipient industry have a very bleak future. Besides, the very proposition of buying food
from the surplus countries which are incidentally very high cost countries, must remain a luxurious dream, for a disadvantaged country like Bangladesh cannot be expected to generate enough foreign exchange to pay for the import of a substantial portion of her food requirements. Moreover, as said earlier, a country which is fast approaching bankruptcy, cannot and must not go for urban/industrial build up which is necessarily expensive both in terms of domestic currency and foreign exchange. Nor are there any industrial raw materials in Bangladesh except the agro-based raw materials like jute, sugar-cane or tobacco which are obviously in short supply.

Further, it is well known that generating urban employment is much more capital intensive, than rural employment, and this is precisely the reason why Third World countries are unable to provide employment of the preconceived type in the scale that is demanded by the situation. Still worse, the conventional industrial/urban technology is by and large labour-displacing. Automation is resorted to increasingly in the name of capital efficiency and quality standardization, and also for the ease of management. As a result total capital outlay fails to create the required number of jobs and urban unemployment and squalor overhangs as an ominous cloud of social unrest.

In the employment oriented approach there is still another danger of being trapped in the jargons of conventional economics such as overheads and wages, labour
productivity and output, rate of return, profit and capitalization, opportunity cost of capital and so on, which would becloud the whole decision-making process. If instead we approach the problem from the roots, i.e. food production requirements and other necessities for survival, then the imperatives become much more clear and pressing. This should be the guiding viewpoint for not only Bangladesh but all other countries in the Third World which are struggling for survival and any progress at all. Planning can claim to be 'rational' only by attending to 'first things first'. It may also be pointed out to those who would prefer the 'employment approach' that such a policy of development through agricultural/rural production would almost automatically take care of the 'employment' problem also (see Chapter 13).

The lessons for Bangladesh are clear and straightforward: first, the estimated goals in the most crucial items of production must be achieved through the adequate provision of the components of the 'package deal' (as elaborated in Chapters 16 to 21) as well as such other provisions as may be necessary to develop a reasonably satisfactory cultural and physical environment without which it will not be possible to keep the whole range of development personnel in the field required for the purpose. Service people (particularly their families) do not find any amenities in the rural areas and hence are unwilling to volunteer for a rural abode. Young and promising people move out of the arena of crucial
production not because they want an urban residence but because they want the opportunities of a fuller and better life. All round development measures are necessary, therefore, to create a progressive atmosphere in the rural area to hold the most urgently required people, i.e. the service personnel and the youth.

Second, modern public utilities and services are costly to provide and therefore require such locational policy which will bring the widest benefit to the largest number of people as opposed to the present trend where only an infinitesimal section of the population enjoy the benefits of modern amenities and services. Obviously the greater the number of such services can be grouped together in rationally located common service centres, the more economical it will be. Since there is an undeniable hierarchy in services, a range of hierarchical service centres will be needed - starting from the modest rural service and market centres, to the sub-regional towns, to the regional cities, and finally the national metropolis. Without such a policy the urban-rural conflict and imbalance cannot be mitigated, nor can the promises of social justice be fulfilled.

Third, the prospects of population and resources in Bangladesh and the appalling experiences of some dualistic societies such as India or Mexico makes an urgent demand that a viable balance between the urban and rural population and resources be worked out well in advance and constantly monitored; otherwise concentration of
resources in a few hands and still fewer places, and widespread wants and miseries will inevitably lead to disastrous social unrest.

Fourth, a country like Bangladesh in the nascent stages of industrialization has a great deal to learn from the costly mistakes of the industrialized-urbanized countries. Free play of market forces and the profiteering of the private entrepreneur has shaped the environment of those countries. But a high cost had to be paid and still higher costs are inevitable in the future. In the hope of higher economic efficiency, human settlements have been allowed to inflate, but now they become over-inflated and are suffering from inordinately high land values, acute congestion and blight, high cost of movement, and the incalculable price of urban nausea. Still worse, they are admittedly beyond any measure of re-ordering or management and are in a perpetual process of degradation. The physical maladies are paralleled by social diseases such as crime, violence, broken homes, and, above all, shameful social deprivations. What is more significant to note is that the bigger the size of agglomeration the higher is the rate of social pathogens. *

In the light of the above it is perhaps prudent to

* For documentary evidence see Watt, Kenneth E.F.; Costs of Urbanization, The Ecologist, Vol. 2, No. 2, February 1972, pp. 20-22. - Professor Watt reminds us that unlike in the past, a great deal of scientific attention is now being devoted to the analysis of data on the dynamics of cities and towns. "Now we are in a position," he writes, "to predict with accuracy the consequences of growing or not growing."
expel the term 'urbanization' from our conceptual predisposition and opt for such terms as 'settlement development' and/or 'development of the environment'. The term 'urbanization' as commonly used has a sinister connotation meaning city establishment and growth and/or population increase in the city resulting from both internal growth and immigration, as well as spatial expansion of the 'physical construct' itself. In this sense 'urban' would imply excessive agglomeration of settlements. This aspect is clearly insidious because 'urbanization' as a societal process of concentration of population and activities brings in its wake enormous complexities of organization in economy, technology, administration and politics. Besides, cities are the nodes in the environmental landscape where man's strongest interference with nature takes place. Cities are the climax where man alters to the highest degree the fundamentally essential resources of air, water, land and the fellow species, thus creating alien micro-systems which are continuously threatening the balance of the larger eco-system.*

We must also re-educate ourselves on how to prepare the foundation of a stable society that can be sustained indefinitely while providing for optimum satisfaction to

* It is out of such perilous threats that the Stockholm Conference on Environment in 1972 declared as a 'principle' that "the natural resources of the earth including the air, water, land, flora and fauna and specially representative samples of natural eco-systems must be safeguarded for the benefit of present and future generations through careful planning or management" - as quoted in Inter-economics, No. 9, 1972, p. 266.
its members. A Blue-print for Survival published in a widely circulated critical journal suggests that the principal conditions of a stable society are:

"(i) minimum disruption of ecological processes; (ii) maximum conservation of materials and energy - or an economy of stock rather than flow; (iii) a population in which recruitment equals loss; and (iv) a social system in which the individual can enjoy, rather than feel restricted by, the first three conditions." 9

A fundamental tool of laying the foundation of such society suggested in the 'Blue Print' is:

"decentralization of polity and economy at all levels and the formation of communities small enough to be reasonably self-regulating and self-supporting." 10

The soundness of such principles can hardly be questioned for it is well established that from the sociological viewpoint people grow most normally and fully in small communities while larger concentrations, lacking unity and mutual identification, abound in extreme individuation, aggression and dissension.

Happily, the socialistic aspirations of the new-born nation also demands that the potential source of any future disparity, tension or conflict between smaller and larger communities be defused at the start and a compromised settlement (see Fig. 22.1) be evolved whereby resources will be evenly distributed, communities will be self-manageable and no community will be belittled or threatened by the enormity of others.

10 Ibid., p. 8.
Fig. 22.1  Conceptual Arrangement of Settlement Hierarchies
The imperative action programme for Bangladesh that emerges from such policy discussions is that first of all the Thana centres, where the field staff for agricultural and other complementary development services will be stationed, should be developed primarily for the sake of ensuring the required agricultural production. As pointed out earlier, without some minimum amenities it will be impossible to retain the service personnel (public servants) in the rural areas. The parameters for Thana development are not, however, just the service personnel, their families and the related tertiary community. On the principles of rural stabilization and resource distribution the Thanas will have to provide social and economic amenities to their entire area of jurisdiction.

According to the current administrative arrangement there are 410 Thanas each covering about 156 villages on the average. On the basis of the prototype village unit (set out in Chapter 18) there should be about 178,000 people per Thana in 1975 and about 238,000 in 2000. It was also estimated that about 25% of rural families will have to be absorbed in non-agricultural rural livelihood programmes. On this basis, provision will have to be made for non-agricultural occupations for about 16,000 adults in 1975 and another 20,000 in 2000 in each Thana area. Assuming that 25% of these may be absorbed in rural crafts, animal raising and rural trade in the villages themselves, the remaining 12,000 and 15,000
adults respectively will have to be catered for in the Thana centre itself if the principle of providing work closer to the people is to be followed. As it happens such centres will be spaced on the average between 10 to 12 miles from each other and are likely to grow to between 20,000 to 50,000 in population.

Evidently the Thana centres, in addition to their roles as administrative and development service centres, will have to work as important markets including, typically, urban goods and services, educational and cultural centres and a centre for rural industries, such as food processing and the processing of raw materials for industries, minor manufacturing, and agricultural tool making.

In order to provide services to the entire hinterland, the Thana township should be effectively linked up with all the villages and hats in its jurisdiction through a network of communication however modest in physical make up. Land for the purpose of Thana township development should be acquired ahead of any development action. But the over-riding concern should be not to affect any agricultural land at all for obvious reasons and population density standards should not be guided by any borrowed/western concept. But they should be derived from the reality of the given circumstances as well as from the peculiarities of any special situation.

So long as Thana township development is viewed as an essential pre-requisite for the much too pressing
agricultural development, the rationale for such development will be self-evident. Thus political decision making will be rendered easier, the chances of spatial discrimination over locational choice will be ruled out and the base of social justice in terms of distribution of social, economic and cultural amenities will be laid. Above all, it will go a long way in stabilizing the rural society and economy. As estimated above, the Thana townships alone will be able to contain between 10 and 20 million people at the turn of the century.

The Thana townships will not however be able to relieve the frightful burden of the projected urban population which will soar from existing 5 million to an unthinkable 55 million in the next thirty years or so. What is more benumbing is the present trend of urban polarization into three centres, i.e. Dacca-Narayanganj, Khulna and Chittagong. In view of the general problems associated with urban polarization as well as the particular problems of strictly physical nature (discussed in Chapters 6 and 10),* that obtains in the environment of Bangladesh, polarized concentration of settlements is suicidal. Therefore the tendency of concentration that

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* Due to the very nature of landscape and soil structure a truly dense and compact development in terms of high rise buildings, etc., is not feasible. Partly due to the invariable presence of water-bodies and depressions and partly because of the predominantly rural life style of the rural immigrants, the cities are sprawling out of proportion requiring much more land area than otherwise would be necessary. Thus eating up agricultural land on the one hand and pushing the cost of city services inordinately high on the other.
is progressively building up must be opposed at the earliest.

The chief mechanism of decentralization obviously is the decentralization of public investment. As expected, in the past private investment has closely followed the track of public investment. In spite of tax holidays and other concessions, private investments could not be attracted to new locational centres at any substantial rate. Therefore public investment, and much more of it than before, must take the lead in decentralization. This is not a matter of ideological preference; it may not be even economically attractive over a short time perspective. It is a course of action which is imperative in view of the foreseeable absurdities lurking ahead.

It has been noted in Chapter 6 that a substantial number of second and third order urban places offer considerable advantages to sustain selected industrial complexes of the 'foot-loose' type. Most of these urban places at present happen to be district and sub-divisional administrative headquarters. There may be as many as 40 such townships now whose size would vary from 20,000 to 100,000. Some basic infrastructures already exist in these centres and as such they have, supposedly, gathered inertia for expansion already. Investment in these centres, therefore, would be most logical and sensible. If the district and sub-division townships are selected for the purpose of achieving decentralization, the most
widespread and even decentralization will be accomplished.

Of these townships those which are situated within the jute belt may be designated primarily to accommodate the jute industry. There is no reason whatever why the jute industries should be concentrated in Dacca-Narayanganj or Khulna instead of being located in the region where raw jute is produced. Industrial location policy for the 'foot-loose' types should be such as to enable setting up of labour intensive industries in those areas where multiple cropping is less feasible. And also to those areas where the incidence of landless labourers is high. As the landless labourers are the most disadvantaged group, preferential treatment on this count should be viewed as a rational course of action.

Given adequate incentives in public investments and overhead facilities these townships may grow up to a size of about 500,000 or so at the turn of the century. Some of them which are situated at the nexus of river, rail and road communications such as Chandpur, Faridpur,

* The characteristic physical features of the country commonly identified by many as handicaps towards decentralization such as the rivers and their branches, are in fact assets when viewed as potential network of a most elaborate system of communication. Hills and forests are physically at the outskirt of the country. Besides, such hills are not as high or difficult as might be presumed. The threat of flood on the one hand and tidal bore on the other are not really differential factors - they are present everywhere anyway. An additional impediment in the distribution of townships as visualized by Professor J.R. James is the distribution of jute growing land. Contrary to this observation the jute belt can be largely instrumental in facilitating decentralization of the jute industry.
Bhairab-bazar, Mymensingh, Bogra, may be encouraged to become major industrial centres and facilitated to grow to about a million population. By and large all of them will have to serve as regional cities covering a service area of about 10 to 12 Thanas each, and as such will have to be linked up with the Thana townships within their individual jurisdictions. In addition to their administrative, industrial and the associated commercial activities these regional cities will have to perform as centres for higher education, applied research, cultural activities and shopping for 'fashionable' consumer goods and services.

In their role as regional centres for collection of agricultural commodities for export and distribution of imported as well as home made commodities, these cities will have to be connected with the national ports as well as the first order cities/metropolises including the capital with fast transportation links (preferably using the waterways and thus saving road development expenditure).

All told, the regional cities will perhaps be able to accommodate some 20 to 25 million people by the turn of the century. This still leaves us a population of another 20 to 25 millions uncatered for. Since the existing metropolises should not be allowed to grow to the size of 8 or 10 millions, it is imperative to encourage one or two more centres to expand on a metropolitan scale. So far as the locational choice of a metropolitan centre is concerned, the northern region of
Bangladesh deserves special attention. So far this region has not had any blessing from the government in terms of public investment programmes in settlement. It is high time that the long-felt disparity be given adequate attention. The potential centres such as Bogra or Rangpur are in no way less attractive than anywhere else in the country. Both of these centres offer considerable advantage for industrial development based on agricultural raw materials such as tobacco, sugar-cane and jute; and both of them have an advantage, in terms of geographic (strategic) location, over their potential contenders Rajshahi and Dinajour both of which are located awkwardly close to the border.

Similar potential centres exist in the north-eastern part of the country, namely Sylhet and Mymensingh. While Mymensingh is inside the jute belt itself, Sylhet lies in the middle of the tea growing region. The hinterland of Sylhet also offers an abundance of high quality pineapples. Both of these centres are located at the fringe of a swampy depressed region which offers immense potentialities in the development of fishery resources. Thus both these centres offer comparative advantages in industrial developments in jute or tea and also of fish and/or fruit canning.

If metropolitan decentralization is not spread over the potential centres mentioned above, it will be impossible to protect the existing three centres from population bombardment, and each of them will explode to
a size of 10 or 12 million people each. If the worst is allowed to happen, the appalling miseries of Calcutta, which has become perhaps the saddest story of urban development in the world, will be surpassed by those of Dacca, Khulna or Chittagong. The threshold of service capacities in these cities have already been surpassed and now it is the story of deteriorating standards of living even for the so-called urban middle class let alone the nameless, faceless, 'below-class' immigrants. In the worst case, these centres will become the biggest monument of disgrace to the existence of man.

Table 22.1. Suggested Settlement Hierarchy and Population Distribution around the year 2000

<table>
<thead>
<tr>
<th>Order</th>
<th>Type</th>
<th>Size Range</th>
<th>Total Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Capital cities</td>
<td>3,000,000 to 5,000,000</td>
<td>15,000,000</td>
</tr>
<tr>
<td>II</td>
<td>Inter-regional cities</td>
<td>1,000,000 to 1,500,000</td>
<td>5,000,000</td>
</tr>
<tr>
<td>III</td>
<td>Regional towns</td>
<td>100,000 to 500,000</td>
<td>15,000,000</td>
</tr>
<tr>
<td>IV</td>
<td>Local (Thana) townships</td>
<td>20,000 to 50,000</td>
<td>20,000,000</td>
</tr>
<tr>
<td>V</td>
<td>Villages</td>
<td>1,200 to 1,600</td>
<td>102,000,000</td>
</tr>
</tbody>
</table>

Following the policy of decentralization outlined above, the future metropolitan settlements can be contained within a limit of 3 to 5 million each. Still
this size in itself will be problem enough in view of the economic prospects of the country. The biggest challenge lies in the minimization of cost and the demands for land. Here the question of standard in relation to housing and other infrastructure is most crucial. The architects, planners and engineers in the country suffer from the chronic obsession of luxurious standards such as individual toilets, attached bathrooms and so on even in the context of low income housing. If a country like Great Britain in her heyday could offer communal facilities like the public baths, public wash-houses* and lavatories, why should not a poor country like Bangladesh follow the same policy?

Similarly, in respect of housing and other building layout extravagant concepts of density standards prevail amongst the technicians concerned. Dacca is perhaps the most ludicrous example of providing fabulous house lots for individual families right in the middle of the city. This is a suicidal legacy in a land-hungry country. Paradoxically enough, the same professional groups of architects, planners and engineers somehow forget that row houses and four-storey walk-ups are the commonest types of housing developments in the wealthy urban centres, the model of which they so ardently try to copy. Obviously, individual house lots are a luxury which the country can no longer afford in the metropolitan settle-

* Public baths and laundries (the 'steamies') are still a feature of Edinburgh.
ments. There is no doubt that unless the injuriously inappropriate concepts of standards are expelled from the 'technical' thought processes of our professionals, no headway will be made in the field of housing and infrastructure development in order to accommodate the swarming millions in the cities. Worse still, an inordinately high rate of sprawl will take place devouring crucially needed agricultural land on the one hand, and rendering the cities increasingly unserviceable in terms of utilities and transport on the other.

In respect of cost minimization another conceivable way of saving the extremely limited financial resources is to initiate widespread self-help programmes. Many of the settlement development programmes such as construction of roads, school buildings or communal amenities (public baths, wash-houses, and latrines) can be undertaken by the participation of the community concerned using indigenous materials as far as possible. In other cases, the pool of unemployed or underemployed millions may be marshalled towards infrastructure building with payments being made in food which is otherwise distributed on a charitable basis. So far as the strangulated parts of the existing cities are concerned, a great deal may be achieved by community participation through involving the affected communities themselves towards the rehabilitation and revitalization of such areas. Self-help development programmes offer dual benefit of (i) saving capital by utilizing people's labour which
is available in plenty, and (ii) arousing civic inertia and interest by incorporating mass participation. Without such down-to-earth practical approach it will not be possible to accommodate the future millions in the cities, available scanty resources will be exhausted long before the targets are achieved and the plans, no matter how meticulously worked out, will remain only pious wishes.

At the end, it must be reiterated that there is no room for laissez-faire in the settlement policies in Bangladesh. As warned elsewhere in this work, between now and the turn of the century is the most critical time during which the whole base must be prepared for survival and a viable population-resource relationship to work into the ensuing century. It is difficult to see an early relief on demographic pressures. With the best efforts population control policies start bearing fruit only after a generation. On the other hand, there is usually several years delay before the efforts in agricultural development fructify. Clearly therefore if we are to wait for another ten years or so before embarking on the implementation of settlement policies, the situation may be well out of hand, and there will not be any way left to avert the miseries hitherto unknown anywhere else in the world. Nature will perhaps defend the eco-system in the end by the inevitable famine regulation of the human population but surely there is no wisdom in letting the worst happen and then applying futile measures to rectify.
Chapter 23

IMPLEMENTING A PILOT PLAN

Models are beautiful to look at no doubt, but we cannot live by models. They need to be tested and adapted to real situations. The basis for the implementation of theoretical models is a sequence of tests carried out in pilot projects. Such tests can give us some idea of the rigours of implementation and the extent of adaptation that may be required; and it is through such adaptation that new patterns of village settlements may be evolved to meet the differing physical and social needs throughout the entire national landscape. An idea on a clean slate has tremendous possibilities but transformation of one that exists is bound to be faced with many challenging difficulties. The difficulties that may have to be encountered in implementing the social and economic micro-model implicit in this work cannot be tested without going into the field; but the conceptual physical model can be tested against the physical pattern of the existing villages.

For the purpose of testing the model a village representing the typical challenges and prospects of rural Bangladesh may be chosen from the core agricultural region of the country. Luckily information on physical configuration of such a village in the most densely populated part of the country is available. Although this village does not correspond in size and population
to that of the model, it satisfies other conditions as assumed in Chapter 18, i.e. about 20% of its area is under dwelling structures and about 15% under water-bodies, and the rest is under agriculture (including horticulture), trees and other perennial crops. Although a considerable amount of land in the village is shown to be under horticulture which might seem to be non-typical, horticulture here is a form of intensive agriculture resulting from extreme land shortage; and hence these areas can be treated as crop-land (see Fig. 23.1).

Following the principles of agglomeration (discussed in Chapter 18), the rudiments of an efficient road pattern may first be identified on the map to serve as the frame for the task of clustering. Next the isolated households should be earmarked and measured for relocation in the clusters. In the process of relocation it must be borne in mind that the total area under households must not exceed that of the present. Therefore the uncultivable small parcels within the clusters may be identified and measured, and houses may be relocated matching their previous sizes - thus achieving compact clusters while keeping the total area under households unaltered (see Fig. 23.2). However, in the sequence of actual relocation the age of the house and its physical state should be a primary criterion for demolition and relocation.

Since one cannot afford to lose any amount of agricultural land in the given circumstances of Bangladesh, the small parcels lost in the process of village
Fig. 23.1 Existing Physical Structure of a Village in the densest region
(source: Khan, F.R.; Kazikashba, Panam and Joradeul -- a Study in Landuse; Oriental Geographer; vol.1, no.2, July 1957)
Fig. 23.2 A Tentative Physical Re-organization of the Village under Study
(on the basis of Fig. 18.4 and Fig. 18.12)
agglomeration must be compensated by a simultaneous process of land reclamation through filling the ponds which are usually irregular in size, derelict in physical state, and awkward in location. Earth for such fillings may be obtained by dredging the existing canals and extending them in order to provide local irrigation - thus combining two development imperatives. So far as the alignment and direction of the local irrigation canals is concerned, the suggestion has to remain only indicative at present. The actual alignment will depend on detailed studies of the micro-physiographic conditions at the local level.

As for the woods and clusters of perennial trees appearing in the middle of the crop-lands, these must be left untouched now. Clearing of these patches of woodland must be matched closely to the rate of tree crop regeneration in order to prevent ecological disaster. It is important to re-state here that instead of growing trees in patches and thus blocking out considerable amount of agricultural land, new trees must be planted linearly alongside the canals which will prevent erosion of their banks, and along roadsides which will protect the roads from being washed away. Conceivably, the clearing process cannot start before 10 to 15 years - a time gap which must be allowed for the trees in new plantations to reach maturity. Thus compact village settlement as envisaged in the schematic model (Chapter 18) could be achieved by 1985-90 if a start were made now.
Physical implementation of a pilot project might well be initiated in Sheikh Mujib's own village, which happens to be situated in a similar agricultural region as that of the above case study. Tagore, the great dreamer of Bengal, for the betterment of the Bengalis, conducted an experiment covering improved agriculture, animal husbandry, public health, sanitation, adult education and rural industries in Sriniketan adjoining the Shantiniketan; Sheikh Mujib the Bangabandhu (the great lover of Bangladesh) must be able to set examples of his own declared ideals and his profound love for the people. For the Bangabandhu 'charity' must 'begin at home' - to set agrarian reform in motion Sheikh Mujib must be persuaded to set the example of a peaceful redistribution of land resources and perhaps to reaffirm his ideals of 'socialism' by making over his patrimony, however small, to the peasants of his own village and thus enable the establishment of an ideal cooperative village. Without active example the traditional party men will not be convinced, educated, or motivated towards self-sacrifice and abnegation. In the present context of Bangladesh 'socialism' and 'nationalism' are not to remain political slogans or intellectual debates, they are to be transformed into beliefs with the dynamism of a religion. 'Socialism' is how to redistribute productive resources amongst all and thus ensure adequate consumption in favour of all, and also how one acts and lives as a socialist. Without the party in power being
truly immersed in its professed values of socialism both in act and deed it is difficult to see how the nation will be motivated. That a large peasant nation in Asia cannot be expected to be motivated without the dynamism of nationalism and the ideals of socialism is, perhaps, the principal lesson of the Chinese Revolution.

It is only appropriate to cite here that personal attitude and example of Julius K. Nyerere has helped tremendously in restricting the opportunities for acquisition of property and interests by the elite in Tanzania. Nyerere's party made, and enforced, regulations that no person in any position of leadership in the party or in the government should retain any interest in any profit-making concern. This meant not only shares in private business but also rent-earning property and employment of labour of any sort other than seasonal labour. Following Nyerere's example the politicians have sacrificed their property and have accepted salary cuts.

One cannot disagree with the distinguished Indian scholar J.P. Narayan when he maintains that in a society where it was possible for the people by democratic means to bring about social change, it would be counter-revolutionary to resort to violence. This is in essence the Gandhian technique of social revolution and reconstruction. But, in the face of a gigantic impasse, the Gandhian technique as exemplified in the Bhoodan Gramdam, and Gram-raj movement led by Acharya Vinoba Bhave has not been able to achieve any widespread impact after some
initial local success. In the presence of strong reactionary currents the voluntary movement is unable to make headway to the extent necessary for fundamental change. On the other hand, the growing strength of co-existing capitalist agriculture has made the nascent self-reliant sector a very weak party in India's dual agricultural economy. That is why the economic status of India's rural millions has remained unaltered (perhaps worsened) in spite of very impressive (in figures) land donations (Bhoo-dan). Unfortunately about half of the land so donated is unfit for cultivation.\textsuperscript{*}

In the light of Indian experience it seems most unlikely that slow evolution in the so-called 'democratic' line can succeed in the face of all the agrarian problems of the Indian sub-continent. The human and social situation does not suggest that there could be a gradual process from the impasse of mass poverty to a state of national development. The ceiling regulations in India, which were visualized by Nehru as a prologue to co-operative farming, have remained merely a politically inspired gesture proffered to win the allegiance of the poor peasants. In view of such social paralysis a crash programme of land liberation and communalization through due process of law is imperative. Such legislative action could dislodge vested interests at one stroke while reducing the social and economic distances

\textsuperscript{*} See Suresh Ram's article on Sarvodaya, The Sunday World, New Delhi, October 1, 1972.
between the rich and the poor in the villages. The way will thus be prepared for an egalitarian, productive and institutionally harmonious rural society, the essential basis for the development of true agricultural cooperatives. Unless a comprehensive approach towards mass poverty and national underdevelopment is adopted it will remain impossible to provide opportunities never available before to those so long under-privileged.

Yet the need for setting examples of sacrifice by the national leadership is not reduced, for in the last analysis it is the attitudinal make-up of the legislators in the country which must change before the required legislative initiative may be expected from them. And in this regard educative examples from the national leadership will go a long way indeed.

The initial commitments* of the Bangabandhu and the declared promises of his party must be shown to be not expressions of pious wishes only, but constitute the essential ingredients of social policy and the basis of development-planning in Bangladesh. A principal handicap is the profound self-complacency of the established politicians in their apparent unwillingness (or is it incapacity?) in recognizing problems as problems. This is surely a sign of immaturity and lack of confidence and represents one of the most untractable features of under-

* In an exclusive interview with Mr David Frost (BBC) on January 16, 1972, Sheikh Mujib stated: "We have an enormous task at hand...we have to give them (the people) food, we have to give them clothing, we have to give them houses to live in"...
development. In developed countries when problems of national urgency appear, even the champions of 'democracy' and 'individual liberty' do not hesitate to assume sweeping powers in the face of necessity, to curb temporarily individual freedom and liberty. Britain's three-day-week, the ban on Sunday motoring and the imposition of speed limits in Western Europe and the U.S. are clear examples of the most recent state interventions on individual freedom of action. And these actions were rationalized in the name of national emergencies. Bangladesh has a much more challenging emergency at hand. Why then should not Bangladesh assume political powers to impose restrictions on an individual's free action? To fight a so-called ideological battle thousands of miles away from home, thousands of young American lives were sacrificed not on a voluntary basis but by the coercion of the draft. If a certain degree of compulsion and/or coercion is necessary for the survival of Bangladesh then there must be coercion. There should not be any inhibition or indignation about it, for apparent coercion in Bangladesh will be for a far more genuine purpose than that of the U.S.A.

Another weakness of policy makers in Bangladesh lies in their over-estimation of the potential strength of conservative elements in the country. The apprehension that there will be severe resistance to a radical land reform programme in Bangladesh is largely unfounded. Simple observation reveals that the vested interest group
is not yet insuperably big in the country; big landholders equivalent to those of Latin American countries or even those of India, do not exist in Bangladesh, and the urban middle class is neither numerically significant in proportion to the total population, nor politically integrated as an exclusive group. Thus, the strength of reactionary elements in Bangladesh is really illusory and another element of lack of knowledge and confidence. Progressive actions directed towards collective well-being launched with determination and coupled with the provision of information about policies and actions at all levels should meet little organized resistance. This is particularly true of the agricultural areas where the main elements of national regeneration are to be found.

In the way of an epilogue it is important to reiterate that no start will be made if politicians, planners and bureaucrats do not look inwards and identify indigenous assets and resources, take note of the characteristic strengths and weaknesses, and plan accordingly. There is no more room for the naive belief that food-aid and dollar-aid will continue to arrive. There are enough indications that the U.S. farmers will not be able to produce surplus grains in the future as they have in the past. Even if there is a surplus there is the likelihood that it will be utilized to meet the rising food expectations of the Russian people, an end which the U.S. Government sees as a factor in achieving a détente with the Government of the U.S.S.R. Similarly,
European countries are withdrawing from world roles and see their future economic and political solidarity in the EEC. Apparently both Russia and India, the great benefactors of Bangladesh, are to solve their own food problems let alone those of Bangladesh. On the other hand, the newly emerging oil-based economic powers in the Arab world are more oriented towards the West than to their previous Third World brethren. There is no sign of any adherence to Gadhafi's proposal of a two-tier oil price system, one being in favour of the poor countries. Kuwait is going to pump in millions of pounds sterling into the British banking system because that is where profits and security of investment lie, not in helping Third World countries. In the Arab world apparently the concept of 'Muslim Brotherhood' at least in relation to far-off Bangladesh is of little significance.

The worst economic effects of increasing oil prices are still to come. The four-fold rise in the price of oil during the past year has had disastrous world-wide consequences already. Under these circumstances all countries are bound to emphasise their own self-interest. While the rich countries have the accumulated capacity to absorb the impact of the unforeseen consequences of the new economics of oil, the poorer countries will be hit more cruelly - their already weak economies are already being disrupted to the point of collapse in those countries suffering from national disasters as well as oil-price effects.
In such a divided, selfish world, the need for self-reliance in a poor country like Bangladesh is self-evident. Self-reliance should not only mean throwing away the 'begging bowl', withdrawal from the selfish and/or aggressive outside world, but also a simultaneous bold effort to challenge the world outside and its economic relationships. After all what do the rich countries 'give' to the poor countries? Capital, to be repaid with hard-earned foreign exchange, with interest, except a very small amount of capital and gifts. Even then the use of such aid is usually tied to the production of the nations. Or they provide expertise and technology for which payment must be made one way or the other, and both of which are often inappropriate to the reality of the recipient. It is also important to bear in mind that, psychologically at least, one should not seek help to become self-reliant. Self-reliance is depending on one's own strength and not seeking help from others, expect perhaps as mutual aid for self-reliance.

It is often argued that the country does not have enough technical knowledge with which to become self-reliant. This is entirely unfounded. Bangladesh can line up hundreds of Ph.D.s and thousands with Masters degrees from the rich world's universities. What this vast array of the knowledgeable group lacks is wisdom and self-confidence. There has been hardly any attempt to adapt the knowledge to the realities of the countries. Limitations were not recognized as limitations and hence
grandiose plans and programmes based on experience of rich countries were conceived demanding heavy expenditure based on foreign loans, but solving few or no problems at all. The time has come to achieve 'more with less', to do big things in small ways. This is possible but only after the rejection of current preconceptions on \textit{'development'}, \textit{'technology'}, \textit{'investment'}, and the like which is based on the experience of others under different restraints. The required base of knowledge is there, what is needed is the willingness to find the appropriate answer – an answer in the framework of the given resource constraints.

In Bangladesh men have been looking for too long towards the West. The 'glitter' of the West has blinded their vision, and now they are unable to see the possibilities of blossoms at their own dusty doorsteps.

\textbf{Valedictory Note}

To end on a personal note, I see a future, albeit distant in which we, the countless children of the mighty Brahmaputra, must enable ourselves to find our own path and direction by our own strength and our own dynamics. The success story of Bangladesh will then no doubt belittle that of any other country, for, to begin with, Bangladesh has problems unparalleled in the whole world. I would wish to see that this work is making a small contribution by suggesting a way ahead, and thereby generating a little optimism towards the solution of gigantic problems.


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- APPENDICES -
### APPENDIX - I -

**POPULATION PROJECTIONS**

A. Some Population Parameters of Projected Population under Three Separate Fertility Assumptions, East Pakistan

July 1, 1960-July 1, 2000

<table>
<thead>
<tr>
<th>Population Parameter and fertility assumption</th>
<th>July 1</th>
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<tbody>
<tr>
<td>Birth rates&lt;sup&gt;1&lt;/sup&gt;</td>
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<tr>
<td>Assumption I</td>
<td>49.51</td>
</tr>
<tr>
<td>Assumption II</td>
<td>49.51</td>
</tr>
<tr>
<td>Assumption III</td>
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<tr>
<td>Death rates&lt;sup&gt;1&lt;/sup&gt;</td>
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<td>Assumption I</td>
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<tr>
<td>Assumption II</td>
<td>18.01</td>
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<tr>
<td>Assumption III</td>
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<tr>
<td>Rates of Growth&lt;sup&gt;2&lt;/sup&gt;</td>
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<td>Assumption I</td>
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<tr>
<td>Assumption II</td>
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<tr>
<td>Assumption III</td>
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<tr>
<td>Masculinity ratio</td>
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<td>Assumption I</td>
<td>105.5</td>
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<tr>
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<td>Assumption III</td>
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</table>
APPENDIX - I (contd.)

POPULATION PROJECTIONS

B Projected Population of East Pakistan by Sex Under Three Separate Assumptions, July 1, 1960-July 1, 2000 (numbers are in 000s)

<table>
<thead>
<tr>
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<td>Both sexes</td>
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<td>139,912</td>
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<td>73,360</td>
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<td>123,833</td>
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<td>Assumption III</td>
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(For assumption I, II, III see page 120)
### Appendix II

#### Demographic Structure

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<th>Number 000's</th>
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<td>97.99</td>
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<tr>
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<td>100.00</td>
<td>1776.85</td>
<td>1741.38</td>
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</table>
APPENDIX - III

A. Average Energy Requirement per day of Moderately Active Adults of Reference Body Weight at Different Ages

<table>
<thead>
<tr>
<th>Age groups (years)</th>
<th>65 kg man (kcal)</th>
<th>65 kg man (MJ)</th>
<th>55 kg woman (Kcal)</th>
<th>55 kg woman (MJ)</th>
<th>% of Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 - 39</td>
<td>3000</td>
<td>12.5</td>
<td>2200</td>
<td>9.2</td>
<td>100</td>
</tr>
<tr>
<td>40 - 49</td>
<td>2850</td>
<td>11.9</td>
<td>2090</td>
<td>8.7</td>
<td>95</td>
</tr>
<tr>
<td>50 - 59</td>
<td>2700</td>
<td>11.3</td>
<td>1980</td>
<td>8.3</td>
<td>90</td>
</tr>
<tr>
<td>60 - 69</td>
<td>2400</td>
<td>10.0</td>
<td>1760</td>
<td>7.4</td>
<td>80</td>
</tr>
<tr>
<td>70 - 79</td>
<td>2100</td>
<td>8.8</td>
<td>1540</td>
<td>6.4</td>
<td>70</td>
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</table>

B. The Effects of Body Weight and Occupation on Energy Requirement of Man per Day

<table>
<thead>
<tr>
<th>Body weight (kg)</th>
<th>Light Activity</th>
<th>Moderate Activity</th>
<th>Very Active</th>
<th>Exceptionally Active</th>
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<tbody>
<tr>
<td>Kcal</td>
<td>Kcal</td>
<td>Kcal</td>
<td>Kcal</td>
<td>Kcal</td>
</tr>
<tr>
<td>50</td>
<td>2100</td>
<td>2300</td>
<td>2700</td>
<td>3100</td>
</tr>
<tr>
<td>55</td>
<td>2310</td>
<td>2530</td>
<td>2970*</td>
<td>3410</td>
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<td>60</td>
<td>2520</td>
<td>2760</td>
<td>3240</td>
<td>3720</td>
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<tr>
<td>65</td>
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<tr>
<td>75</td>
<td>3150</td>
<td>3450</td>
<td>4050</td>
<td>4650</td>
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<tr>
<td>80</td>
<td>3360</td>
<td>3680</td>
<td>4320</td>
<td>4960</td>
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</table>

* Reference man which has been assumed for the calculation of energy requirements in this study. The Reference man is between 20 and 39 years of age, is free from diseases and physically fit for active work @ 6 hours per day in a very active (non-sedentary) occupation. He spends 8 hours in bed, 4 - 6 hours of moving around in light activity, and 2 hours of walking or active recreation or household duties.

a. Relation between calorie intake and work output in a steelworks

(b) Estimated General Magnitude of Semi-starvation Effects Resulting from Different Average Losses of Body Weight in Adult Populations

<table>
<thead>
<tr>
<th>percentage of body weight loss</th>
<th>civil disorder and strife</th>
<th>capacity for prolonged physical work</th>
<th>actual work performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>slight</td>
<td>(?)</td>
<td>- 10</td>
</tr>
<tr>
<td>10</td>
<td>moderate</td>
<td>- 10</td>
<td>- 20</td>
</tr>
<tr>
<td>15</td>
<td>serious</td>
<td>- 30</td>
<td>- 50</td>
</tr>
<tr>
<td>20</td>
<td>very serious</td>
<td>- 50</td>
<td>- 80</td>
</tr>
<tr>
<td>30</td>
<td>moderate</td>
<td>- 80</td>
<td>- 90</td>
</tr>
<tr>
<td>40</td>
<td>slight</td>
<td>- 95</td>
<td>- 95</td>
</tr>
<tr>
<td>50</td>
<td>none</td>
<td>none</td>
<td>none</td>
</tr>
</tbody>
</table>

(source: UN/FAO; Nutrition and Working Efficiency; Freedom From Hunger Campaign Basic Study No. 5; Rome 1962, p15)
a. THEORETICAL RATE OF ANIMAL PROTEIN REQUIREMENTS

[Graph showing theoretical rate of animal protein requirements across different age groups with clear annotations for girls and boys.]

source: FAO Committee on Protein Requirements (1957) Report, FAO Nutritional Studies, No. 16

b. RELATIONSHIP BETWEEN ANIMAL PROTEIN INTAKE AND CHILD DEATH-RATES

[Bar charts showing animal protein intake per caput/day against death rates 0-1 year/1000 live births and 1-4 years/1000 population for countries like U.S.A., Canada, Argentina, Chile, Venezuela, Mexico, Colombia, and Guatemala.]

source: WHO, Freedom From Hunger Campaign Basic Study No. 12, Malnutrition and Disease, Geneva, 1963, p17
### Theoretical Safe Level of Protein Intake

<table>
<thead>
<tr>
<th>Age groups (years)</th>
<th>Average Body weight (kg)</th>
<th>Requirement per kg Body weight per day (kg)</th>
<th>Requirement per caput per day (kg)</th>
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<tbody>
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<td>-</td>
<td>(a)</td>
<td>(a)</td>
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<tr>
<td>1 - 3</td>
<td>13.4</td>
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<td>15.9</td>
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<tr>
<td>4 - 6</td>
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<tr>
<td>7 - 9</td>
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<td>24.7</td>
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<td>36.9</td>
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<td>39.9</td>
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<td>13 - 15</td>
<td>51.3</td>
<td>0.72</td>
<td>36.9</td>
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<tr>
<td>16 - 19</td>
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<tr>
<td>13 - 15</td>
<td>49.9</td>
<td>0.63</td>
<td>21.4</td>
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<tr>
<td>16 - 19</td>
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<td>0.35</td>
<td>22.4</td>
</tr>
<tr>
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<td>0.57</td>
<td>37.1</td>
</tr>
<tr>
<td>Adult Women</td>
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<td>0.52</td>
<td>28.6</td>
</tr>
<tr>
<td>Allowance for Pregnancy</td>
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<td>-</td>
<td>5.5(b)</td>
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<tr>
<td>Allowance for Lactation</td>
<td>-</td>
<td>-</td>
<td>17.0(a)</td>
</tr>
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</table>

Note: (a) No requirements are indicated for infants because in a culture where breast-feeding continues on the average for a year or so, infants of less than one year age are likely to get most of their protein requirements from the mother's milk.

(b) When the number of pregnant women in a population group is not known, it may be assumed that there are 10% more pregnant women than infants aged 0 - 12 months allowing for a pregnancy wastage and perinatal mortality.

# APPENDIX - V

## Multiplication Factors in Relation to the Requirements of Reference Man (as used in this work)

<table>
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<th>Protein¹</th>
<th>Energy &amp; Protein²</th>
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<td>7 - 9</td>
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<td>0.75</td>
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<tr>
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<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
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<tr>
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</tr>
<tr>
<td>60 - 69</td>
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<td>1.00</td>
<td>0.75</td>
</tr>
<tr>
<td>70 +</td>
<td>0.70</td>
<td>1.00</td>
<td>0.75</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
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<tr>
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<td>0.78</td>
<td>0.75</td>
</tr>
<tr>
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<td>1.02</td>
<td>0.85</td>
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<td>0.81</td>
<td>0.70</td>
</tr>
<tr>
<td>20 - 39</td>
<td>0.90</td>
<td>0.77</td>
<td>0.80</td>
</tr>
<tr>
<td>40 - 49</td>
<td>0.86</td>
<td>0.77</td>
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<td>0.80</td>
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<td>0.77</td>
<td>0.55</td>
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<td>0.55</td>
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<tr>
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<tr>
<td>16 - 19</td>
<td>0.95*</td>
<td>1.26**</td>
<td>-</td>
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<td>20 - 39</td>
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<td>0.95**</td>
<td>-</td>
</tr>
<tr>
<td>20 - 39</td>
<td>0.90*</td>
<td>0.92**</td>
<td>-</td>
</tr>
</tbody>
</table>

* No additional allowance has been made for these groups because the additional requirements of these have been incorporated in the requirements for less than one year age group.

** Includes the requirements of the children under one year of age where no requirement has been shown.

( note continued in the following page)
# APPENDIX - VII

## FOOD REQUIREMENT PER DAY IN BANGLADESH (IN TONS)

<table>
<thead>
<tr>
<th>Food items</th>
<th>1975</th>
<th>1990</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals</td>
<td>32681.61</td>
<td>50045.67</td>
<td>63893.02</td>
</tr>
<tr>
<td>Pulses</td>
<td>4638.80</td>
<td>7162.22</td>
<td>9191.96</td>
</tr>
<tr>
<td>Vegetables</td>
<td>8720.96</td>
<td>13515.65</td>
<td>17361.65</td>
</tr>
<tr>
<td>Fruits</td>
<td>2906.91</td>
<td>4505.17</td>
<td>5787.15</td>
</tr>
<tr>
<td>Oil</td>
<td>2325.48</td>
<td>3604.38</td>
<td>4629.65</td>
</tr>
<tr>
<td>Fish</td>
<td>1855.48</td>
<td>2865.15</td>
<td>3676.71</td>
</tr>
<tr>
<td>Meat</td>
<td>927.69</td>
<td>1432.39</td>
<td>1838.32</td>
</tr>
<tr>
<td>Egg</td>
<td>927.69</td>
<td>1432.39</td>
<td>1838.32</td>
</tr>
<tr>
<td>Sugar</td>
<td>1744.18</td>
<td>2703.04</td>
<td>3472.22</td>
</tr>
<tr>
<td>Milk</td>
<td>12370.31</td>
<td>19099.44</td>
<td>24512.06</td>
</tr>
</tbody>
</table>

## FOOD REQUIREMENT PER YEAR (IN MILLION TONS)

<table>
<thead>
<tr>
<th>Food items</th>
<th>1975</th>
<th>1990</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals</td>
<td>1112928</td>
<td>18266</td>
<td>25320</td>
</tr>
<tr>
<td>Pulses</td>
<td>1.693</td>
<td>2.614</td>
<td>3.355</td>
</tr>
<tr>
<td>Vegetables</td>
<td>3.183</td>
<td>4.933</td>
<td>6.337</td>
</tr>
<tr>
<td>Fruits</td>
<td>1.061</td>
<td>1.644</td>
<td>2.112</td>
</tr>
<tr>
<td>Oil</td>
<td>0.848</td>
<td>1.315</td>
<td>1.689</td>
</tr>
<tr>
<td>Fish</td>
<td>0.677</td>
<td>1.045</td>
<td>1.341</td>
</tr>
<tr>
<td>Meat</td>
<td>0.338</td>
<td>0.522</td>
<td>0.670</td>
</tr>
<tr>
<td>Egg</td>
<td>0.338</td>
<td>0.552</td>
<td>0.670</td>
</tr>
<tr>
<td>Sugar</td>
<td>0.636</td>
<td>0.986</td>
<td>1.267</td>
</tr>
<tr>
<td>Milk</td>
<td>4.515</td>
<td>6.971</td>
<td>8.946</td>
</tr>
</tbody>
</table>

Note contd. from previous page:

1. Based on Table 26 and Table 28 of the WHO technical Report Series no.522
2. This scale was used by Dr. S. Postmus (WHO Officer, Nutrition Project, Burma) and by Dr. A. Me Mosby (Asstt. Director of Health Services, Rangoon) in order to calculate the different rates of consumption requirements by different age groups. -- Report on the Dietary & Nutritional Survey in Maymyo District, Burma, March 1955.
Appendix VIII

INDORE PROCESS OF COMPOST MAKING

The Indore Process of making compost (humus) from animal and vegetable wastes was devised and perfected by Sir Albert Howard between 1924 and 1931 at the Institute of Plant Industry, Indore, India. The two main principles underlying the process are: (i) the admixture of vegetable and animal wastes with a base for neutralizing acidity, and (ii) the management of the mixture so that the micro-organisms which do the work can function in the most effective manner.

The Raw Materials Needed

Vegetation of waste areas, grass, weeds including sea- and water-weeds, plants grown for shade or green manure, sugar-cane leaves and stumps, prunings, all crop residues not consumed by livestock, hedges and bank trimmings, damaged hay and clover.

An ensured supply of mixed dry vegetable wastes throughout the year, in a proper state of division, is the chief pre-requisite in the process. The ideal chemical composition of these materials should be such that after being used as a bedding for livestock, the carbon:nitrogen ratio is in the neighbourhood of 33:1. The material should also be in such a physical condition that the fungi and bacteria can obtain ready access to and break down the tissues without delay. The bark
which is the natural protection of the celluloses and lignins against the inroads of fungi, must first be destroyed by a simple method of crushing, crumbling and trampling.

Animal residues include urine and dung of livestock, poultry droppings, fish entrails and all other kitchen wastes including bones. (In China human excreta supplies the major requirements.)

In the manufacture of humus the fermenting mixture soon becomes acid in reaction. In order to neutralize this acidity so that the work of the micro-organisms can proceed, a base is necessary. Carbonates of calcium or potassium in the form of limestone or chalk, or even simple wood ash mixed with earth, provide a convenient base for maintaining the general reaction within the optimum range (pH 7.0 to 8.0) needed by the micro-organisms which break down cellulose. Where wood ashes, chalk or limestone are not available, earth can be used by itself. Slaked lime can also be employed.

Water is needed during the whole process. Abundant aeration is also essential during the early stages. But if too much water is used the aeration of the mass is impeded, the fermentation stops, may become anaerobic much too soon. If too little water is employed the activities of the micro-organisms slow down and eventually cease. The ideal condition is for the moisture content of the mass to be maintained at about half saturation during the early stages, as near as possible to the conditions of a
pressed out sponge.

The simplest and most effective method of providing water and oxygen together is whenever possible to use the rainfall and always to keep the fermenting mass open at the beginning so that atmospheric air can enter and the carbon dioxide produced can escape. After the preliminary fungous stage is completed and the vegetable wastes have broken down sufficiently to be dealt with by bacteria, the synthesis of humus proceeds under anaerobic conditions when no special measures for the aeration of the dense mass are either possible or necessary.

Composting may be done either in pits or in heaps. Composting in peats is disadvantageous on account of water-logging by storm water, by heavy rain or by the rise of ground-water from below as a result of which the composting materials turn into a wet sodden mass. In order to obviate such water-logging the composting pits: (1) surrounded by a catch drain to cut off surface water; (2) protected by a thatched roof where the rainfall is high and heavy bursts of monsoon rain are inevitable; or (3) provided with soakways at suitable points combined with a slight slope of the floors of the pit towards the drainage corner. Where there is a pronounced rise in the water-table during the season care must be taken in silting the pits so that they are above the expected rise in the water-table.
Charging the heaps or pits

A convenient size for the compost pits is 30 feet by 14 feet and 3 feet deep with sloping sides. The annual yield from such a pit will be about 1,000 tons. Aeration is a very important factor and as such adequate aeration must be provided by means of vertical vents every 4 feet or so made by a light crowbar. Charging a pit 30 feet long takes place in six sections each 5 feet wide. The first section, however, is left vacant to allow of the contents being turned. The second section is first charged. A layer of vegetable wastes about 6 inches deep is laid across the pit to a width of 5 feet. This is followed by a layer of soiled bedding or farmyard manure 2" in thickness. The layer of manure is then sprinkled with a mixture of urine soaked earth from the cow-shed and wood ashes or with earth alone, care being taken not to add more than a thin film of about an eighth of an inch in thickness. The layers are then watered with a hose fitted with a rose for breaking up the spray. The charging and watering process is continued as before until the total height of the section reaches 5 feet. Since aeration is a very important factor, three vertical aeration vents, about 4 inches in diameter, are then made in the mass by working a crowbar from side to side. The first vent is in the centre, the other two midway between the centre and the sides (the vents will be 3 feet 6 inches apart).

Two things must be carefully watched and prevented
during the first phase: (1) the establishment of anaerobic conditions caused generally by over watering or by want of attention to the details of charging; it is at once indicated by smell and by the appearance of flies attempting to breed in the mass; when this occurs the pit should be turned at once; (2) fermentation may slow down for want of water. In such cases the mass should be watered.

To ensure uniform mixture and decay and to facilitate the anaerobic phase it is necessary to turn the material twice. The first turn should take place between two and three weeks after charging. Watering should be taken care of and a series of vertical air vents should be made as before. About five weeks after charge the material is turned a second time but in the reverse direction. By this time the fungus stage will be almost over, the mass will be darkening in colour and the material will be showing marked signs of breaking down. From now onwards bacteria take an increasing share in humus manufacture and the process becomes anaerobic.

Soon after the second turn the ripening process begins. It is during this period that the fixation of atmospheric nitrogen takes place. The activity of the various micro-organisms which synthesize humus can most easily be followed from the temperature records. A very high temperature, about 65°C (149°F), is established at the outset, which continued with a moderate downward gradient to 30°C (86°F) at the end of the ninety days.
(This range fits in well with the optimum temperature conditions required for the micro-organisms which break down cellulose.) Three months after charge the micro-organisms will have fulfilled their task and humus will have been completely synthesized. It is now ready for the land.

It must be reminded that if kept in heaps after ripening is completed, a loss in efficiency must be faced. The oxidation processes will continue. Nitriﬁcation will begin, resulting in the formation of soluble nitrates. If humus must be stored it should be kept under cover and turned from time to time.

(After Sir Albert Howard; An Agricultural Testament, Oxford University Press, London, 1943, pp. 39-52.)
Appendix IX

FERRO-CEMENT STORAGE BIN

Construction

The bin is normally constructed with the rim of the concrete base about ½ metre above general ground level so that the centre of the base, like a saucer in shape, is at ground level. This can be varied to suit local conditions. The base is circular in plan, cast in two layers of concrete with a Flintkote seal between.

The walls, in ferro-cement about 3 cm. thick, are constructed on a self-supporting matrix of steel tubes (commercial water pipe) 2 m. long, surrounded by horizontal hoops of small diameter (5 mm.) steel rods and covered on both faces with wire mesh. The tubes incline inwards towards the top which consists of a lid set in a concrete frame about 1 metre diameter and this gives a great rigidity during the ferro-cementing operation.

It is essential to use a mix of the correct workability with minimum water-cement ratio in order to reduce shrinkage and give a high early strength, to apply the mortar in a continuous operation and to cure the finished ferro-cement carefully with the protection of damp sacks for several days, in order to avoid surface shrinkage cracks. Appendix 9/4 shows a typical cross section of the construction.

Ferro-cement bin of the above type for the hermetic storage of paddy, with capacity ranging from 3½ tons to
about 10 tons, was designed in 1968 by Dr R. B.L. Smith at the Asian Institute of Technology, Bangkok. The construction and subsequent testing of such a bin was carried out at the Institute between May 1969 and September 1970. The moisture content of the paddy at the start of the test was 11%. At the end of the test, as reported, it was 12% and the seeds remained viable with germination of 95% after 18 months of storage. On the basis of the tests it is concluded that grains with a moisture content of 15-16% is susceptible to mould growth unless the oxygen concentration of the inter-granular air can be kept at less than 0.5%; and even then anaerobic fermentation may take place leading to a taint which makes the grain unpalatable. The recommended safe method is to dry the paddy to 12% moisture content or less. However, in order to preclude chances of evaporation from the grains and the subsequent condensation on the inside of the top lid which drips back on to the paddy, the bins should be shaded by thatch or trees. It may also be possible to absorb, trap or expel any moisture condensed inside the top of the bin. Methods are now being experimented at the Asian Institute of Technology on this line.

The question of loading and unloading the paddy grains did not pose any important difficulties. In the more recent bins constructed, a hatch at ground level has been incorporated into the wall from which the paddy may easily be extracted, and the simple method of loading
through the top hatch is reported to be adequate. But if other methods are desired such as some form of swinging basket, it can easily be introduced without affecting other aspects of the method.

Cross section of a trial ferro-cement bin (3.5 tons capacity) developed at the Asian Institute of Technology, Bangkok.

source: Intermediate Technology Bulletin No. 9, Intermediate Technology Development Group, Parnell House, 25 Wilton Road, London SW1
Appendix X

HUMPHREY PUMP

The Humphrey Pump is a combined engine/pumping unit which was invented by H.A. Humphrey at the beginning of the century. It is a multifuel internal combustion engine employing a water piston which also acts as an energy storage device in the same way as the flywheel in a conventional engine. In 1913, four 40 million gallons per day and one 20 million gallons per day units were installed at the King George V Pumping Station, Enfield. The pumps were in operation until a few years ago.

Interest was lost in the Humphrey Pump after the First World War and much information on the development was destroyed in a fire in the inventor's office. The idea was revived at the Reading University in 1970 because the pump appeared to be particularly suited for use in developing countries. A four-inch diameter pump has been constructed and operated satisfactorily for some time. This pump is fueled by natural gas and pumps 360 gallons per hour to a 13 feet head at a frequency of 35 strokes/minute.

Ignition and Fuel Metering

A simple car spark ignition system is employed in the present pump. There is considerable advantage in replacing this by an alternative not requiring a battery. This aim may be achieved in various ways including
linear magnets, glow plug and piezo ignition. Fuel is arranged to enter the combustion chamber by simple standard arrangements which will depend on the nature of the fuel.

Mechanical and Thermodynamic Cycles

Both two and four stroke arrangements are possible. Also there are several possibilities for mechanical coupling including, for example, the double acting piston.

Mechanical Details

Care is required in the selection and positioning of the gas and water valves and in the arrangements for their sequential operation.

Operation of the Pump (see Fig. )

The theoretical P-V diagram for the device is as follows:
In order,

1 - 2 : Compression
2 - 3 : Ignition
3 - 4 : Expansion
4 - 5 : Free Movement of Column
5 - 6 : Exhaust
6 - 7 - 6 : Cushion and Bounce
6 - 1 : Intake

Elucidation of the sketch of cycles in Fig.

(1) Ignition (2 - 3 on P-V diagram) - the mixture is ignited and expansion stroke starts (stroke 3 - 4 on P-V diagram).

(2) Expansion - gases fully expanded (4 - 5 P-V diagram); Pressure in chamber (atmospheric or slightly lower due to continued movement of column). Exhaust and water intake valves open. Water is taken into system from inlet tank.

(3) Exhaust stroke (5 - 6), cushion stroke (6 - 7).

(4) Column returns under pressure from delivery head, shuts exhaust valve by impact and cushions on the trapped gases. Water valve shuts when pressure starts to rise above atmospheric.

Bounce stroke (7 - 6), intake stroke (6 - 1), water valve opens again.

(5) Column bounces on the trapped gases and performs intake stroke, drawing in mixture through intake valve which drops open when pressure reaches atmospheric.

An alternate locking arrangement for the exhaust and intake valves is used.
Fuel Alternatives

It is possible to use petrol, or, with suitable vapourising arrangements, kerosene or diesel fuel. The most attractive possibility which may have some general application is the use of animal dung or vegetation mixture of both to generate methane as a fuel. There is very little loss of nitrogen in the fermentation process and the residue can still be used as manure in the normal way. Fermentation is achieved in a digester which will yield between 0.4 and 0.9 c.ft. of gas per day per c.ft. of digester volume. Typical yield for dry vegetation is 4 to 5 c.ft. of gas per pound, and for dung the corresponding figure is about 1 c.ft. per pound. If we assume a 20 ft. head and an efficiency of 20% then one gallon of petrol will pump 124,000 gallons of water. One gallon of petrol is equivalent to 225 c.ft. of gas or the equivalent of the daily output of 7 cows (assuming 30 lbs. of dung per cow as the typical daily output).

In other words, dung from 7 cows every day can be used to pump 124,000 gallons of water and the slurry residue can still be used as an input for composting. Fig. shows a simple gas generator. (Bio-gas produced by fermentation contains about 60% methane and the remaining 40% is largely carbon dioxide; it has a calorific value of 550 to 650 BTU per c.ft. compared to 1012 BTU per c.ft. of pure methane.)

The Humphrey Pump is of particular interest for manufacture and use in developing countries since it is
simple and cheap to construct, can be manufactured locally and, most important, can be operated and maintained by local indigenous resources and local labour. The capital cost of the Humphrey Pump should be considerably less as compared to diesel motor pump, because it contains fewer components, requires less machining and has looser tolerances on the machined parts. There is a greater flexibility in the choice of materials. The pump can be made in small numbers and does not require either complex or expensive manufactured equipment, nor quantity production. This simplicity in construction also leads to easier maintenance and reliability.

(After Dunn, P.D.; Humphrey Pump for Use in Developing Countries, Appropriate Technology Conference, University of Edinburgh, September 1973, mimeo.)
Schematic Drawing of Humphrey Pump and its Operation

source: Dunn, P.D.; Humphrey Pump for use in Developing Countries, Appropriate Technology Conference, University of Edinburgh, September 1973
APPENDIX X/B
Schematic Drawing of a Methane Gas Generator

"If 1984 is frightening, what about 1985?"

.....

"If present trends of population and agricultural production continue we shall see the number of undernourished people in the world rise from some 400 million to 750 millions. At the same time the bills their governments pay to import food from the rich nations could in one year use half their present reserves of gold and foreign exchange. In other words they would be bankrupt within two years. And this equation does not account for the hugely inflated costs of oil imports."

"The latest forecasts of the American wheat harvest have been cut by 4.5 million tons, and in the Soviet Union, where yields are described as no more than average at the moment...... After a disastrous year in 1972, the 1974 world food crop is of crucial importance if the spectre of mass starvation is to be averted."

-- Harold Jackson
The Guardian Extra
July 12, 1974
*

"Why going back to the land is the only hope for the Third World"

....." Following the harvest reports that have been coming in during the past two months, the situation we were so often so confidently told could never happen is now likely to : worldwide famine
that will kill millions of people and seriously reduce the precarious standard of living of hundreds of millions of others.

-- Jonathan Power
The Times, October 18, 1974.

* * * * * * *

"100,000 feared dead in famine"

"The Bangladesh Government will not officially admit that people are dying of starvation, but unofficially it is accepted that the death figures during the past fortnight is 100,000."

-- A report by Abu Musa from Dacca
The Sunday Times, October 27, 1974

* * * * * * *

"Land sold for food"

"Farmers in Bangladesh are selling land at giveaway prices to buy food for their starving families. Taking advantage of the famine now afflicting huge areas of the country, buyers are constantly forcing land prices down."

-- A report by a correspondent
The Observer, October 27, 1974

* * * * * * *

"In a decade or two, there will be more hungry people in the shanty towns and villages of the poor countries than can be fed even from North America's bountiful granary."

"The world food problem cannot be solved in the American Midwest. The problem can only be solved by doubling and tripling the pitifully low per-acre yields on the 150 million small farms of the developing world."

-- Edgar Owens (Washington Post)
Reprinted in The Guardian Extra, Nov. 1, 1974
"Bangladesh hears out Malthus's prophecy"

"Hundreds of Bengalis are dying here every day from famine and related diseases."

"In few countries does the hope of solution seem so dim. It is arguable that the situation envisaged by Malthus, where runaway population expansion is held in check only by famine, disease and war, has already come to pass in Bangladesh whose 75 million inhabitants would increase on present growth trends to between 160 million and 170 million by the year 2000."

-- Michael Hornsby from Dacca
The Times, November 5, 1974

"Hungry Bangladesh is pressed to mend its economic ways in return for World Bank help"

"Famine-stricken Bangladesh received a somewhat reserved and critical response when it took its troubles to the World Bank's newly formed aid consortium in Paris at the end of last month, according to informed sources here."

"The Dacca Government was apparently read some fairly stern lectures on the virtues of greater self-help and more efficient utilization of aid when given."

"The Bangladesh Government estimates that its balance of payments gap in 1974-75 will be S 1200 million since export earnings are expected to cover only about a third of import costs."

"The Government reckons that it will need to import a total of 2,300,000 tonnes of which 1,100,000 tonnes has already been arranged for. But no more than 200,000 tonnes in food aid seems likely to materialize as a result of the Paris meeting."

-- Michael Hornsby from Dacca
The Times, November 7, 1974
The Conference ended with the following recommendations:

1. The establishment of a world food council which would coordinate the activities of the various international agencies. If the proposal is approved by the UN General Assembly, the council will be established at ministerial or plenipotentiary level to function as an overall coordinating mechanism for policies on food production, nutrition, food security and food aid.

2. The creation of an international fund for agricultural development to channel investment towards the improvement of agriculture in the developing world with voluntary contributions from nations normally associated with foreign assistance and from developing countries with ample means.

3. Agreement on an international undertaking on world food security based on a coordinated system of nationally held cereal reserves supported by a worldwide food information and food shortage detection service.

4. A commitment to provide on a three year forward planning basis, commodities and financing for food aid to a minimum level of 10 million tons of cereals plus certain other commodities.

The Conference declared that "every man, woman and child has the right to be free from hunger and malnutrition."
On the eve of the Conference in Rome, a BBC-TV commentator, on the basis of a series of television interviews of prominent Americans, reported that "here in USA it appears that charity begins at home, not in Rome."........................................

-- BBC TV, November 10, 1974

Another commentator said that Britain's contribution at the Conference was very disappointing. The British Delegate is quoted to have told the Conference that he was worried by the existence of malnutrition in the U.K. .................................................................

-- BBC TV, December 1, 1974

In the meantime --

................................" There is no sign yet of a comprehensive JRC (Joint-River-Commission) assisted flood control plan in Bangladesh. Dacca will have to be content with its long-term flood protection schemes, hopefully to be implemented in the next 15 years. And the country will go on being affected by the scourge of flood havoc every 2/3 years, with heavy losses in human lives and materials."

-- Syed Kamaluddin from Dacca
VCOAD
Action for Development
London, December 1974