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D Ghosh, I Banerjee, S Bhattacharya

Sewage treatment and fisheries in urban fringes

It is only recently that the scientists have begun to regard waste as a resource. A major rearrangement of the building blocks of urban waste engineering is yet to take place, but changes in attitudes and willingness to rethink are very much in evidence. Urban waste is no longer a sanitary problem to be dealt with summarily. On the contrary recycling it in the hope of achieving hitherto unknown benefits is now the subject of serious scientific inquiry.

The culture of conserving a resource and using it as many times and in as many ways as possible has been seen to thrive among the poor. There is primafacie an inverse relationship between affluence and affinity with recycling. Discoveries over which scientists in advanced countries congratulate each other have in fact been in effective use in the villages of the less developed parts of the world. Examples of this are the fisheries and garbage gardens of east Calcutta which have lived in perfect symbiosis with the city for the past fifty years ; taking sewage and refuse and providing in return fish and fresh vegetables.

IDEAS AND INTERESTS :

A recent World Bank report describes the 2,500 hectares of fisheries in east Calcutta as the single largest system in the world to use sewage. China has a total of 670 hectares divided among 42 cities, the largest being an 160 ha unit at Changsha. According to the report, other countries having similar fisheries are Germany, Israel and Hungary. What is not mentioned in the report is about the two other systems of recycling that co-exist in east Calcutta :

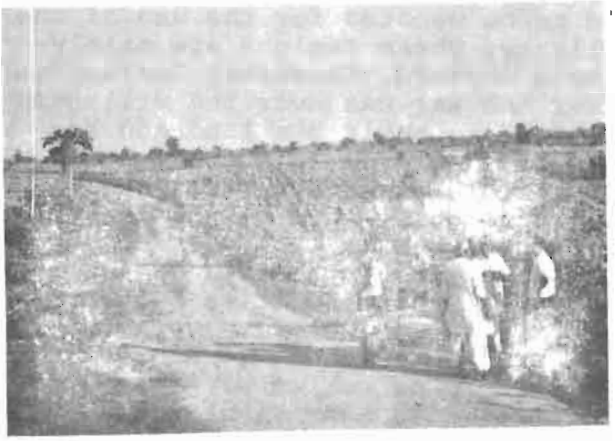
1) the practice of using garbage to grow vegetables and
2) channelling effluent from the sewage treatment fisheries to agriculture.

The total area covered by these three systems is more than 12500 hectares. The largest urban waste recycling system that we have in the east of Calcutta is not merely the fisheries using sewage but the total recycling region. The villagers depend on the time-tested practices for perpetuating these systems and in fifty years or so an unique non-formal skill has been developed.

The interest in east Calcutta's waste recycling ecosystem should be understood in the context of a search for development alternatives, for locally adapted, appropriate modes of development rather than transplantation of alien models. Too often planners look abroad for ideas without realising the appropriate principles and practices flourishing in their backyards. Eco-development entails bringing together creative techniques with the ways in which people perceive and approach the issues of quality of life and environmental changes that are in the forefront of planning debates. Human and ecologically sound planning requires an integration of such understanding with suitable techniques and procedures.

Urban waste, particularly sewage, have long been deposited in marshes and swamps adjoining the cities.

Sewage Treatment Fisheries in East Calcutta



Garbage Farms in East Calcutta

However a purposeful study of the wetland ecosystem in treating waste water did not commence before 1970. Almost at the same time a separate set of studies for examining the waste recycling capabilities of sewage fed fisheries came into being. For returning solid waste directly to agriculture, however, very little organised information is available.

The significance of the waste recycling region in environmental rescue is manifold. It takes the city's sewage and garbage and supplies a major share of the city's requirement of fresh vegetables and fish. Furthermore, these recycling systems provide excellent natural biological treatment of waste and that too for a city where no working waste treatment plant exists. The region conceals one of the biggest laboratories in the world for sanitary engineers to standardize and develop least cost alternatives in municipal waste management that would ensure maximum recovery of nutrient available in waste.

The responsibility to protect the largest urban waste recycling in the world should now be shared by all of us with those farmers. If so much has been achieved without any formal recognition of the virtue of recycleing one can imagine what would have been the results with the right kind of control and support the system needs.

The strength of these recycling systems must have been generated from the economic viability inherent in them and their contributions towards the well being of the society. In return the villagers have to depend essentially on nature and flourish in a system where we offer little support.

ORIGIN, GROWTH AND DECLINE :

During the later part of the last century the once active Bidyadhari river on the eastern fringe of Calcutta and other distributaries of the Hugli were silting up. When the river was active, it was under the tidal influence of the Bay of Bengal, which resulted in flooding of the area. Gradually the tidal influence stopped due to silting and the spill area of the river became an agglomerate of stagnant pools of water - both brackish and rain water. Around 1930's this spill area was gradually converted into sewage fed fisheries and Calcutta sewage became the main source of water (non-brackish) supply in these low lying areas.

The first commercial nature of sewage treatment fisheries began in the year 1929. Mr. B.Sarkar, an imaginative entrepreneur, made the first attempt to produce sewage grown fishes commercially in a large tank (1000 hectares). In his second attempt, in the subsequent year 1930, Mr. Sarkar succeeded in this culture of sewage treatment fisheries. The name of this fishery is 'Nalbal Fishery' (Bheri), and is now run by a State enterprise. Since 1930 these sewage treatment fisheries grew all over the wetland area east of Calcutta. There was however, a desperate need for an alternative source of water and for this the role of city sewage was quickly appreciated and utilised. The fisheries introduced raw sewage as its input and released highly purified effluent (Ghosh 1983) through the internal grid of drainage channels, excavated and maintained by the entrepreneurs.

The growth of these fisheries are linked with the natural systems as well as the anthropogenic interventions. The Bidyadhari river had a gross cross-sectional area of barely 173 sq.mtrs. in 1830 at Bamanghata. It rapidly increased to 1230 sq.mtrs. in the same area in 1883. The whole region was the spill area for the river Bidyadhari. But after the construction of a series of artificial cuts that joined the Bidyadhari and the Kulti Gong, more spill areas and spill channels were thrown into the basin of the river Kulti – the only outfall recepticle for Calcutta sewage. Moreover, free spill into the Salt Lake were curtailed both naturally and artificially. The Bidyadhari dwindled her sections from 1230 sq.mtrs. in 1883 to 425 sq. mtrs. in 1904. By 1928, it further reduced its sections to barely 200 sq.mtrs. after which the river was officially declared as useless by the Bengal Government either for drainage or for navigation purpose. In consequence, the brackish water fisheries were converted into swampy land and the entire fish production in this region was to stop. Just at this time in 1930, Mr. Sarkar successfully performed his experiment to grow fishes using city sewage. The news of such success spread widely. But the sewage fed fisheries could not grow on a widespread scale. Because of the swampy character of the region and failure of the drainage system, the whole region could not be reclaimed as fisheries immediately. But in 1940, the Bidyadhari could no more carry the city's sewage which began to accumulate. This could not continue for any length of time. The irrigation engineers of the state suggested to avail of the stormwater(SW) Channel as an emergent measure. This was completed in 1939.

With the clearance of already collected water, the fisheries of the eastern wetland started using sewage. This was further accelerated after the construction of the Dry Weather Flow (DWF) Canal. The bed level of DWF canel was much higher than that of the SW canal and when sewage was allowed to pass through the DWF canal it began to gravitate automatically into the fisheries. All the earlier fisheries of both the North Salt Lake and the South Salt Lake were converted into sewage treatment fisheries by 1942-43.

The sedimentation tank at Bantala began to function from the 1st May 1945 and the fisheries were getting about 80% silt free sewage. This phenomenon boosted up the interest of the fishery owners to use this sewage for the fisheries. Soon after the sewage-fed became the only type of fisheries in this region. Till 1956 these fisheries were undisturbed.

During the World War II some portions of the North Salt Lake area had to be vacated for the use of the military. These regions are mainly Tihura Nayabad, Kheadaha, Deora. But after the war was over the villagers returned to their own land and the fisheries were in full swing again. Except for this short period there was practically no odds for these fisheries. But in 1956, a land acquisition notices was served on the North Salt Lake fisheries by the Land Acquisition Collector, Government of West Bengal for the expansion of the city. The same notice was served for the South Salt Lake Fisheries in 1957. These notice are not formally invalidated by the authority who worked for the scheme in this area. Thus an atmosphere of uncertainty had been prevailing all over the region. For this the entrepreneurs became shy. As a result the work of desilting in these fisheries was stopped. Approximately 10 cm to 15 cm of desiltation was necessary for these fisheries after every 5-6 years. But since this work has not been done for a pretty long time, the bed levels of these fisheries are rising and as a result the production of fish is reduced.

Furthermore, for the development of the Salt Lake City (3000 acres) and for the Baishnabghata complex (1000 acres) fisheries land is lost in two phases of urban sprawl. Similarly, for the expansion of the city about a thousand acres of fisheries land was converted . Thus for the expansion of the city so far about 5000 acres of fisheries land is lost.

ECONOMIC APPRAISAL :

The efficiency of resource recovery based landuse was further established as we made an economic appraisal of an integrated resource recovery project on the waste recycling region covering over 12500 hectares. The present appraisal is based on a conservative estimate of benefits derived from an integrated fishery and agriculture system using the Calcutta sewage. The purification of sewage, which takes place through the system is not considered in the benefit estimation.

Total Project Cost	:Rs.1134 Lakhs
Period of implementation	:5 years (1986-87 to 1990-91)
Expected life of the Project	:20 years

(1£=Rs. 17.00, 1$ = Rs.12.14
1 million = 10 lakhs.)

Economic Costs :

(a) The tentative annual investment layout is as follows :-

Year	Cost(Rs. lakhs)
1986-87	344
1987-88	389
1988-89	377
1989-90	12
1990-91	12
	1134

(b) Annual average recurring costs : Rs.413.00 Lakhs.

For estimating the benefit cost ratio (i.e. the ratio between the present value of the benefits and the present value of the costs) the time series of both the returns and the costs have been used. Some of the benefits will start accruing partly during the implementation period itself. An estimation of annual benefits accruing from different years have been made for our purpose for two different alternatives (alt. A & alt. B) under two assumption where for alternative A the yield forecast for fish is 7 ton/ha and increased employment for 2.5 persons/ha for 350 days while for alternative B the same is 10 ton/ha and increased employment for 3 persons/ha for 350 days. It is expected that some of the benefits will start accruing from the third year and this alongwith the others will progressively improve over the implementation period and full benefits will accrue from the 6th year.

It is also assumed that the project cost remains the same for both the alternatives. It is possible that the villagers use their labour in alternative uses and due to their formal engagement in the proposed project work other productive activities and hence output are affected. But in a labour abundant economy like ours, for the sake of convenience, it is further assumed that the off-project wage opportunity is negligible or zero and output forgone is nil.

The benefit cost ratio has been calculated on the basis of a standard 10% discount rate; but in view of the strong inflationary pressure prevailing in the country a 15% discount rate has also been tried with.

The economic appraisal of the project establishes that it is well conceived from the economic point of view. On a very conservative estimate of direct benefits alone the B-C ratio appeared to be 1.48(10%), 1.26(15%) and for an optimistic assumption the ratio came out to be 2.12(10%), 2.06(15%). These direct benefits included only the increased value product and services which could be unambiguously quantified. Apart from the direct benefits, it is necessary to consider all other benefits accruing from the project like indirect benefits (arising from processing) secondary benefits flowing closely from the project like increase in trade and transport associated with increase in agricultural and fish output, induced benefits like increased activity expected from increase in population and employment (multiplier effect) and finally social benefits consisting of the increased welfare of the community brought about by the project. However, in view of the difficulties in quantifying the volume of profit from these activities all the above benefits have been excluded (which are likely to be quite substantial) while calculating the benefit cost ratio from the discounted stream of benefits and costs. The project therefore obviously deserves special attention and a very high priority.

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