

FLOOD-FLUSH SCHEMES IN BENGAL.

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The term 'flood-flushing' probably needs to be defined in order to understand the object and usefulness of that process. Its distinction from ordinary 'irrigation' is also to be noted. 'Irrigation' may be defined as 'the introduction of water on to land by artificial means for the purpose of watering the crops grown thereon'.

Accordingly, the amount of water so introduced is regulated by the requirements of the crop to be irrigated, and it is the constant aim of the Irrigation Engineer to so perfect the method and arrangements for the distribution of water that as large an area of cultivation as possible may be efficiently served with the supply available. As a general rule a depth of watering of $2\frac{1}{2}$ inches to 3 inches is given, and such waterings are repeated at intervals of about 10 days until the requirements of the crop have been met. Taking one cubic feet of water per second, commonly known as 'one cusec', as the unit of discharge, an area of 79 acres can be inundated to a depth of 3 inches by one 'cusec' in a period of ten days. 'Flood-flushing', on the other hand, aims at introducing water on to land for the sanitary improvement of the area flushed as well as for the revitalizing of the land and the irrigation of the crops grown thereon.

As its name implies, flood-flushing can only be carried out during the flood season when the rivers are heavily silt-charged and full to overflowing, and there is no anxiety about the adequacy of the supply available, and the only limits to the discharge that is to be passed on to the land are those imposed by the survival of the crops, the capacity of the drainages and the safety of buildings, and culverts, etc.

Bengal is a deltaic province and one of the principal functions of its rivers is to spill, during the flood season when their waters are heavily charged with silt, over the surrounding land.

If the natural conditions are allowed to prevail the lowlands traversed by deltaic rivers are gradually raised to above flooding level by the recurring deposition of silt and sand thereon from the spill of the rivers.

It would take too long to go in detail into the process of land reclamation by delta-building rivers and of the harmful results that follow interference with such natural action, suffice it to say that during the process of raising the level of the land the swamps, and low areas generally, are refreshed for

several months annually, and the land spilled over is raised and rendered fertile for cultivation.

In Bengal, owing to the economic needs of a rapidly increasing population, embankments to prevent many of its rivers overflowing their banks have been erected. At first the results of such action were very profitable, crops were grown without risk of ruin by flooding, railways, roads, factories, and all the other amenities and accompaniments of material and industrial progress were introduced. Later, however, the harmful effects of the policy of embankments began to be felt. When a river is embanked the silt, which is intended by Nature to be discharged on to the surrounding lands, cannot escape from the river channel and is mostly deposited on the bed, thus choking the channel and causing the bed level to rise. As the bed level rises the water level also rises and, in consequence, the embankments have also to be raised to keep pace with the rise in the bed and water levels of the river. The lowlands remain at the same levels and so unhealthy swamps are formed which cannot be drained and become a menace to public health; the lands, which would normally be revitalized and moistened by river spill, become infertile and the natural system of surface drainage becomes upset. Owing to the rise in the river levels the danger of breaches in the embankments and of disastrous flooding of large areas becomes ever present.

The contrast between the conditions in East Bengal and Central Bengal is very striking. In the former (except in a few areas where embankments along rivers have been constructed) the countryside is subject to river spill and is fertile and populated by a virile and healthy population.

In Central Bengal where the rivers have been embanked, all the harmful effects mentioned above are evident. The rural population is declining and has become debilitated by malaria and other diseases, and agricultural prosperity has decreased. The remarks made in the foregoing paragraphs are not intended as a criticism of former engineers. Embankments in similar circumstances are still being erected in other countries, the most recent example being along the rivers Axios and Aliakmon in Greece to prevent them spilling over the Salonika plain.¹

Of course, farmers and their lands that have been accustomed to the protection of embankments cannot suddenly be exposed to the fury of flooded rivers. Nevertheless, it is the declared policy of the Irrigation Department in Bengal to slowly abolish embankments wherever possible and to prevent the erection of any fresh embankments.

In addition, following the activities and investigations of medical scientists like Dr. Bentley and Rai Bahadur Dr. G. C. Chatterjee a policy of flood-flushing has been initiated. Those workers have shown that, apart from the beneficial effect on the productivity of the soil and the gradual raising of low

¹ *Vide* a paper by B. W. Huntsman, B.Sc., M.Inst.C.E., read at the Institution of Engineers, London, on the 26th January, 1937.

areas, the passage of silt-laden water over agricultural lands has a marked beneficial effect on the public health of the locality concerned. As far as it can be understood by a layman the propagation of mosquitoes in hollows in the land is interrupted, while the tanks and swamps are refreshed, and there again the breeding of mosquitoes is interfered with by the introduction of silt-laden water and of carp fry which are carried in suspension by the flushing water and which soon grow into vigorous larvæ-devouring fish.

The conditions that prevail in East Bengal and those ruling after the otherwise disastrous breaching of the Damodar river embankment in 1913 and again in 1935 left no room for doubt that the theories propounded by the workers named are correct. So a beginning was made, in a small way, with flood-flushing schemes in different parts of the province. Thus the highly malarial village areas of Pingla, Naraingarh and Kola in the district of Midnapore, covering an area of 8,278 acres including 729 tanks, have been flushed with water from the Cossye and Rupnarain rivers through the Midnapore canal system, free of charge to the villagers, during the flood seasons of 1932 to date.

The inhabitants there are kept under medical observation by the authorities of the Public Health Department, and the reports show a marked improvement in public health as evidenced by reduced treatment at dispensaries for malaria and other fevers and by a reduced spleen index. The results of the introduction in 1934 of flood water (free of water tax) from the Gobra Nullah on to the lands of the villages of Maidyagobindpur, Madapur, Bahadurpur, Sultanpur and others in the Murshidabad district, were even more striking for whole village sites which had been abandoned on account of malaria were reoccupied. Seven thousand one hundred and twenty acres were flushed and the report shows that in addition to reducing malaria the yield of the *aman* paddy crop was approximately doubled and grubs and insects like white ants were destroyed. Again, with the aid of the Collectors of the Jessore and Nadia districts, it is hoped to throw open to river spill, from the Mathabhanga river and its tributary channels, considerable areas where unhealthy conditions at present prevail.

The area of land between the lower reaches of the rivers Damodar and Hooghly is one where unhealthy conditions prevail and where the productivity of the soil is now much less than in former days, in consequence of the presence of the embankment along the left bank of the river Damodar. Encouraged by the success of the trial measures mentioned above, and acting on the suggestions put forward by the Public Health Department and by the Rural Development Commission of Bengal, an ambitious scheme has been submitted to the Local Government for flushing 3,50,000 acres, in the districts of Burdwan, Hooghly and Howrah, between the Damodar and Hooghly rivers, by the flood waters of the Damodar river at a cost of Rs.273 lakhs = (£2,100,000). The salient features of the scheme include a barrage in the river Damodar near Burdwan and a network of distributing channels fitted with regulators,

capable of carrying 13,160 cusecs (a discharge equal to the normal flood discharge of the Thames river at Staines), and adequate sluices for the drainage of the excess water into the river Hooghly.