

Growing Problem of Sedimentation and Weeds in Reservoirs of Irrigation Projects in Non Ghat area of Maharashtra

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ABSTRACT

Reduced vegetal cover on account of deforestation, rapid urbanization, and developmental activities in the catchment area, faulty agricultural practices etc contribute to rapid erosion of the land in the catchments of reservoirs. The soil erosion in the catchment accelerates the process of sedimentation in reservoirs which poses threat to their useful capacity by rapidly eating away the storage potential created behind the dams. In India every year about 5334 M Tonnes of soil (about 16.35 t/ha) is eroded annually out of which about 10 % gets deposited in the reservoirs causing reduction in their storage capacity by 1% to 2% annually. Reduced storage in the reservoir on one side and increased demand for non irrigation use on other side puts the management authorities on edge in making equitable distribution of water. In addition to this, there is an emerging problem of growth of semi aquatic weeds like Ipomoea Carnea (Local name -Morning Glory, Besharam, Behaya etc) in the submergence area of the reservoirs. The most common location for growth of such weeds is the peripheral area of the reservoirs. The growth of such Besharam shrubs is widely observed in many reservoirs in the non Ghat areas of the State, especially in the reservoirs in the Deccan plateau where the topography is flat. Such vegetation grows and spreads profusely forming colonies over long stretches in the reservoir submergence area. Growth of such weeds reduces the storage capacity of reservoirs by trapping the silt, develops marshy areas which create favorable environment for mosquitoes causing spread of disease like Malaria in the nearby places. It also reduces the aesthetic value of the reservoir and also creates bad impact on fisheries development. Regular monitoring of reservoirs for assessing their capacity, preventing growth of such noxious weeds and marshy areas needs to be done.

Major reservoirs like Ujjani in Solapur district, Jayakwadi in Aurangabad district, Manjara in Beed district, Lower Terna in Osmanabad district, (in South Maharashtra and Marathwada region), Hatnur in Jalgaon district, Nandur Madhyameshwar in Nashik district, (North Maharashtra) are affected by sedimentation and growth of the semi aquatic weeds like ipomoea carnea i.e. Besharam shrubs. The reservoirs viz. Lower Pus, Arunavati in Yavatmal district, Lower Wunna (Vadgaon and Nand reservoirs), Jam reservoir in Nagpur district, which are less than 15 years of age are also invaded to some extent by growth of such weeds especially near the peripheral shallow water area at the tail and banks,. The above list is just a representative one.

INTRODUCTION

Reduced vegetal cover on account of deforestation, rapid urbanization, developmental activities in the catchment area, excessive quarries and mining etc are some of the important factors responsible for rapid erosion of the land in the catchments of reservoirs. The soil erosion in the catchment accelerates the process of sedimentation in reservoirs. The sedimentation poses threat to the useful capacity of reservoirs by rapidly eating away the storage potential created behind the dams. In India every year about 5334 M Tonnes of soil (about 16.35 t/ha) is eroded annually out of which about 10 % gets deposited in the reservoirs causing reduction in their storage capacity by 1% to 2% annually. The reduction in water storage hampers the entire irrigation and domestic water planning. Reduced storage in the reservoir on one side and increased demand for non irrigation use on other side puts the management authorities on edge in making equitable distribution of water. The problem of eutrophication in reservoirs of irrigation projects is not generally observed because these reservoirs are normally located far away from the city or village area. As such the domestic waste and sewage, material with high phosphorus and nitrogen content together with the untreated industrial effluent etc, which causes eutrophication, are not directly drained in to the reservoir. But there is an emerging problem of growth of semi aquatic weeds like *Ipomoea Carnea* (Local name -Morning Glory, Besharam, Behaya etc) in the submergence area of the reservoirs. These weeds grow in shallow reservoirs and lakes where rise and fall in water levels with the season is a regular phenomenon. These weeds may be called as semi aquatic. The most common location for growth of such weeds is the peripheral area of the reservoirs. The growth of such Besharam shrubs is widely observed in many reservoirs in the non Ghat areas of the State, especially in the reservoirs in the Deccan plateau where the topography is flat as compared to that of Ghat region of Sahyadri and Konkan. The reservoirs located in these areas have large catchment areas with major land use as agriculture. The soil erosion is also more because of regular tillage activities. There fore, sedimentation in reservoirs in these areas is also more. Run off from such catchment carries loose soil particles along with the nutrients like phosphorus and nitrogen from the fertilizers applied to the agricultural fields. The eroded soil along with the high percentage of nutrients supports and enhances the weed growth. Such vegetation grows and spreads profusely forming colonies over long stretches in the reservoir submergence area. Growth of such weeds reduces the storage capacity of reservoirs by trapping the silt particularly in the live storage zone, develops marshy areas which create favorable environment for mosquitoes causing spread of disease like Malaria in the nearby places. It also reduces the aesthetic value of the reservoir and also creates bad impact on fisheries development. Regular monitoring of reservoirs for assessing their capacity, preventing growth of such noxious weeds and marshy areas needs to be done. For large reservoirs, sometimes it becomes difficult for the controlling authorities of the reservoirs to reach the problem areas physically because of inaccessibility and other reasons. These areas therefore remain unattended and neglected.

STUDIES CONDUCTED

Maharashtra Engineering Research Institute, Nashik has been regularly conducting sedimentation studies of major and medium reservoirs by remote sensing technique as well as by hydrographic surveys. So far about 40+ major and medium reservoirs have been resurveyed for assessing their present capacity. While conducting the sedimentation studies of these reservoirs located in different parts of the state, it was observed that many reservoirs, especially in the flatter areas of Marathwada and Vidarbha and north Maharashtra regions are affected by sedimentation as well as by the growth of such weeds in the submergence area. Growth of such weeds is found to be increasing over a period of time. The periodic satellite images of these areas have also shown that the area occupied by such weeds is increasing. In case of recently constructed reservoirs also, the growth of such vegetation is observed. Such noxious weeds grow in the water happily and are aggressive colonizer in the shallow water zone. When the water level depletes during summer, leaf shading of such vegetation occurs. The vegetation remains in semi dry to dry state during this period. Such patches of weeds appear yellowish white in standard false colour composite (FCC) of the satellite data. During rainy season, when the reservoirs receives floods and the water level increases, these again turn to green and dense because of new broad leaves and appear bright red in satellite image. These changes in vegetation cover in the reservoir area can be clearly observed from the satellite images. Its spread is fast and within few years it encroaches over hectares of area and form colonies in submergence area. Sometimes the height of such vegetation can be about 2 to 3 meters and the density is such that it is difficult for a man to walk through. This vegetation is not even edible for animals nor is suitable for green manuring. Such vegetation develops in the delta formation area which is a result of sedimentation in the different reaches of the reservoir. It then traps the silt coming into the reservoirs in the live storage portion and allows it to settle there which forms a platform for the vegetation to spread. This causes the reduction in live storage capacity of the reservoir. Thus sedimentation and growth of vegetation are complementary to each other. It is therefore necessary to monitor the weed growth regularly. It has also been observed that wherever the domestic and the industrial waste and untreated effluent is carried by rivers and streams in to the reservoirs, growth of water hyacinth and other aquatic weeds has occurred. This very fact has so far been neglected and has not been given due importance by the reservoir management authorities. In many rivers flowing through a town or city where the untreated effluents are directly discharged in to the river, development of such noxious weeds is a common phenomenon. Today at some places, the water quality in reservoir is not suitable for drinking. Tomorrow it may not be even suitable for irrigation as well.

FINDINGS

Major reservoirs like Ujjani in Solapur district, Jayakwadi in Aurangabad district,

Manjara in Beed district, Lower Terna in Osmanabad district, (in South Maharashtra and Marathwada region), Hatnur in Jalgaon district, Nandur Madhyameshwar in Nashik district, (North Maharashtra) are affected by sedimentation and growth of the semi aquatic weeds like ipomoea carnea i.e. Besharam shrubs. The above list is just a representative one. These reservoirs are of 30 + years of age. But in case of reservoirs like Lower Pus, Arunavati in Yavatmal district, Lower Wunna (Vadgaon and Nand reservoirs), Jam reservoir in Nagpur district, which are relatively younger are also invaded to some extent especially near the peripheral shallow water area at the tail and banks, by growth of such weeds. At present though the area covered by these weeds may appear to be small as compared to the total submergence area of the reservoirs, it may increase rapidly in future and cause ill effects on the reservoir functioning making the water unfit for drinking and irrigation purposes.

In the Western Ghat areas of Maharashtra, the sedimentation in the reservoirs is found to be much less as compared to that in other parts of the state. This probably may be due to better biomass cover in the catchment areas of projects situated in the Western Ghat area. Koyna, Dhom, Kanher, Bhatghar, Warasgaon, Panshet Khadakwasla, Manikdoh , Bhandardara, Upper Waitarna , Bhatsa, Gangapur etc are some reservoirs located at the foot hill of Sahyadri range. Growth of semi aquatic weeds was also not observed in these reservoirs while conducting their sedimentation surveys in last few years. The reason for this may be that the catchment areas of all these reservoirs are almost hilly and are free from the activities like industrial development and urbanization. Hence the rivers are free from contamination due to untreated industrial effluent and domestic sewage. Moreover, since the percentage of agricultural land in the catchment is less, soil erosion is also less.

The process of sedimentation of the reservoirs can be brought under control by undertaking catchment area treatment programmes on a long term basis. These measures can be of engineering techniques, agronomic treatment, afforestation and grass cover. Activities viz. conducting periodical capacity surveys, identification of areas prone to erosion, catchment area prioritisation work, effect of sediments on quality of water, monitoring the growth of aquatic vegetation viz. water hyacinth and water weeds in the reservoirs needs to be given due importance

DISCUSSIONS

The use of satellite remote sensing technique is very useful for such monitoring. Remote sensing satellite images give a synoptic coverage of the land use pattern in the catchment area. This gives the information about the vegetal cover on the surface (actual agricultural land, forest land, area under natural vegetation etc) the extent of barren land, etc. Land use pattern of the inaccessible area can also be effectively mapped by studying the satellite images. Information about Soil type, slopes, land use pattern derived from the images of remote sensing satellites in conjunction with the

hydrological parameters like rainfall intensity, runoff can be effectively used to know the silt load from the catchment and probable silt volume likely to be dumped in to the reservoirs. In some cases it is possible simply by visual observation of the satellite image to identify the stream or tributary contributing most to sedimentation in reservoirs. Silt in suspension and the shallow depth due to sedimentation at the confluence of river / nallas draining into reservoir is reflected clearly in the satellite image giving bluish or cyan colour. The land use /land cover information derived from satellite images clubbed to together with the physiographic information such as slope, relief, and hydrological parameters like rainfall can help estimate soil loss with the help of Universal soil loss equation. After identifying such erosion prone areas they can be treated with proper measures. The sedimentation in the reservoirs can be monitored at regular interval by conducting periodic capacity assessment surveys by remote sensing technique(Fig. 1-4).



Fig. 1: Besharam growth in Arunavati reservoir, Yavatmal



Fig. 2 : Besharam growth in Ujjani Reservoir, Dist. Solapur

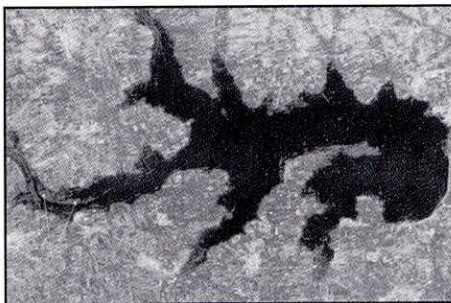


Fig. 3 : Satellite image of Manjra reservoir showing intrusion of Besharam shrub inside the water body shown in red colour



Fig. 4: Growth of Besharam in Navegaon Bandh in Gondia District

Silt removal by dredging of silted bed and periphery of reservoir to restore its original capacity is not advisable though this soil is generally rich in nutrients. Silt removal by any method is not economical and secondly the dumped silt over the field gets washed away and enters the reservoir on down stream. It is felt that increasing the existing height of the dam to accommodate extra storage is more appropriate way for restoration of capacity lost due to sedimentation. The rehabilitation problem is also not severe.

The eradication of semi aquatic weeds like besharam needs to be thought of seriously. Physical removal of these shrubs the submergence area, manually, is troublesome and more over its growth is cyclic. The research on genetic control of such weeds or control using pesticides may be undertaken. Alternatively, since it is not edible or consumed by cattle and buffalo, the possibility of its use as fuel in baked form like coal should be explored. The Environmental scientists and Botanists and Biotechnologists may come forward and carry out research in this area.