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New invention on Reuse of Sewage and Wastewater by Phytorid Technology

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Abstract - Insufficient or non-existing management of municipal andwaste water results in immense environmental problems and increasing hygienic risks for the growing urban population thereby hampering poverty alleviation and a sustainable development of the Indian society. A treatment system that provides a sustainable, closed-loop system, which closes the gap between sanitation and agriculture. The objective of Phytorid technology concept is to produce hygienically safe and useful resource out human wastes, which can not only improve the environmental situation, but also improve living conditions in a sustainable way and lower risks on human health. The objective of this paper is to provide a feasible solution for ever increasing sewage treatment problem and eventually conserving natural water bodies removing possibility of dumping.

Keywords - *Sewer systems, Decentralised, Phytorid Technology, Loop, Sewage*

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I. INTRODUCTION

A direct relationship exists between water, sanitation, health, nutrition, and human well-being. Lack of or inadequate sanitation impacts on the local economy, productive and school days lost due to sickness, the overall quality of life for those living in the vicinity including the general aesthetic.

United Nations General Assembly declared the year 2008 as the “International Year of Sanitation.” The goal is to raise awareness and to accelerate progress towards the Millennium Development Goal (MDG) target i.e. “to reduce by half the proportion of people without access to basic sanitation by 2015” [1].

Although many sources of energy exist in nature, it is coal, electricity and fossil oil which have been commercially exploited for many useful purposes. Though the Earth is called the blue planet, freshwater is a scarce resource. Only 2.5% of all water resources are freshwater, of the 2.5% which are freshwater, nearly 70% is not accessible, because it is bound in snow and ice, thus only 0.5% of the total water on earth is accessible for drinking and other freshwater uses [1]. This water crisis is in part a direct result of the failure of the current sanitation paradigm. Sewered sanitation has the status of a widely accepted solution, or scientific truth. There is little discussion about its core problems, which result in health and environmental problems around the world. The fact that our current sanitary systems are, for the most part, directly connected to the water cycle which requires that both the sanitation and water crises be considered, before we can begin trying to de-couple them.

Limitations of Conventional Sanitation Systems

In most parts of the world, basically two options to tackle sanitation problems are applied which can be described as “drop and store” and “flush and forget”[2]. These conventional forms of wastewater management and sanitation systems are based on the perception of faecal material, which is considered as repulsive and not to be touched. The design of the technologies is furthermore based on the premise that excreta are waste and that waste is only suitable for disposal. Conventional sanitation systems, based on water-borne sewerage, are the accepted manner for removal of human waste from cities. However, in recent years they have proven to be unable to make a significant impact on the backlog of nearly half of the world’s population. Moreover, even if a sufficient investment could be made, so that conventional sanitation systems could be provided to address who lack access to adequate sanitation, the resulting sanitation systems would not be sustainable. In many places, sewered sanitation results in polluted ground and surface waters. It can therefore lead to a whole new series of problems.

"Advanced" water-borne sewer frameworks are a generally new innovation, which just started to spread in European urban communities from around the end of the nineteenth century, when channeled water supplies and the utilization of flush toilets lead to an expanded water utilization, and waste-water generation. This prompted streams and stagnant pools of wastewater in city lanes, bringing about episodes of cholera and different infections. To handle this issue, sewer frameworks were bit by bit presented. Later, when this was seen to bring about genuine water contamination, regulated mechanical wastewater treatment plants, biological treatment for the debasement of natural sub-positions, and tertiary treatment for the evacuation of supplements were added to diminish the contamination and coming about eutrophication of the getting water bodies. These now speak to the current situation with the-craftsmanship in wastewater treatment. The issues be-come especially genuine when there is a quick increment in the urban populace.

Customary unified frameworks require an enormous monetary venture, and have moderately high support and operation costs. The challenges brought on by these costs don't just keep creating countries from accurately fabricating and working incorporated sanitation frameworks, yet industrialized countries additionally confront tremendous issues in the upkeep and operation of their sewer systems and treatment plants. Regardless of the fact that such frameworks add to a more beneficial environment in the urban areas where they are introduced, they do the inverse for those living downstream. At the point when working appropriately, the release from routine wastewater treatment plants is still not safe from a wellbeing perspective, neglecting to meet the quality necessities of washing water, if the weakening is not adequate. Customary treatment plants have been created for the evacuation of vast particles, biodegradable natural substances and supplements with a specific end goal to secure accepting waters. The decrease of pathogenic life forms is however deficient.

Neither pit toilets nor pour flush toilets development included resource recovery as part of their function. Indeed, the health impact of underground waste disposal, particularly its impact on groundwater, was rarely considered. Fortunately, pathogenic organisms as a rule, did not survive in the ground, and in any event did not travel very far.

Be that as it may, the expanding thickness of populations then frequently has prompted circumstances where the required least separation between drinking water well and pit toilets can't be re-spected. Shallow groundwater is still a noteworthy wellspring of water supply in rustic and peri-urban ar-eas, particularly for poor people. The configuration of the customary "drop and store" pit-can (and of most other on-plot frameworks) dirties this valuable groundwater as it purposely intends to hold just strong matter in the pit and penetrates however much of the fluids as could be expected into the subsoil [3]. As these fluids contain all the dissolvable components of the ex-create and additionally infections and pathogens, this sort of sanitation, contingent upon the hydro-topographical sit-uation, can be a thruway to groundwater contamination.

Lack of Attention to Macro-Nutrient Cycling

Our ordinary wastewater frameworks are to great extent straight, end-of-funnel frameworks where drinking water is abused to transport waste into the water cycle, bringing about natural harm and hygienic dangers, and adding to the water emergency.

While the above are not kidding inconveniences of both water-borne and dry routine sanitation frameworks, a significantly more principal issue is that they don't encourage the reuse of full scale and smaller scale supplements present in excreta and wastewater. This absence of supplement recuperation and use prompts a direct stream of supplements from horticulture, by means of hu-keeps an eye on to beneficiary water bodies. Notwithstanding when sew-age slop is utilized as a part of horticulture, just a little portion of the supplements contained in the ex-crement are reintroduced into the living soil layer. Most are either demolished in the treatment process (e.g. by nitrogen end) or enter the water cycle, where they dirty the earth, bringing about the eutrophication of lakes and waterways.Not returning the nutrients to the soil has led to a situation where there is an increasing demand for chemical fertilizers, in response to the problem of decreasing soil fertility. To produce the required chemical fertilizers, large amounts of energy are needed, and finite mineral resources, such as phosphorous, must be exploited. The relatively inexpensive phosphorous used today will almost certainly cease to exist in the next 50 years [4].

The New Sanitation Paradigm: Phytorid Methodology

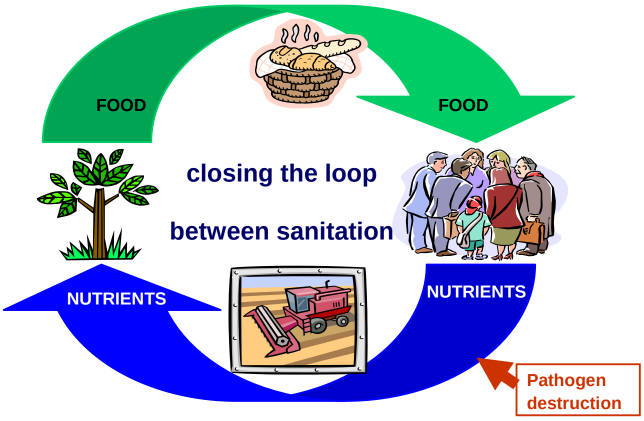

Fig. 1: Closing the Loop

Farmers around the world yearly require 135 Miotons of mineral fertilizer for their crops, while at the same time conventional sanitation dumps 50 Miotons of fertilizer equivalents flows into our water bodies, nutrients with a market value of around 15 Billion US dollars [4]. Figure 1 show how loop can be closed when Phytorid system is applied.

II. METHODOLOGY

In our college premises due to overloading of septic tank, sewage without treatment has become a mess and it has formed a lake of un-treated sewage which is seeping through soil degrading groundwater and eventually affecting productivity of crops.

To tackle this problem a bed resembling to natural wetland is been built on an experimental basis. All constituents of wetland technology are been taken into account for this bed. A wooden basket of 1m depth and 0.8m diameter has been taken into consideration as a bed which would be covered from all outer sides by black plastic and cowdung from both inner and outer sides which would act as purifying media in bed.

Equal layers of aggregates in two available sizes would act as a basic filter. Top layer would comprise of soil to help in Phytorid plants' process. The top most layers would be of cowdung which now would act not only as a filter but also as a bacterial media which would energize the sewage and help in cleaning it. Above all Phytorid plants like Eichhornia, Helicornia, and Pan Umbrella etc. would be used as the major purifying factors in this Phytorid process.

As these plants survive and flourish on nutrients in sewage, they absorb oxygen from atmosphere and send down to sewage from their roots thus increasing oxygen content eventually purifying sewage in clean water. An opening would be given from wooden basket to a container where clean water would be discharged after a specific detention time of 72 hours [5].

Plants which act as a purifier in this topic are sometimes readily available in our surroundings such as 'Indian Shot' etc. but due to its incomplete know how such useful plants are wasted.

One of the most important aspects regarding implementation of this project is not a single labor was used for any of the works. Considering right from sewage handling to laying of aggregates or preparation of semi portable Phytorid bed to pouring layer of cow dung over soil on the bed which acts as a filter media.

III. RESULTS

Following are the tests conducted on sewage accumulated in college campus. These test results have been provided by Ashalini Enterprise, Panvel conducted on sewage sample.

Parameters	Sample	Result	Methods
pH	9.58	8.50	
BOD (mg/lit)	80 mg/lit	110.50 mg/lit	IS: 3025 (Part -44): 2003
COD (mg/lit)	240 mg/lit	298.89 mg/lit	IS: 3025 (Part -58): 2006
TSS (mg/lit)	480 mg/lit	126.00 mg/lit	IS: 3025 (Part -17): 1999

Fig. 2: Sewage accumulated in College Campus

Following are the results of tests on sewage after subjected to Phytorid Technology.

Tests	Sewage Sample	Treated Sample	Permissible Range of Effluent
pH	9.58	7.34	7.1 - 7.5
BOD (mg/lit)	80 mg/lit	9 mg/lit	< 5 mg/lit
COD (mg/lit)	240 mg/lit	27 mg/lit	< 20 mg/lit
TSS (mg/lit)	480 mg/lit	12 mg/lit	10-20 mg/lit

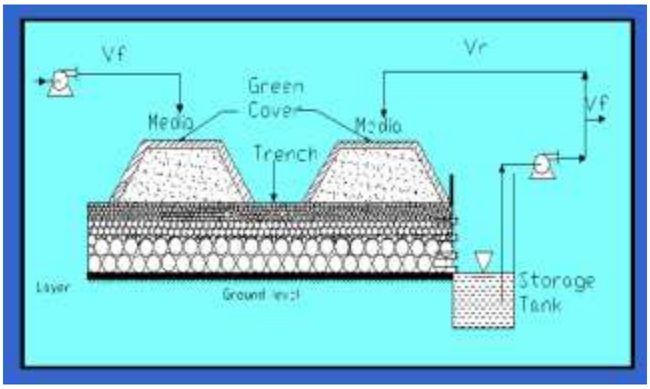

Fig. 3: Model picture of Small Scale Phytorid Bed

IV. CONCLUSION

The new paradigm in sanitation must be based on ecosystem approaches and the closure of material flow cycles rather than on linear, expensive and energy intensive end-of-pipe technologies. Sanitation systems are part of several cycles, of which the most important cycles are the pathogen cycle, water cycle, nutrient and energy cycle. In order to ensure public health, sanitation approaches primarily aim at interrupting the life cycle of pathogens. In addition, the new approach is recognizing human excreta and water from households not as a waste but as a resource that could be made available for reuse, especially considering that human excreta and manure from husbandry play an essential role in building healthy soils and are providing valuable nutrients for plants. While conventional sanitation restricts health security to the in-house environment and sometimes leads to a disastrous situation in the neighborhood or the receiving water body, the new approach is aiming at sanitizing the products instead of exporting problems and apply a health oriented multi-barrier concept of treatment, crop restriction and exposure control.

Phytorid technology system offers a range of low cost to high tech sanitation options which are hygienically safe, comfortable to use, environmentally friendly and often more economic than conventional systems. In addition, they ideally enable a complete recovery of nutrients in household wastewater and their reuse in agriculture.

This system not only conserves vital resources which are otherwise simply wasted but also creates employment opportunities. In spite of the fact that it requires minimum maintenance as compared to other prevalent systems.

In this way, they help preserve soil fertility and safeguard long-term food security, whilst minimizing the consumption and pollution of water resources.

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