

PROPAGATION OF EM TECHNOLOGY IN INDIA

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Synopsis:

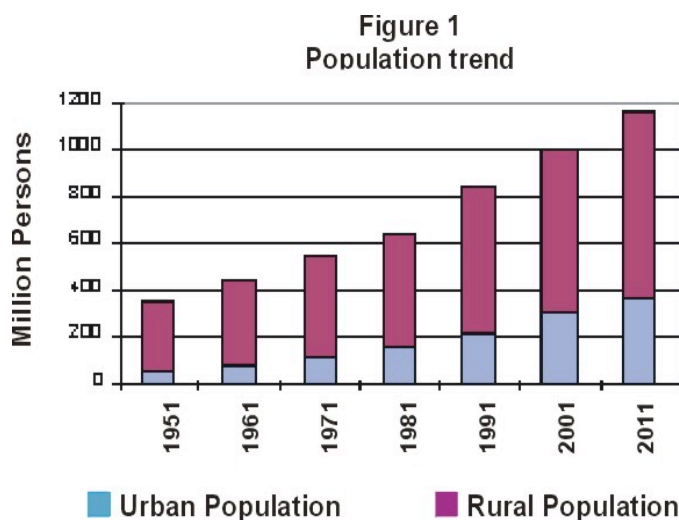
India is one of the most important Countries in southern Asia. It offers a rich diversity of flora and fauna, has more than 1,600 dialects being spoken, has perhaps one of the richest cultural heritage in the world. It is a secular Country with many religions being followed.

India has made substantial progress in most spheres of development over the last fifty years. However, the benefits of this growth have been substantially offset by environmental degradation. Large-scale environment degradation has resulted from population pressures, industrialization and the indiscriminate use of forest areas for fuel, power generation and irrigation purposes. The spread of green revolution has given India a certain measure of food security, but it has been at the cost of falling water tables, degrading soils and the harmful side-effects of increasing pesticide and fertilizer use.

Through the introduction of EM technology in various spheres, we intend to bring about a revolution in the progress of the Country keeping in mind the preservation of the environment.

The adverse impact on environment owing to an increase in agricultural production:

India has the distinction of crossing the 1 billion-mark population last year (Figure 1). This figure contributes to almost 10% of the world population, making India the most densely populated amongst all the Countries in the world. Almost 70% of the population is in the rural areas (Figure 1) where there are areas even today with little electricity and no proper infrastructure for education.



Source : Registrar general, 1991

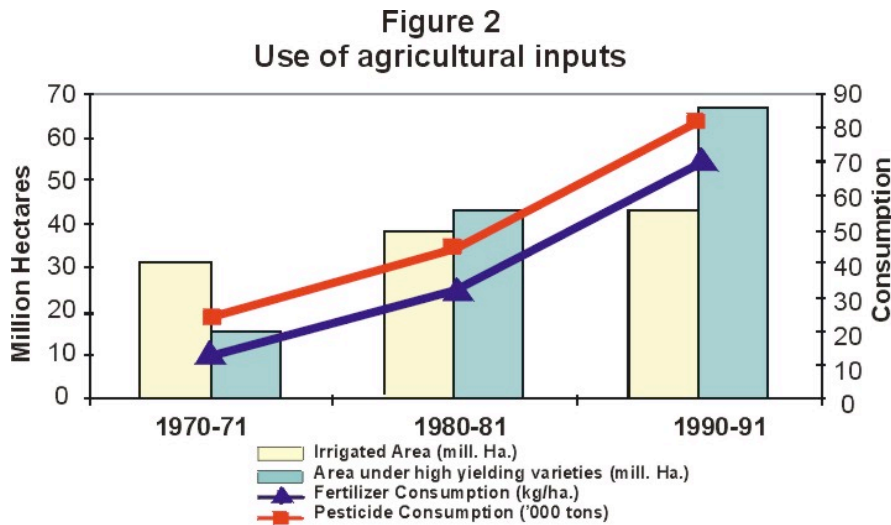
their consequences, resulting in non-sustainable agricultural practices and environmental costs.

This alone places a lot of demand on food cultivation. India has, to some extent, been able to keep pace with its population, and has even been able to achieve increases in per capita agricultural output for its average citizen. These gains have been accomplished through agricultural advancements and through an increase in land under agriculture, as well as the intensification of agricultural inputs, i.e. fertilizers, pesticides, and irrigation.

Unfortunately, the gains resulting from these practices have not been without

Land Use: Beginning with extension of agriculture, the amount of India's land area dedicated to food grain cropping has grown steadily, from 99.3 million hectares in 1950, to 127.5 million

increment of land over the last four decades has come from previously forested areas, as well as marginal and hill areas. (Figure 2)



Source: Ministry of Agriculture 1992.

Fertilizer consumption:

In the last three decades, Indian consumption of N, P and K has grown at 9.5 percent annually, making India the fourth largest consumer in the world of chemical fertilizer. The most recent data places India's fertilizer consumption at 69.66 kg/ha. However, in the face of limited land availability, growing land degradation and environmental problems,

meeting the food requirements of an ever-increasing population will necessitate the consumption of fertilizer for crop production to increase to 22 Mt in 2000. (Figure 2)

Pesticide consumption: India has increased its consumption of various pesticides from only a little over 24 thousand tons in 1971 to 82 thousand tons in 1991. Many of these insecticides are not in use in the developed countries. The largest percentage of this figure is made up by insecticides, which comprise about two thirds of the total. Farmers are suspected to practice inappropriate application of the chemicals due to improper information, etc. (Figure 2).

In the State of Kerala, indiscriminate use of Endosulphan has resulted in deformities in various forms amongst children and foetus.

Irrigation: The area of agricultural land under irrigation has continued its growth, from 32 percent in 1970, to 43 percent in 1990 (ibid.). The majority of this increase has come from increased water extracted from groundwater supplies. This is significant because in many ways, groundwater supplies can be considered a non-renewable resource (Figure 2). Finally, the demand for water for irrigation is expected to increase markedly over the next few decades, in line with population growth. Estimates for 1990 place the demand for irrigation water at 46 million-hectare meters, and project a growth to over 85 million-hectare meters by 2025 (CWC, 1993 and Shah, 1987). (Figure 2)

Treatment of wastewater and solid waste treatment in India:

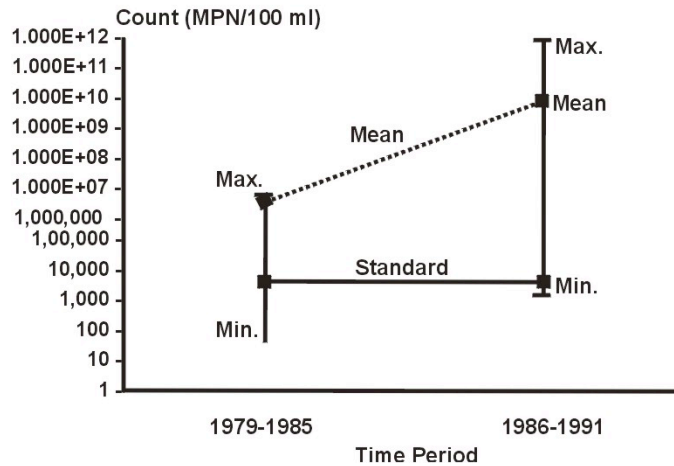
During the last fifty years, the number of industries in India has grown rapidly. But water pollution is concentrated within a few sub sectors, mainly in the form of toxic wastes and organic pollutants. Out of this, a large portion can be traced to the processing of industrial chemicals and to the food products industry. In fact, a number of large and medium sized industries do not have adequate effluent treatment facilities. Most of these defaulting industries are sugar mills, distilleries, leather processing industries, and some thermal power stations. Industrial wastewater usually contains specific and readily identifiable chemical compounds.

budget. The plague epidemic hit Surat (Gujarat) in 1994. An analysis of the gasses like NO₂ and SO₂ being emitted bare testimony to the mis-management of solid waste generated.

An ordinance had to be passed by the Supreme Court to ban large-scale commercialization of prawn farming in India. This was as a result of large-scale pollution being caused by the prawn farmers who practiced farming in a non-scientific manner and without any thought to the environment.

The facilities to treat wastewater are not adequate in any city in India. Presently, only about 10% of the wastewater generated is treated; the rest is discharged as it is, into our water bodies. Due to this, pollutants enter groundwater, rivers, and other water bodies. Such water, which ultimately ends up in our households, is often highly contaminated and carries disease-causing microbes.

Figure 3
Surface Water Quality
Total Coliforms Count



Interestingly, the achievement in controlling industrial pollution is not the result of government involvement but due to the participation of local communities, non-governmental organisations (NGOs) and individual organizations. Unfortunately, policies and institutions to control pollution and degradation of the resource base are weak and still in a nascent stage. Monitoring mechanisms are often not effective because of poor availability of financial and human resources, bureaucratic inertia, lack of transparency and public accountability.

Introduction of EM Technology in India:

The Chairman of our Company, Mr. Madan Mohanka, an industrialist with a clear vision of the future, met APNAN personnel in Bangkok and got introduced to EM technology. He assessed the potential of propagating EM purely from the point of view of introducing an advanced technology in India which could easily be applied economically to take care of the pollution arising from agriculture and industrial intensification.

In an attempt to propagate EM technology, to the grass root level, he realized, that there would have to be a commercial component in EM propagation, which will bear the expenses of spreading the use of EM in a holistic fashion, as conceived by Mr. Muchido Okada San and Prof. Higa. After a trip to Bangkok, where APNAN personnel very kindly showed us the various benefits of using EM technology for the betterment of living conditions for the people of India.

For accomplishing this task, Maple Organics was conceived and put up as an entity, devoted to propagating EM technology all over India. Professionals who are pioneers in their fields of expertise run Maple Organics. We have environmental engineers, agricultural scientists, and commercial managers.

example of bio-diversity in terms of plains and hilly region. It is well connected by train, plane and road and has now become the capital city of the newly formed Uttarakhand State.



Mr. Shimoji San inaugurating the factory at Dehradun

Production of EM started in November'2000 in a modest factory built for this very purpose. Initial capacity of the factory is 10,000 ltrs per month and it has been ensured, that should the need arise, capacity could easily be increased to 50,000 ltrs without making any major modifications. Currently we are distributing about 300 ltrs of EM per month all over India, essentially for conducting trials.

The production was carried out with the help of APNAN personnel, namely Kanda San, Shimoji San and Takara San. In the

factory, separate rooms have been provided for manufacture of seeds, storage of raw material and finished goods and a laboratory for conducting experiments.

Model Organic Farm: A small model farm is being setup in Dehradun to show the farmers and dealers the multiple benefits of using EM for various disciplines like agriculture, animal husbandry, aqua culture and waste treatment. Attempts are being made to make it a fully integrated farm. The farm is being set up under the able guidance of Takara San and an agricultural scientist, Dr. R.K. Bhatnagar (retired from IARI, New Delhi). We hope to have it fully completed by the end of June 2002.

We have extended an invitation to SKK to consider the setting up of a center on our farm. The immediate effects noted at the farm after applying EM for the first time were as follows:

- a) The growth of weeds was much less as compared to the growth by conventional farming methods during cropping.
- b) Application on citrus fruits improved the number of fruits per tree and also reduced the dropping of fruits.
- c) After applying Fish FPE, the fruits were found to be sweeter in citrus as well as strawberry plantation.
- d) Timber trees registered a much better growth.
- e) There has been a decrease in the population of insect pests and nematodes, without a decrease in beneficial insects.
- f) At the model farm, training on EM application is being carried out in a proper systematic manner. Around 100 demonstrations have already been carried out. We have also carried out seminars and presentations.



Good quality Papayas being grown with EM Technology at the model farm

Tests are also being carried out in combining EM Technology with Vermi culture. Three kinds of worms are being used for this purpose. They are *Eisenia foetida*, *Perionyx excavator* and *Eudrilus eugeneae*. Pure cultures of these are being raised for further tests at our laboratory. However, initial findings are that

Uttaranchal Government: The newly formed Uttaranchal government has shown a keen interest in adopting EM Technology. We have received intimation from the government to carry out,

- i) large scale composting of waste from forest and sugarcane mills (appx. 18,00,000 tons), and,
- ii) Treating city garbage to convert into useful compost.

Activities carried out by Maple Organics: We at Maple Organics have preferred to play a background role in propagating EM Technology in India. The various activities taken up by us are as follows:



Mr. Sanjay Aggarwal talking to Scientists of Raipur Agricultural University, Raipur, Madhya Pradesh on EM Technology

- a) Making and supporting dealers for extension activities on EM Technology in different disciplines like agriculture, animal husbandry and waste treatment.
- b) We have become a single window for providing technical assistance to any person interested in EM Technology.
- c) We have direct interaction with various State governments, Agricultural Universities, large Corporations and even small farmers. As a result, various trials are being carried out by scientists, waste treatment consultants and farmers.
- d) A large shipment of EM was sent to Gujarat on free of charge basis to help the people, who were affected by a devastating earthquake. It was sprayed on several dead bodies by the civic authorities. According to them, foul odour vanished in a very short duration and chances of an epidemic were reduced.

- e) Waste treatment has always been our forte. Many large Corporations in India have already started using EM to treat their waste like Levers, ICI and Dabur.
- f) We are planning to send EM free of charge to Kerela to combat the use of Endosulphan.
- g) Our parent Company, MM Aqua technologies is working out the modalities of marketing EM all over India through their offices. We have already trained personnel in



Mr. Sanjay Aggarwal, along with Mr. Takashi Shimoji, Mr. Shoji Kanda and Mr. Shinji Takara from APNAN, giving a presentation on EM technology at Bhopal, Madhya Pradesh.

Involvement Of NGOs: After studying the philosophy of EM technology, EMRO, INFRC and SKK, we have decided that the best suited way to propagate EM to the grass root level would be through the involvement of NGOs in India. We are pleased to report that many NGOs have shown a keen interest in EM propagation. They are:

1. Auroville, Pondicherry, Southern India.
2. BAIF, Pune, Western India.
3. SBMA, Garhwal Hills, Northern India, and
4. Nav Utthan, Allahabad, Central India.

Many more NGOs are being contacted, and we are confident that the list will increase with time.

At Auroville, a lot of activity is taking place on EM propagation. They have not only adopted the technology in a holistic manner, but are also aggressively propagating it. Ms. Margarita Correa and Dr. Lucas Dengel are mainly sharing the work of EM.

They have jointly carried out the following activities:



Dr. Lucas Dengel in a discussion with APNAN personnel during a visit at Auroville.

1. Small-scale trials and demonstrations with EM on seed germination; on crop productivity in orchards, field crops and vegetables; pest and disease control, dairy farming; Odor control and improvement of performance in ETPs; Ongoing production of extended EM for distribution to household level users and small-scale gardeners and farmers.
2. Demonstrations and meetings with major organizations in Private and Government sectors, including hotels for treating their waste with the help of EM technology.
3. They have presented various papers on EM in International Conferences in India and abroad.
4. They have conducted three workshops on EM Technology with a cross section of users like farmers, architects, town planners and people involved in water management.
5. Internship with universities and schools of USA, Holland, France and Germany. The students have been given training on EM Technology and organic farming.
6. AuroAnnam farm has been made into training Centre in EM Technology for India and the world. They have also setup a response center for responding to queries sent by anyone interested in EM technology.



sections with EM Technology, in composting and Ecological Agriculture. The third is coming soon in Research with some photographs on EM Technology.

At BAIF, Pune, Mr. Shinji Takara has imparted training to the staff of BAIF, Pune. EM propagation is being handled directly by Dr. Joshua Daniel, who is an Agronomist and has done a lot of work in sustainable agricultural technologies. He is well known in India for the tremendous amount of work put in by him in this field. Through his efforts, there are many farmers who are today using EM for carrying out organic farming. Based on his strong belief in EM technology, Dr. Daniel has enthused the various centers of BAIF to conduct trials with EM in different parts of India. The report sent by him is as follows:



research station (CRS), Pune. However, they have still not quantitatively estimated the parameters responsible for the improved taste.

Dr. Joshua Daniel, along with BAIF workers, APNAN Staff and the author at the Central Research Station, Pune making Bokashi.

tomato at Ahmednagar. An observation here was that there was an increase in the number of harvests by 2-3 in the EM sprayed plots.

4. Anaerobic standard bokashi is being tried as feed additive for milking cattle. Some farmers have reported slight yield increases, further studies are envisaged.
5. Some work has been initiated on the use of EM in paddy nursery. There are some positive leads, but more studies are needed to standardise the technique.

Other parts Of India:

EM Technology was introduced in Coorg district, State of Karnataka from December 2000, The and has been used for the following projects:

1. Promotion of the growth of crops, which include Coffee, Tea, Cardamom, Vanilla, Black Pepper, Fruits like Pineapple, Strawberry and also Paddy.
2. EM has been amplified using molasses or jaggery and used in dilutions ranging from X500 to X1000 on the adult and nursery plants. In a few instances, bokashi has been prepared using the basic materials of paddy straw, greens, rice bran, cattle manure, poultry manure and a few other additions, and used in the preparation of nursery beds. Since most of these crops are perennial in nature, the effect of the regular application of EM on their general growth patterns, resistance to local pests and pathogens, and yields is being monitored. The effect of

plants will be taken from the nurseries for planting in the field. Controls are being maintained in all cases.

3. EM is also being used in the preparation of compost using farm wastes, greens and cattle or poultry manure. The time for manure preparation is decreased by about 20-30 per cent, all foul odour have been eliminated, and quality of the compost is excellent.
4. EM has been tried for its efficacy in treating polluting wastes of coffee pulping by one grower for the time being as pulping is done only during the months of January-March, during coffee harvest. Several more growers have been introduced to this concept and hope to see its use increase during the next harvest period in 2002.
5. EM has shown promising results in Poultry rearing. The diet of the birds has been deprived of antibiotics and the birds are showing better growth and vigor. A decline in mortality has been observed within the week of using EM in their feed. The eggshells are thicker, and as a result of this, the breakage during handling has decreased by 50 per cent or even more in some cases. The yield of eggs has increased by about 20-25 per cent. Yield and other data are under scrutiny, and are being closely monitored. Overall, the results are very encouraging. A poultry grower has been encouraged to develop his farm as a "model farm" where it is proposed that other poultry farmers will be introduced to the concept of using EM.
6. It has been observed that the potential benefits of the use of EM both in the agriculture and poultry sector are enormous. The quantum is yet to be worked out, as EM technology has been recently introduced in this region. Its benefits in conserving the agro-ecosystem and encouraging growers to move away from the use of chemicals in their fields is what is being targeted. Alongside during the last 5 years, several methods of crop protection have been developed, which are non-toxic and ecologically sustainable. EM is being used in complementation to these methods and it is hoped that more substantial data in the near future can be presented.

EM technology was introduced in the State of West Bengal from February 2001. It has shown a lot of results within a short span of time.

In the beginning, intensive field research work was undertaken to ascertain customers' requirement in terms of ETP, STP and counter sales.

It was found that it was not possible to do 'over the counter sales', as an in-depth knowledge was required by the end user to apply EM Technology effectively. It appears that perception and understanding on using microbiology for enrichment of the farmland is lacking. For Tea gardens usage, certifications are required from Tea Research Institute and government approved test houses. There was also a request from a group company to have the product approved by M/s. Institute Fur Marktologie, Switzerland (IMO). As most organic farms are certified by them. As it was very expensive to get this certification at this stage, we decided to concentrate on other avenues.

Therefore, concentrated sales efforts were made on reputed, well-organized, private sector units for treating their septic tanks. The first task of introducing E.M was not difficult, as mostly imported; bacterial solutions were being used by these organizations. This could be easily done due to:

- a) The low selling price of EM.
- b) Being locally manufactured and
- c) Being readily available.

bacterium will be used till the end of this year because some companies have kept fairly large stocks of the same owing to the product's long shelf life (3 to 5 years).

The second aspect considered was the running of an ETP. (ETP is a non-earning investment) for every manufacturing unit. Every factory manager looks for cost effectiveness. Using EM not only reduced the power consumption, but there were also savings in sludge removal costs and savings in switching off expensive equipment –such as compressors, heavy-duty motors etc.

In the case of a soft drink manufacturing unit, it was found that they had a problem of very high pH value in the inlet of the ETP of over 11. They had to run an acid plant for neutralizing the high alkali and bring down pH value to 6.5 /7. After introducing EM in a controlled manner pH value was naturally brought down to a value of 7. At this point, the acid plant was switched off and repeat order was placed for EM. There are many such success reports, which we have come across and have not mentioned in detail. We now have over 11 very reputed companies who are placing repeat orders for EM.

All this was achieved in five months and half a ton of EM has already been delivered up to the end of June. The future looks exciting and the customer list is increasing with many repeat orders.

STP is now the next step coupled with government agency users. Already strong interest is being shown by these agencies for STP and large septic tanks. Entry into this segment is planned for the present quarter, which again will only need tenacity in follow-ups and intensive marketing.

References:

1. Tata Energy Research Institute, New Delhi.
2. Ministry of Agriculture, New Delhi.
3. Everything about water – Mumbai Web site.
4. Auroville, Pondicherry.
5. Golden Mist & Plantations, Koorg, Karnataka.
6. Unitech Consultant, Calcutta, West Bengal.
7. EM Organic Farm, Dehradun, Uttaranchal.