

## HUGE WASTAGE OF ORGANIC MANURE RESOURCES IN INDIA.

By C. N. ACHARYA, *New Delhi.*

(Communicated by Prof. N. R. Dhar, F.N.I.)

The ecological aspects of crop production are apt to be overlooked in the modern craze for exploitation of land and immediate profits. In any system of long term planning for agricultural development, due consideration must be given to the fact that plants are complex living organisms, which have been evolved to suit the substratum of a living soil, containing myriads of micro-organisms, which are as much living as the plants or animals themselves. In fact the links, man - animals - plants - microbes - viruses and enzymes, form an inter-connected series in the phenomenon of vital energy manifestation, which has been evolved to be in tune with the broader ecological conditions existing in this planet since it was created. Any fundamental alteration in any one of the above links is sure to affect the strength and vitality of the other links in the chain. The method of feeding the microbes and plants of the soil is an important matter which in turn affects the food of animals and of man, and hence their physical and mental make up.

It is against the above background that we have to consider the present question of 'Organic vs. Inorganic Manures in relation to land improvement and crop production'.

Through long centuries and in fact through thousands of years, ever since man changed over from his nomadic life and settled down to agriculture, we have been adopting a method of cultivation of crops based on the use of organic manures, and we have got the cumulative experience of the above long period to show that man's best physical and mental development could be secured by the consumption of crops grown in the above manner.

But very recently, namely during the last one hundred years, scientists have found out that plant growth can be stimulated by the addition of chemicals containing nitrogen, phosphoric acid and potash. Davy in the beginning of the last century started the idea that the plant was a chemical phenomenon whose growth can be controlled with the help of chemicals. Liebig followed this up with his chemical theory of plant nutrition which laid the foundation for the fertilizer industry, which during the last 100 years has grown up to enormous proportions. The idea was first taken up in England by Sir John Lawes who started a flourishing fertilizer business and established the Rothamsted Experimental Station.

A great deal of intensive propaganda has been carried out by the fertilizer industry to persuade farmers of the 'immediate' profits that can be obtained by dumping chemicals on their land; and their propaganda has been helped to a great extent by the wave of industrialization that is coming over agriculture all over the world with its attendant evils of reckless exploitation, craze for immediate profits and blindness to the results of tomorrow.

Even Liebig, the father of the Chemical Theory of Plant Nutrition, realized the limitations of the chemical hypothesis when he said: 'There is but one manure, which permanently keeps up the fertility of the land and that is farmyard manure; and when the necessities of the times compel the farmer to search for means to replace this invaluable manure in all its effects, this can only be rationally done with any prospect of success if we replace all its constituents'. Again, Sir John Lawes, the founder of the Fertilizer Industry in England, declared, 'Sometimes it has been maintained that a soil is a laboratory... But not only the facts ascertained in our own and other investigations but the history of agriculture through the world so

far as it is known, clearly show that a fertile soil is one which has accumulated with it the residue of long periods of previous vegetation and it becomes infertile as this residue is exhausted.'

The effects of the indiscriminate dumping of chemicals on to land were first seen in the U.S.A. which was blessed with about 1,500 million acres of the richest land in the world, when it was occupied by the settlers from Europe. During the last 100 years, reckless exploitation of the land has been going on so rapidly that it is now estimated that about one-third of the land has become infertile and that another one-third has become 'marginal'. The Americans have not felt so badly the results of their indiscreet treatment of their land due to the fact that their population is less than one half of that of the Indian Union and their fertile area is still double India's. But public alarm and soil-consciousness in the U.S.A. has been aroused sufficiently in the matter and the Government have formed a Soil Conservation Service, for pooling together Governmental and private resources in a national effort to save the remaining land from destruction and to reclaim the 'marginal lands'; but it remains to be seen how far the craze now prevalent in the U.S.A. to industrialize agriculture and to mine their lands would permit the private owners to preserve their lands on a basis of permanent fertility.

Scientists know that the capacity of a soil to erode is closely related to the structure of the soil, which in turn is conditioned by the amount of humus present therein and the activity of micro-organisms. The soils in America were originally rich in humus and in fertility, but due to reckless exploitation, they lost humus rapidly and became in the end vast dust bowls—vast sheets of floating sand. In India also the problem of expanding deserts and soil erosion is standing at the doors of the fertile Gangetic valley and is advancing eastwards at the rate of a mile per year.

The only way to save our lands from gradual conversion into deserts is to adopt sound methods of agriculture based on the use of Organic Manures and absence of stimulants.

The work of McCarrison and Viswa Nath in India has shown that food grown on a fertile soil (organically manured) has higher nutritive value than food grown on poor land or with chemicals. The effect of different chemicals on the microbial population of the soil has not yet been studied in detail, but it is known that they adversely act on the earth-worm population, which under conditions of organic husbandry help to aerate and enrich the soil considerably.

Probably, the only country which has shown, by example, its capacity to maintain its soils at a high level of fertility for the last 3,000 or 4,000 years is China which possesses almost a similar density of population as India. China has been able to produce enough food for all its 500 millions without the use of chemical fertilizers and at the same time the fertility of their soils is remarkably high, compared to that in India. The yield of rice in China is more than double that in India; and these high yields have been maintained for centuries together without any soil deterioration. The secret of the continued success of Chinese agriculture during thousands of years is due to the fact that they have taken extraordinary pains to collect and apply to their land very large quantities of organic manure prepared from the refuse materials available in their towns, villages and farms. F. H. King, in his well-known book: 'Farmers of Forty Centuries', gives a striking testimony to the agriculture of China and the adjoining countries of Korea and Japan, when he says, 'One of the most remarkable agricultural practices adopted by any civilized people is the centuries long and wellnigh universal conservation of all human waste in China, Korea and Japan, and its utilization in the maintenance of soil fertility and in the production of food. On the basis of the data of Wolff, Kellner and Carpenter, or of Hall, the people of the United States and of Europe are pouring into the sea, lakes or rivers, and into the underground waters, from 5,794,300 to 12,000,000 pounds of nitrogen, 1,881,900 to 4,151,000 pounds of potassium, and

777,200 to 3,057,600 pounds of phosphorus per million of adult population annually, and this waste we esteem one of the great achievements of our civilization. In the Far East, for more than thirty centuries, these enormous wastes have been religiously saved, and today the 400 millions of adult population send back to their fields annually 150,000 tons of phosphorus, 376,000 tons of potassium, and 1,158,000 tons of nitrogen comprised in a gross weight exceeding 182,000,000 tons. They are gathered from every home, alike in the country, villages and in great cities like Hankow-Wuchang-Hanyang with their 1,770,000 people swarming on a land area delimited by a radius of 4 miles.

‘Man is most extravagant accelerator of waste the world has ever endured. His withering blight has fallen upon every living thing within his reach, himself not excepted; and his besom of destruction in the uncontrolled hands of a generation has swept into the sea soil-fertility which only centuries of life could accumulate—fertility which is the substratum of all that is living.’

Mr. Chaman Lal in his recent book on ‘Cottage Industries in Japan’ gives the following anecdote which reveals clearly the high value which the Japanese attach to night-soil. He says:

‘Japan is the most modern country in Asia, yet she faithfully clings to the old practice of preserving the night-soil in the homes, in towns, in the fields and in the villages. When I established a home in Tokyo I wrote to the Municipality to send me a sweeper twice daily to clean the toilet. This request shocked the officer-in-charge who wrote back saying that as a special favour he was prepared to send me a sweeper every tenth day although regular collection of night-soil from homes was made only once a month. Every home is provided with a disinfectant which is used twice daily to deodorize and the night-soil is preserved in a deep pit until the sweeper comes on his round with a clean wooden container (not the open buckets as used in India). The containers are loaded on carts and sometimes on animals. They used to be carried by sweepers too, but the practice has been abandoned. How I wish the sweepers in India could be provided with the same facilities. I asked an official in Tokyo, “Why don’t you flush the entire night-soil out into the sea?” He retorted: “That would be waste. We throw nothing away. It is worth much money.” The peasant realizes the value of night-soil so much so that he invites passengers on the roads to use his field lavatory for his benefit. Notice boards on the roadside invite passers-by for profit to the owner of the field. Manure is like gold to the peasant.”

Even though India possesses more cattle per acre under cultivation than Japan, she is applying less than a ton of organic manure per acre, as compared to about 4 to 5 tons per acre applied in Japan.

TABLE I.  
*Comparison of Japan and India in Manure Production.*

Particulars.	Japan.	India.
1. Number of cattle and horses .. ..	4.5 millions ..	150 millions.
2. Area under cultivation .. ..	14.44 million acres.	200 million acres.
3. Cattle (including horses) per acre of cultivated area .. ..	0.32 ..	0.75
4. Total quantity of cattle shed and rural compost prepared .. ..	62.8 million tons ..	150 million tons.
5. Quantity of manure per acre of cultivated area .. ..	4.40 tons ..	0.75 tons.
6. Quantity of plant nutrients added in the manure:		
Nitrogen .. ..	52.3 lb. per acre ..	8 lb. per acre.
P <sub>2</sub> O <sub>5</sub> .. ..	20.4 lb. per acre ..	3 lb. per acre.
K <sub>2</sub> O .. ..	44.8 lb. per acre ..	10 lb. per acre.

India, of course, has vast potentialities for organic manure preparation from her indigenous resources, but due to lack of proper organization and the indifference and in some cases active opposition of the vested interests during the 200 years of British rule, not even 10% of her manurial resources are at present being utilized as shown by the data in the table given below:

TABLE II.  
*Potential supplies of Manure in India.*

Particulars.	Dry matter.	Organic matter.	Nitrogen.	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
(All figures in millions of tons per acre.)					
POTENTIAL SUPPLIES PER YEAR:					
(A) Cattle shed refuse from 150 million cattle (produced in night time while the animals are tied up in the cattle sheds).					
Dung .. .. .	144.6	115.7	1.808	0.723	1.085
Urine .. .. .	33.8	26.5	3.616	0.072	2.531
Wasted fodder and litter at 1 lb. per head per day ..	20.0	16.0	0.100	0.060	0.160
(B) Farm wastes (80 million tons of weeds crop residues, sugarcane trash, cotton stalks, jowar, stubble, etc.) ..	60.0	50.0	0.240	0.140	0.420
(C) Human wastes of 350 millions population:					
Night-soil .. .. .	4.80	4.35	0.240	0.192	0.096
Urine .. .. .	6.00	2.40	0.960	0.144	0.216
Town and village refuse at 1 lb. per head per day ..	50.00	25.00	0.250	0.250	0.500
(D) Forest litter available for manure preparation, water hyacinth and other sources 50 million tons per year ..	20.00	16.00	0.200	0.100	0.200
<b>TOTAL MANURIAL RESOURCES IN RURAL AREAS ..</b>	<b>339.20</b>	<b>255.95</b>	<b>7.414</b>	<b>1.681</b>	<b>5.208</b>
RECOVERED AND USED AS MANURE AT PRESENT:					
(A) 150 million tons of manure prepared in villages—(Moisture 50%, Nitrogen 0.4%, P <sub>2</sub> O <sub>5</sub> , 0.2% and K <sub>2</sub> O, 0.6%) ..	75.0	18.00	0.600	0.300	0.900
(B) 10 million tons of compost prepared in towns and on farms ..	5.00	1.20	0.050	0.030	0.060
<b>TOTAL QUANTITY RECOVERED .. .. .</b>	<b>80.00</b>	<b>19.20</b>	<b>0.650</b>	<b>0.330</b>	<b>0.960</b>
Percentage efficiency of recovery .. .. .	23.60	7.5	8.8	19.6	18.5

India is at present losing every year about 237 million tons of organic matter 6.76 million tons of nitrogen, 1.35 million tons of phosphoric acid and 4.25 million tons of potash. Even if one half of the above losses could be saved and applied to land as manure, we can increase our food production by about 20 million tons, which would be more than sufficient to make the country self-contained in the matter of foodstuffs for another 10 years to come.

The main loss of organic matter and of nitrogen occurs under the following heads:

(a) *Cow dung burnt for fuel*: This is estimated at about 300 million tons fresh weight, containing about 50 million tons of organic matter, 0.9 million tons of nitrogen, 0.36 million tons of phosphoric acid and 0.5 million tons of potash. The seriousness of this loss was pointed out as long ago as 1893 by Dr. J. A. Voelcker in his Report on the 'Improvement of Indian Agriculture' presented to the Government of India, but nothing substantial has been done and the position has further deteriorated since then. Quite recently, Government of India have started a drive for tree planting all over the country and a Vana Mahotsava Week is being celebrated from July 1st to 8th. The drive, however, will have to be intensified and a proper plan of re-forestation in villages will have to be executed on a large scale if substantial results are to be achieved.

(b) *Loss of cattle urine* in the night-time by soaking into the cattle shed floor while the animals are tied up in the villages. Even if one half of the urine can be saved it would amount to the big figure of nearly one million tons of nitrogen. This cattle urine is a very good starter for decomposing farm litter and should be conserved by spreading litter or earth under the cattle in the zones where the urine soaks into the ground.

(c) *Loss of night-soil and urine in towns and villages*: The loss under this head amounts to about 12 lakhs tons of nitrogen, 3.30 lakh tons of phosphoric acid and 3 lakh tons of potash. At present a small scheme is working for composting town refuse and night-soil, under which about 15 lakh tons of manure are being prepared, at about 1,000 Municipal centres, but there is potential scope for increasing the production to a level of 100 lakh tons by utilizing the refuse available from all the 5,000 urban centres.

Then there are nearly  $5\frac{1}{2}$  lakhs of villages containing a rural population of nearly 250 millions. In China, the human excreta are conserved to the utmost extent both in the towns and in the villages. In India also we should introduce the Wardha System of Trench Latrines into all the villages. By doing so we could prepare an extra 250 lakh tons of good manure.

(d) In addition to the above major items, there are others in which substantial losses of organic matter and nitrogen occur, e.g., in the burning of sugar-cane trash on sugar-cane estates. There are about  $3\frac{1}{2}$  million acres under cane in India and the total production of trash is estimated at about 10 million tons per year. This could be converted into useful compost manure on the fields themselves. Again, nearly 50,000 acres are infested with water hyacinth in West Bengal and there are also considerable areas so infested in North Bihar, Orissa and parts of U.P., Travancore and Hyderabad State. Water hyacinth, if collected and composted, forms excellent manure containing about 2% of nitrogen. Then again, we have about 1,71,000 sq. miles (about 100 million acres) under forests in India which contain heavy accumulation of well decomposed humus. Without causing any damage to the natural regeneration or fertility of the soils, it will be possible to remove say 10 tons per acre once in 10 years from a totation of forest blocks. This would yield us a supply of nearly 100 million tons of good quality manure every year.

The above brief review will show that we have enormous resources of good quality organic manure in the country and it is an economic loss of the order of nearly 1,000 crores of Rupees per year if we allow the good organic manure to either soak into the ground or gasify into the air and at the same time we spend crores of Rupees of our limited wealth in order to import fertilizers from abroad.

The use of organic manures has been tested through thousands of years experience as a safe method of maintaining soil fertility and obtaining high yields, and we have with us unused resources for preparing nearly 300 to 400 million tons more of such organic manure, which will provide us enough food to meet our

requirements for some decades to come. Instead of treading the uncertain path of spoiling our soils by indiscriminate dumping of chemicals which would only stimulate them and goad them temporarily, why not feed the soils in a healthy manner and obtain food of the best quality which would sustain and invigorate the people in their onward march to take their rightful place as a healthy and virile nation in the *World Community* of Nations.

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