

Department of Agriculture

BULLETIN No. 34

1909.

NIGHT-SOIL—A VALUABLE
MANURE.

BY

G. K. KELKAR,

Assistant Professor, Agricultural College.



BOMBAY

PRINTED AT THE GOVERNMENT CENTRAL PRESS

1909

[Price—4a. or 5d.]

**OFFICIAL AGENTS FOR THE SALE OF INDIAN OFFICIAL
PUBLICATIONS.**

In England.

E. A. Arnold, 41 & 43, Maddox Street, Bond Street, W., London.
Constable & Co., 10, Orange Street, Leicester Square, W. O., London.
Grindlay & Co., 54, Parliament Street, S. W., London.
Henry S. King & Co., 65, Cornhill, E. C., London.
P. S. King & Son, 2 & 4, Great Smith Street, Westminster, S.W.,
London.
Kegan Paul, Trench, Trübner & Co., 43, Gerrard Street, Soho, W.,
London.
B. Quaritch, 11, Grafton Street, New Bond Street, W., London.
T. Fisher Unwin, 1, Adelphi Terrace, London, W. C.
W. Thacker & Co., 2, Creed Lane, London, E. C.
Luzac & Co., 46, Great Russel Street, London, W. C.
B. H. Blackwell, 50 & 51, Broad Street, Oxford.
Deighton Bell & Co., Cambridge.

On the Continent.

Friedlander & Sohn, 11, Carlstrasse, Berlin.
Rudolf Haupt, 1, Dorrienstrasse, Leipzig (Germany).
Otto Harrassowitz, Leipzig.
Karl W. Hiersemann, Leipzig.
Ernest Leroux, 28, Rue Bonaparte, Paris.
Martinus Nijhoff, The Hague.

In India.

Higginbotham & Co., Madras.
V. Kalyanarama Iyer & Co., Madras.
P. R. Rama Iyar & Co., Madras.
Thacker, Spink & Co., Calcutta.
W. Newman & Co., Calcutta.
S. K. Lahiri & Co., Calcutta.
R. Cambray & Co., Calcutta.
Thacker & Co. (Ld.), Bombay.
A. J. Combridge & Co., Bombay.
Superintendent, Government Central Press, Bombay.
D. B. Taraporevala, Sons & Co., Bombay.
Sunder Pandurang, Bookseller, etc., Bombay.
Gopal Narayan & Co., Booksellers, etc., Bombay.
N. B. Mathur, N. K. H. Press, Allahabad.

Department of Agriculture, Bombay.

BULLETIN No. 34.

1909.

NIGHT-SOIL—A VALUABLE
MANURE.

BY

G. K. KELKAR,

Assistant Professor, Agricultural College.



BOMBAY

PRINTED AT THE GOVERNMENT CENTRAL PRESS

1909

NIGHT-SOIL—A VALUABLE MANURE.

1. The disposal of night-soil to the best advantage has been a very important problem for a very long time. As long as man lived in small families and was constantly wandering from place to place like some of the nomadic tribes of today, his excreta could be left wherever he happened to be and his health was not affected in any way. But as soon as the people began to live in communities such as we find at present in villages, towns and cities, the excreta and offal began to be a nuisance and the question of disposal of these substances became important.

2. When the question of their relation to health arose, numerous efforts were made from time to time to suitably dispose of the night-soil. Mixing night-soil with earth, ashes or town sweepings and the application of the mass to the land was one of the simplest methods.

3. In the Bombay Presidency the use of night-soil as a manure was not altogether unknown, though its systematic use in the form of poudrette is of recent date. Its Maráthi name "sonkhat"—meaning golden manure—indicates the appreciation of the people for it.

In pre-municipal days the right to collect manure from the houses and public latrines was held by a body of sweepers. The sweepers used to sell the manure to the cultivators. Since the establishment of municipalities in big towns and cities, the human excreta is being manufactured into poudrette in various ways and sold to the public. Near Poona poudrette has the greatest demands, as there are large areas under the Mutha Canal of sugar-cane and other garden crops.

4. Night-soil is a general manure, which is obtainable everywhere—but against its use there is in many places great prejudice, which will gradually die out as its usefulness becomes more and more impressed on the minds of the people. In China and Japan human excrements are freely handled and carefully preserved by the cultivators themselves. It is looked upon as a principal source of manure for maintaining the fertility of the soil.

The value of this manure is plainly demonstrated by the superior productivity of the fields situated near the village site

Utilization of Waste

From the analyses of mixed human excreta made by Wolff in Europe
Kellner in Japan it appears that as an average, these carry in every 2000
lbs 12.7 lbs of Nitrogen, 4 lbs of Potassium and 107 lbs of Phosphorus.
On this basis and that of Carpenter, who estimates the average amount
of excreta per day for the adult at 60 ounces, the average annual production
for millions of adult population is

{ 5,294,300 lbs of Nitrogen
1,825,000 lbs of Potassium } carried in
775,600 lbs of Phosphorus } 456,250 tons
of excreta.

which, according to the primitive habits of the people, gets the
advantage of the night-soil. This superiority is manifest except in
very dry seasons. From this it will be clear that night-soil is a very
useful manure in dry-farming also in favourable seasons with certain
precautions. No crop can be grown on land heavily manured with
crude human excrements until the manure has had time to decay
and become part of the soil. If a crop is sown immediately after
such manuring, it will make a good start, but will soon turn yellow
and die. It is not always safe to use the crude night-soil without
a preparatory treatment.

In China -
1/6 of an acre
of good land
is ample for the
maintenance of
one person +
3 persons per acre
in South Japan

5. * There are several methods by which human excreta is
utilized as manure :-

- (1) *Poudrette system*.—In this system fresh excreta in the semi-liquid state is carted to a depôt and mixed with town sweepings, earth or ashes, either in beds or in pits. The mixture is ready for handling in a few months. This is a very good manure, although bulky.
- (2) *Trench system*.—This system consists in opening shallow trenches in the field and laying a thin layer of fresh night-soil in the bed and then covering it with pulverized earth. This system is suitable for small municipalities and village sanitary committees.
- (3) *Screen system*.—This consists in laying out the field into lands by furrows and putting up moving screens, which are to be changed every 4th day—according to the number of people visiting the place. This is practised in relief camps and is suitable for small villages.
- (4) *Japanese systems*.—
 - (a) *Earth privy system*.—This consists in mixing the fresh excreta in the latrines with dry earth and then removing the same to the field daily.
 - (b) *Liquid system*.—This consists in mixing the excreta with water and keeping it in pots, from which it is ladled out into the furrow at sowing time and afterwards in several doses with a large scoop.

6. From an agricultural point of view the dry earth systems are all well and good—but from the sanitary point it is a great problem before the public as to how the city and town sewage should be disposed of to the best advantage.

7. At present the washings from the cities etc. are conveyed in sewers and let into rivers, streams or sea. This system in the

case of sea is all right ; but if the sewage is led into rivers or streams, the water is polluted and may prove a source of danger to the health of the people who drink from the stream lower down.

This necessitated the purification of sewage before letting the same into rivers and thus came in the liquid system of purification. It has been found recently that the purified sewage at a certain stage can be applied to the cultivated fields.

8. The following systems of disposal of night-soil are practised in the Bombay Presidency and are described in detail.

The Poona City and Cantonment and Nagar Municipality methods fall under Poudrette system.

Poona method.

9. The process adopted may be called the sun-drying process. It consists in covering night-soil with ashes in shallow beds and exposing it to the sun to dry ; when properly dried, it is heaped away and sold to the cultivators as a manure. The night-soil collected is in a semi-liquid state, as a great quantity of water used by the people at the time of answering nature's call mixes with it.

The ashes are obtained by burning the street and house sweepings collected from the dust-bins of the city.

This burning is done in open heaps in the hot season, but in damp weather the refuse does not burn well and is burnt in such kilns as are ordinarily used by brick and tile burners. The refuse requires sifting before and after burning.

Ashes are the basis of success in removing an objectionable odour and turning out the best poudrette. This may also make the poudrette richer in potash.

Bed system.

10. The night-soil depôt is situated about $2\frac{1}{2}$ miles from the Poona City, where beds are formed with a floor made of murum to receive the night-soil ; the beds are 18' x 15' and 1 foot deep. A layer of ashes about an inch in thickness is first spread over the floor of the beds ; the night-soil is then poured in about 5 inches deep and is covered over with a layer of ashes also an inch deep. It is then allowed to remain for 24 hours in the sun during the fair season. The night-soil is then stirred and well mixed with the ashes spread above and below it with wooden rakes and a fresh layer of ashes about an inch thick is put on ; it is then allowed to remain for three days in the fair weather and eight days during the rains. The mixture is then again stirred with rakes, taken out of the beds and spread on dry open ground to complete drying.

When ready, it is collected and put into heaps for sale. In the dry weather the manure is fit for immediate use.

In the rainy season the drying has to be done under cover and consequently the process takes about a fortnight, whereas in the cold season it takes about a week and in the hot season only five days.

11. Since 1906 the Poona Municipality has discontinued the regular manufacture of poudrette as it does not pay the expenses. The carting of night-soil, urine and sweepings etc. from the city is put to auction every year, and now the contractor manufactures poudrette and sells the same to the best advantage. He has adopted the pit system. The pit is 60' long, 5' broad and 3½' deep. On the bottom he puts a layer of town sweepings, over this is poured a 6" layer of semi-liquid night-soil. This process of alternate layers of town sweepings and night-soil is repeated until the pit is completely filled—the topmost layer being of town sweepings. The mass thus pitted is fit for handling in about 6 months' time. The pit of the above dimensions fetches from Rs. 100 to Rs. 110.

Pit system.

12. In the Poona Cantonment system pits are dug about 5' deep and of convenient length and breadth. Into these pits night-soil and earth are put in, in alternate layers and in equal proportions. This system is more sanitary than the above, but the poudrette manufactured by this method cannot be handled for several months. Poudrette manufactured by the municipality is more concentrated than that produced in pits.

13. Recently the Poona Cantonment have modified the system. The pits are of any length varying from 20' to 100'—each being 3' deep and 10' wide. The stable litter, which is available in quantities in the cantonment, is carted and spread on the bottom of the pit about 3" thick, a layer of semi-liquid night-soil about 1" to 2" thick overlies the litter and a second layer of light litter is spread to a thickness of about 6". After a week or so the whole mass is covered over with the heavy rubbish (sweepings), which in its turn is covered over with a 3" layer of earth a week afterwards. The manure is ready for handling and sale within 6 to 8 months from the date of filling.

The manure from a pit measuring 100' long, 10' broad and 3' deep will fetch about Rs. 200 and will fill from 50 to 60 cart-loads.

Ahmednagar method.

14. The Nagar Municipality manufactures poudrette by two methods : the pit system and the shallow bed system. The depôt is about a mile and a half from the city and is situated on a black soil.

Pit system.

15. On a portion of this ground a number of pits are kept ready dug up for the disposal of night-soil. The city has a population of about 36,000. Twenty cart-loads of semi-liquid night-soil is daily collected from the city and carted to the depôt where it is dumped into a pit 20' long, 5' broad and 5' deep. This pit is just sufficient to hold the daily production. The quantity when poured in fills up the pit to a depth of about 4'. A foot at the top is filled with town sweepings and on the top of this dry pulverized earth is thrown. The sweepings being light float on the semi-liquid mass below and thus prevent the earth for some time from sinking down. After two days more earth is put on as the manure settles down in the pit. This is continued every alternate day until the apparent settling is stopped. On the whole this filling and refilling does not last more than 10 days. The pit is allowed to remain in this state for about a year or more until the manure is in a fit condition for being handled. During the process of settling more earth is put on occasionally when necessary. The night-soil pitted in this way does not smell at all and the process is carried on only during the rains, *i.e.*, June to October. Up to the beginning of January 1908 the Municipality used to mix the night-soil only with town sweepings and it was said that it produced a very objectionable smell and the depôt was very badly frequented by flies. The pulverized earth appears to be a better deodorizer than even the ashes used by the Poona Municipality.

Shallow bed system.

This method is followed from November to the end of May and consists in removing the turf and scraping the surface soil to a depth of about 3". Then a shallow bed 200' long and 20' broad is made. The loose soil is drawn up and made into a ridge about 3 inches high. Night-soil is carted daily and emptied into the bed to a depth of about 2 inches. Then a layer of 2 inches of ashes and earth is thrown over (ashes are made by burning the town sweepings), and within about 4 days the whole thing dries up. On the 5th day the manure thus dried and got ready, is stored into a long and narrow heap. The poudrette thus manufactured is ready for application within a month.

From each pit 20 cart-loads of manure are obtained and the whole pit is sold for Rs. 3. The poudrette manufactured in shallow beds is sold at the rate of 6 annas a cart-load.

17. In the years 1895 and 1896 experiments were conducted on the Mánjari Farm with poudrette manufactured by the Poona method. The results comparing with those of farmyard manure and cakes in the case of sugarcane (New and Ratoon) are tabulated below.

The quantities applied per acre in each case contained the same amount of Nitrogen *viz.* 500 lbs.

Name of the manure.	New cane, 1895-96.		Ratoon cane, 1896-97.	
	Quantity of manure applied per acre in tons.	Yield of Gul per acre in lbs.	Quantity of manure per acre in tons.	Yield of Gul per acre in lbs.
Poudrette	22'3	10,455	20'1	7,410
Cattle dung from ordinarily fed animals.	25'1	7,510	18'9	8,150
Cattle dung from cake-fed animals ...	29'0	6,950	25'09	7,870
Safflower cake	3'3	12,320	3'9	8,430
Castor cake	5'9	9,820	6'2	9,780
Karanji cake	6'6	9,770	5'3	8,445
Cotton seed crushed	7'1	10,280	6'5	9,050
Bassia cake	8'6	7,725	8'3	7,895

18. Several samples of poudrette manufactured by the different processes have been kindly analysed by Dr. Mann, Agricultural Chemist to the Government of Bombay. Their chemical composition, which compares the percentage of the important plant food elements, is given below:—

	Nitrogen.	Phosphoric acid.	Potash.	Moisture.
	Per cent.	Per cent.	Per cent.	Per cent.
One-year old shallow bed system (Nagar) ...	·80	1'63	3'61	4'64
Two-year old do. do. (Nagar) ...	1'68	3'97	4'02	6'42
Two-year old from pits (Nagar) ...	1'40	3'09	2'22	7'57
Three-year old from pits (Nagar) ...	1'42	4'10	2'50	8'26
Made by the Poona Municipality ...	1'21	3'02	4'02	13'79
Do. do. Cantonments ...	·89	1'57	5'33	5'60

The value of these poudrettes is exceptionally high, and the old ones are, as would be expected, considerably the most valuable.

19. There is another system called the 'Meagher or Trench system' which can be very well adapted in villages and small towns. This system is very simple and less expensive. The odour is lost soon and the field can be cultivated in a short time after deposition of night-soil. Again the night-soil is not required to be rehandled like poudrette.

20. The fields selected for manuring should be at some distance from the town, so that the prevailing wind may not carry the bad odour towards the houses.

The selected field is first divided into shallow beds by means of a trenching plough which consists of planks 10" broad, 5'-6" long and 1" thick; the distance between the two planks at the further end being 5'-6".

Before working with the implement the field should be thoroughly tilled and made friable. With the implement described above, beds to the required depth can be prepared over an area of two acres in one day.

When the beds are ready the night-soil cart is led into these beds and the contents gradually poured in to a depth of about 2" thick as the cart moves along. The sweepers follow and spread the night-soil evenly, which is then covered over with an inch of earth.

The night-soil deposited in this way is deodorized in about a fortnight. Fields so manured are cultivated in the ordinary way when the rains set in. The period during which the night-soil can be utilized in this manner is from November to the end of May.

21. On the Surat Farm two plots were treated with fresh night-soil in 1904. To the first, night-soil was applied in beds and to the second in trenches made by the Turnwrest plough. Similarly two plots manured with farmyard manure were set aside for comparison. The following statement compares the results with jowár and cotton in rotation:—

Yield per acre.

Manure applied.	Jowár, 1906-07.			Cotton, 1907-08.	
	Grain.	Chaff.	Kadbi.	Seed cotton.	Stalks.
<i>Results with night-soil.</i>	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
1. Night-soil applied in beds in 1904—but no manure since	1,222	308	3,656	899	1,485
2. Night-soil applied in trenches made by Turnwrest plough in 1904—but no manure since.	1,335	326	3,396	848	1,300
<i>Results with farmyard manure.</i>					
3. No manure in 1904—but 20 loads of farmyard manure applied in 1905 to make it even with other plots—but no manure since ...	719	193	1,176	514	845
4. 20 loads of farmyard manure applied in 1904—but none since	937	250	1,631	513	736

N. B.—The results of the first two years have not been stated here, as they were not comparable on account of unfavourable season.

22. From the results obtained in this experiment it may be estimated that a single application of night-soil to black cotton soil will leave a residual effect which is more marked than the farmyard manure and may continue to increase the yields of crops up to a period of 10 years or more. It is evident from this that night-soil cannot fail to be one of the most valuable manures.

23. Several systems of purifying sewage have been tried on the Poona and Mánjari Farms in connection with the Poona Drainage Scheme. This was worked from 1899 to 1905 by the Agricultural Department in co-operation with the Poona Municipality and Sanitary Engineer so far as the manurial value of sewage is concerned.

24. Experiments in this connection were first commenced in the year 1894-95. In this experiment fresh night-soil was directly applied to the land by the shallow bed system. One month from the date of application the land was ploughed, harrowed and sown with Sundhia for fodder. The yield obtained was 1,133 bundles of fodder per acre.

25. In 1898 a small septic tank was constructed in the Mangalwar Peith of the Poona City and the effluent from this tank was carted to the Kirkee Farm daily and applied to the crops named below. The effluent was compared with farmyard manure and poudrette at the rate of 20 and 25 tons per acre respectively.

26. The following statement compares the results of the sewage experiments :—

Poona Farm, 1899-1900.

Name of crop.	Plot No.	Treatment.	Outturn of produce per acre.
			Lbs.
Sugarcane ...	1	Effluent from Poona septic tank ..	9,576
	2	25 tons of farmyard manure ...	8,304
	3	25 tons of poudrette ...	8,752
Guinea-grass ...	1	Effluent ...	56,308
	2	20 tons of farmyard manure ..	28,532
	3	20 tons of poudrette ..	39,900
Lucerne ...	1	Effluent ...	102,088
	2	20 tons of farmyard manure ...	74,620
	3	20 tons of poudrette ...	96,180
Sundhia ...	1	Effluent ...	32,480
	2	20 tons of farmyard manure ...	18,816
	3	20 tons of poudrette ...	30,912

Name of crop.	Plot No.	Treatment.	Outturn of produce per acre.
			Lbs.
Nilwa ...	1	Effluent ...	44,716
	2	20 tons of farmyard manure ...	25,648
	3	20 tons of poudrette ...	42,056
Sorghum Amber ...	1	Effluent ...	55,132
	2	20 tons of farmyard manure ...	32,480
	3	20 tons of poudrette ...	52,164
Sorghum Collier ...	1	Effluent ...	54,740
	2	20 tons of farmyard manure ...	29,148
	3	20 tons of poudrette ...	52,192
Maize and Utavli.	1	Effluent ...	59,192
	2	20 tons of farmyard manure ...	25,424
	3	20 tons of poudrette ...	44,058

27. During the years 1900, 1901 and 1902 the effect of effluent on various garden crops was tried. They were mostly vegetables, such as onions, potatoes, knol-khols, sweet-potatoes, álu, turmeric and yams.

28. Encouraged by the results obtained at the Kirkee Farm, Mr. J. C. Pottinger, Sanitary Engineer to Government, planned, in consultation with the Agricultural Department, a trial of three distinct systems of sewage purification at Mánjari. A septic tank, Dib-Dins filter and a macerating tank were constructed and sewage purification under these three systems was going on from 1899 to 1905. The necessary quantity of night-soil and urine were carted daily from the Poona City and mixed with water at the rate of 20 gallons per head of population.

The effluent of three different systems was compared with poudrette, farmyard manure, castor-cake, niger-cake and safflower-cake respectively.

29. The three years' results of the sugarcane experiments with sewage at Mánjari are tabulated below :—

Plot No.	Manurial treatment. Kind.	Yield per acre.			
		1900-01.	1901-02.	1902-03.	Average.
		Lbs.	Lbs.	Lbs.	Lbs.
1	Septic tank effluent ...	9,977	8,949	5,325	8,083
2	Dib-Dins filter effluent ...	11,543	7,371	4,822	7,913
3	Macerating tank effluent ...	11,211	6,983	3,954	7,382
4	Poudrette ...	10,411	10,640	5,371	8,807
5	Farmyard manure ...	8,583	8,994	5,348	7,641
6	Nigerseed-cake ...	12,994	10,274	4,994	9,420
7	Safflower-cake ...	11,463	10,994	7,245	9,900

30. The above plots were planted with lucerne in the year 1903-04 and were given the same treatment as before. The results for two years are tabulated below :—

Plot No.	Manurial treatment.	Yield per acre.		
		1903-04.	1904-05.	Average.
		Lbs.	Lbs.	Lbs.
1	Septic tank ...	35,680	46,980	41,330
2	Dib-Dins filter ...	38,410	51,730	45,070
3	Macerating tank ...	31,700	45,530	38,615
4	Poudrette ...	32,250	39,140	35,695
5	Farmyard manure ...	27,800	30,230	29,015
6	Niger-cake ...	26,070	29,720	27,895
7	Safflower-cake ...	28,800	27,990	28,395

31. The success of the above experiments was so marked that Government, on the advice of the Sanitary Engineer to Government, undertook to demonstrate conclusively the agricultural value of the sewage and to furnish a basis for calculation in carrying out the drainage scheme of Poona.

32. The purification plant of the Mánjari experimental sewage farm consisted of mixing tank, a septic tank, bacteria beds and sand filters.

The necessary quantity of night-soil and urine was carted from the Poona City and mixed in the mixing tank with water.

33. The experiments in Bombay gave 6 ounces of night-soil and 40 ounces of urine as the average per head daily. This was taken for a basis and 14 gallons of night-soil and 170 gallons of urine were placed in a mixing tank and water was added to make up a total of 5,000 gallons.

34. There were two sets of experiments. In one case the sewage was passed from the mixing tank to the septic tank and there allowed to remain for 24 hours for purification and then applied to the crops. In the second set of experiments the sewage from the septic tank was further purified in contact beds by allowing the effluent to stand for two hours. Then it was led over the land. In the septic tank, the organisms, which thrive well in the absence of air, dissolve up the whole of the solid matters of the sewage and simplify the organic compounds. The purified sewage which passes from this tank is not usually odourless and does not contain nitrates or free atmospheric oxygen. For complete purification the effluent from septic tank is passed into a tank which contains coke and cinders. This tank is properly called filter bed, contact bed or bacteria bed. In this bed the sewage comes in contact with the second class of organisms which thrive perfectly in the presence of air and in a short space of two hours the organic matters are further simplified so that the liquid has no longer any offensive odour. The nitrogenous substance is largely converted into nitrates. Fish will live well in this liquid and it may be passed into river without causing any kind of nuisance. On the soil it forms a very valuable manure and very heavy crops of various kinds, such as sugarcane, onions, groundnut, turmeric, surans, sweet-potatoes and ginger, have been grown by its aid at Mánjari.

Experience has shown that the sewage of about 200 persons applied in nine months is quite sufficient for one acre of sugarcane and nearly two acres of other crops.

35. The sewage Farms at Karáchi and Ahmedabad are working with crude sewage for some time. There is no system of purification in either of these places. The crude sewage, as it comes, is pumped up and taken to the farm where the character of the soil varies from sandy to sandy loams. The sandy character of the soil prevents it from being choked up even by the constant use of this sewage. At Karáchi magnificent fodder crops are raised in succession.

Lucerne gives 30 cuttings per year ; the weight of each cutting varies from 4,000 to 6,000 lbs. per acre.

Guinea-grass gives 8 cuttings in a year; the yield is very extraordinary—25,000 to 30,000 lbs. per cutting.

Hariali gives 8 cuttings in a year; the yield is 5,000 to 6,000 lbs. per acre per cutting.

Paspalum Dilatatum gives 16,000 lbs. per cutting.

At Ahmedabad the land is rented to market gardeners at the rate of Rs. 140 per year and they raise on crude sewage álú, Sundhia fodder, garlic, tobacco and vegetables.

36. Of all the systems employed for the manufacture of poudrette, the one, in which the night-soil and town sweepings are mixed with a top-layer of earth for weighting down the whole mass, appears to be the best suited for adoption by the municipalities where the question of disposing both these substances in quantities is important.

From the sanitary point of view the town sweepings are equally efficient as earth and deodorizes the night-soil as equally if care is taken to mix the night-soil and sweepings in adequate proportions. - The proportions used by the Poona Cantonment appear to be satisfactory.

From the figures of analysis of the samples of poudrette manufactured in different processes, it will be seen that the one obtained by mixing pulverized earth with the night-soil is richer than the one obtained by mixing town sweepings. But it may not be cheap in all places to get the necessary amount of pulverized earth.