Eminent scientists have recently given solemn warnings of the threat of world famine, a threat which will become reality if the world's population maintains its present rate of increase without a corresponding increase in food production.

It is fifty years since Sir William Crookes gave his gloomy warning of famine. Then, he was able to say that the Chemist must come to the rescue by solving the problem of fixing atmospheric nitrogen. The Chemist did come to the rescue and the plant breeder too; but to-day a laissez faire attitude of inactivity and hope that the Scientist will find a similar solution of our difficulties would be both dangerous and stupid.

It is in the more densely populated countries of the world, where the population is increasing so rapidly that the danger of famine is most imminent, science has done its work well, gone are nature's pruning hooks, pestilence, disease, and tribal wars. It in these countries too that ignorance is so rife, teeming with peasants who have little knowledge of the maintenance of soil fertility, the land is over-farmed and soil erosion is the inevitable consequence. India with a population increase of five million a year and Egypt with a population of 2,000 per square mile are examples.

Of the far East the same cannot be said; here the peasants have evolved a farming system which is a model in correct land usage. Legumes are used extensively in their rotations for ploughing in as green manure to maintain the humus of the soil and for composting.
Every form of waste which can replace plant food removed by crops, is religiously returned to the soil. They have thus demonstrated a fundamental grasp of essentials which puts to shame the dust bowl farmers of the United States and many of our agricultural administrators.

It is along these lines then that we must now direct some of our energy in the fight for increased food production. Where necessary we must teach the peasant to conserve and make use of every available form of plant food.

The Trinidad peasants realise the value of farm yard manure, many keep one or two head of cattle and make full use of the farm yard manure their stock produce, it is in their method of storage where there is need for improvement. On holdings in the St. Augustine area, practically without exception, the manure is thrown here and there; no attempt is made to build a heap, scattered far and wide, exposed to the sun, wind and rain the loss of practically all its value as a manure is inevitable, and in addition it forms a perfect breeding ground for flies and becomes more a liability than an asset to the peasant. Vigilant Sanitary Inspectors are ever on the watch for these fly breeding grounds and rather than risk prosecution many peasants sell their manure as it is made.

What is the best method of storing farm yard manure? This problem has engaged the attention of European farmers and scientists for many years, indeed in Roman times the importance of the correct storage of manure was fully realized. Varro writing about 40 B.C. stated that the manure should be well rotted before use and therefore there should be two heaps, one fresh and one rotted. The heaps should also be kept moist by applying water and their sides protected from the sun by a covering of twigs and leaves.
In more recent times the problem has received considerable attention. In a series of experiments J. Russell and F. H. Richards found that the ideal to be aimed at was complete anaerobic conditions and a temperature of 26°C. This could only be attained by storing in a water-tight tank or pit, so as to keep out oxygen and keep in carbon dioxide. Besides the cost of building such a tank this method presents practical difficulties.

All their experiments showed that manure left under the beasts suffered a loss of about 15% nitrogen, there was no accumulation of ammonia but on the contrary less ammonia than corresponded with the digestible nitrogen in the food. This method is far from perfect but always came out better than heap storage in comparative experiments.

Storage under the beasts is not always practicable. On the College farm the bullock pen was cleaned out frequently, the manure well wetted and stored in long rectangular heaps. It was impossible to keep the heaps moist in the dry season, too much water was required and it was uneconomic to have them turned. The heaps were exposed on all sides to the sun and wind and there was no breakdown of the litter; there was thus a thick layer of undecomposed cane trash and elephant grass stalks on the outside; see figs (1) and (2). Manure on the College Experimental Peasant Holdings was stored similarly.

The peasant with his limited capital resources cannot afford to build elaborate concrete dungsteads, but storage, however, would be possible for the peasant and would have several advantages over the heap method outlined above. To begin with, the manure would be sheltered from the drying wind and moisture conserved.

In order to explore the possibilities of pit storage two pits were dug 8 ft. by 6 ft. and 3 ft. deep and manure stored.
and manure stored in them. In No.1 pit, manure was thrown in daily and water added but no attempt was made to compress it in any way or to turn it.

In pit No.2, a bullock was tethered daily for approximately four hours, see fig 3, water was added as in pit No.1. It was thought that the bullock, trampling in the pit would compress the manure and storage under the beast would be simulated; thus conditions would be anaerobic, no nitrates would be formed and there would be no accumulation of ammonia.

The amount of water added daily to each pit was 27 gallons; this is the amount of water normally used by a peasant household as determined by a survey of peasant holdings in the St. Augustine area. The water was added thrice daily, in the morning at noon and in the evening.

Manure and litter from a cow and calf housed inside was collected daily and divided equally between the two pits. The first manure was put into the pits on the 24th February, 1948.

To try and prevent fly breeding each pit was covered with a thick layer of litter uncontaminated with dung. This layer of litter was removed when manure was added and during the time the bullock was tethered.

No fly larvae were found in pit No.1 but large numbers were found in pit Number 2. Egg laying took place in the freshly voided dung during the time that the bullock was tethered in the pit. As the manure heated up the larvae crawled to the surface to the cooler layers and when full grown crawled away into the soil at the side of the pit to pupate. Breeding was controlled eventually by shaking up the top layer of manure twice daily, and the larvae were shaken down and killed by the heat of fermentation.

The experiment was stopped
The experiment was stopped on the 13th May, 1948, the pits emptied, the manure weighed and sampled for analysis. The results were as below. The mean of four analyses of peasant holding manure prepared in the heap is also given.

PEN MANURE ANALYSES

<table>
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<tr>
<th>PERCENT OVEN-DRY BASIS.</th>
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<tr>
<td>Peasant Holdings Heap Method.</td>
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<tr>
<td>Ash.</td>
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<tr>
<td>Organic Matter.</td>
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<tr>
<td>Nitrogen</td>
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<td>Phosphate.</td>
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<td>Potash.</td>
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<td>C/N Ratio</td>
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The high ash content of the peasant holding manure as compared with the pit manure is very striking, the reason for the discrepancy is not clear but may be due to the inclusion of appreciable amounts of soil in the peasant holding manure. The peasants' cattle are housed in sheds with earth floors and manure cleaned up from them must have a considerable amount of soil sticking to it. To some extent this would also account for the big discrepancy in the figures for organic matter content, but in any case one would expect the organic matter content of the pit manure to be greater than that of manure prepared in heaps in the open.

The nitrogen and phosphate content of all the manures is approximately the same, but it is worth noting that the manure produced in the pits was very much more broken down than in the heaps, College farm or peasant holdings; and there would be a loss of nitrogen when the heap manure was eventually put on the land.

The high potash content of the manure from the pit No.2 is also worthy of note and was probably due to the urine voided by the tethered bullock.

The total weight of/
The total weight of manure produced is of interest; from both pits it amounted to 3,363 lbs. The litter used was semi withered. A cow and follower then would produce approximately 7 tons of manure per annum, water content 60 - 65%.

The experiment sketchy and inconclusive as it was, does indicate the need for further investigation, which if undertaken should include experiments to test the value of manure produced on growing crops, which is the only true test.

However even if no further experimental work is done there is no doubt of the need for teaching the peasants how to store and make the best use of the manure their stock produce. Everything should be done to induce them to construct proper storage pits. These should be sited where they will not become waterlogged during the rainy season. They should be close to the household drain which should run into a 44 gallon drum or other receptacle, the contents of which could be emptied onto the manure at will. The pits should be lined with some impervious material and roofed, if possible, stabilised swish bricks are very durable and cheap and would be suitable for lining purposes.

In the more advanced countries greater agricultural production will be achieved by the more efficient use of fertilisers and by better and more efficient mechanisation. But where peasant agriculture predominates the problem should be tackled first by teaching the peasants to make better use of existing farming systems and resources. As they build up the fertility of their land, and become soil erosion conscious, greater output will follow and, as, their earning capacity grows, mechanisation and the use of fertilisers will follow also.

Here is a golden opportunity for the Trinidad Department of Agriculture to demonstrate how greater food
production can be achieved in a peasant community using existing resources and to give a lead in the march against the threat of world famine.

Extension work should be started immediately along the lines indicated, such a policy would be fundamentally sound and a wise Government would assist by making grants to cover the cost of lining pits. A small grant to cover the cost of the cement would be all that was necessary, the peasant could do the lining and with a few bamboo, erect a thatched roof.