Dr. Maria Montessori

1 Per Cent.	2 Plant Food.	3 Lbs. Per acre of	4 Fertilizer.	5. Lbs. of Plant Food.	6. Per Cent. in Diluted Mixture.	7. NH_3.
			GRAIN CROPS.			
3	N	80	Nitrate of soda	12	2.4	3
10	P_2O_5	250	Acid phosphate	40	8	
8.75	K_2O	70	Muriate of potash	35	7	
		400 lbs. equal to 500 lbs. of a mixture with percentages as shown in column six.				
			PASTURES AND HAY.			
4	N	150	Nitrate of soda	22.5	3	3.6
8	P_2O_5	280	Acid Phosphate	44.8	6	
11	K_2O	120	Muriate of potash.	60	8	
		550 lbs. equal to 730 lbs. of a mixture with percentages as shown in column six.				
			ALFALFA, CLOVER, BEANS, PEAS AND OTHER LEGUMES.			
0	N—None necessary unless on very poor soil.					
11	P_2O_5	320	Acid Phosphate	51.2	8	
14	K_2O	130	Muriate of potash	65	10	
		450 lbs. equal to 650 lbs. of a mixture with percentages as shown in column six.				
			CORN.			
3	N	120	Nitrate of soda	18	2.4	3
9	P_2O_5	340	Acid phosphate	54.4	7.25	
11.7	K_2O	140	Muriate of potash	70	9.3	
		600 lbs. equal to 750 lbs. of a mixture with percentages as shown in column six.				
			MANGELS, TURNIPS, BEETS, ETC.			
3	N	130	Nitrate of soda	19.5	2.4	3
10	P_2O_5	400	Acid phosphate	64	8	
9	K_2O	120	Muriate of potash	60	7.5	
		650 lbs. equal to 800 lbs. of a mixture with percentages as shown in column six.				
			ONIONS, CELERY, CABBAGE, CAULIFLOWER, ETC.			
4	N	250	Nitrate of soda	37.5	3.75	4.55
8	P_2O_5	450	Acid phosphate	72	7	
11	K_2O	200	Muriate of potash	100	10	
		900 lbs. equal to 1,000 lbs. of a mixture with percentages as shown in column six.				
			POTATOES.			
3	N	130	Nitrate of soda	19.5	2.4	3
9	P_2O_5	370	Acid phosphate	59.2	7.4	
12	K_2O	160	Sulphate of potash	80	10	
		660 lbs. equal to 800 lbs. of a mixture with percentages as shown in column six.				
			TOBACCO.			
3.2	N	150	Nitrate of soda	29.5	2.25	2.73
8	P_2O_5	350	Acid Phosphate	56	5.6	
14	K_2O	200	Sulphate of potash	100	10	
		700 lbs. equal to 1,000 lbs. of a mixture with percentages as shown in column six.				
			FRUIT TREES AND BUSHES.			
3	N	150	Nitrate of soda	22.5	2.5	3
9	P_2O_5	420	Acid phosphate	67.2	7.5	
12	K_2O	180	Muriate of potash	90	10	
		750 lbs. equal to 900 lbs. of a mixture with percentages as shown in column six.				

HOW TO FILL A PRESCRIPTION.

Supposing it is desired to prepare a mixture corresponding to a "2-8-10" brand, we proceed as follows: The 2 per cent. may be taken as "ammonia," so we first of all convert it into nitrogen, multiplying by 14 and dividing the product by 17. This gives 1.64 per cent. nitrogen, so we have: 1.64 per cent. nitrogen, 8 per cent. available phosphoric acid and 10 per cent. actual potash. Now 1.64 per cent. means 1.64 pounds in every hundred. As one ton contains 20 hundreds, we multiply 1.64 by 20, obtaining nearly 33, the number of pounds required per ton of mixture. Nitrate of soda contains 15 per cent. nitrogen, so we multiply 33 by 100 and divide by 15, the result being 220, the number of pounds of nitrate of soda required to supply our 2 per cent. ammonia (or 1.64 per cent. nitrogen). Using acid phosphate (16 per cent. available P_2O_5) and muriate of potash (50 per cent. K_2O) we may show the whole calculation as follows:

	Per Cent.	Hundreds.	Lbs. in Ton.	Lbs. of Material Employed.
(2 NH_3)	1.64	×20=	33=	220 Nitrate of soda.
	8	×20=	160=	1000 Acid phosphate.
	10	×20=	200=	400 Muriate of potash.

Thus in 1,620 lbs. we have the full amount of plant food contained in two thousand (2,000) pounds of a "two-eight-ten" brand. Other materials may be used, as occasion demands, in compounding the mixture, the quantity of each required being estimated by the following formula:

$$\frac{\text{Per Cent. of Plant Food Required} \times 20 \times 100}{\text{Divided by percentage of Plant Food in material}} = \text{Number of pounds required of that material.}$$

Thus with the phosphoric acid supplied in acid phosphate (16 per cent. available P_2O_5):

$$= 1{,}000 \text{ pounds acid phosphate. } \frac{8 \times 20 \times 100}{16}$$

PLAN FOR A FERTILIZER EXPERIMENT.

Plot 1.—Complete Plot (unfertilized).
Plot 2.—Complete Fertilizer (N-P_2O_5-K_2O).
Plot 3.—Potash Omitted (N-P_2O_5).
Plot 4.—Phosphoric Acid Omitted (N-K_2O).
Plot 5.—Nitrogen Omitted (P_2O_5-K_2O).

If desired, further check plots might be included; for instance, one might be introduced between plots three and four and another after plot five. Care must be exercised to provide even conditions over the whole series of plots, since inequalities of soil, etc., would affect the value of the experiment.

Interpretation of Results.—A comparison of results from plots one and two will indicate the general effect of the fertilizer, while a comparison of the yield from plot two with those from each of the other plots will show the comparative effect of each ingredient. If plot five were to produce a yield almost or quite equal to that of plot two, it might be assumed that little or no nitrogen is required in the fertilizer for that particular crop under the prevailing conditions. The five-plot test mentioned forms the basis of all fertilizer experiment plans. It may be extended by the addition of plots to which each ingredient is applied separately or of others on which varying quantities are used. We would suggest that the farmer confine himself chiefly to the five-plot plan, but the inclusion of another plot, receiving a heavier application of a complete fertilizer, would sometimes be advisable.

AFTER EFFECTS OF FERTILIZERS.

In the application of fertilizers we ought to consider not only the requirements of the first, but also the benefits which succeeding crops will derive from the residues in the soil. So fully were these residual effects recognized that, under the provisions of the Agricultural Holdings (Scotland) Act of 1900 compensation was required to be paid to the outgoing tenant of a farm for the residue from fertilizers used during the last years of his tenancy. In the administration of the measure, it is assumed that only one-half of the phosphoric acid in acid phosphate and of the potash in muriate and sulphate of potash was used up in the first season, one-third of the remainder being available to each succeeding crop. Of course, from large applications proportionately more will remain than from small amounts. The officials of the Rothamsted Experiment Station have during recent years been conducting research work with the object of securing more definite data on the rate of fertilizer exhaustion in the soil, which, however, are not yet available. Mr. John Milne, of Dyce, a prominent agriculturist and fertilizer manufacturer, whose intimate practical knowledge of agricultural chemistry, combined with strict business integrity, gained for him a well-earned reputation as one of the leading authorities in great Britain on the subject of fertilizers, last year presented a paper before the Committee of the Northeastern Counties Auctioneers' and Valuators' Association, from which we beg leave to quote. Mr. Milne submits the following table (given here in part) showing rates of exhaustion:

Year.	1st	2nd	3rd	4th	5th	6th
Nitrogenous Ingredients, except Nitrates:						
Exhausted per cent.	75	15	5	5	—	—
Phosphates of Lime of all kinds, finely ground, diminishing:						
Exhausted per cent.	35	12	10	8	7	6
Potash Salts of all kinds:						
Exhausted per cent.	40	25	15	10	5	5
Lime, Chalk and Finely-ground Limestone, diminishing:						
Exhausted per cent.	20	16	14	12	10	9

Mr. Milne advances the following arguments (in part) in support of his decisions:

"Scales of Exhaustion.—In considering the rates of exhaustion there should be taken into account not only the increase of the crops in the years following the application, but also, as the larger part of the fertilizers has been used for the turnip crop the fertilizing ingredients in these and from the increased straw crops have been in a large measure returned to the land year after year since their application, in the manure wherever this has not been wasted by bad storage. This is a strong reason for lengthening the period in which the effects are unexhausted, and it forms the basis of a claim for cumulative fertility.

"Nitrogenous Fertilizers.—The effects of an application of nitrates are usually exhausted by the first crop, but sulphate of ammonia and organic nitrogenous compounds show continuous effects for a few years, and as the increased crops following their use result in a larger quantity of manure made available I think it only fair to al-