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**AGRICULTURAL EXPERIMENT STATION****MICHIGAN STATE COLLEGE  
Of Agriculture and Applied Science****SOILS SECTION**

East Lansing, Michigan

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**FERTILIZER SUGGESTIONS FOR VAN BUREN  
COUNTY SOILS**

By M. M. McCool and J. O. Veatch

The amount of fertilizers used by Michigan farmers on their lands is increasing and more questions than formerly are asked about the possibilities of profit from their use. Farmers in the older, settled agricultural regions of this country have found the use of commercial fertilizers necessary to maintain or to increase the crop-producing power of their land. This has been the history also of several European countries,—notably Denmark, Germany, Belgium and England, where within the last 50-year period the use of commercial fertilizers has increased enormously and where the yields of all crops have become greater. In fact it is generally recognized that if lands under cultivation are to maintain their productivity, available plant food materials must be applied to them. Nevertheless it should be recognized that the beneficial results obtained from commercial fertilizers may not be due entirely to the nutritive value of the materials they carry. They doubtless perform additional functions in the soil.

It should be distinctly understood and constantly kept in mind that rational systems of soil management are not restricted solely to the use of commercial fertilizers. Experimental work, in Michigan as well as elsewhere, has shown conclusively that, if soils are greatly in need of lime, correction of this deficiency should receive first consideration, especially in the growing of clovers and alfalfa; otherwise the results from the use of the fertilizers may prove very disappointing. Numerous investigations, made in this and other countries, to determine the relative value of commercial fertilizers and animal manures and of combinations of these, show that the most satisfactory profits over large areas are to be obtained where both manures and fertilizers are utilized. Furthermore, where intensive or truck farming is practiced, the yearly application of large amounts of manure is not as satisfactory as the application of smaller quantities reinforced by properly selected commercial fertilizers. The results show also that it is not advisable to rely solely upon the latter, although one can maintain the soil fertility in this manner. Provisions must be made for a renewal of the organic matter in the soil. This means,

of course, that proper crop sequence or rotations and the use of catch crops and crop residues must be practiced, especially on farms where livestock is limited or lacking. Drainage, too, must be considered when one contemplates the use of commercial fertilizers; if it is inadequate, the application of fertilizers may not result in entirely satisfactory financial returns.

Broadly speaking, the chief object in the use of commercial fertilizers is an increase in the acre yield of the crops grown. However, there may be and frequently are, other considerations. The hastening of maturity may be of great importance as in the case of corn on certain soils in some sections. Numerous reports on record show that the growth period of corn can be shortened approximately ten days with an appreciable increase in the percentage of mature ears, by the use of liberal amounts of phosphates. If by the proper use of fertilizers increased earliness could be secured in the tomato or cabbage crop this would be more profitable than a marked increase in yield coming later. As a rule, crops growing in soils provided with a liberal amount of available plant food materials suffer less from drouth than those growing on soils that are deficient in them.

Finally, the needs of the soil to which the commercial fertilizer is to be added should receive careful consideration, inasmuch as different groups of soils may vary markedly with respect to the nature of the plant food and the rate at which they give it up to the crops grown upon them.

Discussion of all phases of the fertilizer question in this report is not practicable. Additional information on commercial fertilizer is given in Circular Bulletin No. 53, Special Bulletin No. 133, and Regular Bulletin No. 284, copies of which may be secured upon request to R. S. Shaw, Director, East Lansing, Michigan.

The soils of Van Buren County have been thrown into six groups and suggestions for their fertilization made in tabular form. The groupings and fertilizer suggestions are based on field observations, fertility experiments and laboratory investigations. As additional knowledge of the soil needs of the county is gained and agricultural practices altered the fertilizer suggestions may be changed.

The soil divisions shown on the accompanying map are based upon the distribution of soil types as determined by the soil survey of Van Buren County, which was conducted in co-operation with the United States Bureau of Soils. Each division constitutes a group of soils possessing some common attributes of drainage, moisture, physical and chemical properties and it follows, therefore, that a correlation with fertilizer requirements of the soil may be established. The map has a two-fold purpose and use: it shows the locations and extent of the land for which particular fertilizer recommendations are made, and it affords a broad inventory of the soil resources of the county on the basis of natural fertility.

In the use of the word fertility, it should be understood that this is a relative term and is a thing that cannot be measured in a precise quantitative way. Also a distinction is necessary between **fertility** and **productivity** since a naturally infertile soil may be made highly productive through skillful management. In particular local instances man has modified the soil in such a way that he has increased or on the

other hand, decreased its natural productiveness and a recognition of this is obviously important in a discussion of fertilizer treatments.

**The soils of relatively low fertility, originally with good drainage,** are mainly sands low in organic matter, relatively low in average content of moisture, are acid, and pervious in structure permitting free movement of water and rapid leaching. This group occupies approximately 19.8 per cent of the total acreage of the county. The recommendations of Column I of the fertilizer chart will apply.

**The soils of low to medium fertility, originally with good drainage,** are mainly sandy loams characterized by a moderately retentive clayey layer at shallow depths; the content of organic matter is low or only moderate; the reaction is generally acid. This division represents a group of soils capable of a great increase in productiveness if properly managed; on the other hand, they are likely to show a rapid loss in productiveness if improperly handled. Much of the area has fallen below average natural productiveness, partly because of erosion on the more steeply sloping land, but chiefly because of failure to maintain a good supply of organic matter in the soil. The recommendation of Column II of the fertilizer chart will apply to the treatment of these soils. This group comprises approximately 31.0 per cent of the total acreage of the county.

**The soils of medium to relatively high fertility, originally with good drainage,** comprise mainly the loams, silt loams and clay loams underlaid by retentive clay layers either in the soil or in the immediate substratum; the content of organic matter is moderate to relatively high; the reaction of the surface soil varies between strongly acid and alkaline, but the lower part of the soil or substratum is uniformly high in lime and alkaline in reaction. The soils are durable since they are not subject to excessive and rapid losses from erosion and leaching. This group comprises approximately 25.2 per cent of the total acreage of the county. The recommendations of Column III of the fertilizer chart will apply to the treatment of these soils.

**The soils of low to medium fertility, originally with poor drainage,** are those that are waterlogged at shallow depths and in some cases alternately excessively wet and moderately dry at the surface; their textures are sandy; the organic matter may be low or fairly high but is more rapidly lost than in the group of high fertility of poor drainage; the reaction ranges from very strongly acid to nearly neutral. Some of these soils are characterized by a brown organic hardpan. This group comprises about 10.0 per cent of the total acreage. The recommendations of Column IV of the fertilizer chart will apply to the treatment of these soils.




**The soils of relatively high fertility, originally with poor drainage,** are mineral soils containing a high amount of organic matter which is not rapidly lost under cultivation; they vary in texture from heavy sandy loams to clay loams; they range from slightly acid to alkaline in reaction. This group comprises about 5.7 per cent of the total acreage of the county. The recommendations of Column V of the fertilizer chart will apply to the treatment of these soils.

**The muck soils** are for the most part deep, high in organic matter, dark brown or black, fairly well decomposed and loamy at the surface;




LAKE MICHIGAN

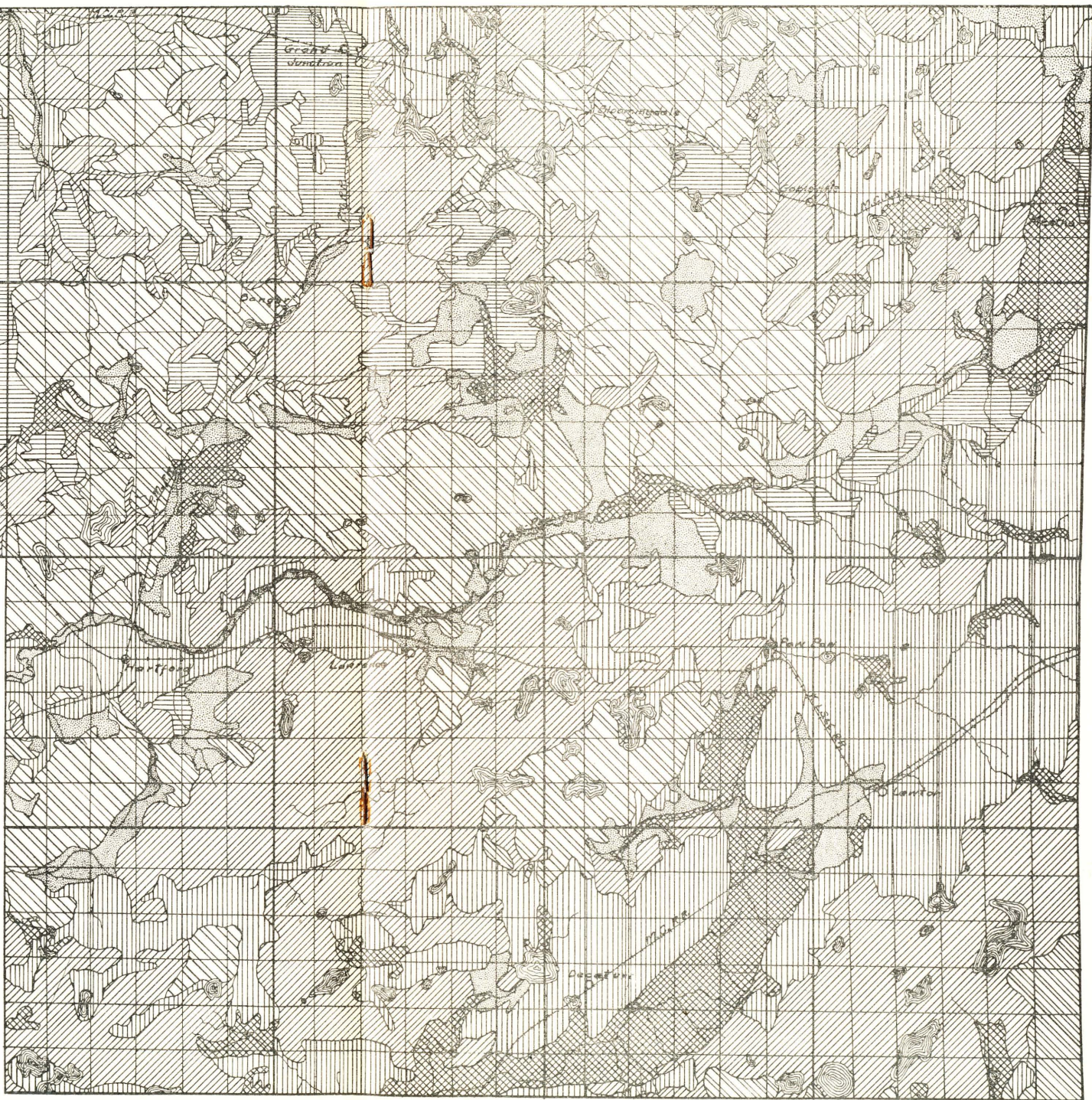
### FERTILITY MAP OF VAN BUREN CO. MICHIGAN.

WELL DRAINED

-  *Relatively low fertility.*
-  *Low to medium fertility.*
-  *Medium to relatively high fertility.*

PODOLY DRAINED SOILS

-  *Relatively high fertility.*
-  *Low to medium fertility.*
-  *Mucks (Wide range but mostly medium to high in relative fertility for this class of soils.)*



## GROUP OF SOILS ORIGINALLY WELL DRAINED\*

		COLUMN I	COLUMN II		COLUMN III	
		Relatively low fertility	Low to Medium fertility		Medium to relatively high fertility	
			Producing below average yields of general farm crops	Producing above average yields of general farm crops	Producing below average yields of general farm crops	Producing above average yields of general farm crops
Wheat and Rye.....	Fall....	2-16-2..... 2-12-2.....	2-16-2..... 2-12-2.....	..... 0-16-0 (4).....	2-16-2..... 2-12-2.....	..... 0-16-0.....
	Spring..	Nitrate of Soda Sulphate of Ammonia (1).....	Nitrate of Soda Sulphate of Ammonia.....	Nitrate of Soda Sulphate of Ammonia.....	Nitrate of Soda Sulphate of Ammonia.....	.....
Wheat and Rye with spring seeding of Alfalfa or Clovers	Fall....	3-12-4..... 2-12-6.....	0-12-6..... 2-16-2..... 2-12-6.....	..... ..... 0-16-0.....	2-16-2..... 2-12-2.....	..... 0-16-0.....
	Spring..	Nitrate of Soda Sulphate of Ammonia.....	Nitrate of Soda Sulphate of Ammonia.....	Nitrate of Soda Sulphate of Ammonia.....	Nitrate of Soda Sulphate of Ammonia.....	.....
Oats and Barley.....	Spring..	2-12-2..... 2-16-2..... 4-12-0.....	..... 2-16-2..... 2-12-2.....	..... ..... 0-16-0.....	2-16-2..... 2-12-2.....	..... 0-16-0.....
	Spring..	Nitrate of Soda Sulphate of Ammonia (2).....	Nitrate of Soda Sulphate of Ammonia.....	Nitrate of Soda Sulphate of Ammonia.....	Nitrate of Soda Sulphate of Ammonia.....	.....
Oats and Barley with spring seedings of Alfalfa or Clover	Spring..	0-12-6..... 4- 8-6..... 2-12-6.....	0-12-6..... 4- 8-6..... 2-12-6.....	..... ..... 0-16-0.....	2-16-2..... 2-12-2.....	..... 0-16-0.....
	Spring..	Nitrate of Soda Sulphate of Ammonia ..	Nitrate of Soda Sulphate of Ammonia.....	Nitrate of Soda Sulphate of Ammonia.....	Nitrate of Soda Sulphate of Ammonia.....	.....
Corn.....	Spring..	2-16-2.....	2-16-2.....	.....	.....	.....
		4-12-0.....	4-12-0.....	0-16-0.....	0-16-0.....	0-16-0.....
Alfalfa, Sweet Clover and Red Clover.....	Spring or late summer	0-12-12.....	.....	.....	.....	.....
		0-12-6.....	0-12-6.....	0-16-0.....	0-16-0.....	0-16-0.....
Timothy (6).....	Early spring..	.....	.....	.....	.....	.....
Soy Beans.....	Spring..	0-12-6.....	0-12-6.....	.....	2-16-2.....	0-16-0.....
		2-12-6.....	2-12-6.....	0-12-6.....	2-12-6.....	2-16-2.....
Potatoes.....	Spring..	3-12-4.....	0-16-0.....	0-12-6.....	.....	.....
		4- 8-6.....	2-16-2..... 2-12-6.....	2-16-2..... 0-16-0.....	0-16-0..... 2-16-2.....	..... 0-16-0.....
Beans.....	Spring..	0-12-6.....	0-12-6.....	.....	.....	.....
		3-12-4..... 2-12-6.....	3-12-4..... 2-12-6.....	..... 0-12-6.....	2-12-2..... 2-16-2.....	2-12-2..... 2-16-2.....
Sugar Beets.....	Spring..	.....	.....	3-12-4.....	3-12-4.....	.....
		.....	3-12-4..... 2-12-6.....	2-12-6..... 2-16-2.....	2-16-2..... 0-16-0.....	2-16-2..... 0-16-0.....
Cabbage.....	Spring..	2-12-6.....	2-16-2.....	2-12-2.....	3-12-4.....	.....
		3-12-4.....	3-12-4.....	2-16-2.....	2-16-2.....	0-16-0.....
Cucumbers.....	Spring..	2-12-6.....	2-12-6.....	.....	.....	.....
		3-12-4.....	3-12-4.....	.....	.....	.....
Tomatoes.....	Spring..	4-12-0.....	2-16-2.....	2-16-2.....	2-12-2.....	.....
		3-12-4.....	3-12-4.....	0-16-0.....	2-16-2.....	0-16-0.....
Lawns.....		3-12-4 (3).....	3-12-4 (3).....	3-12-4 (3).....	3-12-4 (3).....	3-12-4 (3).....

1. Rate of application per acre—Nitrate of Soda 60 to 100 lbs. Sulphate of Ammonia 40 to 75 lbs. It is not advisable to apply Sulphate of Ammonia on very sour soil.
2. Small applications of Nitrate of Soda or Sulphate of Ammonia, supplementing the mixed fertilizer proves beneficial.
3. Top dressing with Sulphate of Ammonia, or Nitrate of Soda at the rate of  $\frac{1}{4}$  to  $\frac{3}{4}$  lbs. per square rod as needed.
4. Acid phosphate 0-18-0, 0-20-0, 0-24-0 or 0-44-0 where procurable may be substituted in proportional amounts for 0-16-0.

FERTILIZER SUGGESTIONS FOR VAN BUREN COUNTY SOILS 7

GROUPS OF SOILS ORIGINALLY POORLY DRAINED.\*

COLUMN IV Low to Medium fertility		COLUMN V Relatively high fertility		COLUMN VI Mucks (5)
Producing below average yields of general farm crops	Producing above average yields of general farm crops	Producing below average yields of general farm crops	Producing above average yields of general farm crops	
2-16-2		2-16-2		0- 8-24
2-12-2	0-16-0	2-12-2	0-16-0	0-12-12
Nitrate of Soda Sulphate of Ammonia				0- 8-24
				0-12-12
0-12-6				
2-12-2		2-16-2		0- 8-24
2-12-6	0-16-0	2-12-2	0-16-0	0-12-12
Nitrate of Soda Sulphate of Ammonia				0- 8-24
				0-12-12
2-16-2				
2-12-0		2-16-2		0- 8-24
4-12-0	0-16-0	2-12-2	0-16-0	0-12-12
Nitrate of Soda Sulphate of Ammonia				
2-16-2				
2-12-2	0-16-0	2-12-2	0-16-0	0- 8-24
				0-12-12
Nitrate of Soda Sulphate of Ammonia				
2-16-2				
4-12-0	0-16-0	0-16-0	0-16-0	0- 8-24
				Muriate of Potash
0-12-12	0-12-6			0-8-24
0-12-6	0-16-0	0-16-0	0-16-0	Muriate of Potash
				0-8-24
				Muriate of Potash
0-12-6	2-12-2	0-12-6	0-12-6	0-8-24
2-12-6	2-16-2	2-16-2	2-16-2	Muriate of Potash
2-16-2				
2-12-6	2-16-2	2-16-2		0-8-24
4- 8-6	0-16-0	0-16-0	0-16-0	Muriate of Potash
0-12-6				
3-12-4	2-12-2	0-12-6	0-12-6	
2-12-6	2-16-2	2-16-2	2-16-2	
		3-12-4		
		2-12-6	2-16-2	0-8-24
		2-16-2	0-16-0	Muriate of Potash
2-12-6	2-12-2	2-12-2		
3-12-4	0-16-0	0-16-0	0-16-0	2-8-16
2-12-6	2-12-6			
3-12-4	3-12-4			
4-12-0	2-16-2			
3-12-4	0-16-0	0-16-0	0-16-0	
3-12-4 (3)	3-12-4 (3)	3-12-4 (3)	3-12-4 (3)	0-8-24

5. *Special crops on muck.* Celery, 3-8-24 or 0-8-24 onions, cabbage, cauliflower, swiss chard, spinach and lettuce, 2-8-16 or 4-8-16, mint 2-8-16. Carrots, parsnips and beets, 0-8-24. Celery and lettuce respond to side dressings of nitrate of soda or sulphate of ammonia if manure is not used. Very acid mucks require more nitrogen in the mixture than is needed by sweet mucks.

6. The best results have been obtained from top dressings of nitrate of soda.

\*Fertilizer recommendations made by G. M. Grantham, O. B. Price, and P. M. Harmer

they are high in lime and not strongly acid. Less decomposed mucks generally characterized by a dominance of tamarack and shrubs in the native growth, are present in considerable bodies, and raw highly acid mucks, generally characterized by huckleberry, cassandra and mosses, are also present but only in a small aggregate acreage. The mucks comprise 8.3 per cent of the total acreage of the county. The recommendations of Column VI of the fertilizer chart will apply to the treatment of these soils.

The soil map is necessarily generalized, since a great variety of soils occur in small intermixed patches which cannot be separated with entire accuracy on the scale of mapping employed. Furthermore it is not implied that all of the land in any one area shown on the map is uniformly and without exception low in fertility or high in fertility as the case may be, and consequently some exceptions to the fertilizer treatments that are suggested may be found.

**Table I.—Fertility inventory of Van Buren county—based on soil survey and fertility grouping maps.**

	Per cent of total area
<b>Well drained land:</b>	
Low fertility .....	19.8
Low to medium fertility.....	31.0
Medium to relatively high fertility.....	25.2
<b>Poorly drained land:</b>	
Low to medium fertility.....	10.0
Relatively high fertility .....	5.7
Mucks (mainly medium to high for this class)..	8.3