SOURCES OF FERTILIZING MATERIALS FOR ILLINOIS FARMS

BY CYRIL G. HOPKINS AND F. C. BAUER

URBANA, ILLINOIS, JUNE, 1918
LOCATION OF QUARRIES OF AGRICULTURAL LIMESTONE. SEE PAGE 4
SOURCES OF FERTILIZING MATERIALS FOR ILLINOIS FARMS

By CYRIL G. HOPKINS, Chief in Agronomy and Chemistry, and F. C. BAUER, Associate in Soil Fertility

For practically all the normal soils of Illinois there are only three constituents which must be supplied in order that systems of farming may be adopted which, if continued, will increase or at least permanently maintain the productive power of the soil. These are limestone, phosphorus, and organic matter. Some abnormal soils, such as peaty swamp soils, and possibly some "alkali" soils may be improved by the use of potassium.

Limestone must be used to correct soil acidity, and sometimes to supply the elements calcium and magnesium. In southern Illinois, little can be done toward growing better crops until the acidity of the soil is corrected by a liberal use of limestone. In other portions of the state it is recognized that on most soils limestone is coming more and more to have a definite value for soil improvement, especially in the production of legumes, and particularly for alfalfa and sweet clover. Phosphorus is needed solely for its plant-food value. The organic-matter supply of the soil must be renewed in order that the soil be provided with nitrogen and the mineral elements in the soil made available thru decomposition. Potassium on peat soils is needed for plant food, and on some soils salts of potassium are valuable in correcting certain injurious conditions present or even of taking the place of organic manures in the making available of mineral plant foods until such can be replenished by natural means.

With the exception of organic manures which can be produced upon the farm, these various materials must be secured from sources other than the farm and applied to the soil.

In view of the growing interest on the part of the farmer, many inquiries are received by the Experiment Station relating to sources of these materials, of limestone crushing machinery, and of distributors. The addresses of firms concerned in the production or manufacture of such materials are listed herewith, solely as a matter of information, and the Experiment Station makes no recommendations or guarantees as to reliability.
LIMESTONE

The companies producing agricultural limestone are arranged in alphabetical and numerical order, and their quarries are indicated by number on a map showing the railroad connections. The firms are as follows:

<table>
<thead>
<tr>
<th>Map No.</th>
<th>Office address</th>
<th>Location of quarry</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Albert J. Ward Company</td>
<td>Chicago, Ill.</td>
</tr>
<tr>
<td></td>
<td>Fullerton Avenue Bridge, Chicago</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A. C. O. Laughlin Company</td>
<td>Bellewood, Ill.</td>
</tr>
<tr>
<td></td>
<td>1007 Chamber of Commerce, Chicago</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Bettendorf Stone Company</td>
<td>Bettendorf, Iowa</td>
</tr>
<tr>
<td></td>
<td>Bettendorf, Iowa</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Brownell Improvement Company</td>
<td>Thornton, Ill.</td>
</tr>
<tr>
<td></td>
<td>1220 Chamber of Commerce, Chicago</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Black White Lime Company</td>
<td>Quincy, Ill.</td>
</tr>
<tr>
<td></td>
<td>Quincy, Illinois</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Burlington Quarry Company</td>
<td>Montrose, Iowa</td>
</tr>
<tr>
<td></td>
<td>Keokuk, Iowa</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Carrico Stone Company</td>
<td>Rockford, Ill.</td>
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<tr>
<td></td>
<td>Rockford, Illinois</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Casparis Stone Company</td>
<td>Fairmount, Ill.</td>
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<tr>
<td></td>
<td>Fairmount, Illinois</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Casper Stolle Quarry &amp; Contracting Co.</td>
<td>Stolle, Ill.</td>
</tr>
<tr>
<td></td>
<td>East St. Louis, Illinois</td>
<td>Whitehill,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Johnson Co., Ill.</td>
</tr>
<tr>
<td>10</td>
<td>Charles Stone Company</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Marion, Illinois</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chicago and Alton Railroad Company (See No. 36)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Columbia Quarry Company</td>
<td>Columbia, Ill.</td>
</tr>
<tr>
<td></td>
<td>St. Louis, Missouri</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Dolese Brothers</td>
<td>Buffalo, Iowa</td>
</tr>
<tr>
<td></td>
<td>10 S. LaSalle St., Chicago</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Dolese, Shepard &amp; Company</td>
<td>Hawthorne and Gary, Ill.</td>
</tr>
<tr>
<td></td>
<td>108 S. LaSalle St., Chicago</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>East St. Louis Stone Company</td>
<td>East St. Louis, Ill.</td>
</tr>
<tr>
<td></td>
<td>East St. Louis, Illinois</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Elmhurst-Chicago Stone Company</td>
<td>Elmhurst, Ill.</td>
</tr>
<tr>
<td></td>
<td>Elmhurst, Illinois</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Farmers Limestone Milling Company</td>
<td>Robinson, Ill.</td>
</tr>
<tr>
<td></td>
<td>Robinson, Illinois</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Goleconda Cement Works</td>
<td>Goleconda, Ill.</td>
</tr>
<tr>
<td></td>
<td>Goleconda, Illinois</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Hart &amp; Page</td>
<td>Rockford, Ill.</td>
</tr>
<tr>
<td></td>
<td>Rockford, Illinois</td>
<td>No shipping station.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grinder moved from</td>
</tr>
<tr>
<td></td>
<td></td>
<td>farm to farm.</td>
</tr>
<tr>
<td>19</td>
<td>Lamar, Louis</td>
<td>Dixon, Ill.</td>
</tr>
<tr>
<td></td>
<td>Rosiclare, Illinois</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Laughlin Company (See No. 2)</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Leake, C. R. (No shipping facilities)</td>
<td>Dixon, Ill.</td>
</tr>
<tr>
<td></td>
<td>Dixon, Illinois</td>
<td></td>
</tr>
</tbody>
</table>
### SOURCES OF FERTILIZING MATERIALS

<table>
<thead>
<tr>
<th>No.</th>
<th>Firm Name</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>Lehigh Stone Company</td>
<td>Kankakee, Illinois</td>
</tr>
<tr>
<td>22</td>
<td>McManus Quarry Company</td>
<td>Keokuk, Iowa</td>
</tr>
<tr>
<td>23</td>
<td>Marblehead Lime Company</td>
<td>Quincy, Illinois</td>
</tr>
<tr>
<td>24</td>
<td>Marble, White Lime Company</td>
<td>Quincy, Illinois</td>
</tr>
<tr>
<td>25</td>
<td>F. W. Menke Company</td>
<td>Quincy, Illinois</td>
</tr>
<tr>
<td>26</td>
<td>Mississippi Sand Company</td>
<td>Alton, Illinois</td>
</tr>
<tr>
<td>27</td>
<td>National Stone Company</td>
<td>Joliet, Illinois</td>
</tr>
<tr>
<td>28</td>
<td>Ottawa Stone &amp; Sand Company</td>
<td>Joliet, Illinois</td>
</tr>
<tr>
<td>29</td>
<td>Prairie State Fertilizer Company</td>
<td>Fairmount, Ill.</td>
</tr>
<tr>
<td>30</td>
<td>Reliance Quarry &amp; Construction Company</td>
<td>Alton, Ill.</td>
</tr>
<tr>
<td>31</td>
<td>Southern Illinois Penitentiary</td>
<td>Menard, Ill.</td>
</tr>
<tr>
<td>32</td>
<td>Superior Stone Company</td>
<td>LaGrange, Ill.</td>
</tr>
<tr>
<td>33</td>
<td>Truebger, Wm.</td>
<td>Golconda, Ill. (portable crusher)</td>
</tr>
<tr>
<td>34</td>
<td>United States Crushed Stone Company</td>
<td>McCook, Ill.</td>
</tr>
<tr>
<td>35</td>
<td>Western Whiting Manufacturing Company</td>
<td>Elsah, Ill.</td>
</tr>
<tr>
<td>36</td>
<td>Chicago and Alton Railroad Company</td>
<td>Pearl, Ill.</td>
</tr>
</tbody>
</table>

The following firms are also able to furnish Illinois farmers with agricultural limestone:

<table>
<thead>
<tr>
<th>Firm Name</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>A &amp; C Stone &amp; Lime Company</td>
<td>Greencastle, Ind.</td>
</tr>
<tr>
<td>Mitchell Lime Company</td>
<td>Mitchell, Ind.</td>
</tr>
<tr>
<td>Ohio &amp; Indiana Stone Company</td>
<td>Greencastle, Ind.</td>
</tr>
<tr>
<td>Spencer Limestone Company</td>
<td>Spencer, Ind.</td>
</tr>
</tbody>
</table>

Some companies furnish ground limestone and some furnish limestone screenings which may vary from very fine dust to particles as large or larger than corn kernels. In carload lots the price on board cars at the plant varies from about 75 cents to $1.50 a ton according to fineness and cost of production. The freight charges are one-half cent per ton per mile, with a minimum charge of 25 cents per ton by each railroad handling the car, and with a minimum carload of 33 tons.
At most points in Illinois the cost delivered in bulk carloads should be from $1 to $2 a ton. Sometimes one can get one and one-half tons of material containing one ton of fine dust and one-half ton of coarser particles, varying in size from smaller than a pin head to larger than a corn kernel, at no greater expense than would be required for one ton of fine-ground stone containing no coarser particles. The coarse particles have some value, and they will last longer in the soil than the fine material, which is rapidly lost by leaching. A product that will pass thru a sieve with 4 to 8 meshes to the linear inch and that contains all the fine dust produced in the process of crushing or grinding is very satisfactory. More detailed information in regard to the use of limestone for soil improvement will be found in Circular 110, which may be secured upon application to the Agricultural Experiment Station.

**MACHINES FOR GRINDING LIMESTONE**

In certain localities there are outcrops of limestone rock which if crushed would be of considerable value to the farmer on whose land it occurs, or to the farmers of the community. Such limestone rock may be prepared for agricultural purposes by portable machines, a threshing engine or tractor being used for power. Crushing or grinding machines of this type may be secured from—

- Day Pulverising Co., Knoxville, Tenn.
- Jeffrey Manufacturing Co., Columbus, Ohio
- Universal Crusher Co., Cedar Rapids, Iowa
- Williams Patent Crusher & Pulverizer Co., St. Louis, Mo.
- Worthington Pump & Machinery Corporation, Cudahy, Wis.

**MACHINES FOR SPREADING LIMESTONE AND PHOSPHATE**

There are two general types of machines in use for the spreading of limestone and phosphate. One runs on its own wheels as a separate machine, and the other is an attachment for the wagon on which the load of stone is hauled. The first type is usually the more satisfactory machine, because it can be operated by one man and with less horse power than is required to haul the loaded wagon carrying the ‘‘end­gate’’ attachment. In either case, the limestone must be shoveled from the wagon box into the spreader.

A machine that has given good satisfaction is the homemade spreader described in Circular 110, mentioned above. This machine is carried on old mower wheels and can be made by any good blacksmith and carpenter. Machines of this type are made by a number of blacksmiths in the state and are usually kept in stock by George Kubacki, DuBois, Illinois.
Other machines now upon the market are made by the following:

American Seeding Machine Co., Springfield, Ohio
Excelsior Drill Co., Springfield, Ohio
Hurst and Company, Indianapolis, Ind.
Holden Manufacturing Co., Peoria, Ill.
International Harvester Co., Chicago, Ill.
C. A. Long, Milford, Ill.
Monmouth Plow Factory, Monmouth, Ill.
Peoria Drill and Seeder Co., Peoria, Ill.
Thomas Manufacturing Co., Springfield, Ohio

NATURAL ROCK PHOSPHATE

Fine-ground raw rock phosphate, containing from 12 to 14 percent of phosphorus, can be obtained from the following companies, delivered in bulk on board cars at the mines in Tennessee for $4.00 to $6.50 per ton, the price varying with the quality. The freight rate from Tennessee per ton of 2,000 pounds in carload lots varies from $2.57 to points in southern Illinois, to $3.77 to northern Illinois points.

Central Phosphate Co., Mt. Pleasant, Tenn.
Federal Chemical Co., Louisville, Ky.
Prairie State Fertilizer Co., Nashville, Tenn., and 14 E. Jackson Blvd., Chicago, Ill.
Robin Jones Phosphate Co., Nashville, Tenn.
Ruhm Phosphate Mining Co., Mt. Pleasant, Tenn.
Sears, Roebuck & Co., Chicago, Ill.
Virginia-Carolina Chemical Co., Mt. Pleasant, Tenn.

It should be borne in mind that rock phosphate varies much in quality. It should be finely ground, so that at least 90 percent of the material can be washed thru a sieve with 100 meshes to the linear inch, or with 10,000 meshes to the square inch. Consequently, it should always be purchased upon a guaranteed analysis, and it is advisable for the purchaser to take an average sample of the carload when received and have it analyzed both for phosphorus and for fineness, even tho the analysis cost him $2 or $3. To collect an average sample, take a small teaspoonful from about fifty different places in the car, not only from the surface, but also from different depths. These fifty spoonfuls well mixed together will make a trustworthy sample, and about one pound of this should be sent to some commercial chemist for analysis.

On the basis of a guarantee of 14 percent phosphorus, or 280 pounds per ton, and 90 percent of the rock fine enough to pass thru a 100-mesh screen, it is readily seen that at a delivered price of $8 per ton the company guarantees to deliver 252 pounds of the element phosphorus, in the 100-mesh material, at a cost of about 3 1/6 cents per pound. If the analysis shows only 13 percent phosphorus and only 85 percent fine enough to pass thru a 100-mesh screen, there is a delivery of only 221 pounds of phosphorus in the 100-mesh material;
and on the basis of 3 1/6 cents per pound for the element, the buyer should pay only $7 per ton delivered, instead of $8, a difference which on a 40-ton car amounts to $40.

The important phosphorus compound in rock phosphate is calcium phosphate, $\text{Ca}_3(\text{PO}_4)_2$. The percentage of this compound in the rock phosphate marks the purity of the rock. Thus, if the rock phosphate contains 70 percent of calcium phosphate, it is 70 percent pure, with 30 percent of impurities.

Sometimes the guarantee is given as "phosphoric acid," meaning phosphoric oxid, $\text{P}_2\text{O}_5$. This also is a definite compound and always contains $43\frac{2}{3}$ percent of the element phosphorus. Thus it will be seen that the same sample of rock phosphate may be guaranteed to contain 70 percent of calcium phosphate, $\text{Ca}_3(\text{PO}_4)_2$, or 32 percent of "phosphoric acid" ($\text{P}_2\text{O}_5$), or 14 percent of phosphorus (P).

As a rule, it is more satisfactory to purchase in bulk rather than in bags (see page 15 of Circular 110).

**BONE MEAL**

A good grade of steamed bone meal (12 to 13 percent phosphorus) can probably be obtained delivered in Illinois for $30 to $40 per ton from Armour & Company; Darling & Company; Hirsh, Stein & Company; Morris & Company; or Swift & Company; Chicago, Illinois.

**POTASSIUM SALTS**

Europe has been the chief source of potassium salts such as kainit, potassium, chlorid (or "muriate"), and potassium sulfate. Since the war has been in progress, however, it has been impossible to secure these salts. Under these conditions farm manures are the best substitutes, and they must be resorted to as much as possible where potassium is needed.

Some American sources of potash have been developed recently, and some products placed upon the market. The Potash Products Company, Omaha, Nebraska, is now selling salts containing 20 to 25 percent of the element potassium, but the price is still prohibitive for use in the production of staple farm crops even where potassium is deficient in the soil.