

manure would not contain so much plant food as is assumed in the table, and further allowances must be made if the manure is of inferior quality. Practical results seem to indicate that about fifteen tons per acre of fair quality of manure may be regarded as the maximum quantity necessary on average soil for the heaviest feeding crops, such as roots and corn. For wheat, the requirements are considerably smaller, as may be seen by referring to the table, where wheat is compared with turnips. Probably ten tons per acre, or even less, may be regarded as a heavy application for wheat. No fixed rule can be given regarding the quantity of manure to apply for different crops. Each farmer must be guided largely by circumstances, and by an understanding of some general principles underlying the operation. It is a pretty safe conclusion that moderate applications of manure to a large area will give better ultimate returns than heavy applications to a small area; and the smaller the supply of manure, the greater the necessity of restricting the amount applied per acre. The time has passed when it was thought necessary to apply from twenty to forty tons of manure per acre.

*Depth of Covering.* Farmyard manure should be kept as near the surface of the soil as possible. The rainwater as it percolates through the soil, has a tendency to carry the soluble plant food downward and out of the reach of plants; consequently an attempt should be made to delay the downward progress of plant food instead of assisting it by plowing the manure in deeply. Then again, nitrification is most active near the surface of the soil. Therefore manure kept near the surface is under more favorable conditions for having its plant food made available and consequently gives quicker returns. When a heavy application of manure has been plowed under deeply, it is no uncommon thing to see lumps of manure brought to the surface by subsequent plowing, showing that it had never become properly incorporated with the soil. It is quite probable, too, that this deeply buried manure has lost considerable nitrogen through denitrification. Economical manuring consists in obtaining quick returns over as large an area of the farm as possible, and this is accomplished by moderate applications incorporated with the surface soil. Shallow covering of manure also increases the humus of the surface soil. As a result, the soil does not bake and crack in dry weather; it absorbs and retains water much more satisfactorily, and works up into a fine tilth more easily.

*Time of Application.* Farmyard manure gives better results with spring sown crops if applied and incorporated with the soil during the preceding fall. This is the case especially with crops sown in the early spring, such as mangels or a grain crop. The reason is obvious, since mixing the manure with the soil in the fall gives more time for the preparation of the plant food which it contains. The quantity of manure available for fall application is usually limited, for keeping manure in the yard throughout the summer is open to some very grave objections. Extended experiments at various American experiment stations show that very serious losses may occur in the manure pile during the summer. Sheldon, of the Kansas Experiment Station, concludes that manure should be hauled to the field in the spring, otherwise the loss in six months may amount to nearly forty per cent. of the nitrogen it contains. Experiments at the Cornell Experiment Station tend to confirm this conclusion; but in one case, where the manure was very firmly packed, the loss in value was less than ten per cent. When manure is carelessly scattered over badly constructed yards during the summer, the loss in value is extremely great. When kept in manure sheds during the summer there is danger of excessive fermentation. To say the least, it