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Extension Division Notes.

By A. D. Wilson, Supt.

Get the habit of hauling manure to the field every day as it is taken from the barn. The sooner manure is spread in the field, the smaller the loss of fertility incurred, and the smaller the amount of labor required to handle it.

Keep the stock comfortable. There probably no term that signifies more regarding the condition in which stock should be kept than the term, "comfortable;" and if one bears this in mind, and keeps his stock comfortable—that is, not hungry or cold, or excited, or standing in an uncomfortable position, or sleeping in an uncomfortable bed,—his returns will be satisfactory.

Visit the school. The boys and girls and the teacher will be greatly pleased and encouraged if you show enough interest in the school to devote a half-day's time to visiting and showing your interest in it. A few words of encouragement to the pupils and teacher will give them increased interest in their work, and increase their enthusiasm for the school and for the community.

Do not fail to attend the Institute held in your community. The Institutes are for you. The men who speak at these Institutes are practical farmers who have succeeded. While you know better than anyone else how to run your own farm, finding out how other people do things will do you no harm, and you may hear something that will mean additional profits and pleasure to you.

Potatoes for seed should be carefully stored where the temperature will be as low as possible without freezing the potatoes. Narrow bins, lightly raised from the floor, and with slatted sides, are much better for storing seed-potatoes than are tight bins. Cellars can often be kept reasonably cool, early in the fall and in the spring, by leaving the windows open at night and closing them in the day-time.

Study and master at least one farm problem during the leisure time this winter. There is a great deal of reliable information available on nearly every farm problem, and certainly this information is worth more to a farmer than to anyone else. A careful and systematic study of some problem—perhaps some new phase of your work that you are just taking up—may be instrumental in making that industry profitable and interesting.

There is one delightful thing about farming, which is not true of some other industries, and that is that each farmer is really benefited by the success of his neighbors. In a progressive neighborhood, where good stock is kept and where farming is generally profitable, roads and schools are better, the price of farm land is higher; and, owing to the fact that a great quantity of farm products is offered for sale, markets are better; so boost your neighbors, and by so doing help yourself.

We again urge that all farmers at this time consider the matter of the selection of seed for next spring. One hundred bushels of heavy, plump seed, graded from 400 or 500 bushels of grain as threshed this fall, is probably the best possible seed you can get for your farm. This plump seed comes from plants that, by producing plump seed, demonstrated their adaptability to your locality, and their ability to avoid injury from disease. By grading your seed, you not only have heavy, plump, strong seed, but seed that has in a measure been bred for your particular conditions.

Care of the Seed Corn.

Notwithstanding the fact that the past season has been unusually favorable to the production of corn, great care is necessary to insure seed-corn of strong germinating qualities next spring. Since September 1st, when the corn matured, the fall has been very wet. Many of the ears are soft from the continued moisture, and have spoiled in the shock. It is not uncommon to find ears that can be broken down readily in the hand. In fact, many of the ears crumble under the operation of husking. The cob, especially at the butt of the ear, is saturated with moisture and poor germination will be the result unless carefully dried. Greater care than usual is necessary in the selection of seed-ears for this reason, and great care must be exercised in drying the corn. It would be advisable this year to use some artificial heat during the early stages of drying, even though the corn appears to be practically dry. From three to ten days, in a room in which

there is sufficient heat to dry the air, will be the safest plan to follow. In ordinary seasons early picked seed-corn will not require artificial heat. Following ten days in the drying-room, the corn can be stored in any place where the circulation of air is free, and where freezing will not take place too early. Corn should be especially well dried before freezing comes on this year. If allowed to freeze up for the winter, with an undue amount of moisture, poor germination is sure to follow. The weather conditions this fall bring out clearly the advisability of early selection of seed-corn.—Andrew Boss, Agriculturist, Minn. Experiment Station.

Fuels, Their Comparative Value and Efficiency.

A fuel may be defined as any substance capable of becoming a source of heat; thus defined many substances would be classified as fuels which are not ordinarily considered as such, viz.: sulphur, magnesium, etc. However, to produce a useful effect, the combination must be rapid; additional considerations, determining the substances commonly used as fuels, being the available supply, cost of transportation, etc.

Fuels may be classified as gaseous, coal gas, natural gas, etc.; liquid, as crude petroleum and its products; solid, wood, coal of various kinds, as lignite, bituminous, semi-bituminous, semi-anthracite, and anthracite. Anthracite has approximately twice the heating value of lignite, the efficiency being in the reverse of the order given above.

The combustion of a fuel takes place according to chemical laws, hence the nature of the fuel, and the conditions under which combustion takes place, determine the effect produced. If the fuel be burned under improper conditions, the full effect will not be obtained, resulting in a waste of fuel and loss of heating efficiency. The heating power of a fuel can only be obtained by complete combustion of the fuel. The various gaseous products driven off at the beginning of combustion are known as the volatile combustibles; the percentage being high in lignite and bituminous coals and low in anthracite. The flame is due to the volatile combustibles and its length depends upon their amount. The carbon not driven off as volatile combustion is known as fixed carbon, which is the principal source of heat, as the heat from the volatile combustibles is largely lost. It is well to remember that a luminous flame heats by radiation, while a non-luminous flame heats by contact.

The conditions governing the complete combustion of fuel are:—a shallow fuel-bed, not too high a temperature, sufficient supply of air, and removal of products of combustion. A shallow fuel-bed permits access of air to all portions of the fuel, and facilitates removal of products of combustion. All parts of the fuel-bed being accessible to air, the combustion proceeds evenly, with the maximum evolution of heat. Proper stoking of a furnace is of prime importance in securing heating efficiency. Too high a temperature leads to heat losses from increasing the percentage of volatile combustibles. The proper regulation of the draught determines the completeness of the removal of the products of combustion. Analyses of flue gases would no doubt lead to increased efficiency of many furnaces, as only in this way can the conditions under which a furnace is working be accurately known.

Sulphur in coal, although largely combustible, corrodes the grate-bars. The color of the ash is an indicator of the quality of the coal. A white ash indicates good quality, while a red ash indicates the presence of iron, which is a cause of clinkers.

The conditions for burning wood are of course somewhat different from those for burning coal. As to the comparative value of wood and coal, the following table by S. P. Sharpless is of considerable interest.

Weight per Cord and Coal Value of Thoroughly-Air-Dried Woods.

Hickory or Hard Maple	4500 lbs.—1800 lbs. coal
White Oak	3850 lbs.—1540 lbs. coal
Beech, Red & Black Oak	3250 lbs.—1300 lbs. coal
Poplar, Chestnut and Elm	2350 lbs.—940 lbs. coal
Average Pine	2000 lbs.—800 lbs. coal

Although not specified, the coal in above table was evidently a good grade of anthracite. 35,000 cubic feet of natural gas, and approximately the same amount of coal gas, equal in heating value one ton of coal.

G. W. WALKER,
Asst. in Agr. Chem. and Soils.

The teacher who can tell how a thing should be done, and who is prepared by practical experience to demonstrate the thing by actual performance—that is the kind of man who is today very much in demand as a teacher of Agriculture in Minnesota high, consolidated and graded schools. In other words, the day of the educated farmer as a professional man has "arrived."

Orchard and Garden Notes.

By LeRoy Cady, Horticulturist, Minn. University Farm.

Fall plowing of the garden destroys cutworms and other insects, besides getting rid of fall weeds.

Lay down and cover raspberries, blackberries and grapes this month. Do this when there is no frost in the canes.

Throw a few shovelfuls of earth against the young apple and plum trees, before the ground freezes. This will help keep mice away from the trunks.

Plan to take a vacation the first week of December, and attend the winter meeting of the Horticultural Society in Minneapolis. It's worth while. Send to Secretary Latham, 207 Kasota Block, Minneapolis, for a program.

Save a few cuttings of grapes for planting next year. Cut the wood into pieces having two or three buds, and place in sand or sawdust in a cellar until spring, when they may be planted out in nursery rows.

Squash and pumpkins should be stored in a dry cellar or building, where the temperature is between 50 and 60. Only mature specimens should be used, and these should be handled carefully to prevent injury.

Orchard trees may be mulched this month. Place the straw or manure out about as far as the branches go, and leave at least three inches bare at the base of the tree, so mice will not work on the tree. Put on about four inches thick.

A supply of rhubarb may be had during the winter, if a few clumps are taken up before the ground freezes and put in boxes or on the cellar floor. These clumps may be broken into pieces and covered about one inch deep with soil. Water thoroughly, and keep in the dark, so that only a small leaf surface will be formed. It is well to let the roots freeze until about December 20th.

To The Editor.

This sheet is printed exclusively for your use and for the benefit of your readers. It has no other readers—no subscription list. Only by the reproduction of its articles in your pages can it accomplish anything for the farmer.

It is of the greatest moment to us, then, that the articles we present shall be such as you want—such as you think will increase the value of your paper to your subscribers. We shall, therefore, be grateful for any suggestions you may offer, from time to time, concerning topics to be treated in these columns. And if, occasionally, you want a special article, on some topic of immediate interest to the farmers of your particular locality, just write us, and we will endeavor to furnish it.

The Root-Cellar.

A great many Minnesota farmers have been and are being forced to sell their potatoes, at a rate very much lower than might otherwise be obtained, for lack of a suitable cellar in which to store them. The supply in the country at large is so small that potatoes are likely to be worth a dollar or more per bushel a few months hence, and the possessor of a good crop and a good cellar can afford to bide his time before putting them on the market. Meanwhile, the men without storage facilities are glutting the market, and temporarily forcing prices down, in their eagerness to realize what they may on their potatoes before it is too late to save them from freezing.

The situation affords another illustration, like that in the apple orchards, of the futility of spending one's time and energies on the cultivation of a crop, without "planning ahead" to take care of it when it comes. In these days of cheap concrete, the preparation of an ample root-cellar is a comparatively inexpensive matter. The difference between the October price of potatoes and that which they will bring a short time hence would often more than pay the cost, and the structure will add to the permanent value of the farm. Few potato growers can afford to be without one.—C. R. Barns, Extension Div., Minn. University Farm.

Get Manure on Fields, if Possible.

There is often time, during the late fall and early winter, to clean out the yards and sheds before stock is put in for the winter. Experience goes to show that there is less waste of the fertilizing elements of manure when it is taken directly to the fields from the yards. When spread in the fall, remaining frozen through the winter, there is very little loss of fertility, and time is saved in the spring in preparing the land for a crop. While it is advisable to plow in the fall the land intended for corn, there is often land that cannot be reached, on account of pressure of other work; and frequent-

ly a piece of land is reserved, for fodder or ensilage corn, that is not plowed until spring. Such a piece offers splendid opportunity for dressing with manure from the yards and also in hastening the spring work by having the manure hauling reduced to the minimum. It is a mistake to allow the manure to lie in the yards from early fall until after the crop is in the next season, or until it is harvested. Economy of labor and conservation of the manurial elements demand that the manure be spread upon the land as fast as it accumulates about the barns and yards. This practice should be followed so far as the growth of crops and the climatic conditions will allow.—Andrew Boss, Agriculturist, Minn. Exp. Station.

Co-Operation, City and Country.

Whatever advantages the city may claim over the country, either as a place of residence or as an arena for business enterprise, are mainly due to the fact that in the city the principle of co-operation has found a larger development. The co-operation may be often involuntary, and in many cases the principle has been perverted to the enrichment of corporate and other monopolies; but it nevertheless so permeates all municipal life as to constitute the largest factor in the making of the city. The improved roadways and sidewalks, the water supply and sewer systems, gas and electric lighting and heating facilities, the trolley lines, telephone service, parks, libraries, picture galleries, hospitals, express deliveries, cheap amusements and superior school advantages—all are the fruits of a varied application of the "co-operative plan." For co-operation is simply an agreement by a number of men to unite in doing or maintaining something which none of them, individually, would be able to do or maintain. The mere fact of a man's taking up his residence in a city makes him, however involuntarily, a co-operator in all its works of public service. Their maintenance is a part of the "cost of living" there.

The growth of co-operation has been more rapid in the cities because of the multiplied contacts among the number of people there brought together, which have practically forced them to join hands for the general advancement, along some lines; and along others, has made it easy for the corporate and monopolistic beneficiaries of co-operation to levy the tribute charged for the use of their several conveniences—conveniences which the multitude was not yet ready to install from its own resources. But today similar contacts—stimulated by the presence of the telephone, the trolley, the daily mails, and all that they imply—are as numerous in many a country district as they were in the city of "ye olden time" before the advent there of the agencies named. And the multiplication of contacts stirs the progressive spirit in the country as it has done in the city. And that spirit can find no outlet like that afforded by the development of co-operation.

How many are the avenues of beneficent endeavor which center at Co-operation's door! Yet how few of those avenues have we, until recently, tried to penetrate! We have made some beginnings with co-operative elevators and grain-selling; with creameries and egg-selling associations; with live-stock shipping and stock-breeding associations; with fruit-growers' and market-gardeners' unions. But nine-tenths of the business in the several lines named, except in the case of the creameries, is still handled on a non-co-operative basis; and this in the face of repeated demonstrations of the effectiveness of co-operation in securing larger returns to the farmer.

The extension of co-operation along these lines may well engage a large share of the new spirit now kindling. So, also, may the "Good Roads" movement, than which few co-operative undertakings promise more. Such extension will make easier the application of the co-operative idea to the purchase and use of costly farm machinery; to the creation—where neighbors are sufficiently near—of a permanent supply of running water; to the common raising, for shipment by the carload, of a single kind of vegetable, a single breed of cattle or hogs, a single type of horses; to the establishment of social and civic centers at schoolhouses or churches; to the beautifying of country roads with shade-trees and side-lawns; to the establishment of a free government news service, which shall enable the country daily to compete with the city sheet, and thus restore the independence and dignity of journalism; to the lightening of the burdens of the farmer's wife by the establishment of the co-operative laundry. These are but a few of many avenues through which, by co-operation, our people may attain to higher and better living.—C. R. Barns, Extension Division, Minn. College of Agriculture.

How Much Capital Have You?

Many farmers do not realize the extent of their investment; nor that during the past few years land values have been increased by the use of improved machinery and more rigid livestock requirements; that the capital invested in their farms has increased enormously. According to preliminary figures from the last census, the average investment in Minnesota farms, without consideration of seed, cash, and minor items, is \$11,385. A great many of our farms, that are of average size, in the southern part of the state, will show average valuations of \$18,000 to \$25,000. In fact, most farmers have as great an investment in their business as the average country business man has invested in his business. The amount of capital, and the form in which it is invested on the farm, should be carefully considered by the farmer who wishes to make the greatest profit.

Capital may be invested in forms which are relatively unproductive. This is true principally where capital is invested in buildings which are too expensive for the use to which they are put; in stock which is unproductive; or in machinery and equipment which is either used insufficiently or is not properly cared for.

Capital, to be productive, must earn current rates of interest. These rates will average from 5 to 6 per cent in this state. This means that the average farm must not only pay the cost of operations, but in addition pay \$683.10 in interest, before the owner can figure that he has received anything for his own labor or the labor of his family. While a great many farms are not earning interest at this rate for their owners, and paying them wages in addition, it is because of the fact that they are either improperly organized or not well farmed. As the capital invested in the farms increases, methods of farming must be so changed as to give an increased earning power equivalent to the additional capitalization. Most farms in Minnesota could increase their earning power by using additional capital in the purchase of productive live stock. At the present time, the farms show too large a percentage of their capital invested in land, and not enough in stock and equipment for caring for it.—Thomas Cooper, Minn. Agricultural College.

Some Good Yields at Duluth.

The past year has been a trying one for crops; yet notwithstanding unfavorable conditions, some very creditable results have been obtained on the Jean du Luth farm.

This farm consists of several thousand acres, of which some six hundred have been cleared, and is located ten miles north of the City of Duluth. We usually think of Duluth as being in the heart of the mining district of Minnesota; yet when the timber lands are cleared, the soil has proved to be most excellent in texture, full of humus and very productive.

The writer inspected the farm this fall, while some of the crops were being taken off, and was thoroughly pleased with the agricultural prospects. Clover seems to be a sure crop; and I have never seen a heavier crop of potatoes, judging by the thickness on the ground when dug. The MacKinley potato is the variety grown; and the reported yield was 529 bushels to the acre on the best ground, and an average of 350 bushels for the entire ten acres.

The Jean du Luth being a large stock farm, fodder crops are important, and large yields have been obtained; 11 tons to the acre of ensilage, 2½ tons of clover hay, and 1,300 bushels of rutabagas per acre, with carrots in proportion. Farm grains are not far behind in productivity, and 56 bushels per acre of oats is reported, and an average of 36 bushels of rye, with some of the best pieces going 40 bushels to the acre.

The character of the soil is not alone accountable for the excellent showings made, since one of the strong features in the management of this farm is the care and selection of good seed.—Geo. P. Grout.

Incomplete milking not only robs the dairyman of the richest portion of the milk—the "strippings"—but it damages the cow, tending to lessen her daily production and to shorten the period of lactation. It takes a little more time to draw the last pint of milk from the udder; but the time is well-spent in view of the gain both to the cow and to its owner.

One advantage of the co-operative neighborhood cannery is found in the fact that in the former a more complete sterilization of the product is secured through the use of steam super-heated under pressure. Some germs survive the ordinary boiling practiced in home canning, and a higher degree of heat is necessary to destroy them.