Extension Circular 368

April 1941

LIQUID MANURE TANKS

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Federal Cooperative Extension Service
Oregon State College
Corvallis

Cooperative Extension Work in Agriculture and Home Economics
Wm. A. Schoenfeld, Director
Oregon State College and United States Department of Agriculture, Cooperating
Printed and distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914

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Proper handling of barnyard manure is one of the best methods of maintaining fertility on any farm where livestock is a major enterprise. Careful experiments have shown that when fed to livestock 80 percent of the fertilizer value removed from the soil could be returned providing there is no waste. If this 80 percent could be returned to the soil, the natural fertility would last five times as long as where the entire crop is sold from the farm.

On most farms in Oregon the fertility has been depleted to a point where commercial fertilizers of some type are beginning to show profitable increases in yield. This is indicative of the fact that natural fertility has been depleted and that, as time goes on, the use of fertilizers will become of more importance if crop yields are to be maintained. If it is necessary to purchase commercial fertilizers, certainly then any fertilizing material on the farm has a certain definite monetary value.

The value of the fertilizing materials nitrogen, phosphorus, potash, and sulphur contained in manure will have a value of approximately $30 for each cow each year. This value is based on the present market quotations of fertilizing materials containing these elements. Certainly some expense and effort are justified to prevent a waste of any substantial portion of this value.

Wastes of plant food from barnyard manure occur in two different ways. If the manure is subjected to heavy rains, much of the soluble plant food is lost by leaching. If the manure is stored dry so that fermentation or heating is possible, a substantial portion of the nitrogen is lost as a gas ammonia. Haven't you noticed the odor of ammonia around a pile of manure that is heating? Nitrogen has the highest value of the plant foods contained in manure.

Proper storage of manure should prevent both leaching and fermentation losses. The liquid tank method of handling barnyard manure prevents both. Leaching is not possible since the manure is stored in a water-tight tank; fermentation losses cannot take place since any gases that are formed are immediately dissolved in water. This method of handling manure has further advantages in that the labor of handling is greatly reduced, both from the standpoint of removing manure from the barn and from the standpoint of spreading it on the fields. This method has a further distinct advantage in that the manure as spread on the fields is in ideal condition to be of immediate use to the growing crop. On pastures and perennial hay crops it is much more satisfactory than solid manure even when a manure spreader is used.

To handle manure by this method it is first necessary to build a storage tank of ample capacity to store the manure through the months when it is impractical to spread it on the fields. Under western Oregon conditions a storage capacity of 150 cubic feet per cow is a minimum capacity where the cows remain in the barn the major portion of the time during the winter months. Tanks may be built either of wood or concrete. A wooden tank will cost approximately one-third as much as a concrete tank. One can expect a life of 20 years from a well-constructed wooden tank. Detailed plans for the construction of either tank are available for use through the offices of the county agricultural agents.

Careful construction is necessary for a satisfactory concrete tank. Adequate reinforcing steel properly placed must be used. It is usually desirable to secure the services of an experienced concrete construction man when building a concrete tank.

Wooden tanks are easily built. The pit is first excavated to the desired size and depth. The bottom of the excavation should be given a fall of 2 inches to each 40 feet of length toward one end which will be the outlet or the end from which the material will be pumped. Final grading is completed using ½ yard of sand to make an even bearing for the bottom of the tank. The bottom of the tank is made of rough 2 x 12 planks faced on top with 1-inch tongue and groove flooring. The sides are made of 2 x 4's. For the ends 2 x 6's are used near the bottom and 2 x 4's near the top. The sides and ends are built up one complete layer around the tank at a time. The material is laid flat making a 4-inch wall on the sides and a 6-inch wall at the bottom of the ends with a 4-inch wall on top. Strong leak-proof corners can be made by alternating the overlap at the ends. Each layer should be securely nailed to the one below with 16 D galvanized nails. Often one can use No. 2, No. 3, or even cull material for construction; however it is necessary that it be true to size. Rough material is usually not satisfactory.

It is necessary that the tanks be built in a location that will permit the draining of the waters into the tank. In some sections it may be necessary to secure the approval of the dairy inspector as to the exact location of the tank. With some barns it may be necessary to rebuild the gutters so that the drains are in the proper direction to permit the flow of the manure to the tank. Tanks can be located at a considerable distance from the barn providing a pipe line at least 6 inches in diameter is provided to carry the manure from the gutter into the tank. Tanks can easily be covered with tight covers and a small amount of screen will cover any necessary openings. From the standpoint of sanitation, flies, or undesirable odors, the liquid tank is ideal.

When the manure is removed from the barn, it is literally washed down the gutter and into the storage tank. If a large amount of bedding is used, the manure containing the coarse straw is removed separately and placed in a pile. It is desirable that this solid pile be located in such a manner that the leaching will drain into the liquid tank. A considerable amount of straw could be handled satisfactorily through the tank providing it is not over 3 or 4 inches in length. On many farms where bedding is relatively expensive, straw and all are handled through the tank.

In spreading liquid manure on the fields, an inexpensive home-made tank wagon is used. A rectangular wooden tank 2 feet deep, 3 feet wide, and 8 feet long is constructed so as to fit on a low-wheeled wagon. A valve is constructed on the bottom of the rear end of the tank so that it may be opened, closed, or adjusted from the driver's seat. This may be a 3- or 4-inch "molasses valve" or a home-made valve made with a wooden slide over an opening 4 inches square cut in the bottom of the rear end wall of the tank; either may be operated from the driver's seat through rods and levers. This valve permits the liquid to flow from the tank and drop on a round piece of metal shaped from a round-pointed shovel or a piece of sheet metal. The discharge is adjusted so that the liquid is discharged in a fan-shaped, light stream approximately the width of the wagon wheels. The forepart of the tank is blocked up 6 inches to permit draining the entire tank in the field.

If the dairy barn happens to be situated on a hill, it is often possible to drain the storage tank into the tank wagon by gravity. The liquid is led through a 6-inch pipe line, which may be constructed of either clay or concrete sewer tile, to a point where it is possible to permit driving the tank wagon under a discharge pipe, which should be steel or iron pipe on which is fastened a gate valve and a movable elbow to permit discharging the liquid into the tank wagon. With such an arrangement it is possible to do all the work of spreading without getting off the driver's seat.

Many barns are not situated to permit emptying the storage tank by gravity. Under such conditions it is necessary to purchase a pump especially designed to handle this material. Such pumps were developed in Switzerland where this method of handling manure has been in use many years. Pumps made in Switzerland can be purchased, or a copy of this pump is manufactured in this country. Either is very satisfactory. A 2- or 3-horse-power plant is required to operate this pump.

When manure is being spread from the storage tank, it is necessary that it be completely agitated since some of the solid material settles to the bottom and some of it floats on the surface. For tanks with a gravity discharge, it is necessary to use a large, hand-operated, wooden "rake". Stirring two or three times a day should mix the material enough to permit satisfactory spreading. It is also desirable to agitate the material in the tank from time to time during the months it is being stored. Where a pump is used to empty the storage tank, it is possible by using a little extra pipe to use the pump to circulate the material in the tank, giving a very thorough job of agitation.

If the amount of water used in cleaning the barn has been limited, it may be necessary to add more water to the tank before spreading. It is desirable to have the actual manure diluted at least one-half with water. Where the liquid is applied as a top dressing to some crops, further dilution may be desirable.

The construction of equipment for a wooden tank should not cost over $15 per cow. There are instances where the cost has been only a fraction of this amount. The loss in plant food saved should return this value in 1 or 2 years' operation. The saving in labor in handling the manure also means a big saving over handling the manure by ordinary methods.

On many farms in the Willamette Valley where some general farming is done in connection with the dairy enterprise and ample straw is available, it is a good practice to keep the cows in a loafing shed. It is possible to use straw enough to prevent any loss from leaching and the continued drainage of the material prevents any loss from fermentation. Where loafing sheds are used, the liquid tank may be used to store the manure from the milking barn. Here a tank of smaller capacity—75 cubic feet per cow—is adequate.

In some sections users of liquid manure tanks have the impression that it is necessary for the liquid to go through a certain amount of fermentation before it is ready for spreading on the fields. As nearly as can be determined, there is no foundation for this belief. The impression was that the liquid would not be ready to spread until an inflammable gas was given off. The test was to touch a match to the surface of the tank. If a flame spread over the surface, the liquid was ready to spread. It should not be necessary to point out that there is some fire hazard in this test.

There is another impression that does not seem to be founded on fact. This is in regard to the depth of the tank. To permit the proper fermentation the tanks were not to be over 6 feet in depth. As far as storage is concerned, the depth makes little difference and in some localities definite savings may be made by building a tank 7 or 8 feet deep. It should be remembered, however, that it may be necessary to clean out solid matter once in a while, such as gravel or sand that may be washed into the tank from the barns. If the tank is too deep, this cleaning is rather difficult. On some farms, too, deep tanks may present difficult problems of construction because of the high water table in the soil or difficulty in emptying. Usually a depth of 6 feet will prove entirely satisfactory.

Regarding the rate of application, this will vary with the type of crop, as will applications of solid manure. If the liquid has been diluted one-half with water, an application of 20 loads per acre will be the equal of 10 tons of manure. This application is a bit heavy for top dressings on pastures and field crops. Here the application should be reduced to the equivalent of 7 or 8 tons of solid manure per acre. This would mean approximately 16 loads of the liquid per acre. If the tank wagon does not spread this thin, equivalent results can be secured by further dilution with water.

A discussion of the "liquid tank method" of handling manure would not be complete without mentioning how well the liquid and irrigation work together, especially on pastures. Where irrigation water is available, the liquid can be applied at any time during the summer without any harmful effects on the pasture. Novel labor-saving combinations can be worked out with irrigation. Should the storage tank be properly located, the liquid can be drained or pumped from a storage tank into the distribution ditch if the flood system of irrigation is used. The liquid can be applied at the same time that the land is irrigated. With sprinkler systems, the pipe can often be used to distribute the liquid, although application by sprinkling is out of the question. The sprinklers are removed and the liquid is merely "flooded" onto the ground.

On many dairy farms it is desirable to apply phosphate fertilizer to land that is being manured. Where liquid tanks are used the phosphate can be applied at the same time that the manure is applied. As the spreader tank is filled each time, enough phosphate can be added to make up the necessary rate per acre. For example, if you are applying 20 loads per acre and wish to apply 300 pounds of 20 percent superphosphate per acre, 15 pounds of this material should be added to each tank full.