

Problems of Recycling Manure for Feed: Cattle Manure

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It is good to be here and talk with you about our work with feeding cattle. I've enjoyed the comments I've heard so far. It's been very helpful. I have a few slides, they will guide me through the few comments I want to make.

What I really would like to start off with is telling you, if you didn't already know, there is a new day in the livestock feeding business and although a lot of us would like to think of these longhorn cattle and where they reside, and how nice it is to see them, we can't afford this sort of thing anymore. If I had one important thing to leave with you it would be this: we are in this changing time and whether we like it or not, there is some serious concern about how long livestock will be with us in the world. I know it is not your concern and mine because I could certainly give a very strong reason that we're going to have livestock along for you to keep healthy and for me and some others to help feed for a long time to come. We know that, but, unfortunately, so many people do not know that today and if you read the popular press, one thing should concern you. All these people are talking about how we've got to get rid of all the livestock because they are not efficient. It is true now in terms of the way you might mention efficiency of feed conversion or food conversion to animal products. It doesn't look too good on the surface, but certainly you know and I know that you can't take those at face value. You must look toward how this can be done more efficiently. Certainly there are all kinds of ways of improving efficiency of livestock production. Health being one, better nutrition being another vs. many other things, of course. That's what we really want to do. Very seldom do you see those sort of conditions for using feed for animal production used in the most efficient sort of a situation. It is always the average, or less than average situation. You can do a lot to talk about this improved efficiency and it is whenever you improve management, whether it is nutrition or health. Therefore, we are moving away from this, and the thing I would like to leave with you today is just what I will call a new dimension in livestock feeding that improves overall feed efficiency of the cattle.

Animal waste, what is it? I think today we must pretty well accept, based on the data, that it is a resource out of place. It is out of place and many times we don't like to fool with it because it is so out

of place. Manure to improve feed efficiency of cattle. That's why we want to use it in a feeding program and I do consider that that is a new dimension in livestock production. In case you want to know about this, there is a young man in this audience who happened to come up to me out there in the hall and he asked if I knew him. I had to think for a minute but I did. He was one of the outstanding vet students at Auburn a number of years ago and he happened to have worked on this project. He said he was with me in the early days when I was washing manure. This happened to be that earlier work and this young man was separating animal waste into components. Let me say this, there are at least two ways clearly defined this day and time where you could use animal waste as a feed for cattle. One of those important ways would be to separate animal wastes into components and use those components in the feeding program. That happened to be the kind of work we did originally. The shaker screen was that sort of a thing where you washed the animal wastes and pulled out the fiber. We used this fiber in the feeding program. In 1975 we have come along with those two processes (I haven't mentioned the second one) of pulling nutrients from animal wastes, concentrating those into a very valuable animal feed and moving it into commercial channels. That is a valid approach. It is a good approach this day and time. I think the data support that. Most of these are aimed at very large installations and therefore I will not discuss that here. Another approach is a valid one—to pull out protein if you will, and then have a fiber. I don't favor the washing of the manure just to get into a liquid phase, and at a fibrous phase, I think that is a wrong approach. But you can separate animal wastes, pull out the component, make it into a commercial feed and use it effectively and I think we will see much more of that. The other thing that I wish to review with you (it fits more situations certainly) is the blending of manure with other feed ingredients and storing as silage. This appears to be the most feasible means of using manure or at least it fits more operations and that's the point I want to leave with you. I will try to review what is involved with you as you consult with people and work with them where they are planning to do refeeding.

At the end I have some comments that I think will be most important to you. I was asked to do that. But

let me just establish a base if you will for when you do this animal waste recycling that it will improve efficiency. Let me convince you of that first by showing you some data and then we'll move on into a few comments at the end about health aspects of this program.

Well, wastage that we introduced a number of years ago. For us, wastage means only one formula actually. It is animal wastes from the floor of where these cattle are fed and you blend it with hay and store it in a silo and we call that wastage. It comes out with about 60% dry matter and it is a good feeding program to use although we moved away from wastage concept into a high energy diet. This happened to be one of the earlier programs; it's still a good one if you want to store your material this way and feed it out of here as silage along with concentrate.

We tested wastage in a long-time feeding program with breeding ewes and just simply say that it was effective for the health of the animal and for saving feed (he saved about 0.79 kilograms of hay per ewe per day going through breeding, lambing, nursing, rebreeding). It showed that the wastage program was a more effective way to feed these ewes than feeding them hay without blending it with animal wastes. At the end of the trial, ewes fed the wastage were in a better state of health. They were more vigorous than those that were fed just the hay. We did the same sort of work in the early days with cattle. These were bred heifers and they brought normal calves, nursed normally and we showed healthwise it was quite adequate for these animals with no adverse affects on the health of the animal and it was a good feeding program. This was some of the early work to show the health aspects of it and it was a good feeding program. In conclusion, the wastage was proven to be a valuable feeding program for cows and slaughter cattle. We were interested in a higher energy diet that could substitute for the kind of feeding programs we would normally have with feedlot cattle. So we went over to the program which we have here, representative formula with grain about 48%, hay about 12% and the manure 40%. The 40% manure is about all you will use in a program without adversely affecting performance of cattle, so keep that in mind although we use higher levels. In a feeding program you take 40% manure off the floor, blend it with the basal diet that you would normally be feeding and this will give you the same results in improved feed efficiency. That is the overall concept.

The important thing is that the ensiling process is the treatment process. You want it in a silo. You want it to go through an acid fermentation because therein lies the effective treatment processes you are going to give. This is easy to do because the feed ingredients that you are using to blend with this, including the manure, are fermentable and then, given the proper storage, they are going to ferment there readily and acid is going to be produced quickly. In 20 hours you have already the pH lowering about to maximum out.

The main thing is put these ingredients together and store them, so they will ensile and it is pretty easy to do because you are going to be using fermentable products. Let me use these data to kind of wrap it up on the kind of performance you might expect in blending these rations and feeding to feedlot cattle.

I would like to review a piece of research we have just finished. This ration was a typical one, 82% corn and a little bit of forage, which I think we all here today agree we need in our fattening ration. Perhaps you don't use quite that much, but somewhere around that 12% level. It also included a little bit of protein, minerals, vitamins supplement, and calcium salt. This is a basal ration. Then we took the same basal ration and blended it with manure. We had three test groups, one that got 20% animal waste blended with it, one that got 40%, one that got 60% and those were fed to cattle. Of course, the animal waste containing rations were ensiled; the other was a dry ration. What did we get in terms of performance? Looking at the first column, the daily gain. Those animals fed the 20% and 40% actually outgained the control slightly, not significantly, but they had a numerically higher daily gain. Only when we went to 60% waste did we actually lower gain. By going to 20% animal wastes we reduced the basal per unit of gain by essentially 10% and in this test going to 40% we reduced it by 24%. We actually reduced it further by going to 60% but this was at the expense of lowering the daily gain.

What we really had in this ration was only about 7% of the dry matter being manure in the 20%; 16% with 40% and 31% manure if we go to 60%. The amount of lowering the basal was more than about 50% in the actual dry matter replaced. So, if you see 6.8% of animal wastes reduced basal by 9.8%, 16-24, 30-32 if you will. The animal wastes in dry matter actually replaced equal or more than its weight in basal material. That's really the way you evaluate this, if you add manure to replace basal feed, and in this case it was an appreciable replacement. Actually then, any time you can use animal wastes in an effective refeeding program it is worth far more as a feed replacement than it is as an amendment. I would like to get you to believe me on that. It has fertility values, but if you can use it in the feeding program it will have more value for you as a feed than it will as a fertilizer and keep in mind that the ultimate disposal of all organic wastes is to soil. Even though you use it in a refeeding program, sometime down the line it will have the same manural values it had if you had never recycled it.

The value of the wet manure in this trial per ton of wet manure (metric ton) with the 20% was 45 dollars off the floor, it was \$48 with 40% and \$35 with 60% per metric ton. This is a feed replacement value of the wet manure now that has about 22-23% dry matter as you pick it up off the floor. It had these kind of dollar values in 1975.

The metabolism of energy values, simply by replacement, shows you it is as valuable as corn, but

the main thing is the feed replacement value.

What sort of product are we producing? Are we lowering the quality of food? Absolutely not. With many tests along this line and in these cattle too, we did the usual sort of testing and found out by taste panel that there is no difference among these animals whether fed waste or not fed waste but fed the basal feed. The mineral content, also, we have to look at the muscles of these animals, the steaks, if you will, to find out if we changed such things as the mineral element in the tissue. The data showed that we do not change these mineral elements in the tissues of the animals fed the waste. Even though as an example we increased the iron somewhat in the ration, this is not taken up, it does not get deposited in the tissue, so the tissue mineral element content is the same as those fed the basal diet.

We also carry out human feeding studies and we never get anyone to turn us down. We invite people in to have steaks from cattle fed in this way. It is very delectable and we never have a complaint. In performance data, animals can be maintained with the addition of manure up to 40% of the basal diet. What we really say here is, whatever ration that you are using now and satisfied with (satisfied with the productive performance) you can take that same basal diet, blend it with animal wastes from the floor of those cattle, put it in the silo, feed it back to the cattle at a feed savings somewhere around 15%. The performance will not be lowered.

We can say that animal wastes is a new dimension in livestock feeding programs. As you look at the breakdown of efficiency, how cattle get feed and utilize it, we've got to now throw in this other thing of the waste recycling which does improve feed efficiency considerably. For health aspects which you are most interested in perhaps, ensiling is an effective process to keep in mind. Ensiling, as we showed in some of the earlier work, does eliminate the parasitic nematode problem in cattle. You can have infected cattle and carry out the proper kind of blending and ensiling, and it does eliminate the parasitic infection potential for these animals. You don't have to worry about it if you collect it, put it in the silo, and let it go through the ensiling stage.

Salmonella is also effectively eliminated through feeding. We use salmonella as a reference organism. We studied this, we presented this paper at the International Animal Wastes Symposium in April of this year, and we're studying other organisms? But salmonella is a reference organism and it shows that you do get elimination of this type of organism if it happened to be in the chain of events. You eliminate it in this silo and this is the effective treatment process.

What are some of the things that you out in the field perhaps need to think about in this matter of recycling animal wastes. One is your recall you must have fermentable products blended together. This is not great concern, because most products including hay, as an example, is very fermentable and if you

put it together with the right kind of moisture, it is going to ferment. The moisture content in the silo ought to be somewhere between 50% and down as low as about 35%. If you get lower than 35% you're not going to get rapid fermentation. We want to keep it as dry as we can and continue to have fermentation. Fermentable products must be blended with it, but that is no big problem.

Proper storage conditions: an oxygen-controlled structure, top filling, bottom-unloading silo is a very effective one. It actually can become your feed mill. You don't really have to have it, I'm simply saying it makes a nice structure to use in this sort of a feeding program. What is the minimum time in this silo? It needs to stay in the silo a given period of time. We recommend 10 days. It is not absolute for 10 days but certainly this is a good reference point. A few days short of that would be all right. Longer makes no difference, but the main thing is is to try to get 10 days. Then you are protected. Minimum moisture of 35%.

Now we do a problem. We have no problem from about Kentucky south. Any time of the year it's going to be all right, but if you go into the upper Midwest you have to be concerned with low temperatures because with low temperatures you are not going to have rapid fermentation. We can work around this, but keep this in mind and be concerned about this somewhat.

Well, you are producing good cattle. We've had people from many places in the world and all over the United States, tell us they are interested in animal waste recycling because they seem to know it is a way to improve feed efficiency. We've had tour groups from other countries come to the Auburn setup. We don't have much to show them. We simply talk about the work, and try to send them some other place. But nevertheless they come here. The important thing is the health aspect. It is okay if you do it properly and you are out in the field and you know how to do it. It is important in this program of using animal wastes as feed.

Animal wastes is a resource out of place. It is wet out here somewhere where you have to pick it up. Many times it is better to go and get a new bag of feed than to get this one off the floor. So, the main thing that needs to be seriously considered in going into the animal waste recycling is to have all the things set together. Think it out clearly so that the operation from the time of harvest, into the silo and out, is simplified as much as possible, so you do not have time involved in these various steps of harvesting, blending, and storing. If you don't think that out you'll have too much time involved, and it is not efficient anymore. The industry has this equipment available that you can orient it though, you can make it an efficient harvesting, blending, and storing and in that way you can pick up this 15% improvement of feed efficiency. The health aspect is quite good.

These are some things I have tried to point out to you that you need to be concerned about.