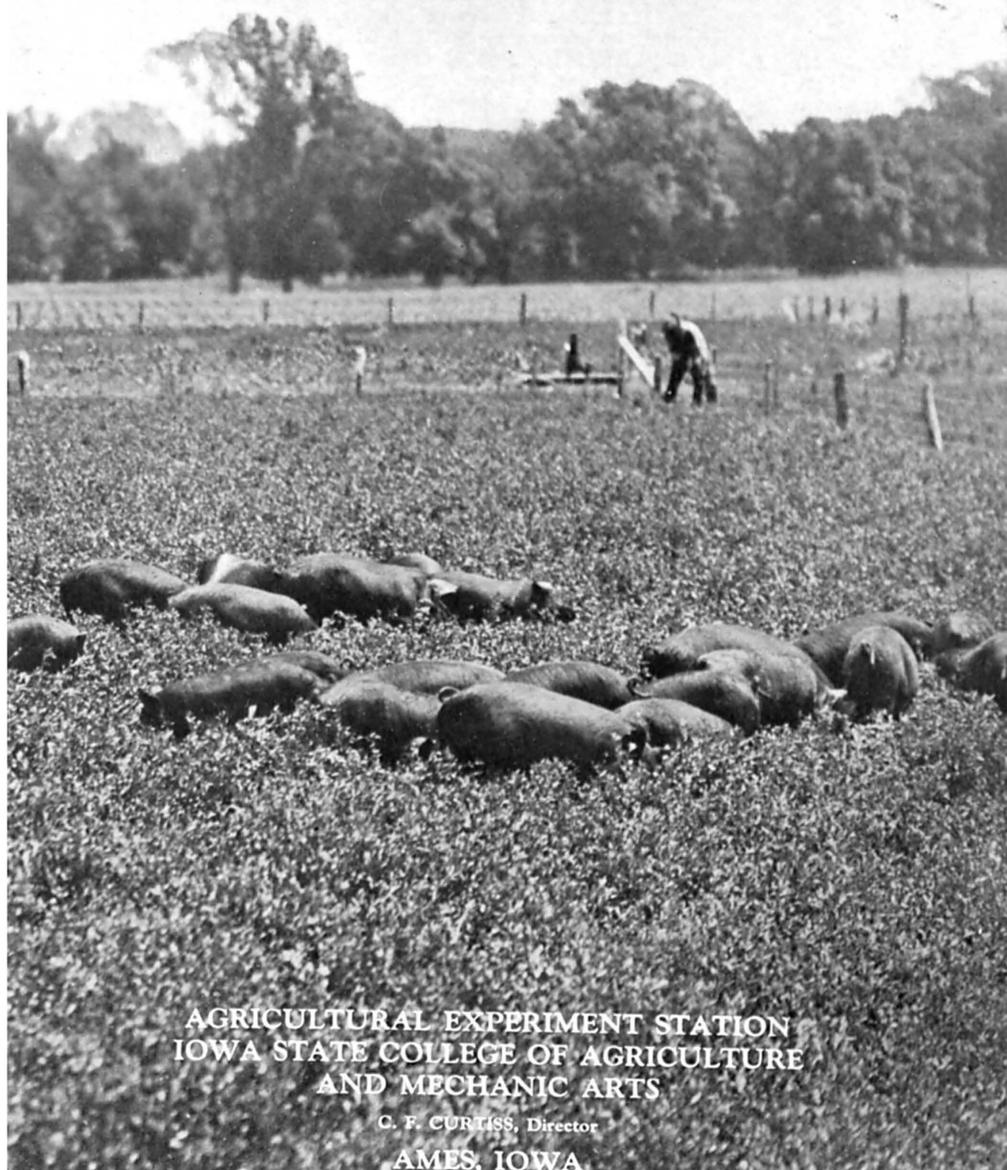


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FORAGE CROPS SAVE PROTEIN SUPPLEMENTS



AGRICULTURAL EXPERIMENT STATION
IOWA STATE COLLEGE OF AGRICULTURE
AND MECHANIC ARTS

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Forage Crops Save Protein Supplements

By John M. Eppard

Forage crops are essential in good and economical summer rations for growing and fattening swine. They provide a way to cut down the cost of gains, inasmuch as they cut down on the requirement of meat meal tankage and other desirable protein supplements which are usually high in price. At the same time they enlarge opportunities for the quicker, more profitable raising of better and healthier pigs.

It is good practice, however, even when pigs are on a satisfactory pasture, to feed a protein supplement. This is especially true when the pigs are being pushed for an early market. One of the good protein supplements is meat meal tankage, which carries, in the high-grade, approximately 60 percent of efficient balancing protein, 10 percent of animal fat, about 4 percent of energy carrying carbohydrates or its equivalent, 15 percent of bone forming and stimulating mineral matter, 3 to 4 percent only of "slowing" rough fiber, and but 7 to 8 percent of ordinary water. Particularly, it is a most efficient supplement to the average corn and small grain basal ration, one tried and proven in the relentless practical mill of feed lot experience. Tankage, because of its goodness as a supplementary feed to corn, barley and similar "backbone" feeds, naturally sells for rather a high price per ton, this because the buyers have long since appreciated its worth. As the appreciation of tankage as a hog and poultry feed has increased, the price has stayed up well, and as a result, the possibility of saving or replacing tankage with forage crops becomes a most practical consideration.

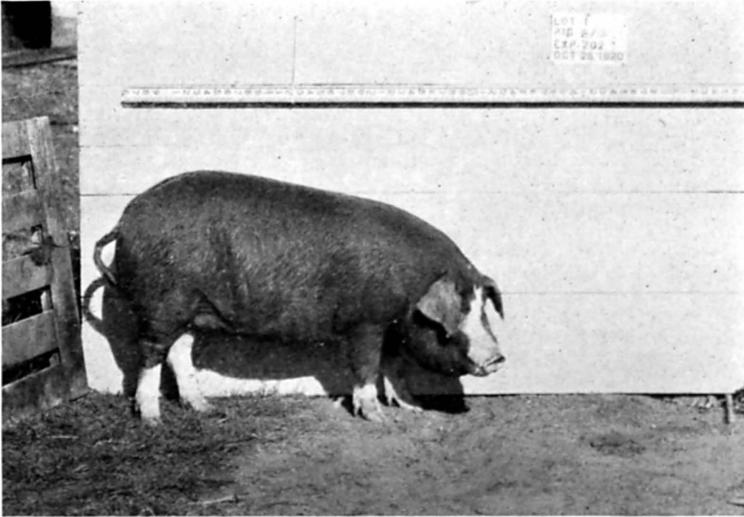
TANKAGE, THO HIGH-PRICED, IS ECONOMICAL.

It is well, however, to emphasize that even tho a meat meal tankage of the 60 percent protein grade is higher priced, it is one of our most concentrated protein-mineral-vitamin supplements, and consequently is often the most economical to use as a single balancer for our basal Iowa feeds, namely corn, barley, wheat, rye, oats and others, but more especially corn grain.

The main reason why 60 percent protein tankage commands a relatively higher price per hundred pounds than other lower protein supplements, such for instance as 34 percent protein linseed oilmeal, or 25 percent protein corn gluten feed, is that a hundred pounds of tankage will balance more pounds of corn and balance it better. Tankage, fishmeal and milk products, such as skimmilk, buttermilk, condensed buttermilk, buttermilk powder, and others, are preeminently the most efficient concentrates used as single supplements to corn grain. Each carries practically all of the needed balancing materials to cover the chief deficiencies of the corn grain. However, in general profitable practice it is not found advisable to confine the entire swine herd, all classes, to just two feeds, because greater returns and more satisfactory results, both physiological and economic, are normally secured by adding other feeds, such as a well-compounded mineral mixture, good pastures and suitable concentrates at times.

If white corn is used with tankage or with skimmilk in dry lot, there is often a deficiency of the fat-soluble vitamin A which must be remedied. Green pastures, the legumes particularly, supply this vitamin. Unfortunately, both tankage and skimmilk in many instances do not carry enough of this vitamin. Apparently, the vitamin A content of tankage depends much on the amount of glandular organs, such as liver, kidneys and others, used in making the meat meal tankage, and in the case of skimmilk, upon the character of the feed given to the cows producing the milk.

At the Iowa station rickets has been produced in young growing pigs by feeding them only white corn and tankage or white corn and skim-



Good forage reduced this pig's supplemental feed bill.

milk, or white corn and buttermilk. The substitution of mixed corn for the white was helpful, while the use of yellow instead of white or mixed corn was attended with much better results. However, the use of alfalfa or other tender, low-fibered, green, leafy pastures in addition to these mentioned rations, even tho white corn is used, apparently completely eliminates the cause of this nutritional deficiency disease.

FORAGES LESSEN TANKAGE REQUIREMENTS.

Meanwhile, the forages fed lessen very materially the tankage and skim milk requirements of the pigs on corn. In the winter time either alfalfa or clover hay for the swine herd, especially the brood sows, provide excellent protective feed. A small amount of alfalfa hay for the fall pigs on a good ration, such as corn and tankage or corn and skim milk, is good.

The relative cost of a feed and the returns a given feed will yield are two important considerations that deserve special emphasis and attention. While tankage feeding is strongly advocated, yet sometimes the price of tankage may be out of price line with efficient substitute feeds. Hence it is well to find ways of supplying relatively cheap, efficient supplementary feeds which will permit an economic reduction in the amount of tankage used.

LINSEED OILMEAL WITH TANKAGE AND PASTURE.

Linseed oil meal, which is widely used as a corn supplement, carries a little over half as much protein as tankage, or approximately 33 as compared with 60 percent. As a lone supplement it is not complete nor adequate. The mixture of linseed meal with tankage apparently enhances the value of both, this being especially noticeable on pasture.

A mixture of tankage and linseed meal equal parts, or one of the former to two of the latter for supplemental feeding on good pastures, is good practice. A good mineral mixture should likewise be supplied free-choice style, and a simple one may be compounded as follows: 20 parts of common salt; 40 parts of bone meal, or bone ash, or bone flour,

or rock phosphate, or acid phosphate, or bone black, or spent bone black; 40 parts finely ground high calcium limestone, or air-slaked lime or wood ashes; total 100 pounds. To this add from one-half to an ounce of potassium iodide, mixing it in thoroly. Recent investigations indicate to some extent that the salt may be decreased even below the 20 percent given, say to 15 percent. This mineral mixture may be allowed in a weatherproof self-feeder or in an open-slatted box kept under cover. It may be fed to pigs in dry lot as well as to those on pasture. Keep it wherever the hogs are fed.

To make up a feed mixture with corn and tankage or corn and linseed meal that will run 15 percent protein, less of tankage than of linseed oilmeal will be required in proportion to the corn. It takes one-ninth as much tankage as corn, whereas it takes one-fourth as much linseed oilmeal as corn. To make up 100 pounds of a 15 percent protein mixture it takes 90 pounds of corn grain plus 10 pounds of tankage, or 80 pounds of corn grain plus 20 pounds of linseed meal.

The corn-tankage mixture runs a little higher in protein than the corn-linseed meal one, or 15 pounds contrasted with 14.8 pounds to the hundred. The corn-tankage mixture is likewise a little richer, having a narrower ratio, which means more pounds of protein to the starch plus starch equivalent present in the feed. The corn 90-tankage 10 mixture runs 1 pound of protein to 5 pounds of the starch or equivalent, whereas the corn 80-linseed 20 combination runs 1 to 5.1, which is a little less rich in protein as compared to the starch equivalent.

A hundred pounds of the corn 90-tankage 10 combination is more valuable than 100 pounds of the corn 80-linseed 20 mixture. With corn at 56 cents the bushel and tankage at \$60.00 the ton, the former costs 90 cents plus 30 cents, or \$1.20. The linseed oilmeal will have to be bought for \$40.00 a ton to give the 15 percent protein mixture the same cost per hundred pounds. This figures 80 pounds corn at 80 cents plus 20 pounds of linseed meal at 40 cents, total \$1.20. On this basis of linseed meal at \$40.00 and tankage at \$60.00, the former to be worth two-thirds as much as the latter, but in dry lot feeding practice, young pigs being used, the oilmeal mixture does not show up as well as the tankage mixture, 100 pounds of the corn and tankage going much farther, or practically as far as 120 pounds of the corn and linseed meal. In the fattening of very well grown shotes in dry lot, the margin is still in favor of the corn and tankage mixture, pound for pound.

PASTURES INCREASE EFFICIENCY OF LINSEED MEAL.

To make the linseed meal worth the most money, good, green pastures, especially of legumes and rape, are essential. On pasture linseed meal does excellently as a corn balancer because the pastures supply in large part the missing minerals, the vitamins, and also improve on the protein quality. Whereas in dry lot feeding, oilmeal is only two-thirds as valuable per ton as tankage, yet on pasture the oilmeal may run up to seven-tenths the value of tankage.

But there is still a better way, both in dry lot and on pasture and the latter particularly, and that is to mix the two supplements together. For instance, a 100 pound combination of 85 pounds of corn, 10 pounds of linseed meal, and 5 pounds of tankage, costing \$1.20 and carrying practically 15 percent of protein may be counted on to give better all-round results, better gains on less feed and better health than where just one of the supplements is added. On good pasture the addition of oilmeal to a corn-tankage ration has been attended with especially good results, the oilmeal in some instances returning a value equivalent to as much as three-fourths and more of the tankage, ton for ton. But the use of good pasture made it possible for the linseed meal to make such a good showing. Hence, the saving from the use of good pastures is all the more emphasized.

CORN OIL CAKE MEAL WITH GOOD PASTURES.

Corn oil cake meal, made from the germs of corn, the corn oil being pressed therefrom, is another high class supplemental feed that works well when fed with tankage in dry lot or pasture. This Iowa product (now manufactured both at Clinton and Cedar Rapids) when mixed with tankage and self-fed in one feeder, shelled corn in another self-feeder, on pasture, added to the benefits of the straight self-fed ration of shelled corn and tankage. The gains were increased, the difference being small on rape, but larger on timothy bluegrass pasture. On rape, 100 pounds of the corn germ oilmeal saved 72 pounds of corn plus 31 pounds of tankage; on the timothy-bluegrass the saving was 83 pounds of corn plus 40 pounds of tankage. With corn at 56 cents the bushel, and tankage at \$60.00 the ton, the addition of a ton of the corn oil cake meal to the tankage self-feeder, both feeds being mixed and fed thus, was instrumental in saving from \$33.00 to \$41.00 worth of feed.

On this given basis of figuring, a ton of corn oil cake meal was worth from a little over one-half to about two-thirds as much as a ton of tankage. On average pastures a rough estimate would give the 100 pound sack of corn germ oilmeal a saving or replacement value equivalent to 75 pounds of corn plus 35 pounds of tankage when it is mixed with the tankage and fed with a good basal feed such as corn.

Tankage (fishmeal is equally as good, pound for pound) is a supplement that the hog feeder can hardly afford to be without when it is at all reasonable in price. In making up an efficient concentrated supplemental mixture for feeding with corn, barley, or other basal grains, it is good management to figure on using tankage or milk as the chief fundamental, protective feed. Of course, if one has a superabundance of cheap skim milk or buttermilk, then the need for tank-



Rape furnishes an abundance of choice nutritious leaves that swine relish.

age, or other high protein supplements, is very, very much reduced. In truth, under such circumstances, one can get along very well without any tankage. On the average farm, however, tankage should, under present conditions, be one of the feeds that are depended upon as corn and small grain balancers.

TENDER PASTURE CROPS HIGH IN PROTEIN VALUE.

One of the best ways to reduce the amount of high-priced tankage is to use good green pastures, especially legume pastures such as alfalfa and the clovers, particularly the red and alsike. Other green pastures, as bluegrass when in the tender stages, Dwarf Essex rape, young and tender, growing timothy, and other young stuff like wheat, rye, barley, and oats, when properly grown and fed, also save a great deal of high protein and high mineral supplement. The green, thin leaves of young, tender forage plants run very high in protein on the dry matter basis, and this protein is of pretty good balancing quality, this being demonstrated in general farm practice as well as in carefully controlled animal husbandry experiments. These green leaves also carry efficient minerals and life-saving vitamins, with little coarse fiber to bother and hold up the nutritional procession.

Some of the chemical tests at the Iowa station have shown that young, tender bluegrass will run as high as 40 percent protein in the dry matter, whereas bluegrass taken from the field, after it becomes hard and dry, carries only about 10 percent, or maybe less, of this important muscle and bone building material. As the protein decreases in the drying process, so does the hard, coarse, undigestible fiber increase, and hence the reason why bluegrass in July and August, during the so-named hard, brown "mat" stage, makes, as some one has put it, "a better gymnasium than a pasture", which means at that period it is a better bed than a feed.

But when the fall rains come and green up the bluegrass pasture, pigs again find good food in the green luscious shoots which push thru the moist soil. And it is marvelous to note how well the pigs do at that time, especially if they have been getting corn on bluegrass up to the time the green, tender grass appears. The reasons are obvious because of what has been said. Nevertheless, it is well to emphasize that the young, green, tender, new growth of bluegrass is especially efficient, not only because it has an abundance of efficient, balancing protein in its dry matter, but also because it has considerable calcium, the stuff that makes some 40 percent of the dry matter of bone, and because it also runs high in phosphorus. It is likewise low in its fiber percentage, which helps to increase its palatability, and it also contains vitamins which help considerably to balance up the ration. Altogether this green and tender bluegrass is the kind of balancing feed, which along with other pastures mentioned and emphasized, saves tankage.

HOW MUCH WILL TANKAGE SAVE?

To give an idea as to how much tankage pasture may save, it is well to quote a few figures. For instance, in one of our experiments we fed one group in a dry lot and one group on a good pasture. The basal ration was the same for all the pigs, or shelled corn self-fed plus 60 percent protein meat meal tankage self-fed plus block salt self-fed. The pigs used were young, growing, weanling pigs, weighing about 40 pounds at the beginning of the test. This practical trial was not concluded until all the groups had reached the weight of 225 pounds.

Naturally, if the pasture furnished feed nutritionally the same as the tankage, then as they progressed, they would eat more of the pasture and less of the tankage, which was the case. Common observation and the scales have emphasized the point time and time again of

a decreased tankage consumption and an increased gain when good pastures were made available.

RECORD OF THE DRY LOT FIGS.

One typical group in dry lot made an average daily gain of 1.06 pounds per pig. They consumed daily 4.2 pounds shelled corn and .48 pound tankage, a total of 4.68 pounds. The feeds required for 100 pounds gain were 396.33 pounds shelled corn plus 45.51 pounds meat meal tankage plus .27 pounds of salt, a total of 442.11 pounds feed. Now bear in mind that these porkers had no pasture whatever, but simply were fed the above concentrated feeds in a spacious dry lot. It took these pigs 174 days to reach the required weight of 225 pounds.

THE ALFALFA PIGS GAIN MORE RAPIDLY.

Now what happened to their litter mates on good alfalfa pasture? No tankage was fed on the alfalfa from June 18, when the experiment started, until September 16, after which the tankage was self-fed, because the pasture began to get a little short at that time. These pigs took 146 instead of 174 days to get to the desired 225 pounds in weight, showing a saving, as compared to dry lot feeding, of 28 days, practically a month. The alfalfa pigs went to market on November 11 when the market was good, while the "dry-lotters" were not ready until the declining market month of December. Speed is an important factor, and here the alfalfa, even tho no tankage was fed during most of the growing season, had an advantage over the dry lot feeding. The pigs did better. A better ration was the reason and hence they "got there" quicker.

These pigs on alfalfa, ten of them, made an average daily gain of 1.26 pounds, which excels the dry lot figures of 1.06 pounds by a difference of .2 of a pound. This means that one pig in five days would gain one pound more on pasture than in the dry lot. This was the case even tho the pigs got no tankage most of the time on good pasture, whereas they did get tankage all of the time in dry lot.

Now the average daily feed per pig on alfalfa was 4.80 pounds shelled corn and .16 pound tankage (this is the figure on the tankage for the whole period, altho really it was only fed for a short time, but was eaten sufficiently to make that average for 146 days). This makes a total of 4.96 pounds fed daily per pig as compared to a lesser consumption in dry lot of 4.68 pounds, thus showing that the pigs on alfalfa had a better appetite. They had a better chance to grow.

The feed required for 100 pounds gain on alfalfa was 381.28 of corn, 12.76 tankage, and .21 pounds salt, a total of 394.25 pounds of feed. The pasture requirement per 100 pounds gain was .0093 acre, which means that an acre of such pasture, along with the feed given for 100 pounds gain, was sufficient to take care of just the pasture requirement only in the making of 10,575 pounds, practically 11,000 pounds, of hog gains.

If the pig on this acre would gain 200 pounds during the season, this would mean a carrying capacity of about 55 pigs to the acre. It is understood, however, that this would be likely to kill out the alfalfa, pasturing it so heavily. Therefore, we did not pasture it as closely, but only enough to permit a regular hay cutting to be taken from it. In charges against the pigs, the hay cutting proposition is carried on the books as hay making, and the grazing charges as pork making, keeping the two operations, pork and hay making, distinct in the charges.

Alfalfa is one of the heaviest forage yielders, producing the most digestible pasture of any of the good pasture crops. It is wonderful how much good, effective dry matter succulent alfalfa yields, this being true even tho it doesn't give one the impression that it is such a good yielder in comparison to sudan grass or sweet clover, the latter

two of which make a splendid showing to the eye, but not to the scales. The pig always shows a decided preference for alfalfa, when given a choice, (altho he does seemingly enjoy the sudan grass in its very early tender stages of growth).

It can readily be figured that for every 100 pounds of gain made on alfalfa pasture, there was a marked saving as compared to dry lot. The saving in corn, for every 100 pounds gain is 15 pounds plus the more important saving of tankage, which amounted to 32.75 pounds. A saving of about 33 pounds tankage and 15 pounds corn for 100 pounds of gain is to be looked upon as a real saving, emphasizing the marked influence of alfalfa in reducing tankage consumption, as well as decreasing the tankage required per 100 pounds of gain.

GAINS MADE BY PIGS ON RAPE.

On rape pasture there is also a marked saving in time and in feed, as compared to the "no pasture pigs". In fact, the rape pastured pigs required only 145 days to get to the required weight of 225 pounds in this particular case one day less than those on alfalfa. However, on rape pasture, we began feeding tankage a little earlier because rape got a little short around October 27. The average daily gain was 1.28 pounds. The feed consumption was 4.48 pounds shelled corn, .29 pounds tankage, a total of 4.77 pounds of feed per pig daily. The feed required for 100 pounds gain shows up well, the pigs consuming 348.82 pounds of corn, which is much better in this particular instance than on alfalfa. The pigs, however, ate more tankage to 100 pounds gain, or 22.24 pounds. The salt consumption was .20 pound, this making in all 371.26 pounds of feed for 100 pounds of gain.

It took more acreage of pasture on rape than on alfalfa for each 100 pounds gain, or .0258 rape acre as contrasted with .0093 alfalfa acre, or between two and three times as much. The reason for this is that if the rape will not yield as many pounds of dry matter to the acre as the alfalfa, yet nevertheless the dry matter, the nutritional stuff that counts in the pig's life, which it does yield, practically all being in luscious leaves, is a high quality edible and highly digestible dry matter; of this it will yield as well or better than red clover. The pigs on rape naturally required a little more feed than those on alfalfa, but much less than the ones in dry lot.

It is important to bear in mind that alfalfa, of all of our forages, is a super-yielder of high-class balancing nutritional ingredients.

As compared to dry lot feeding in this particular test, the pigs on rape, for each 100 pounds of gain, required less corn by 47.51 pounds, and less tankage by 23.27 pounds.

If one pastures 22 pigs to the acre on rape, which is not at all unusual, and they each gain 200 pounds, this will make a total gain of 4,400 pounds. On this basis, counting a saving as on dry lot above mentioned, an acre of rape would be equivalent in feeding value to approximately 1,900 pounds of corn grain plus 531 pounds tankage. At ordinary prices, this would mean about \$19.00 worth of corn and about \$16.00 worth of tankage, a total of \$35.00 worth of feed.

A good many other figures of this sort given could be added here from the Iowa station experiments, but these are sufficient to show that good, green, luscious high protein, high mineral, high vitamin and low fiber pastures are an outstanding asset in swine growing. They are an exceptional asset, not only in that they save tankage and other purchased or home-grown supplements, but an asset in that they promote porcine health.