TECHNICAL NOTES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

ROOM 101, 1405 SOUTH HARRISON ROAD
EAST LANSING, MICHIGAN 48823

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Agronomy #5
SUBJECT: Get Top Protein Production in Alfalfa
DATE: November 6, 1973

TO: All Area and Field Offices

FROM: Palmer G. Skalland, State Resource Conservationist

"Grow your own protein" may become more important to Michigan livestock and dairy farmers as protein feed prices climb. That focuses attention squarely on alfalfa.

There is no other crop that can produce more pounds of useable protein per acre. Alfalfa, well managed, can yield 5 - 7 tons of high-quality feed per acre, running 16 to 22 percent protein - from 1800 to 3000 pounds of protein per acre. Figure that at the present cost of protein in soybean oil meal and it will show the value of alfalfa as a protein producer.

To get that 5-7 ton yield on intensively utilized land in southern and central Michigan, follow the 3 KEYS suggested by Dr. Milo B. Tesar, Forage Researcher at Michigan State University.

KEY 1. THREE CUTTINGS INSTEAD OF TWO
KEY 2. TOPDRESSING ESPECIALLY WITH K > INSEPARABLE

a. 21% yield increase - an extra ton - from 4.1 to 5.0 tons

Earlier cutting of the first cutting permits 3 harvests instead of 2 in southern Michigan and 2 instead of 1 in northern Michigan. With no topdressing, yield increases in 3 experiments showed an increase of only 0.3 tons when 3 cuttings (June 1, July 15, Sept. 1) were taken instead of 2 (June 22, Sept. 1). When topdressed with 0+50+150 annually, the average yield for the three 4-year experiments increased from 4.1 to 5.0 tons, a 0.9 ton or 21% increase.

Taking 3 cuttings instead of 2, then, is not recommended unless the alfalfa is well fertilized. On most alfalfa soils testing low to medium in potassium, 150 pounds K_2O annually is necessary to 5-ton or greater yields. Phosphorus has not been helpful in these tests but where soils tests indicate its need, 25-50 lbs. P_2O_5 annually is suggested (see fertilizer bulletin E-550).

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Taking 3 cuttings pays off also since the first cutting doesn't lodge by late May or early June. Field losses are reduced and haying is not as difficult.

Four cuttings (May 21, June 18, Aug. 1, Sept. 1) by early September are too many, however. Yields were 1.6 tons less than when cut three times (5.0 vs. 3.4).

b. 48-92% increase in feeding value per acre.

More frequent cutting gives finer, leafier, more digestible hay of greater animal intake, especially in the first cutting. Based on in vitro tests (6-hour fermentations in test tubes) which simulate the combination of animal intake and digestibility, feeding value of fertilized DuPuits alfalfa cut 3 times was 48% greater than when unfertilized and cut twice. Compared to non-fertilized Vernal cut twice the increase in feeding value was 92% per acre.

KEY 3. USE EARLY-MATURING, RAPID-RECOVERING VARIETIES (FLEMISH OR FLAMMANDE)

SHORT-TERM STANDS (1-2 years) - Flemish types preferred
- Moderately winterhardy
- Preferably wilt resistant

First Choice - Saranac
Second Choice - Apex, A-24, DuPuits, FD-100, Flandria, Glacier, PAT 30, Promor, Rancher, Thor, and Warrior

MEDIUM-TERM STANDS (3-5 years) - Wilt resistant Flemish types preferred
- Moderately winterhardy

First Choice - Saranac
Second Choice - Warrior
Third Choice - North American types Iroquois, 522, 525, Progress WL 210, WL 215, and Vernal

LONG-TERM STANDS (5 years or more) OR PASTURE - North American types
- Winterhardy
- Highly wilt resistant

Recommended - 525, WL 202, Progress, and Vernal

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Weevil Control Necessary

Control alfalfa weevil (and other harmful insects) according to recommendations. It is possible that if the first cutting is made in late May, spraying of the first cutting may not be necessary. It is likely that most farmers in southern Michigan will need to spray immediately after the first cutting is removed, however, to prevent serious damage to the second cutting.

Proper Harvesting and Storage

Minimize field losses by using a hay crusher in combination with modern haying or ensiling machinery.

Provide good storage to reduce losses. Consider maximum use of haylage for (1) lowest total loss of feeding value from field to feeding and (2) reduced feeding costs because of mechanization of feeding.

High-protein management means early cutting. You've heard lots about the value of early-cut forage. Usually folks talk about early flower, or one-tenth bloom, as the time to cut. But by this stage, we've already lost in percent protein.

Alfalfa in mid-bud-stage will run 20-23 percent crude protein (in its dry matter). By one-tenth bloom this may have dropped to 18 percent, and by full bloom it's down to 16 percent or below.

Biggest factor in this slide is the changing makeup of the alfalfa plant, as it gains in stem weight, and begins to lose lower leaves.

And make no mistake, it's leaves that carry the high protein content, as well as much of the phosphorus, calcium and other essential elements required by cattle. Stems rank low in these categories, and as they develop they pull down the average content of the whole plant.

So high protein means an early first cut, preferably in bud stage, but certainly by early flower. And since you can't cut all your hay in a day, you should probably start with the first buds, rather than the first flowers. Start in better drained fields, where growth starts earlier, preferably fields you did not cut late last fall. Start early, and you'll have a chance of finishing before alfalfa is fully flowered. Cool, cloudy weather some years can hold off flowering for several weeks.

Top protein production calls for more than just being quick on the draw with the harvester. It may mean additional investment in storage facilities and harvest equipment.

Using buds and flowers as indicators is easy to describe, but can be harder to work out. Drying hay in late May or early June is usually a poor gamble.

Most men who harvest this early plan to wilt, chop and put their forage up as silage or haylage. Here they gain two ways, by reducing the risk of weather damage, and holding on to high protein leaves.

At the same time, they mechanize one of the hardest jobs on the farm. But they also run up their investment in storage structures. But the added protein may be worth it!

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Attachment #1
Agronomy Technical Note #5

FORAGE PROTEIN Can Save Feed Costs

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PROTEIN IS one of the more expensive nutrients in rations formulated for dairy cattle. Depending on the relative cost of protein from various sources, high protein forages can replace all or part of the protein from sources such as soybean meal. Let's look at some experiments that substituted forage protein for oilmeal protein in the rations of lactating dairy cows.

IN ONE STUDY with lactating Guernsey cows, a corn-soybean silage containing 38 percent soybean forage (10.6% crude protein, dry basis) was compared with corn silage (8.0% crude protein, dry basis). The crude protein in the grain ration was reduced from 20% to 16% when the corn-soybean silage was substituted for corn silage. Feed intake and milk production were not affected by replacing protein in grain with protein from soybean forage.

IN A SECOND STUDY with lactating Holstein cows, we replaced **oilmeal protein** with **alfalfa protein.** Three forage treatments were used: **(1) corn silage, (2) equal parts corn silage and alfalfa silage, (3) alfalfa silage.** To balance each of the forage rations, we used the grain mixtures shown in **TABLE 1.** The grain was mixed 50:50 with forage on a dry basis and fed free choice.

TABLE 1. COMPOSITION OF GRAIN MIXTURES

INGREDIENTS	GRAIN RATION FED WITH		
	1	2	3
	Corn Silage	Corn and Alfalfa Silage 50:50	Alfalfa Silage
Corn grain, %	64.50	81.42	98.36
Soybean meal, %	30.00	15.00	—
Dyna Phos[1], %	1.00	.72	.44
Limestone, %	3.00	1.50	—
Trace Mineralized Salt, %	1.00	1.00	1.00
Sulfur, %	.14	.08	—
Magnesium Oxide, %	.16	.08	—
Vitamin A & D Supplement[2], %	.20	.20	.20
Total	100.00	100.00	100.00
Percent Crude Protein	21.2	15.4	8.9

[1]24% Ca and 18.5% P
[2]2,250 I.U. Vitamin A/gm and 400 I.U. Vitamin D/gm

The grain mixtures contained 21.2, 15.4 and 8.9 percent crude protein. Note that a much more complex grain mixture was needed to balance the corn silage ration. Except for energy, corn silage is much more deficient in nutrients for milk production than alfalfa is. The forage-grain mixtures fed to the cows were similar in chemical composition.

In this study, alfalfa protein supplied 72 percent of the total ration protein compared to 54 percent from soybean meal when corn silage was the sole forage. The cows produced 49.8 lbs milk daily with 3.10 fat test on corn silage, 49.2 lbs with 3.30 fat test on corn-alfalfa silage mixture, and 48.8 lbs with 3.35 fat test on alfalfa silage. Although cows on corn silage averaged 1.0 lb more milk daily, fat tests were 0.25 percentage units higher with alfalfa.

Replacing alfalfa protein (Ration 3) with soybean meal protein (Ration 1) saved about 5.7 lb soybean meal daily per cow. Depending on relative feed costs, forage protein used in a balanced ration can save much in feed cost.

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