ALFALFA HARVEST MANAGEMENT
DISCUSSIONS WITH COST- BENEFIT ANALYSIS

Circular E-943

PREPARED FOR 1995 REGIONAL ALFALFA CONFERENCES

BY A PANEL OF
ALFALFA PRODUCERS AND EXTENSION PERSONNEL

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INTRODUCTION

Alfalfa growers were asked by the Alfalfa Integrated Management (AIM) group from Oklahoma State University in February 1994 for their input into future extension and research programs in alfalfa. One of their top priorities was to address costs and benefits of various alternative management decisions.

We, the AIM group, took growers' input seriously and began a process to select a focus area for 1995, Alfalfa Harvest Management. Next, we identified frequently asked questions regarding alfalfa harvest management. For each of the questions identified, a person from the AIM group drafted a response. These responses were then reviewed by each member of the AIM group. In some cases, responses were revised and reviewed several times.

The result is a set of responses that integrates academic disciplines (agronomy, entomology, engineering, and economics) and provides you with the best information we have.

We assume readers have some familiarity with alfalfa production. The written format consists of a short answer to each question followed by a discussion of additional information and alternatives. In many cases, we took a partial budgeting approach; that is, if I change this, then what are the costs and benefits? Our responses are not recipes or prescriptions, but guides meant to assist growers in making informed decisions. We provide input for decision-making, but each production situation is unique and fits into an overall farming enterprise.

Questions were organized in chronological order, beginning with two cross-cutting questions on harvesting costs and grazing, then beginning in the fall and continuing through the production year.

We made some baseline assumptions. Alfalfa producers may want to adjust our responses when our assumptions do not match specific conditions. Following is a discussion of the assumptions:

- We assume that most commercial alfalfa growers market to dairy producers. You may, however, use alfalfa in your own operation or target other markets such as, horse, beef cattle, sheep, etc.

- For equipment depreciations, we assume an average of 400 tons of alfalfa handled annually. That might be 5 ton/A/year from 80 acres or 4 ton/A/year from 100 acres.

- We assume an average market price for good quality, weed-free alfalfa is $80/ton.

- The grazing value of alfalfa is assumed to be $60/ton. Feed value was estimated as follows: $.30/lb of gain for stockers, 15 lb of forage consumption per 500-lb. stocker, 2 lb/day gain, forage conversion ratio of 10:1; thus, 1 ton of alfalfa = 133 stocker days, 200 lb gain or $60 value.

- Trade names of insecticides and herbicides are used. Costs of material and application are assumed to be $12/A for insecticide and $18/A for herbicide.

- Harvesting costs are as follows: cutting and swathing, $8/A; raking, $4/A; baling (small square bales), $9/A; and hauling from the field, $10/ton.

Next year, we plan to focus on another aspect of alfalfa management, for example stand establishment, fertility, weed control, insect control, or another area.

Feedback is requested. As you read the questions and responses, if you have comments, suggestions, or other questions, contact any of the authors, reviewers, or your county extension office.

-- The AIM Committee
Spring 1995

QUESTION #1
What is the best size bale for my alfalfa hay?

SHORT ANSWER: The following items should be considered when making the bale size decision.

- Existing hay equipment
- Tons produced each year
- Hay fed on-farm vs. hauled long distances
- Available labor
- Availability of custom haying

EXPLANATION: Seldom would it be economically feasible for a producer to switch types of hay equipment all atone time. The appropriate time to consider making changes is when the age or condition of existing equipment indicates trades are in order.

The table on the next page shows the estimated cost per harvested acre for various types of hay equipment. The term "harvested acres" is the number of acres the equipment will cover each year. For example, if you have 100 acres of hay which is harvested an average of 4 times each year, annual acres should be 400 acres (100 times 4).

Estimated costs include tractor, equipment and labor. At low tonnages per year, mid-size and large square balers are very expensive. For example, at 200 acres per year the cost for the large square baler is $39.46/A. At 1000 acres per year the cost drops to $10.08/A.

Another consideration is how the hay is utilized. Is it to be sold or fed on-farm? If the hay is to be sold, does the buyer have the ability to handle large bales? If the hay is for your own use, consider waste and ability to control livestock daily consumption, large square and small square bales have an advantage over large round bales.

Available labor is also a consideration in the appropriate type of hay equipment. With small square bales, hauling can cost $10.00 per ton or more to move hay out of the field.

With large square bales, a truck can be loaded in one hour or less with a tractor and front end loader. If hay is rained on in the field, its value can be greatly reduced.

Many producers who do not have a large acreage of hay should seriously consider using custom operators. The per ton cost for new equipment (see table) at low yearly volumes (up to 200 tons) is higher than common custom rates regardless of type of equipment. For a complete summary of custom rates by area in Oklahoma see OSU Current Report CR-205. This report includes the high, low and average custom rates for three different regions of Oklahoma.

RELATED COMMENTS: Another source of equipment cost information is a computer software package called AGMACH$ developed by the Oklahoma Cooperative Extension Service. The attached table was generated using this user-friendly software. AGMACH$ can be tailored to your own particular situation. For more information about AGMACH$, contact your county extension office or write to:

AGMACH$
Biosystems & Agr. Engr. Dept.
214 AG Hall
Oklahoma State University
Stillwater, OK 74078-0469

OTHER REFERENCES

AGMACH$ - Agricultural Field Machinery Cost Estimation Software. 1994. R.L. Huhnke and W. Bowers. OSU Oklahoma Cooperative Extension Service.

Oklahoma Farm and Ranch Custom Rates. R. Jobes and D.D. Kletke. OSU Current Report CR-205.

Round Bale Hay Storage. R.L. Huhnke. OSU Extension Facts 1716.

COST PER HARVESTED ACRE FOR HAY EQUIPMENT

Machine	Size, feet	Speed, mph	Initial Cost, $	Total Harvested Acres Per Year							
				100	200	400	600	800	1000	1500	2000
Mowing											
Sickle Bar Mower	9.0	5.0	3,500	$7.86	$5.78	$4.85	$4.67	$4.56	$4.47	--	--
Mower-Conditioner	16.0	5.0	18,500	25.02	13.60	7.97	6.15	5.27	4.88	4.46	4.27
Rotary Disk Mower	9.2	7.0	6,000	10.45	6.80	5.10	4.63	4.49	4.38	--	--
Disk Mower-Conditioner	9.8	7.0	15,000	21.45	12.19	7.65	6.22	5.57	5.36	--	--
Self-Propelled Windrower	16.0	5.0	40,000	51.01	26.19	13.85	9.80	7.82	6.68	5.76	5.31
Raking											
Side Delivery Rake	9.0	6.0	3,200	6.84	4.88	3.91	3.60	3.50	3.46	--	--
Twin Side Delivery Rake	18.0	6.0	8,500	12.02	6.76	4.15	3.29	2.86	2.61	2.36	2.26
Wheel Rake	9.0	6.0	2,000	5.33	4.10	3.49	3.30	3.24	3.21	--	--
Twin Wheel Rake	18.0	6.0	4,000	6.39	3.92	2.69	2.28	2.08	1.97	1.85	1.80
Windrow Inverter	9.0	5.0	2,500	6.53	5.00	4.25	4.04	3.99	3.93	--	--
Baling											
Small Square Baler	18.0	4.0	13,000	20.10	12.18	8.32	7.12	6.69	6.48	--	--
Mid-Size Square Baler	30.0	5.5	48,000	61.75	32.26	17.55	12.67	10.26	8.82	6.94	6.05
Large Square Baler	30.0	7.0	60,000	76.35	39.46	21.05	14.93	11.89	10.08	7.69	6.53
Large Round Baler	30.0	5.0	17,500	24.53	13.82	8.58	6.91	6.12	5.83	--	--

AGMACH$
March 1995

QUESTION #2
Can I just graze my alfalfa with cattle rather than baling and feeding it to them? Buying and maintaining hay equipment costs more and more every year.

SHORT ANSWER: Grazing alfalfa can be profitable for experienced cattlemen who understand critical management practices. Producers who are not familiar with managing livestock on lush forages should be extremely careful and attempt grazing only on a small scale. Grazing has a reputation for shortening the life of alfalfa stands, compared to harvesting alfalfa for hay. This is largely a misconception if proper management practices are followed.

NOTE: Grazing is presented as one of several options in response to several questions posed on the following pages. This section serves to avoid repeating some of the same concepts in other discussions and to avoid the appearance of ignoring the negative aspects of grazing alfalfa.

EXPLANATION: Grazing alfalfa always has both positive and negative aspects. The degree of concern or attractiveness of grazing changes with seasons. For most alfalfa production situations, grazing during fall and winter has many more advantages than disadvantages. Spring grazing, on the other hand, is difficult for most producers, and successful summer grazing can be considered intermediate from both the standpoint of positive and negative aspects. Some of the different ways of considering alfalfa grazing follow.

Positive Aspects -- Some reasons one should consider grazing alfalfa include the following:

- Harvesting alfalfa in **spring** by grazing can reduce weather-related problems associated with normal first-harvest time (late April and early May). First-cutting hay yields are normally high, resulting in large windrows. The hay is difficult to dry and frequently requires 5 to 10 days without rain. As a result, most first-cutting hay is rained on before it gets dry enough to bale.

  Alfalfa grazed in early April will probably not be ready to harvest again before May 15 to 20. The frequency of rainfall may be reduced by that time; thus, hay will dry more rapidly with less chance of rain before baling. The volume of hay will be reduced, and it may be easier to cure.

- In the **spring**, producers often need high quality forage for stockers that were maintained on wheat pasture during winter. Alfalfa can be used for this purpose, and gains can be comparable to those on wheat (frequently more than 2 lb/day).

- Grazing alfalfa infested with alfalfa weevils and/or infested with aphids during **spring** can result in decreased insecticide use. When alfalfa is flash grazed, habitat for insects is removed, and some insects are killed. Fewer insecticide treatments may be required.

- **Summer** grazing is especially attractive when hay yields are low during July and August due to drought. Summer grazing also is a good way to utilize thinning stands infested with grasses. Forage quality of these grasses is good, and grass in alfalfa reduces the chances of bloat.

- Grazing in **late fall and winter** is the most economical means of utilizing alfalfa forage. One of the best mean of reducing alfalfa weevil infestations is grazing in the fall after a hard freeze. Grazing effectively reduces sites for weevil egg-laying.

Negative Aspects -- Grazing alfalfa is associated with many negatives, as evidenced by the fact that very few producers in Oklahoma routinely graze alfalfa.

- **Fear of losing animals from bloat** is the most frequently cited reason for not grazing alfalfa. Lush alfalfa growth in early spring is the most likely to cause bloat. All alfalfa varieties cause bloat, including those called "grazing alfalfa." Careful management of animals can minimize bloat problems. Some widely accepted ways to lessen bloat problems follow.

GUARD AGAINST BLOAT

- Do not put hungry cattle on lush alfalfa.
- Fill animals with dry grass or hay before grazing alfalfa.
- Provide a bloat preventative for several days before and after the start of grazing alfalfa.
- Closely watch cattle several times a day at first.
- Give them a choice of eating dry feed or fairly mature grass when grazing alfalfa.
- Some producers use a "chronic bloater" in the herd as an indicator.
- Remove all animals from the alfalfa field at the first sign of bloat and watch them closely.
- Do not turn cattle onto alfalfa wet with dew. Wait until it dries completely.
- Do not begin early in the morning. Fewer problems occur when starting in the afternoon.
- Pay close attention to weather forecasts and remove animals before weather changes.
- Do not graze alfalfa that has been lightly frosted.

Bloat is less of a problem during the summer; nevertheless, normal precautions should be taken to guard against it.

- **Stand loss problems** (another reason for not grazing alfalfa) can be minimized by removing animals when the soil is so wet that animals leave deep tracks.

- Grazing alfalfa in early April increases the potential of **cool-season grassy weeds** in the second alfalfa harvest. Vigorous alfalfa often smothers out grasses during April. Removing alfalfa allows light to reach the grasses and they are then able to compete with alfalfa and produce seeds. If weed-free hay at second cutting is the target, a herbicide with residual action should be applied during the dormant season.

Economics of Spring Grazing: A strong advantage for grazing is the reduced cost of harvesting alfalfa. Stocker gains of more than 2 lb/day are attainable. Alfalfa yields of 3/4 ton/A can be assumed in early to mid April. Assuming stockers consume 15 lb/day, 100 stocker-days/A are present. Allowing 1 week to consume the available forage, about 14 head/A would be used, gaining 28 lb/A. At 30¢/lb of gain, almost $59/A could be earned. Cost of grazing would include poloxalene and dry hay (for bloat control), fencing, medicine, labor, etc.

Producers can make good money using a few animals on a small acreage and rotational stocking if they manage to keep bloat losses to a minimum. Producers who cannot (or do not want to) move hot wires for rotational stocking and watch the animals closely daily should not risk grazing as an option.

Economic return is a reason for interest in summer grazing. Cutting, raking and baling cost $21/A/cutting. If weed-free hay sells for $80/ton and summer yields are 1/2 ton/A, only $14/A would remain after harvest and hauling costs.

Example #1: If grazed, assuming 1 lb. of gain for each 10 lb. of forage, 100 lb. of beef gain could be achieved. One hundred pounds of gain would be worth $30/A at current rental rates (30¢/lb. gain). If a producer owns his own cattle, a higher return could be achieved.

Instead of making hay, a better option may be to graze droughty alfalfa in late summer. Grazing is the least expensive way to harvest alfalfa. When alfalfa is droughty in the summer, bloat problems are controllable. During late summer when alfalfa stops growing, flash grazing can be a very good way to harvest.

As during any other time of year, it is best for alfalfa stands to graze with a high enough stocking rate to clean up the field in 7 to 10 days. If only a few head of cattle are available, cross fences with hot wires can be used to force animals to clean up an area before moving to another area.

Example #2: Stockers can gain between 1.5 to 2.0 lb/day on this type of forage. Considering 600 lb/A of alfalfa present and light-weight stockers consuming 15 lb/day, there is about 40 stocker-days of forage/A. Stocking at 4 stockers/A, the field could be cleaned up in 10 days. If they gained 1.75 lb/day worth 30¢/lb of gain, the forage is worth about $21/A, about the same as the value of hay, without harvesting equipment costs. As with spring grazing, cost of grazing includes fencing, water, bloat guard, labor, etc.

GRAZING PRACTICES:

There is no single acceptable practice for grazing alfalfa. Both continuous and rotational stocking are possible and can be successful.

- To reduce the chances of damaging stands and to maintain stocker gains of 1.5 to 2 lb/day, some type of **controlled or rotational grazing** should be practiced. There is no set rule on number or size of paddocks; however, paddocks should be small enough to complete grazing in less than a week, ideally. Four or five weeks recovery should be allowed before another round of rotational grazing. A good program would be to divide the field into eight paddocks and graze each paddock four days. Cattle should be removed when fields are muddy to prevent damage to alfalfa.

  Rotational stocking (grazing for 5 to 7 days followed by regrowth for 4 to 5 weeks) will result in high forage production and animal gains. In general, good hay-type varieties respond to cutting for hay and rotational stocking in the same way.

  Ill effects of thinning alfalfa stands can be minimized by rotational stocking. Animals should not be left on any particular part of the field longer than a week. If animals remain on a field longer, much of the available forage is lost by trampling and new regrowth will be eaten. Rotational stocking alleviates both these problems.

- **Continuous stocking** of hay-type alfalfas (and probably grazing types) should be managed so that alfalfa is not grazed shorter than 6". This means stocking rates are adjusted several times during the growing season by removing and introducing animals as dictated by rate of alfalfa growth.

  Research at the Grazinglands Research Laboratory at El Reno has shown that this is a good method for stockers, resulting in gains of more than 2 lb/day using 'Cimarron' (developed as a hay-type variety). Many producers find that the system is difficult because of the need to divide the herd and adjusted stocking rates with each change in growing conditions.

Research and demonstration conducted at the Noble Foundation showed that stockers gained over 2 lb/day throughout four different summers with three different hay-type alfalfa varieties. Under their conditions, however, producing alfalfa for hay was more profitable than alfalfa for grazing.

OTHER REFERENCES:

Grazing Alfalfa. Certified Alfalfa Seed Council, P.O. Box 1017. Davis, CA 95617-1017.

Oklahoma Farm and Ranch Custom Rates, 1993-94. Raleigh Jobes and Darrel D. Kletke. OSU Current Report CR-205.

Pros and Cons of Grazing Alfalfa. C.A. Griffith (Noble Foundation). 1990. Proceedings of the 46th Southern Pasture and Forage Crop Improvement Conference. Overton Texas May 7-10. Pages 90-93.

Beef Production from Continuously Grazed Alfalfa. Jerry D. Volesky and Daniel P. Mowrey. 1993. Forage and Livestock Field Day. USDA-ARS Grazinglands Research Lab. El Reno OK. Pages 20-22.

Southern Forages. 1991. Don Ball, Carl Hoveland, and Garry Lacefield. Order from Potash & Phosphate Institute. P.O. Box 922149. Norcross, GA 30092-8149. (Approx. $25)

QUESTION #3

My old alfalfa stand has 1 foot of regrowth after my September harvest. Should I cut it one more time or graze it?

SHORT ANSWER: Flash-grazing alfalfa after the first killing freeze (20° F) in November or December is likely to be the better option instead of trying to make hay.

EXPLANATION: Haying Option. Making hay in late October or early November is difficult because of poor drying conditions, i.e., low temperatures, high relative humidity, and reduced solar radiation. Another consideration is the value of the hay.

The value of hay would be about $40/A (gross), assuming 1/2 ton/A at $80/ton. When harvesting costs are about $21/A, only $19/A remains. This amount will hardly cover costs of hauling and storage. Remember, this optimistically assumes you can bale the hay before it is damaged by precipitation.

ECONOMICS: Grazing would cost much less than haying, assuming no stocker death loss occurs from bloat. Using a grazing value of $60/ton, the 1/2 ton/A yield would be valued at $30/A. From this value, you must subtract bloat prevention, fencing, getting water to the site, and labor.

Grazing after frost helps control insects. During grazing, habitat for alfalfa weevil egg laying is removed, reducing the number of eggs available for hatching the following spring.

Flash-grazing on dry fields after a good freeze will also result in some **control of broadleaf weeds**. The hoof-action of the livestock will cause uprooting of small weeds.

OTHER CONSIDERATIONS: It is unlikely that stand life or plant health would be drastically affected by cutting or grazing between October and January. This assumes proper fertilization, good drainage, adapted variety, etc. See Question #2 in this series about grazing practices and bloat precautions.

QUESTION #4

My new stand of fall-planted alfalfa is about 1 foot tall. Should I graze or cut it this fall?

SHORT ANSWER: If the forage is not critically needed, the best option would be to leave it until spring. If the forage is needed, flash-grazing in January after the alfalfa goes dormant would be all right.

EXPLANATION: Trying to cure alfalfa hay in late fall (November) is difficult. Although some plants are 1 ft tall, the amount of hay that can be harvested is usually be less than 1/2 ton/A.

When weeds are not a problem: Normally, grazing or cutting fall-sown alfalfa is not recommend that fall or winter. These seedling plants usually stay green throughout the fall and early winter, and considerable root growth occurs during this period. In addition, as indicated above, usually there is not enough alfalfa forage to justify harvesting.

When weeds are a problem: Alfalfa growth stops when shaded by weedy grasses, such as rescuegrass and volunteer wheat. Large grass plants are normally not effectively controlled with herbicides, so flash-grazing may be the only economical control option. We recommend flash-grazing as soon as the grasses out-grow the alfalfa and most of the alfalfa is being shaded, or as soon as there is a hard enough freeze to stop above-ground growth of the alfalfa (usually 15° F or colder for seedling plants).

Forage production from these areas would vary from 1/4 ton/A to 1/2 ton/A. So the value of the forage available for grazing would vary form $15 to $30/A.

Grazing pressure should be sufficient to remove the forage in a couple of weeks. Also, livestock should not be permitted in fields that are wet. Tracking will damage the plants more than weeds.

OTHER REFERENCES:

Question #2 in this series about grazing practices and bloat precautions.

QUESTION #5

My alfalfa was about 10 to 12 inches tall when that hard freeze hit last week. I checked the field this morning and found tops of most stems are bent over. Will these stems recover or must the plants regrow from the crowns? (early to mid-spring)

SHORT ANSWER: If plant terminals have been killed by the freeze, the best option would be to remove the foliage already present by cutting or flash-grazing and encourage new growth from crowns for a profitable harvest later.

EXPLANATION: Damage to alfalfa by freezing temperatures at some point after growth of the first crop is well underway is not unusual in Oklahoma. The ability of the alfalfa to recover depends upon whether plant terminals have been killed.

Terminals Not Killed. If most terminal buds look green and alive after 2 or 3 days, then cutting is not recommended. There may be some loss of leaves, but regrowth of the stems will begin in about 1 week.

Terminals Killed. If nearly all terminal buds are killed, then regrowth will begin from axillary leaf buds and/or crown buds, depending on the amount of foliage damage. If freezing kills most stems, then regrowth will be from crown buds. This regrowth usually begins 1 to 2 weeks later.

Top Terminals Only Killed. If only some of the top terminals are damaged, then damaged stems that are still alive tend to inhibit growth of crown buds. As a result, recovery time before alfalfa would start growing again could be 2 to 3 weeks. Farmers who cut or flash-graze their damaged alfalfa in these situations encourage rapid crown bud growth and recovery.

Harvesting Options. The available forage at this time would be only about 1/2 ton/A, so there is probably not enough forage to pay for harvesting. However, the quality of the hay would be excellent and the quicker recovery time resulting from removing the freezedamaged forage would help offset some of the expense of taking a "short" harvest.

It is unlikely that frost during this season would have any drastic effect on stand life, assuming a vigorous stand with proper fertilization, good drainage, adapted variety, etc.

Flash-grazing would be a cost-effective way to remove damaged forage. The forage needs to be removed as quickly as possible and proper precautions need to be taken to prevent bloating.

RELATED COMMENTS. Insects: Hard freezes during March and April can have important consequences for alfalfa weevil and aphid control. It has been observed that little mortality to insects occurs unless plant terminals are actually killed. If terminals are "burned" slightly and wilted due to freezing temperatures, then insects will not be killed. However, with hard freezes, losses due to reduced forage production may be offset by some killing of insect pests. When a late freeze occurs soon after spraying, much of the value of insecticide application is lost because foliage is frozen; consequently, insects have no food.

Weeds: Cool-season weedy grasses may become more important when growth of alfalfa is slowed due to freeze damage or when the forage is removed at this stage. Many grasses are still in the tiller stage and suppressed by the alfalfa growth during this period. If alfalfa is damaged or forage harvested, then weedy grasses will receive more sunlight and continue growing. Herbicide treatments under these conditions have not been conducted; however, it is doubtful any herbicide would be effective, as the weeds would be fairly mature.

OTHER REFERENCES:

-- Alfalfa Weevil and Its Management in Oklahoma. OSU Extension Facts 2097.

-- Alfalfa Aphids in Oklahoma. OSU Extension Facts 7184.

-- Question #2 about grazing and bloat precautions.

QUESTION #6

I just checked my alfalfa that has grown to a height of 12 to 15 inches since it was sprayed 3 weeks ago. There are a lot of alfalfa weevil larvae and aphids present, and it appears damage is being done. Should I spray again or cut? (early April)

SHORT ANSWER: The most profitable option would be to spray again and allow the alfalfa to grow for another 2-3 weeks so there will be enough forage to make a good cutting.

EXPLANATION: Both insect and plant-related factors must be considered in making this decision. As for the insects, it is still early in spring, and a high probability generally exists that populations of both weevils and aphids may continue to increase for a few weeks. (During some years this may not be true.)

Scouting Is Important. Careful sampling of insects in alfalfa using the "shake-bucket" method will provide a good assessment of current insect populations. At the very least, there may be many small weevil larvae that will continue to grow and cause greater damage than is now occurring. Some type of control measure will likely be needed to prevent serious losses in forage production.

Early Cut. Cutting in early April would also be an option. Forage quality during vegetative growth is high, and cutting this early one time would not normally damage a healthy stand. However, there are some other factors that need to be considered.

First, the yield obtained at this stage would only be about l ton/A compared to 2 ton/A at bud stage. Also, cutting in early April when large numbers of insects are present may result in extensive insect feeding in windrows and damage to regrowth under windrows.

In addition, aphid numbers may increase in the regrowth. It is unlikely that temperatures will be hot enough in early April to dry hay rapidly for baling and removal and to expose insects to conditions that will kill them. In addition, cutting in early April can increase problems with cool-season weedy grasses. Often cool-season grasses are suppressed and even suffocated by vigorous alfalfa growth in the spring. As a result, there is little grass in the first cutting and none in the second cutting. If the alfalfa is cut too early, then the grasses can regrow fast enough to be competitive with the alfalfa. This results in significant grass in the second cutting (25% or greater grass content) and a decreased value of hay.

Although cutting early could save the cost of an insecticide application ($8-$20/A), harvesting would cost about $21/A, and the amount of forage obtained would be greatly reduced in comparison with hay cut at bud or early bloom stage. It is unlikely that money saved by not spraying could offset the reduction in earnings for the first hay crop.

Certainly, part or all of this reduction may be made up in the second crop or later in the season. The high probability of insect damage to hay in and under windrows and the need for an insecticide application on regrowth, make the early cut option quite risky. The best choice would be to make another insecticide application if field sampling indicates it is needed. As there are still 2-3 weeks before the average date of first cutting, harvest intervals after application should not be a problem.

OTHER REFERENCES:

Alfalfa Weevil and Its Management in Oklahoma. OSU Extension Facts 2097.

Alfalfa Aphids in Oklahoma. OSU Extension Facts 7184.

Scouting for the Alfalfa Weevil in Oklahoma. OSU Current Report CR-7177.

QUESTION #7

My new alfalfa looked good last fall, but all I see now is grass. Should it be sprayed, and what should I use? (early April)

SHORT ANSWER: The best option now is to cut the area when the weedy grasses are in the boot stage (seed-heads emerging from the grasses).

EXPLANATION: It is too late to control weeds with herbicides. Cool-season weedy grasses are too mature for herbicides to work efficiently.

Early cut at boot stage: Cutting when grassy weeds are in boot stage will result in about 1 1/2 ton/A of hay, and forage quality will be good (Tables l & 2). Cutting at this stage also minimizes weed stress on alfalfa. Forage value of cheat-alfalfa hay at this stage would be: 1 1/2 tons/A of cheat-alfalfa hay (70% cheat, 12% protein hay) at $50/ton = $75/A.

Normal cut: When alfalfa is starting to bloom and cheat is in the soft dough stage, forage value would be: 2 tons of cheat-alfalfa hay (75% cheat, 9% protein hay) at $30/T = $60/A.

There is a $15 advantage to cutting early when cheat is in the boot stage compared to a normal cutting time. There is also about 1/2 ton/A of weed-free alfalfa ($40 value) produced in second cutting that can be added to the cutting taken when cheat is in the boot stage. This would result in a boot stage cutting with a $55 advantage over the normal cutting time. Another disadvantage of waiting until normal cutting time is the increased potential for killing plants. Alfalfa seedlings stop growing when shaded by weeds and will die if cutting is delayed too long. This is very damaging since poor stands decrease alfalfa yield over several years, and most likely result in shortened stand-life.

Cut at jointing stage of cheat: Cutting weedy grasses too early results in regrowth of weedy grasses; thus, weeds will also be in the second cutting. First and second cutting hay yields associated with cutting at early-boot stage of cheat would be:

1st cutting, yield = 1 ton/A
(50% cheat, 18% protein hay).
2nd cutting, yield = 2 tons/A
(25% cheat, 14% protein hay).

Flash-grazing at boot stage: Another good option for managing grassy alfalfa would be to flash-graze the forage at the boot stage of the cheat. The value of forage available for grazing (1 1/2 ton/A) is estimated to be $90/A. This is $15 more than the hay value.

RELATED COMMENTS: Seedling alfalfa is not very competitive with weeds, so it is common to have weeds such as cheat and volunteer wheat in new stands. If soil nitrogen levels are low (30 lb/A of N or less), then weedy grasses do not grow vigorously and often go unnoticed until they start jointing in April. If nitrogen level is above 30 lb/A, however, weedy grasses respond to the nitrogen by tillering and growing enough to "out grow" the alfalfa in the fall. This can result in essentially no alfalfa production and even stand loss.

It is also important to control insects in seedling alfalfa. Insect stress on alfalfa will decrease the stand's ability to compete with weeds. Alfalfa weevils are often a problem, but their leaf damage is easy to detect. In contrast, blue aphids are more apt to go unnoticed and cause serious damage. Only a couple of blue aphids on small plants will stunt or kill them. Also, some insecticides used for weevils are not highly effective for aphid control.

OTHER REFERENCES:

Question #2 in this series about grazing practices and bloat precautions.

Table 1. Protein concentration and crude protein production of alfalfa and cheat at first harvest as affected by time at first cutting at Perkins, OK.

Time of first cut	Protein concentration	
	Alfalfa	Cheat
	---------- (%) ----------	
Early (cheat - boot)*	19.9a	8.4a
Normal (cheat - dough)*	17.4b	6.6b
Late (cheat - grain)*	16.6c	5.0c

Table 2. Dry-matter production of alfalfa and cheat at Perkins and Chickasha Oklahoma as affected by time of first cutting, with and without cheat overseeding.

Time of first cut	Cheat seeding rate	First harvest		
		Alfalfa	Cheat	Total
	------- (lb/A) ---------			
------- Perkins location -------				
Early (cheat - boot)*	15	540d	1730c	2370c
Normal (cheat - dough)*	15	900c	2180b	3180ab
Late (cheat - grain)*	15	810cd	2640a	3450a
Early	0	2640b	0d	2640c
Normal	0	2820ab	0d	2820bc
Late	0	3090a	0d	3090b
--- Chickasha location ----				
Early (cheat - boot)*	15	810c	2470b	3280c
Normal (cheat - dough)*	15	810c	3010b	3820b
Late (cheat - grain)*	15	730c	3820a	4550a
Early	0	2450b	0c	2450de
Normal	0	2270b	0c	2270e
Late	0	2820a	0c	2820d

Values within the same column and at the same location followed by the same letter are not significantly different (P = 0.05) according to the protected LSD test.

*Cutting of alfalfa at early, normal, and late refers to boot, soft dough, and mature grain stages of cheat, respectively. Data modified from David Pike and Jim Stritzke. 1984. Alfalfa-Cheat Competition. Weed Sci. 32:751-756.

QUESTION #8

I have hay down that needs another day to dry; rain is on the way; what should I do? What about hay preservatives?

SHORT ANSWER: Assuming you do not have access to a preservative and/or application equipment, you should wait and bale when the moisture content of hay is less than 20%. (18% is safer.)

EXPLANATION: Hay baled at moisture contents exceeding 18% is subject to excessive heating and mold. Some heating and mold may be acceptable if the hay is fed to beef or dry dairy cows, but it should not be fed to high producing milk cows or horses.

Using preservatives requires proper planning, chemical selection, and application equipment. The two most common preservatives used are organic acids and inoculants.

Organic acids, such as propionic acid, can be used to treat hay up to about 35% moisture. They are sprayed onto forage as it enters the baler. Proper equipment is essential to insure uniform coverage of the hay. Organic acids act as fungicides, inhibiting growth and reproduction of microorganisms that cause heating and molding in wet hay.

One of the major drawbacks to using acids is their effect on equipment. If a baler is not cleaned properly after each use, corrosion and rust can cut the life of the baler in half. Another potential problem is odor. The acid vapors can be annoying, especially in poorly ventilated storage. In addition, treated hay often has a bleached appearance. The combination of odor and off-color can make acid-treated hay difficult to market, especially to dairy producers and horse owners, sometimes resulting in a reduced price.

Equipment requirements include an applicator with a positive displacement pump, at least two nozzles and a tank. Chemical application rates depend on the hay moisture content at baling.

To be effective, chemical formulations should have at least 60% propionic acid. Equipment and chemicals costs range from $8/ton to more than $12/ ton.

Inoculants consist of enzymes and bacteria that enhance bacterial growth. Hay inoculants are labeled for forages up to 25% content and are applied during baling in liquid or granular form. Equipment and chemical costs range from $2 to $5 per ton.

The effectiveness and economic benefit of inoculants is questionable considering the relatively narrow range of moisture contents. This problem is compounded by the difficulty in getting an accurate measurement of the true moisture content of forage prior to and during baling.

TRADE-OFFS: Calculating costs vs. benefits for preservatives is difficult and inexact, at best. If a treatment saves 1 or 2 ton/A of high quality hay from repeated rains and destruction, it can be worth $40 to $60/ton. Nothing is more expensive than baling tons of "formerly high-quality hay," just to get it out of the field and to be rolled into gullies. But this is what happens occasionally when hay is cut and caught in several rains. Sometimes the hay has no value but must be removed so the plants can regrow.

On the other hand, if preservatives are applied to hay, but rain does not come, producers are out the cost of treatment with no benefit. Even worse, sometimes buyers discount hay for no reason other than the smell of preservatives.

The only advise is: "Don't have more hay down at anytime than you can risk losing because of a faulty weather forecast." Or as the old saying goes, "Make hay when the sun shines."

QUESTION #9
My first-cut hay is usually poor quality; should I change to a silage-type program?

SHORT ANSWER: Putting up alfalfa as haylage (40-60% moisture) or silage (more than 60%) has become a widespread practice to avoid low quality hay in many parts of the U.S. This is especially true where drying is even more difficult than in Oklahoma. Oklahoma hay producers have not adopted alfalfa haylage on a large scale.

EXPLANATION: Haylage or silage is an acceptable solution to some "poor quality" first-harvest problems, but it does not fit some situations, especially cash crop hay. Regardless of the type of forage preservation (hay or ensilage), harvest timing is the most important criterion determining forage quality.

Rain Damage. If your difficulties are the result of rain damage, this situation is insufficient justification for converting to a total silage program **unless** you plan to feed silage near your alfalfa. **A total silage program** requires special equipment for harvesting, storage, and feeding. For example, the initial cost of a bunker silo to store your alfalfa silage can be as much as $110/ton. In most cases, transportation costs limit hauling distances for silage, thereby greatly limiting marketing options.

Another "silage" alternative is to **bale high moisture forage** in large round or mid-size bales and then wrap the individual bales in plastic. Alfalfa baled between 40% and 60% moisture content ferments just as it would in a silo. The main advantage to this method of alfalfa harvesting and storage is that the time between cutting and wrapping is often less than 1 1/2 days, compared to baling dry hay when it can take more than 4 days in the spring for hay to dry.

Assuming you can use your existing baler, the cost of additional equipment (wrapper and bale mover) plus plastic wrap can range from $8 to $15/ton higher than conventional dry hay. In addition to added cost, high moisture bale wrapping also requires more time and labor compared to dry hay production.

Weed Infested. If poor quality is associated with weeds, then it is more important to control weeds than to consider silage. Forage quality is not improved by putting forage into silage.

Proper soil fertilization results in vigorous alfalfa plants that normally crowd out most weeds. If alfalfa is going to be used for beef cattle and most weeds are grasses, then harvesting early can be a good option. Herbicides are available to assist in controlling most weed species after other good management practices fail.

Low Feed Value. If weeds are not a problem and alfalfa hay has low protein and relative feed value, you may be cutting too late. As the alfalfa plant matures, forage quality decreases. (Refer to question #13).

RELATED COMMENTS: A common rule-of-thumb is to cut at 10% bloom. This maturity is a general compromise among persistence, quality, and yield. It **does not** assure "high quality" alfalfa hay. At first harvest, blooming is often delayed because of cool, dry, or wet weather. If you want high quality hay, therefore, it is important to cut in the bud stage or as soon as crown bud growth begins.

Timing of first harvest can also be set by the calendar for healthy stands. Vigorous alfalfa stands can be harvested about April 15 in the southern part of Oklahoma and about May 1 in the north.

Harvesting later normally results in higher yields, but drying times increase with big windrows, thus delaying harvest and increasing the probability of having rain on cut hay. Harvesting earlier accomplishes many of the objectives of silage without the added cost and inconvenience.

OTHER REFERENCE:

-- Questions #7 in this series on grassy weeds.
-- Question #13 in this series on forage quality.
-- Weed Control in Alfalfa. OSU Extension Facts 2761.

QUESTION #10

My alfalfa yields this year are only about half of last year. I've been wondering if I am cutting it right. We had plenty of rain, and the stand is still pretty thick. Maybe I should change varieties. It might be a fertility problem or something else. What do you think?

SHORT ANSWER: It is unlikely that harvest management practices are the cause of this reduced alfalfa hay yield. Most likely, low soilfertility is the cause of the problem. Early symptoms of low soil fertility are low yields and slow regrowth.

EXPLANATION: Cutting frequency, height, date, etc., can vary widely and seldom cause drastically reduced alfalfa hay yields. Poor decisions having to do with variety, insecticide, herbicide, and site selection usually cause stands to thin quickly.

After a few years stands thin more quickly under low soil fertility. It is likely this stand has not yet reached that point, but will soon. Unfortunately, most producers first suspect factors other than low soil fertility or low soil pH.

Good alfalfa production for several decades removes large amounts of fertilizer elements from the soil. Many good fields in Oklahoma were highly fertile for several decades after the prairie was first plowed, but soil fertility has slowly declined. With a relatively small decrease in fertility each year, it is difficult to notice that the soil can supply only a fraction of the amount of phosphorous and/or potassium necessary for good alfalfa production.

Current soil test calibrations predict about 10% yield response when a deficiency of 60 lb/A P_2O_5 is alleviated. For a good field of alfalfa that represents about 1/2 ton/A increased yield. Conservatively, this is $40/A income increase from fertilizer that cost $12 to $15/A to purchase and apply -- cost/benefit ratio of about 1:3.

Each alfalfa field should be soil tested frequently. Soil testing is the only way to know if (or how much) fertilizer should be applied. It is a good idea (and inexpensive) to check the fertility level every year, even when no obvious problem exists and twice a year when there is a problem. Once the fertility has become limiting, large amounts of fertilizer must be applied every year to maintain high yields.

RELATED COMMENTS: Low soil pH can be corrected with a single application of agricultural lime before establishing the field; however, it may be necessary to reapply lime after 6 to 8 years of production.

Soils "severely" deficient in phosphorous or potassium, on the other hand, are more difficult to improve quickly. Even when recommended amounts of these materials are applied before establishment, it will be necessary to apply phosphorous and potassium each year.

A certain amount of phosphorus applied as fertilizer is absorbed by the soil and is not available for plants. In addition, large amounts of phosphorus and potassium are removed each year in hay. Five tons of alfalfa hay contain approximately 75 lb P_2O_5 and 300 lb K_2O. This amount is removed as part of the hay crop and must be replaced by fertilizer or soil weathering. Soil weathering is a complex process whereby chemically bond minerals are released by the soil. Regular soil testing is the best way of accounting for how well soil weathering restores crop removal of phosphorous and potassium.

Low fertility and pH have far-reaching effects on alfalfa. In addition to reducing yield and shortening stand life, as noted above, they can exaggerate the effects of pests. Low fertility conditions result in weak alfalfa plants that do not compete well with weeds. Plant stress caused by low fertility coupled with insect infestations can result in losing an alfalfa stand in a short time. In contrast, well fertilized alfalfa plants without insects, compete with broadleaf and grassy weeds very well, resulting in very little weed encroachment for several years.

OTHER REFERENCES:

OSU Soil Test Interpretations. 1993. Earl Allen and Gordon Johnson. OSU Extension Facts 2225.

Southern Forages. 1991. Don Ball, Carl Hoveland, and Garry Lacefield. Potash & Phosphate Institute. P.O. Box 922149. Norcross, GA 30092-8149.

QUESTION #11
Will I lose my stand if I cut alfalfa before it blooms?

SHORT ANSWER: Cutting alfalfa before it blooms from time to time will not result in stand loss.

EXPLANATION: Recommendations on harvest schedules for alfalfa for many years suggested cutting at 10% to 25% bloom. This is a good time to harvest since there is a good balance between forage quality and yield at this growth stage. Blooming signals that root reserves have been replenished and plants are prepared to regrow rapidly without sacrificing vigor.

Cutting before bloom is essential for reliable production of high quality dairy hay. Research conducted in Oklahoma over the last 15 years indicates that cutting at the bud stage does not severely damage stands. Harvests can occasionally be taken before the plants begin to bud without serious damage; however, repeatedly cutting at prebud may shorten stand life. Frequent cutting at prebud may not allow plants enough opportunity to replenish root reserves between harvests; thus, over a period of several harvests, stand decline may be hastened.

If cutting often at the prebud stage causes stand life to be reduced by one year, this result in reduced profits because of having to establish a new stand earlier than planned. A premium price must be received for hay to offset the loss of profit due to reduced stand life. Economic analyses of alfalfa forage production indicate that 2 years are needed to recover establishment costs and begin making a profit from alfalfa.

OSU surveys indicate dairy managers are willing to pay more for higher quality alfalfa hay. In general, dairies will pay $5-$15 more for --

- 2 to 5 percentage points higher protein,
- 5 to 10 percentage points higher TDN, or
- 15 to 30 points higher RFV.

Any factor that reduces productive stand life must be offset by increased profitability during the remaining years to keep the entire enterprise operating at a profit.

RELATED COMMENTS: In Oklahoma cutting at 10% bloom **is not a good indicator** for determining cutting time of the first crop of alfalfa forage. Weather conditions are often cool and wet enough in Oklahoma to delay blooming.

A much better indicator is to cut when new crown buds are noted at the base of alfalfa plants. Harvesting at this time results in higher quality hay and reduces drying time 1 or 2 days. If you want high quality hay, therefore, it is important to cut in the bud stage or as soon as crown bud growth begins.

Timing of first harvest can also be set by the calendar for healthy stands. Vigorous alfalfa stands can be harvested about April 15 in the southern part of Oklahoma and about May 1 in the north.

OTHER REFERENCES:

Forage Quality Interpretations. 1993. John Caddel and Earl Allen. OSU Extension Facts 2117.

Question #13 in this series on forage quality.

QUESTION #12

When I cut alfalfa real short, it seems to take a long time for the next growth to start. What is the best cutting height?

SHORT ANSWER: The best cutting height for alfalfa is "as short as possible," without cutting plant crowns.

EXPLANATION: Nearly all regrowth comes from buds in the crown area of the plant. Very little regrowth comes from stems higher than 2" from the soil.

When a sickle bar or flail knife hits the ground and cuts crowns, plants die or only regrow slowly. This is a good reason to start with and maintain the smoothest field surface possible. The aim should be to cut all stems as short as possible without scalping crowns.

An important reason for cutting alfalfa short is to remove insect and disease habitat. Most insects, disease organisms, and even dodder (a parasitic weed) need leaf and stem material present at all times. Long stubble left in the field provides a good place for these pests to live until there is enough new growth to support them. Cutting short allows sunlight to reach the soil, killing many microorganisms and some insects.

Cutting short also allows the soil surface to dry. This drying inhibits germination of certain weed seeds. Another reason for leaving as little stubble as possible is to remove old plant material from the field, thereby keeping it out of the next cutting and improving quality and appearance.

Fields greenup slowly under **drought conditions**. This is a drought tolerance trait in alfalfa. Plants go dormant but remain alive under extremely dry conditions, essentially avoiding growth during dry periods. Regardless of cutting height, under such conditions fields normally remain brown after cutting for extended periods .

Fields that are cut high (over 4" above the ground), normally continue to have a green cast after cutting. This is usually old stems and leaves left by the swather. It is not new or normal regrowth.

Frequently, when harvest is delayed, for whatever reasons, and growing conditions are good, alfalfa plants initiate regrowth from crown buds before cutting. Sometimes this gives the impression of rapid regrowth and can occur independently of cutting height.

Regrowth from crown buds before cutting signals original stems have stopped growing, and it is (or was) time to harvest. Regrowth from crowns before cutting is most apt to occur when growth stops because of cold weather or very dry conditions. When warm weather returns or it rains, new growth comes from the crown area rather than from elongation of old stems.

RELATED COMMENTS: We routinely cut alfalfa variety test plots at a height of 2" to 3" with a flail cutter. The harvester creates a little vacuum-action that sucks up leaves and thrash. As a result, the environment is poor for disease organisms and insects. Under good growing conditions, plots are completely green and regrowing rapidly within just a few days.

When cutting occurs earlier than normal, it may take a week or more for fields to green up with regrowth. The reason for this delay is that plants were not physiologically ready to regrow (not short cutting height), and it takes a few days to activate crown buds.

QUESTION #13
What is the best cutting interval for alfalfa? Should I always cut at 10% bloom?

SHORT ANSWER: The best time to harvest will vary, depending on projected use of hay. If hay will be sold as high-quality forage (for dairy cattle), alfalfa should be cut at bud stage or earlier (28 day cycle or less). If alfalfa is being used as feed for a cow-calf operation where high quality is not as critical, it should be cut at 25-50% bloom stage (35-42 day cycle) to maximize yield.

EXPLANATION: The traditional response to the question regarding when to cut alfalfa has been, "cut at 10% bloom for the best combination of yield, quality, and stand persistence." However, as the "short answer" implies, there is no single best cutting interval for alfalfa.

Producers must decide what intervals are most appropriate for their operations and markets. For example, alfalfa cut when less mature (bud stage) may yield 20-30% less forage (Figure 1); however, it will have much higher protein content and relative feed value than that cut at mid-bloom (see Table 1).

If the higher quality forage can be sold for $15 to $20/ton more compared with lower quality forage, revenues may be greater with early cutting. If there is little or no price advantage for high quality, later cutting and fewer harvests per year will normally be more economical.

For farmers who plan to consistently cut their alfalfa at bud stage compared with bloom stage, the following considerations are important. Assuming that the first harvest is taken in late April or early May, a total of six harvests are possible on a 28-day cutting cycle if soil moisture is not limiting. The last harvest would be taken in mid-September (Table 2). This cutting schedule would compare with 4-5 harvests taken on the 35 or 42-day interval. Although annual yields may not differ greatly between the cutting schedules, added harvesting costs of $22-$44/A would be incurred with the 28 or 30-day interval. A higher price must be obtained for the forage cut at bud stage to offset these costs.

Table 1. Market hay grades for legumes, legume-grass mixtures, and grasses -- American Forage & Grassland Council, Hay Marketing Task Force.

Grade	Species and Stage	Description				
		%CP	%ADF	%NDF	%DDM	RFV
Prime	Legume, pre-bloom	>19	<31	<40	>65	>151
1	Legume, early bloom, 20% grass-vegetative	17-19	31-35	40-46	62-65	125-151
2	Legume, mid-bloom, 30% grass-early-head	14-16	36-40	47-53	58-61	101-124
3	Legume, full bloom, 40% grass-headed	11-13	41-42	54-60	56-57	86-100
4	Legume, full bloom, 50% grass-headed	8-10	43-45	61-65	53-55	77-85
Fair	Grass-headed and/or rain-damaged	<8	>45	>65	<53	<77

CP = Crude Protein; ADF = Acid Detergent Fiber; NDF = Neutral Detergent Fiber; DDM = Digestible Dry Matter; RFV = Relative Feed Value.

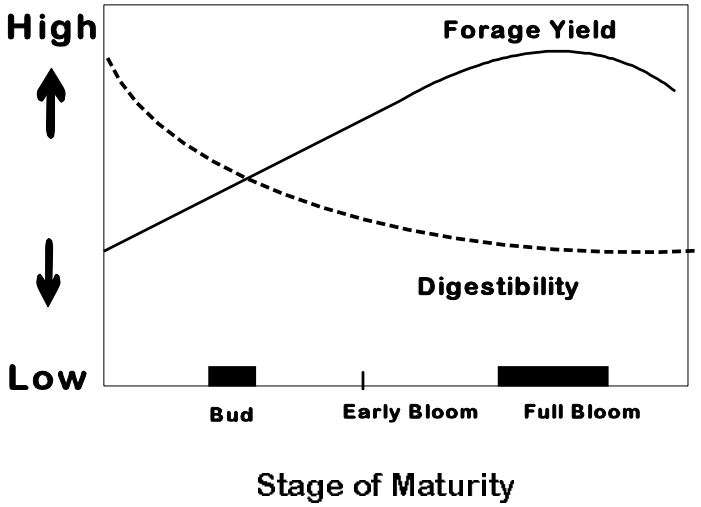
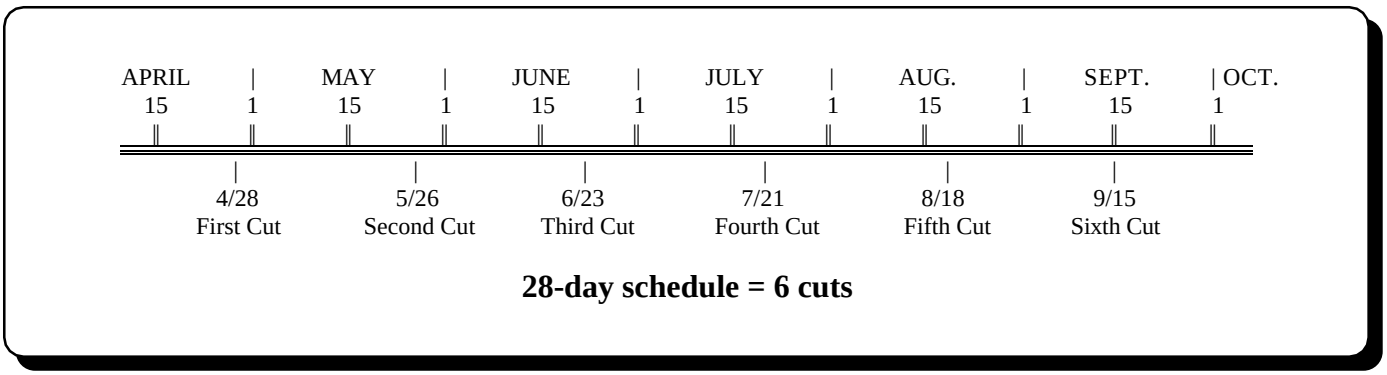
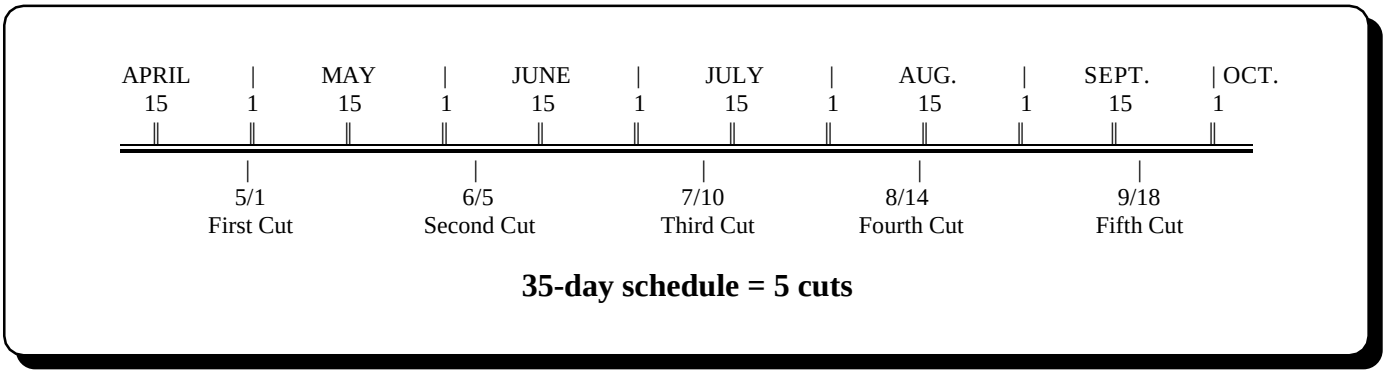


Figure 1. Generalized relationship between forage yield and forage quality as affected by stage of maturity.

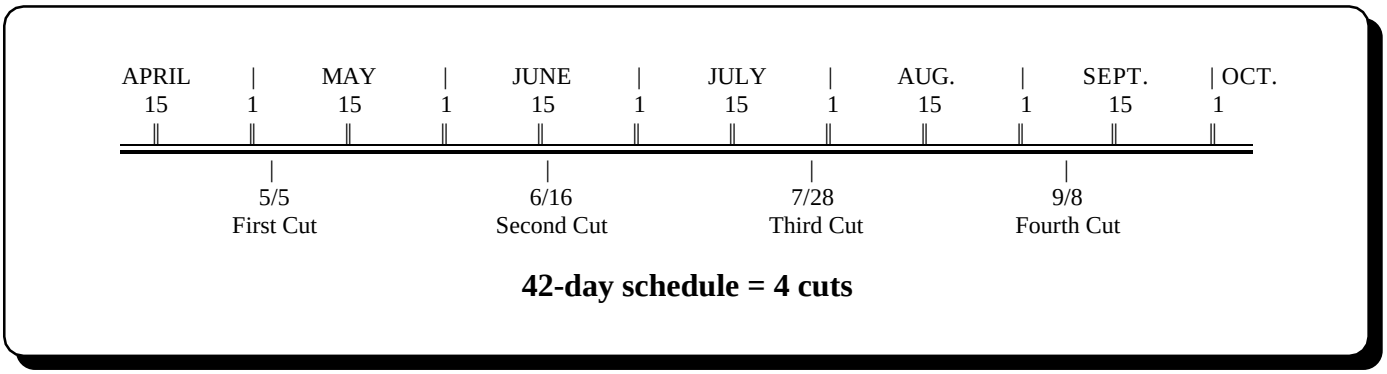
Table 2. Hay-making time lines. Examples of 28-, 35-, and 42-day harvest schedules.



28-day schedule = 6 cuts



35-day schedule = 5 cuts



42-day schedule = 4 cuts

Note: Dates shown in this table are assumed to be for central Oklahoma. With "normal" growing conditions, producers in southern parts of the state should begin about 5 days earlier, and those in the north should usually delay first harvest about 5 days. Temperatures during early April affect ideal timing of firsts harvests. Dry periods during July and August frequently prolong harvest intervals during that period, resulting in later August and September harvest dates.

OTHER REFERENCES:

Forage Quality Interpretations. John Caddel and Earl Allen. OSU Extension Facts 2117.

Question #11 on harvesting alfalfa "early" and the possibility of stand loss.

QUESTION #14

It's mid-July; my alfalfa is 8 to 18 inches tall; it's very thin; but it's blooming in some areas; should I cut it?

SHORT ANSWER: Do not cut it now. Wait a couple of weeks and hope it rains.

EXPLANATION: Hay yields described in this question would probably be about 1/3 ton/A, which would probably not cover harvest costs. Other options would normally be more profitable. These include: 1) doing nothing for a few weeks; 2) harvest by grazing now; or 3) harvesting seed in late August.

Why do nothing? Drought-stressed alfalfa is normally poor quality; consequently, this alfalfa stand would produce mediocre to low quality forage this time of year, worth about $60/ton. At 1/3 ton/A, this would amount to about $20/A. Assuming harvesting costs and hauling at $23/A, it is not economical to harvest this as hay for its cash value. (See Table 1.)

If this alfalfa is produced for high quality dairy hay, it may be important to cut it now. Cutting it removes stems that distract from the appearance and forage quality of the next harvest. This assumes another cutting is highly likely.

Under rain-fed conditions in Oklahoma, predicting whether there will be another cutting in a particular summer is difficult; however, a rule-of-thumb can be helpful. **Alfalfa requires about 6" of water in the soil, available to the plant roots, to produce 1 ton of hay/A**. If the alfalfa described above is suffering from drought, a normal occurrence throughout Oklahoma each summer, one can assume there is very little moisture available to the roots. What is the probability of receiving 6" of rain during the next month? While it is possible to receive thunderstorms in July with more than 6" rains, these rains normally come hard with a lot of run- off.

Based on these concepts and probabilities, it is unlikely there will be enough rain during late July and August to produce a good cutting of alfalfa after droughts earlier in the season. The most economical approach may be to give up trying to make high quality dairy hay in this field this summer. So, do not cut the alfalfa. Just leave it and hope it rains at least 2" or 3" during the next few weeks. These rains would allow a cutting of hay near the end of August. Quality will not be high because of drought stress, although it will probably be higher than necessary for most beef cattle or dry dairy cattle.

Grazing option. Instead of making hay, a better option may be to graze drought-stressed alfalfa in late summer. Grazing is the least expensive way to harvest alfalfa. When alfalfa is droughty in the summer, bloat problems are controllable. During late summer, when alfalfa stops growing, flash grazing can be a very good way to harvest.

Several advantages and disadvantages of grazing alfalfa are discussed in Question #2.

Seed production. Another option, particularly in the western half of the state, that should be considered is letting the alfalfa go to seed. Producers can control harmful insects and supply pollinators (usually honey bees) with relatively little cost (less than $40/A). Seed yields of 200 lb/A can gross $200/A. Expenses for threshing, cleaning, and bagging should cost about $100/A. The producer would sacrifice two light hay harvests and clear as much as $100/A from seed production. Seed yields frequently range from 300 to 500 lb/A.

If dry weather results in low forage yields most years, producers should look seriously at alfalfa seed production as a primary enterprise. The main change that is normally advisable is to harvest hay about May 15. Then, let alfalfa go to

seed, initiating bloom about June 15. Seed harvest should be in mid-August. In addition to seed production, two or three hay harvests are possible -- one or two before seed production and one or two after seed production, if moisture conditions are good.

HARVEST COSTS: The following table estimates harvest costs based on low yield (1/3 ton/A). Note that raking costs are higher than normal because more passes will be made over the field to create windrows large enough for baling. Because there are fewer windrows, estimated baling costs per acre are lower than normal. At 1/3 ton/A yield, the break-even point (between hay value and harvest costs) is approximately $70/ton. Producers should be sure that they can receive $70/ton or more before cutting very low yields for its cash value.

Table 1. Harvest Costs/A at 1/3 ton/A.

Activity	Cost--$/Acre	Cost--$/Ton
Swathing	$8.00	$24.00
Raking	6.00	18.00
Baling	6.00	18.00
Hauling	3.00	9.00
Total	$23.00	$69.00

OTHER REFERENCES:

AGMACH$ - Agricultural Field Machinery Cost Estimation Software. 1994. R.L. Huhnke and W. Bowers. OSU Oklahoma Cooperative Extension Service.

Oklahoma Farm and Ranch Custom Rates, 1993-94. Raleigh Jobes and Darrel D. Kletke. OSU Current Report CR-205.

Pros and Cons of Grazing Alfalfa. C.A. Griffith (Noble Foundation). 1990. Proceedings of the 46th Southern Pasture and Forage Crop Improvement Conference. Overton Texas May 7-10. Pages 90-93.

Beef Production from Continuously Grazed Alfalfa. Jerry D. Volesky and Daniel P. Mowrey. 1993. Forage and Livestock Field Day. USDA-ARS Grazinglands Research Lab. El Reno OK. Pages 20-22.

Question # 2 in this series on Guarding Against Bloat.

QUESTION #15
What is the best variety for grazing?

SHORT ANSWER: There is no "single best" alfalfa variety for grazing that will satisfy most producers in Oklahoma. The main reason for this is that most producers in Oklahoma want to combine hay production with grazing and want a variety that will excel for both uses.

EXPLANATION: Some new alfalfa varieties are marketed as grazing alfalfa. **No variety is available that does not cause bloat**. Some producers "read into" advertisements or assume that a new grazing alfalfa would be "bloat resistant." No breeder claims to have a bloat-resistant variety.

A producer interested in grazing livestock on alfalfa in combination with haying should select the best hay-type varieties. In Oklahoma, current reports are published annually with results of alfalfa variety tests.

In general, good hay-type varieties respond to cutting for hay and rotational stocking in the same way. Continuous stocking of hay-type alfalfas (and probably grazing types) should be managed so alfalfa is not grazed shorter than 6".

'Alfagraze' was the first variety developed for the south and for continuous stocking during the summer. Alfagraze persists better than traditional hay-type alfalfa in such systems, but its yield in Oklahoma is not as good as the best varieties developed for hay. Animals are allowed to graze alfalfa for up to 120 days in continuous stocking systems. Normally animals are taken off the alfalfa only during very wet conditions when they would track up the fields badly.

Typical generalized economic treatment of grazing alfalfa makes it look like an attractive option. There is no consistent difference in price of seed between grazing alfalfa varieties and traditional hay types. For the sake of comparing grazing vs. haying, let's assume -- stocker gains of 2 lb/day during 120 days with gains valued at $.30/lb, a 5 ton/A yield and 20 lb/head consumed, resulting in 500 stocker-days/A. Assuming gains of 2 lb/day/stocker, one arrives at 1000 lb of gain/A or $300/A.

This compares to 5 ton/A of hay at $80/ton resulting in $400/A gross income. Harvest costs of $30/A/cutting for five cuttings leaves $250/A. Generally other production costs are about the same for haying and grazing. This results in a $50/A advantage to grazing alfalfa over haying.

RELATED COMMENTS:

Most major alfalfa breeding programs will release "grazing alfalfas" in the next few years. Each new variety will have to undergo systematic evaluation for persistence and yield.

We currently have two grazing-tolerance tests, both at the Agronomy Research Station at Perkins (just south of Stillwater). The older test was stocked continuously in the summers of 1993 and 1994. The other test was sown in September 1994 and will be grazed until differences among varieties appear.

After one summer, all stands were still very thick and no difference between grazing-type and hay-type varieties was detectable. At the end of the second summer, all entries in the test had thinned much more than comparable varieties in hay-type tests, but no significant difference between types was evident.

OTHER REFERENCES:

Alfalfa Varieties for Oklahoma -- 1994. J.L. Caddel and J.D. Prater. OSU Current Report CR-2106.

QUESTION #16

Bale accumulators are heavy when full and compact the soil so much that it hurts the stand; what is the best way to get big bales out of the field?

SHORT ANSWER: If rutting is a problem, use flotation tires and/or hauling fewer bales at a time.

EXPLANATION: The jury is still out on soil compaction in alfalfa fields. Rutting is usually the result of poor field conditions, i.e., too wet. It could also be the result of excessive loads for the tire capacity. In either case, flotation tires and/or hauling fewer bales at a time may alleviate the problem.

If soil depressions are not detectable, then soil compaction is probably not severe enough for concern. In Oklahoma typical soils used for alfalfa tend to be well-drained and not easily compacted by wheel traffic under dry soil conditions. There are, however, two exceptions, both involving swathers using the same tire path for each cutting.

One situation is the tire path of the first windrow in a field. The second can be observed in fields under center-pivot irrigation where swathers tend to follow the same paths around the field. Even so, this visible decline in plant vigor may be the result of plant damage rather than soil compaction.

Hauling fewer bales at a time and flotation tires increase production costs. The cost of plant damage from wheel traffic and compaction can be estimated only for individual field situations. Producers should avoid such situations to the extent possible.

QUESTION #17

Disk mowers leave alfalfa stems tattered and shredded; how much does this hurt plants by letting in diseases?

SHORT ANSWER: It is unlikely that using a disk mower would cause more disease problems than conventional reciprocating mowers.

EXPLANATION: Tips of cut stems dry out in just a few hours after cutting. Because disease organisms cannot enter through dry stems, it is unlikely pathogens are entering the plant through cut stems.

There may be a slightly longer recovery period associated with the disk mowers. This may be caused by late harvesting coupled with disk mowers cutting stems shorter than reciprocating mowers. Most new shoots emerge from the crown of the alfalfa plant. The shorter cutting height with disk mowers might also cut more of the new shoots. Harvesting should normally be done before new shoots emerge form the crown.

If a producer has a disk mower for another crop, there is no reason to buy a sickle mower for alfalfa.

QUESTION #18

Each year I experience problems with caterpillars and aphids in the summer months. How should I manage these insect pests?

SHORT ANSWER: Timely harvesting can provide effective control of aphids and defoliators that occur in summer.

EXPLANATION: Spotted alfalfa aphids and larvae, such as webworms, armyworms, corn earworms and alfalfa caterpillars may be found throughout the summer in alfalfa. Often, damage by these pests goes unnoticed in thick, healthy alfalfa stands, and insecticide application is not profitable. However, when numbers of foliage feeding caterpillars reach 5-6 per sweep or spotted aphids exceed 20-30/stem, spraying may be justified. If alfalfa growth has reached early bud stage or beyond, cutting can be an effective alternative to spraying. The harvest operation will generally kill the majority of caterpillars. Likewise, spotted alfalfa aphid populations are usually killed by the harvest operation.

Early harvest adds little to the cost of production, assuming there is enough forage (more than 1/2 ton/A) to justify harvesting. In contrast, if forage quantity is insufficient, use of a short residual insecticide, costing approximately $6.00 per acre, should provide adequate control of these insects.

Benefits would include:

- saving approximately 50-100 lb of forage per acre,
- improving forage quality with a better leaf-to-stem ratio, and
- eliminating the build-up of honeydew from aphids.

If aphids are severe enough, the entire harvest can be lost, in addition to total stand loss in heavily infested areas. Forage value associated with increased yield and quality would be:

- $60-70/ton of stemmy hay versus $80/ton (average) of leafy alfalfa.
- Loss of $2-4/A in forage yield.

In light of these figures there is at least a $6/A advantage to cutting early where yields justify this approach (based on chemical cost alone). Where yields are insufficient, the $6/A cost associated with chemical treatment far outweighs the estimates of loss ($14-28 per/A) associated with no treatment. Quality losses may be variable; however, as more leaf tissue is lost, protein and relative feed value decrease.

RELATED COMMENTS: If numbers of aphids or caterpillars are high before cutting, thoroughly scout fields for several days following haying to insure that the insects have been controlled. If insects are damaging regrowth, then an insecticide treatment may be required. Removing the hay before treatment will aid in effective penetration of chemicals into the site.

OTHER REFERENCES:

Alfalfa Forage Insect Control. OSU Extension Facts 7150.

Alfalfa Aphids in Oklahoma. OSU Extension Facts 7184.

QUESTION #19

Part of my market for alfalfa involves selling hay to horse owners. What can I do to eliminate their concerns about blister beetles?

SHORT ANSWER: Totally eliminating concerns of consumers regarding blister beetles in hay is virtually impossible; however, certain harvesting practices can allow a high degree of confidence that hay is free of the beetles.

EXPLANATION: Blister beetle contaminated hay is usually the result of beetles being crushed prior to baling. As hay dries, beetles not killed in harvesting will leave. Crushed beetles occur where the swather, equipped with a crimper, cuts hay infested by a swarm of beetles. Remains of beetles may be concentrated in small portions of bales and fed to livestock. Beetles may also be killed in forage that is driven on before they have time to escape. Suggested means of combating blister beetle problems in alfalfa include:

- Cut hay without using crimpers. This suggestion does not usually interest producers, since not crimping hay increases drying time.

- Use a sickle bar mower without conditioner, which is generally slower and dose not crimp .

- Avoid wheel traffic on standing or cut hay. This can be difficult, since even sickle bar mowers often require driving over previously cut hay. If the cut swath can be straddled, this approach is effective. Many mower/conditioners allow the swath to be straddled by subsequent wheel traffic.

- Cut at or before the 10% bloom stage. Timely cutting of hay in the early bloom stage eliminates flower attractants for adult beetles.

- Use small square bales for horse hay. This allows for easy inspection of flakes of hay as it's being fed to horses.

ECONOMIC ANALYSIS: If alfalfa hay is suspected to contain blister beetles, it has no value as horse feed. The cost of proposed mechanical procedures for avoiding blister beetles is difficult to calculate, but is little, unless new or modified equipment is needed.

Insecticide costs will range from $7-12 per acre. Benefits include being able to sell hay to horse owners with confidence and perhaps less liability insurance.

OTHER SUGGESTIONS:

- When dealing with horse owners, sell hay harvested before May 15 or after Oct. 15. No specimens of the striped blister beetle have been collected in Oklahoma before May 14. Likewise, fall cuttings (mid-late Oct.) can be harvested with little risk from blister beetles. Unfortunately, insect activity is temperature driven; therefore, warm fall weather may prolong activity of beetles.

- Scout fields before and during harvest. Beetles disperse when encountered, so swarms can be detected just in front of the harvester. Drivers spotting swarms can stop and allow swarms to disperse. This is not a very reliable nor realistic approach because small swarms are hard to see in tall, thick stands of alfalfa.

- Treat hay intended for horse consumption with a short residual insecticide. Unfortunately, only a few compounds are labeled for this use. Sevin® and Methoxychlor have a seven day waiting period between application and cutting. Therefore, only beetles present during the treatment period will be killed. Migrating swarms may subsequently contaminate hay.

RELATED COMMENTS: Blister beetle problems are associated with the substance cantharidin. This toxin occurs naturally within the beetles' bodies. Horses are considered most susceptible, with some incidences of toxicity reported in cattle and sheep. The striped blister beetle is the primary concern because of its gregarious (swarming) habits.

Toxicity of blister beetles to horses is variable due to horse age, breed and general health. The estimated minimum lethal dose is one milligram of cantharidin per kilogram of body weight (see Table 1.). Based on results adapted from Capinera et al. (1985), with 1 mg. of cantharidin/beetle, it would take at least 250 blister beetles to kill a 555 lb. horse and could take as many as 545 beetles to kill a 1200 lb. horse.

Table 1. Estimated number of beetles necessary to provide a lethal dose (assuming 1 mg/Kg) to horses.

Cantharidin content/beetle (mg)	Horse Weight (lb)		
	555	**835**	**1200**
	Number of Blister Beetles		
1.0	250	375	545
2.0	125	188	273
3.0	83	124	182
4.0	63	94	136
5.0	50	75	109

OTHER REFERENCES:

Blister Beetles and Alfalfa. Phillip Mulder, Richard Shawley, and John Caddel. OSU Extension Facts 2072.

Cantharidin levels in blister beetles (Coleoptera: Meloidae) associated with alfalfa in Colorado. 1985. J.L. Capinera, D.R. Gardner, and F.R. Stermite. J. Econ. Entomol.

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Alfalfa Varieties for Oklahoma -- 1994. J. Caddel & J. Prater. OSU Current Report CR-2106.

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Weed Control in Alfalfa. J. Stritzke. OSU Extension Facts 2761.

GENERAL PRODUCTION:
Alfalfa Stand Establishment. J. Caddel, J. Stritzke, R. Huhnke, & G. Johnson. OSU Ext. Facts 2089.

Controlling Pocket Gophers. T. Bidwell. O.S.U. Extension Facts 9001.

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