

# **ALFALFA, THE QUEEN OF FORAGE CROPS - REFLECTIONS AFTER SIXTY YEARS EXPERIENCE WITH THE CROP**

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Yes, it is true I have been involved with alfalfa for 60 years and then some. Fact is I was fortunate enough to pick the World's best forage on which to base much of my career about the same time I fell in love with and married the best lady I ever knew. Betty has stuck with me through these crazy wonderful years. She was largely responsible for matters at home and raising the family. She managed our family and home while I was on the move trying to encourage maybe even coerce farmers in Kentucky and then over the USA to grow alfalfa and to improve their pastures and make both enterprises profitable. Thank you and your predecessors who have made this mission fun and satisfying. It's been a great 'ride'.

## **Getting a full time program started:**

I got in the full swing with forages at UK in 1958. Kentucky farmers had been growing alfalfa in scattered areas around the state referred to as 'patches of alfalfa' (I guess the term came from the fact that so often alfalfa followed tobacco and at that time, the tobacco was grown mostly in patches not in fields as they are today). Alfalfa was not thought of as a crop except in a few places like the hills of the bluegrass north of Lexington and in the Mississippi river bottoms below Hickman. There were some serious producers in the heavier dairy farm concentrations around Bowling Green, Glasgow, Shelbyville, Louisville, and Covington.

Farmers came to expect/accept stands to endure for three and sometimes four years. A good average annual yield was three and a half to four tons from three hay harvests normally cut at mid to late bloom.

In university studies, we learned that to grow alfalfa successfully, it must be planted on well-drained soils. Yet, out in the fields we saw dead spots in what we thought to be well drained soils, it just didn't make sense until we started digging plants and found a hardpan and dead tap roots in wet soils even in pretty dry times. We also ran into roadblocks such as proper seeding procedures including time of seeding, altering and modifying fertility and lime needs, ideal seeding depth to produce uniform dense stands. Other information that we needed that was missing included establishing a general or realistic seeding rate and finding and using better and more dependable varieties. Yes, of course we had to deal with insects but the bell-weather of insects, the alfalfa weevil invaded in the spring of 1963.

### **First things First:**

While the alfalfa program and better quality hay needs were very obvious it even more obvious farmers were facing a much a bigger problem that needed our immediate attention. Kentucky 31 Fescue had, by this time been seeded on an estimated 7.0-7.5 million acres. The 'glory days' of high price seed was over and farmers were grazing the grass. The summer drought in both 1953 and 1954 had eliminated legume stands and cattle were now grazing drought stricken straight fescue. Kentucky cattle, mainly beef cattle, were hit hard with an infection called 'Fescue-Foot'. Cattle lost weight, feet, ears, tails, and stood in water where (we later discovered to keep their feet cool) most of the time. It was an economic disaster and farmers desperately needed help.

The Kentucky Legislature (in the mid 1950's) made a one-time \$40,000 grant to the University of Kentucky to develop research to fix the problem. Drs. Timothy Taylor and W.C. Templeton Jr. were handed this assignment. After they studied the problem and combed the literature, they decided that their best bet was to figure a way to establish adapted legumes in established fescue stands without plowing thus diluting whatever the problem was so that cattle would recover and get back to making profits. The program was called **Pasture Renovation** and then as today, has become a part of forage language among Kentucky farmers.

With such a problem and solution available, we chose to spend about 60% of our time and energy from 1959-1965 moving the pasture renovation program all across the state. To set the record straight fescue was and still is in my opinion the best plant introduction that has ever come into this state to preserve soils and provide a grass forage base on which to raise cattle. But the adverse affect that fescue and the dry weather had on animal health and their performance especially in the summer seasons needed serious help. Red Clover and white clover worked well in this system. Both were easy to establish. With the renovation program, this was the first time that red clover was used primarily as grazing. Up until then, it was considered a good two-year clover for hay.

The renovation research was clever and worked to perfection but it wasn't going anywhere until the Extension Service and especially County Agricultural Agents took it to their farmers. They organized county forage councils whose membership consisted of top farmers with interest in forages along with commercial agricultural leaders of the same persuasion. The councils were challenged to look at the local forage and livestock situation and help to build a program to supply more dependable sources of high quality forage to feed the inevitable increasing cattle herd.

Pasture quality was the number one problem in every county. On-farm demonstrations became the primary 'tool' that was used to show how to renovate and see on farm results. The favored system to show results was farm field days. The demonstrations were simple. All we did was to leave an untreated strip in the middle of fields and renovated the remainder of the field according to the 'prescription'. In demonstration sites that were located close to farm-to-market roads, we furnished two pasture cages measuring six feet square and three feet tall. These cages were anchored in the treated and un-treated areas and moved monthly to better observe

changes during and at the end of each period in the peak year, (1963), we recorded 340-pasture renovation demonstration (60 with pasture cages) in 101 counties. The results of this program were overwhelming. Yet, according to records kept by county agents, Agricultural Conservation Program, and reported red clover and white clover seed sales, an estimated 500,000 acres of fescue were renovated in the fourth year after the research was introduced. Farmers are still renovating pastures but it sure is a much easier process. What a difference no-till drills, Gramaxone, and Roundup have made.

### **Back to alfalfa:**

While all this attention was being given to renovating pastures, we were trying to solve the limiting factors associated with alfalfa production to grow more acres and to find and teach improved practices that would give farmers more confidence in the crop. We were studying successful programs in Kentucky and other states that were known to have successful alfalfa programs particularly Pennsylvania, New York, Maryland, New Jersey and Virginia. Winter meetings followed by spring and summer farm visits and field days were the 'order of the times'. To augment this tried and proven method of communication, we 'invented "The Green Letter" designed as a seasonal reminder to farmers of when to do what to make alfalfa more productive and lasting. This new 'tool' was authored at the University and signed and distributed by county agents and mailed to producers who had shown interest in alfalfa. Later, the letter was expanded to include all forage crop improvement practices. After a couple of years, the mailing lists grew to about 20,000 copies per issue and 11-13 mailings each year. Basically, we felt that we had to identify each of the major alfalfa problems and teach a 'whole' production and management program.

Our first priority was to encourage every farmer to **get a soils map for his farm** from their local SCS technician and have the technician explain which areas and fields were best suited for growing alfalfa. This was to serve as a guide for any producer to pick the best and most likely soils for the crop and give them a chance to make realistic long-time plans including the crop.

**Alfalfa will not grow on sour soils. Liming to a pH of 6.2-6.5** should be the standard at seeding and maintained throughout the life of the stands. We had a tough time getting this message across to new growers especially as to the importance of elevating their pH **before** seeding. This pH matter has been fairly easy to deal with over time. Soil testing procedures and facilities that have been made available for every Kentucky Farmer has been extremely helpful in dealing with and adjusting fields to more and better alfalfa production.

It is amazing how many growers get in a hurry to seed a field that is going to stand for several years and wind up with spotted and un-reliable plant distributions. New growers and sometimes even experienced farmers **bury seed too deep for uniform emergence**. The formula is  $\frac{1}{4}$  to  $\frac{1}{2}$  inch depth in a firm seedbed. Ideally the best plantings start off with 25 to 40 (up to 80) uniformly distributed plants per square foot 2-3 weeks after seeding. Seed, any seed, needs to be planted no deeper than 8

times as deep as the seed is thick). More failures are the result of hurried, buried plantings than any other planting procedure. The weather and sometimes the seed or fertilizer or equipment get the blame, but when the seedlings are made carefully and at the recommended time, failures seldom occur.

What is the proper **seeding rate**? When 15 pounds of alfalfa seed per acre are distributed uniformly there are about 75 seed per square foot available. Even though the germination rate is 85 and 95%, only about 50% of the seed that is planted survives even normal seeding procedures and un-planned problems such as weather, diseases, insects, seeding too deep etc. and turn the seed into productive plants. The normal seeding rate for Kentucky has been in the 15-20 pound per acre range for 30 years or more.

I was involved in seed coating several years before my 1973 retirement from UK. So I have had about 30 years experience with seed coatings. I have found, under farm conditions, that there is a valid substitution of product for seed so long as the seeding rate is no lower than 15 pounds per acre. Even though the coating constitutes close to 30% of the weight, the coating itself provides an almost perfect microenvironment for splendid germination and early growth. The characteristics continue to act as a stimulus and stands are denser, more uniform, and more vigorous which nearly always carries over into aging stands.

**Variety selection has changed.** Forty years ago, there were three maybe four recommended varieties on the 'official' recommended list. Today, there are over 200 certified alfalfa varieties sold in the US today. Of the 200, there are 170 that are adapted to our region. The early 'preferred' list included Atlantic, Ranger, and Buffalo. Most of the acreage was planted however to Kansas and Oklahoma commons because the seed was cheaper and the advantages of growing crops of recommended varieties were vague.

Even though there has not been a true known seed source of Buffalo for over 20 years, it is still one of the 'varieties' or 'name' of choice by many growers. UK's variety trials located at Lexington, Bowling Green, and Princeton have shown for years that Buffalo is one of the lower yielding varieties in their tests. Yet there are still farmers who will spend \$150 to \$200 to establish an acre and then seed it to inferior producing varieties. The results are 20-30% lower annual yield than had they chosen one of the better varieties. In a long-time study with Pennsylvania farmers, they found that seed costs represented 4.5-5% of the costs of growing the crop over a four-year life span.

**In 1975, I joined NAPB (now Americas Alfalfa) as National Forage Marketing Manager.** I was in 'Hog Heaven'. Can you imagine being able to market the best alfalfa program and the best alfalfa varieties in America and get paid for it? The bonus was to be able work with the most productive alfalfa plant breeder in America. I hope you heard and understood what Dr. Jim Moutray had to say in his earlier presentation today. He is the best that there is in this industry.

I had no more than hit the ground when I learned that Jim had developed and the company was ready to release the first commercially bred Phytophthora root rot (wet foot disease) resistant variety Apollo. I was handed the responsibility of introducing this variety and to disseminate its' advantages to farmers and professionals across the USA. Even though the disease had been well described in professional literature, few professionals had come 'face-to-face' with field damage. My first job was to develop an educational program for professionals. While we were teaching and learning to recognize the symptoms, farmers were buying us out of seed.

Our marketing program included print and radio advertising, farmer meetings, demonstrations, and educational products such as publications, slide sets, and TV tapes. All of these teaching systems were widely distributed and used throughout the USA by our field staffs and University folks. Farmers could relate to what they heard and saw thus the marketing program became a roaring success. Apollo became the most popular alfalfa variety released since Buffalo.

Nearly all of the certified **varieties developed in the last 30 years** have been bred and released by **commercial plant breeders**. Jim is one if not the most prolific plant breeders of this group. Since 1975, he has developed and released some 140 new varieties.

**Seeding Alfalfa No-Till** has been refined in recent years. With the development and release of Gramoxone (formerly named Paraquat) and Roundup and the development of no-till drills, the procedure has become nearly fail-safe. The complete no-till system for seeding alfalfa without preparing a conventional seedbed system was perfected at VPI in Virginia by Drs. Dale Wolfe and Harlan White beginning in the early 1980's. Since then, the procedures have been refined and the practice by farmers has spread to the Midwest, Upper South, and the East Coast states. In recent years, the process has been further developed to include a system following row crops. Winter small grains (wheat, barley, oats, or rye) are planted following corn or soybeans. The following spring as the winter small grain seedings green-up, the cover is killed with Gramaxone or Roundup and the alfalfa is no-till planted directly into the aftermath.

**An easy to follow hay harvest schedule** has 'bugged' producers for as long as I can remember. At least 30 years ago, Tim and Temp conducted a four-year study to develop a more reasonable harvest schedule for farmers. In this experiment, they mowed alfalfa at 21, 28, 35, and 42day intervals.

They found that the 21day interval produced fantastic quality hay but this interval produced low yields and destroyed much of the stands as early as the second year. The 28day sequence was low yielding, exceptionally good quality but that four-week interval thinned stands and 'invited' grassy weed invasion by the third year. The 35day interval was high yielding and the stands persisted very well for the duration of the study. The quality of the 35day cut was acceptable. The 42day interval cut was not acceptable at least by dairymen. Yields were usually lower but the stands lasted longer. In the 1980's, farmers were growing varieties that were low in pest resistance and regrowth was much slower than it is today. As producers have adjusted to the better

varieties and systems of production, they have been able to alter the cutting schedule and reduce the time of re-growth by about a week to 28-30 days for most harvests depending on the rate of early re-growth after mowing.

**Fertility rates have increased in recent years.** The widely accepted rate of fertilizer removal per ton of hay removed is 15 pounds of phosphate and 45 pounds of potash, ½ pound of Boron, and 100 pounds of agricultural limestone. Many top producers have settled on a yearly application of something like 60-90 pounds of phosphate, 180-270 pounds of potash and 2-3 pounds of Boron per acre and respond to lime top dressing as indicated in regular soil test results. The result, more producers are routinely harvesting two to three more tons of hay annually and keeping stands much longer than ever before. Regular soil testing is still the best better system to establish field-to-field fertilizer ratios. Once the ratios are established, it is much easier for the grower to adjust application rates to suit their yield goals.

The **alfalfa weevil** invaded Kentucky in the spring of 1963. Before that time, from 1960-1963, Kentucky's alfalfa acreage had been growing at 50,000 to 75,000 acres annually. The massive invasion of this insect stopped acreage expansion as many farmers quit growing the crop rather than fighting yet another insect. Many of the more aggressive growers held on to their acres, many even increased their acreage. Even though Kentucky acres were reduced to about 250,000 acres, average yields increased.

The weevil is still with us it is not as abundant thus as harmful to the crop as it was until the early 1980's. The strategic release of parasites that feed on the weevil larvae was initiated by Dr. Bobby Pass at UK in the early 1970's. This event seems to be the key that has reduced the insect numbers and helped to keep the weevil under control. Most years there are sites where the weevil still exists and can be as destructive in those areas as ever. What about weevil resistant varieties? Not yet but maybe sometime. **Potato Leafhopper** resistance is a different matter. Plant breeders have made a lot of progress in developing resistant/tolerant varieties and you can rest assured that a lot more progress will be made in the years ahead.

**Grazing tolerance** in alfalfa is a tremendous breeding breakthrough. The development and release of the variety Alfagraze by Dr. Joe Bouton at the University of Georgia in 1990 opened an expanding era for using alfalfa. We were privileged to follow the development of this variety for about seven years before Alfagraze was released. As we watched Joe's field trials, we could see the dramatic disappearance of standard varieties that were used to gage hardiness and grazing tolerance of his new materials. After four years of intensive grazing (140 days each year) by beef cattle, the 'testing' varieties were reduced to oblivion while Alfagraze remained nearly perfect stands. Our company bid for and was granted the license to exclusively produce and distribute the seed in 1990. That year, we were allowed 300 pounds of the original 620 pounds of the initial seed stock to establish three on-farm demonstrations, (one each in Kentucky, Tennessee and Alabama). First, we wanted to see if Alfagraze would grow well outside of Georgia. We especially wanted to expose what we had already learned about the variety and it's persistence under grazing conditions to professionals and

farmers. The results of the original sites were the same as they were in the Georgia tests. During the next three years, we established 37 sites in 29 states. At some of the sites, we included local popular varieties but we always included the standard variety (Apollo) that was used all throughout the Georgia development and testing process. As expected, the sites were mirrors of the Georgia work and the rest is history.

The durability that was built into this trait has provided additional advantages. Following the methods used by Bouton to develop Alfagraze, Moutray has bred new varieties that are higher yielding, he has added even more pest resistance, he has altered dormancies to fit more climatic zones, and has even improved durability. The new materials are being used widely for hay production since the materials are so durable under mechanical harvest equipment. We have used these materials also in grazing tests and demonstrations. These alfalfas persist under the most severe miss-treatment of any alfalfa varieties released to date and still produce yields that rate in the upper 10% of the yield trials around the country (including Kentucky).

**About the future:** Alfalfa will remain the best forage species for generations to come. Farmers who want to improve profits from all of their acres will be using this crop more widely. Whether the basic interest is hay, haylage, or grazing, alfalfa fits the bill. When it comes to grazing, I cannot imagine why a farmer with beef cattle would pass up growing alfalfa as part of his pasture mix or a dairy farmer who wants to reduce his feed costs, the same applies. Of course inexperienced grazers fear bloat but serious farmers learn to control this problem with experience and are capitalizing on its' fantastic animal performance, (beef gains and milk reduced feed costs in dairy herds). Will we have bloat resistant varieties? Perhaps but it will be a while coming. In the meanwhile, we will learn to deal with this problem with caution and experience and growing it with grass for dilution

Varieties that are grown mainly for hay harvest will continue to be more tolerant to on-farm management mix-ups. Roundup ready alfalfas will be available in two or three years if and when it is cleared by the environmental folks. For growers who have huge native weed populations, this could be a lifesaver. Pest resistance in the crop will continue to be expanded and stands durability and better yields will be the reward. Hybrid alfalfas should become a reality. How farmers react to the use of hybrids will be based on its' performance.

**It HAS been a GREAT RIDE!** I hope my professional and personal life (I have had problems separating my personal life from the professional life) has helped make the lives of your predecessors, your family, and all of Kentucky agricultural life more pleasant and lucrative.