UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

FIELD CROP NOTES

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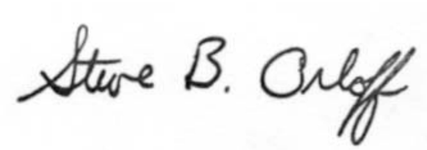

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Skyrocketing Fertilizer Costs: Why are they so high and will they come down?

Adapted from *Supply & Demand, Energy Drive Global Fertilizer Prices* by the Fertilizer Institute & *Fertilizer Outlook: United States and World Supply and Demand Trends* by National Corn Growers Assoc. and *personal communication with Rob Mikkelsen*, Director, Western North America International Plant Nutrition Institute

If you have purchased fertilizer lately there is no doubt you were shocked by the price. It was no surprise that fertilizer prices were going to increase, but who would have imagined that they would increase so rapidly and to the degree they have. Most fertilizer materials cost 2 to 3 times what they did 5 years ago and some fertilizers like 11-52-0 have quadrupled from around $300 per ton to over $1200. It is tempting not to fertilize, but if your soils are deficient, fertilizer is still almost always cost effective. This underscores the importance of sampling soil and/or plant tissue to know the fertility status of your fields so that you do not miss out on potential yield or fertilize unnecessarily.

A question on everyone's mind is "*Why have fertilizer prices increased* ***SO*** *much*?" The answer is rather involved and there are numerous contributing factors including those listed below.

- **Increased global demand for fertilizer.** Overall world nitrogen demand grew by 14 percent, phosphate demand by 13 percent and potash demand by 19 percent from 2001 to 2006.
- **Ethanol production is increasing fertilizer demands.** As corn prices increased due to the demand for ethanol production, corn acreage rose by 19 percent from 2006 to 2007. More fertilizer is applied to corn than many other crops thereby increasing fertilizer demand and driving up costs.

- **Higher transportation costs.** Ocean freight rates are way up due to other competing uses (transportation of iron ore, coal and steel) and high fuel costs. Ocean freight rates have increased 300 to 400 percent over the last 5 years. The cost of shipping fertilizer by rail is also up due to fuel costs and security requirements. As everyone knows, trucking rates are much higher as well due to fuel costs.
- **Value of US dollar way down.** A weak US dollar raises the price of imported fertilizer. The US now imports over half its nitrogen and over 90 of its potash. From December 2003 through December 2007, the US dollar has fallen 35 percent against the Canadian dollar; 27 percent against the Euro; 23 percent against the Russian Ruble; 11 percent against the Chinese Yuan; and 8 percent against the Kuwait Dinar. Much of the world supply of phosphorus is produced in the US. But the weak dollar has increased phosphate sales overseas.
- **Nitrogen fertilizer production costs have soared and we now rely more on overseas sources.** Natural gas is used for producing ammonia, which is used in the making of all other nitrogen fertilizers. The cost of natural gas is 70 to 90 percent of the cost of making ammonia. Average U.S. ammonia production costs rose by 172 percent from 1999 to 2005 as a result of increasing natural gas prices. This has caused 26 U.S. ammonia plants to permanently close since 1999 and several others remain idle. Hence, U.S. ammonia production has fallen by more than 42 percent since 1999 and we rely more on overseas sources.
- **US farmers must compete with farmers from around the world for fertilizer.** Growing world demand for food, shortages due to weather and high crop prices have increased the demand for fertilizer. Dr. Harry Vroomen from the Fertilizer Institute expects global demand for fertilizer to increase by 16 percent from 2006/7 to 2010/2011. Others don't expect demand to increase this much but still anticipate increased demand.

So, in a nutshell fertilizer costs have increased to where they are today due to increased world-wide demand, increased production costs due higher natural gas prices, higher transportation costs, and a weak dollar. What's next for fertilizer prices remains a big question. It is difficult to predict future prices and my crystal ball is probably no better than yours. The factors mentioned above that have caused this increase are not likely to change dramatically in the short term. U.S. demand is expected to decrease slightly with the decrease in corn acreage but worldwide demand for fertilizer will remain strong with high commodity prices and the current food shortage. The world has an additional 70 million people to feed each year. The productivity of agriculture has been amazing, but continuing to grow ever-more food on fewer acres every year is only possible with significant intensification; including better nutrient management. It does not appear that the global demand for fertilizers will be decreasing in the foreseeable future. Fuel prices are not likely to decrease so transportation costs will remain high.

Eventually global supplies of fertilizer will catch up with demand. However, there are serious production issues that limit expansion of the supply. For example, the US phosphate mines are not able to expand at this time (the mines in Idaho are faced with selenium in some of the overburden that regulators are still deciding how to best manage; the expansion of the Florida phosphate mines have been halted for several years as they sort out all the hydrology issues and deal with expanding urban pressures. The North Carolina mine is currently producing at capacity). Therefore, an increase in U.S. produced phosphate is not likely.

There are several very large nitrogen plants under construction in the world (primarily in the Middle East where natural gas is abundant and relatively inexpensive), but they are still several years (or more) from becoming operational. It is a very specialized construction business and only a few companies can build ammonia plants and they are completely booked for many years into the future. When the supply bottleneck is eased for N, perhaps prices will drop—but it also depends on what natural gas prices do in the next few years. Potash production is at full capacity in North America. The cost of a new potash mine is several billion dollars and takes years to sink a shaft, build the processing plant, etc. and no company has had the courage to sink that kind of money into a long-term potash development project in case the price/profitability does not last.

China has previously sold some fertilizer on the world market, but they have now placed very high tariffs on any fertilizer exports to keep the nutrients in their country. International actions like this tend to make everyone nervous and keep prices high. Many of the Asian countries are promising fertilizer to the rice growers in order to boost production for the coming year to ease food shortages, which further tightens supplies.

Therefore, a significant increase in domestic supplies of the major nutrients (N, P, and K) is not probable. An eventual increase in production will likely come for overseas, but even that will take time. So…back to the question ***what is going to happen to fertilizer prices?*** Fertilizer prices tend to peak in spring. So there could be a very slight decline in fertilizer prices due to seasonal demand but there is not anticipated to be much of a price decline in the coming year. Gradually, over the next few years as fertilizer supply and demand come into better balance prices should hopefully lower somewhat. However, I think they will remain significantly higher than in the past—we have likely reached a new era of fertilizer prices.

Dyer's Woad (Marlahan Mustard): Control it now before it sets seed.

Dryer's woad (locally called Marlahan mustard) is a serious problem in Siskiyou County and the infested area seems to be spreading each year. About a decade ago it was primarily confined to Scott Valley but has spilled over into Shasta Valley and continues to spread. Dyer's woad is blooming right now so it must be controlled immediately before it sets seed (actually this newsletter would have been more timely if it was released a couple of weeks ago).

Dyer's woad was cultivated in southeast Russia as a source of blue dye as early as the 13th century and was first introduced to the eastern United States by colonists late in the 17th century for the same purpose. It has since naturalized and has invaded extensive areas of California, Oregon, Utah, Wyoming and Montana. Dyers woad is a B listed noxious weed in California.

DESCRIPTION. Dyers woad is a member of the mustard family. It can be a winter annual, biennial, or short-lived perennial. It is typically 1 to 4 feet in height but its height doesn't exceed 3 feet at most Siskiyou County locations. All leaves have a prominent whitish nerve on the upper side of the leaf blade which makes it easy to identify. Like many mustards, dyers woad has small yellow flowers which appear during May and June. The ¾-inch long seedpods gradually turn purplish brown or black and contain a single seed. A plant is capable of producing 350-500 seeds. Seed longevity is estimated by one source to be at least 8 years. Dyer's woad has a long tap root that may exceed 5 feet in depth. If the original plant is severed it can sprout a new plant.

Dyer's woad grows under a wide range of environmental conditions. It establishes first in disturbed areas and thrives in light sandy and gravelly soils. It is primarily a weed of rangeland, woodlands and non-crop sites where it outcompetes native grasses; however, it also infests grain fields, alfalfa and pastures to a lesser degree. It is not toxic but most livestock and wildlife do not readily graze Dyer's woad.

MANAGEMENT— Dyer's woad can be difficult to control because of its extensive root system. The most effective control measure for Dyer's woad is prevention. Careful monitoring, especially when moving animals or equipment from infested areas, is important. In established infestations, do not let plants go to seed. Hand pull or digging plants individual plants is somewhat effective for small or scattered infestations. It may be necessary to physically remove the plants two to three times each year for 2 to 3 years. Repeated mowing to prevent seed production until seed reserves are depleted may also be effective. Breaking or cutting the tops does not kill Dyer's woad, as it will regrow and produce seed later in the season.

Chemical control at the appropriate growth stages is also effective. I have done tests to compare a spring treatment (bloom stage) with a fall treatment. Fall treatments work well in other states but are not as effective here perhaps due to our lack of late-summer/early-fall rain and the plants are somewhat stressed at that time. Telar was the most effective on the registered herbicides. A tank mix of 2,4-D and Banvel was only partially effective providing about 85 percent control. Multiple years of control are needed because new dyer's woad plants continues to emerge from seed each year until the soil seed bank is depleted.

A trail was conducted by Marla Knight, US Forest Service Botanist in the Klamath National Forest, to compare our most effective chemical treatment (Telar) with hand pulling or clipping/whacking. The clipping/whacking method was done with a manual weed whip and standard garden clippers. Flowering stalks were whacked down, and then clipped to the rosette level. The plots were treated in 2004, 2005, and 2006 and evaluated each year after treatment.

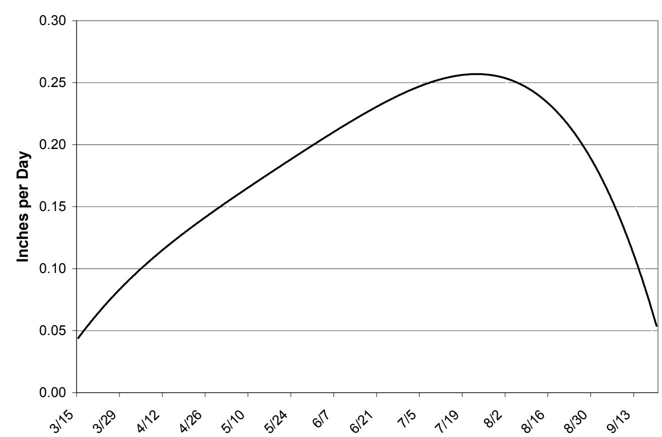
	Percent Control		
Treatment	**2005**	**2006**	**2007**
Clip/wack	0	20	33
Digging	47	70	88
Chemical	93	96	98

The results show that just clipping off the tops was ineffective because the plants re-sprout and re-flower producing new seed. This treatment would be more effective if someone had the time to cut off the flowering stalk every time the plant re-sprouted. Digging was fairly effective providing 88 percent control after three years of treatment. Treatment with the herbicide Telar was the most effective treatment providing 98 percent control after three years. The key with any dyer's woad control program is to eliminate seed production by killing the seed stalk before viable seed is set. Regardless of the program, several years of control is needed. If you only have a few plants, be sure to control them now before the infestation becomes more serious and widespread.

Spring Irrigation Suggestions

This has been one of the driest and coldest springs in recent memory, and as a result overall crop growth has been poor. Knowing when to irrigate and how much water to apply can be challenging in the spring because the weather is so variable. Personally, I am a proponent of irrigating early in dry years like this—especially in dry and cold years. The combination of moisture stress and frost is especially damaging to crops. Also, in years like this, it is not uncommon to almost completely bypass our usual moderate spring temperatures and it seems like we go directly from winter to summer.

If a field goes into the warmer part of the growing season with depleted soil moisture reserves, it is difficult to impossible to "catch up" with most systems—they simply don't have the capacity to refill the soil profile. For this reason, it is preferable to start irrigating fairly early and then irrigate again once the soil has dried out sufficiently to warrant another irrigation. It is important to recognize the seasonal water use pattern of alfalfa and pasture. The crop uses far less water per day in the spring than it does in mid summer. See the figure below for typical daily water use for alfalfa over the season. Because of this water use pattern don't irrigate at the same frequency in spring as you do in summer.



Typical daily water use for alfalfa in inches per day over the season.

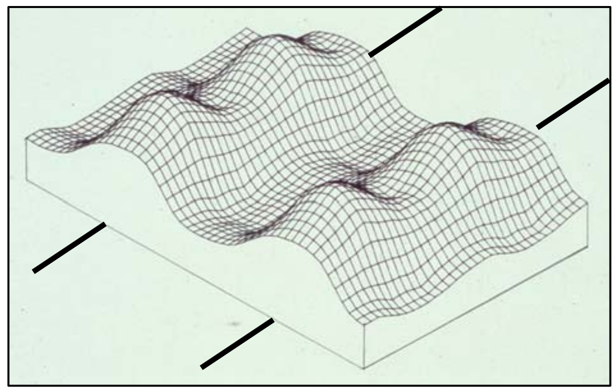
So in a dry year like this, it is best to irrigate early and monitor soil moisture to time the next irrigation. This can be done with soil moisture sensors like the Watermark sensors or just use a soil probe or auger. The key is that it is easier to start irrigating early in a dry year than it is to wait too long and then try to play catch up the rest of the season.

The goal with any irrigation system for forage crops is to apply the water as uniformly as possible. The more uniformly irrigation water can be applied the less extra water that is needed to ensure that nearly all the field is adequately irrigated and dry spots are eliminated. Distribution uniformity (DU) is a field measurement that is used to quantify how uniformly irrigation water is applied to a field. A distribution uniformity of 100 percent would mean that application is completely uniform and that all areas receive exactly the same amount of water. This is a theoretical goal but not achievable in the real world. A typical DU for a wheel-line system operating properly is 70-75 percent, while center pivots are 85-90 percent.

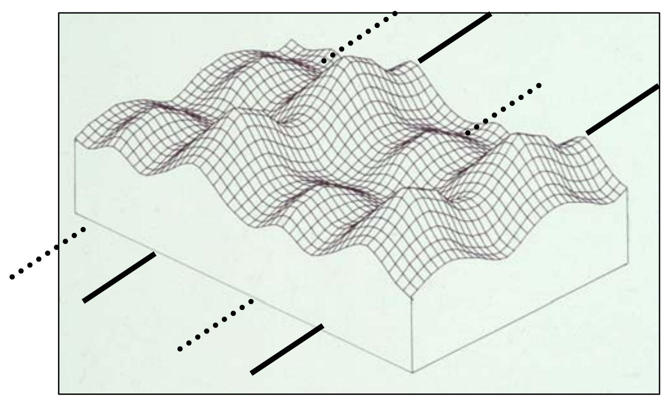
Improving Uniformity of Wheel-Line or Hand-line Systems

One of the reasons why center pivots or linears have better uniformity than stationary systems like wheel-lines or hand-lines is that they move almost continuously rather than remaining in the same location for typically 12 or 24 hours. Wheel-lines ordinarily apply significantly more water next to the sprinkler line (see figure at the right). Therefore, irrigation uniformity can be improved dramatically if the lines are offset from one irrigation set to the next. The sprinkler line would be placed in the middle between where the lines were placed on the previous irrigation. In so doing, areas of the field that were over- or under-irrigated on one irrigation are not likely to be the same areas the next irrigation. The uniformity can be improved dramatically. By offsetting the placement of irrigation lines from one irrigation to the next the distribution uniformity improves to 10 times the square root of the DU as measured with normal spacings. This is only a rule of thumb and may sound complicated but it is not. For example, if the DU of a wheel-line system is measured to be 70 percent, DU over two irrigations would improve to 84 percent (the square root of 70 is 8.3666; multiplied by 10 and rounded off is 84). This is a significant improvement in DU with a relatively simple change in management.

Placing the wheel-line in the center of two previous irrigation sets is not practical because with seven foot wheel-lines three rolls move the line 60 feet. Moving the wheel-line for a 30 foot offset (1.5 rolls) is not feasible for obvious reasons. However, offsetting the irrigation line one roll or approximately 20 foot would still be beneficial. In a study done by Bob Hill, Irrigation Specialist Utah State Univ., a wheel-line system had a coefficient of uniformity (another way of quantifying uniformity) of 62 percent on the 40 by 60 foot irrigation spacing. Uniformity improved to 87 percent when a 20 ft. offset (one revolution to the right or left of the previous wheel-line position) was used on alternate irrigations. The figure below to the at the bottom illustrates the improvement in uniformity that was achieved. Notice how the valleys (low areas of water application) were filled in by offsetting the placement of the wheel-line of the subsequent irrigation set. This is a simple yet practical way to improve irrigation uniformity.



Water Distribution with a 40 ft. nozzle spacing and 60 ft. wheel-line moves. The lines represent the placing of the wheel-lines. The coefficient of uniformity for this irrigation was 62 percent.



Water Distribution with a 40 ft. nozzle spacing and 60 ft. wheel-line moves when the following irrigation is offset 20 feet. The solid lines represent the placing of the wheel-lines for the first irrigation and the dashed lines represent the placement of offset placement of the lines on the subsequent irrigation. The coefficient of uniformity was improved to 87 percent by offsetting the lines by one roll (20 feet) on alternate irrigations.

FIELD CROP NOTES

DATED MATERIAL

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