New Life for Wheat-Fallow

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The wheat-fallow crop rotation was once the foundation of High Plains agriculture and pheasant populations. Today, researchers have found a new way to increase both profitability and pheasant production in this time-tested system.

photos by Randy Rodgers

Perhaps you remember the times when the wheat-stubble fields of the High Plains were loaded with pheasants. That combination was no accident. Those birds were the by-product of a cropping system that meshed beautifully with the pheasant's annual needs — the wheat-fallow rotation.

Designed for the semi-arid conditions of the High Plains, the wheat-fallow rotation produced only one wheat crop every two years. The 14-month fallow period between harvest of one crop of winter wheat and the planting of another permitted accumulation of moisture in the soil and reduced the risk of crop failure. Many farmers allowed weeds to grow in the stubble after wheat harvest. While weeds and farming were perceived by some as incompatible, the practicality of letting weeds grow after wheat harvest in wheat-fallow had been proven in several High Plains agronomic studies.

Pheasants were able to nest very successfully in the abundant green wheat, but took particular advantage of the 14-month fallow. The weed growth at the beginning of fallow was a key to their abundance. Pheasant chicks depend almost entirely upon insects and other arthropods for food in their first two-months of life, and these broad-leaved weeds were the primary source of those insects.

Not only did the weeds harbor this essential food source, their structure provided just the right habitat for broods. At ground level, chicks were able to move about freely to search for insects under a weedy canopy that branched above their heads. That same overhead canopy provided shelter from the hot summer sun, from drying winds, and from pelting storms. Equally important, the weeds concealed them from predators. Just imagine yourself walking through a cool, green forest and you'll get a fairly decent idea, on a different scale, of what it's like for chicks under a canopy of broad-leaved weeds.

In winter, this combination of broad-leaved weeds and stubble offered food, shelter, and concealment. The birds literally never had to leave the field. It was all right there.

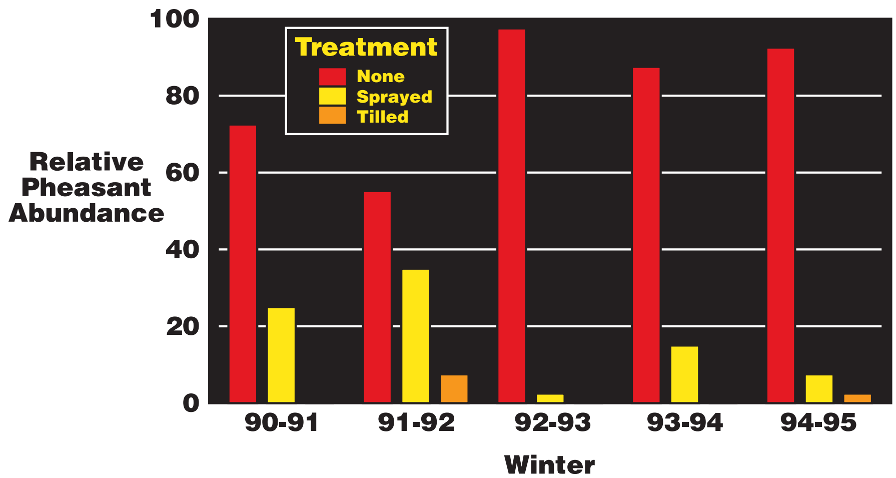
As the days lengthened, new growth of the next wheat crop in nearby fields would draw pheasants away from the weedy stubble, typically just in time to avoid spring tillage. And so, the cycle would start again. The needs of their entire life cycle had been provided by the different phases of the wheat-fallow system.

Weed growth in wheat stubble once provided excellent habitat for High Plains pheasants.

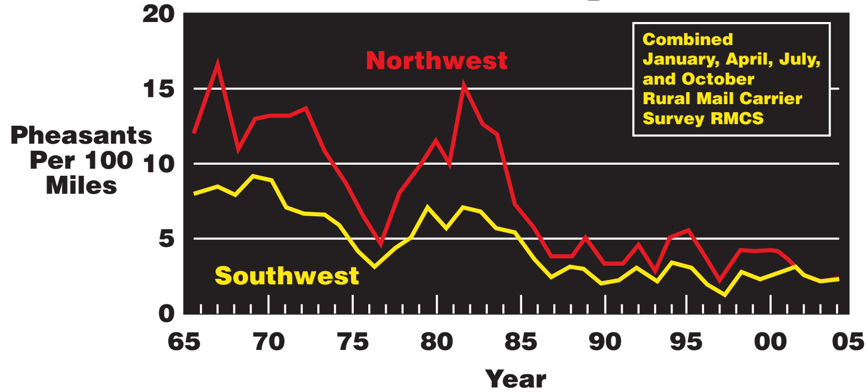
The Decline

By the 1980s, economic pressures and research-driven agricultural intensification was rapidly changing farming practices on the High Plains. Agricultural researchers increasingly considered wheat-fallow's 14-month idle period a waste. They had already found ways to insert more crops, even thirsty crops like corn, into new High Plains rotations. One crop in two years with wheat-fallow seemed inefficient compared to two crops in three years, or even three in four, with the new rotations. A 1987-91 comparison of four variations of the old wheat-fallow rotation to three modifications of a new wheat-sorghum-fallow system concluded that wheat-fallow could not compete economically with the new systems.

Effect of Post-harvest Weed Control on Pheasants



Western Kansas Pheasant Population



Wheat stubble cut short and sprayed with herbicide after harvest is nearly useless for wildlife

But a fundamental requirement of the new, more-intensive rotations was thorough weed control. The practice of letting broad-leaved weeds grow after wheat harvest, as was once common in wheat-fallow, was replaced with an herbicide application not long after the combines left. Instead of a green growing habitat where insects were abundant and available, post-harvest wheat stubble became sterile and nearly lifeless in the new systems.

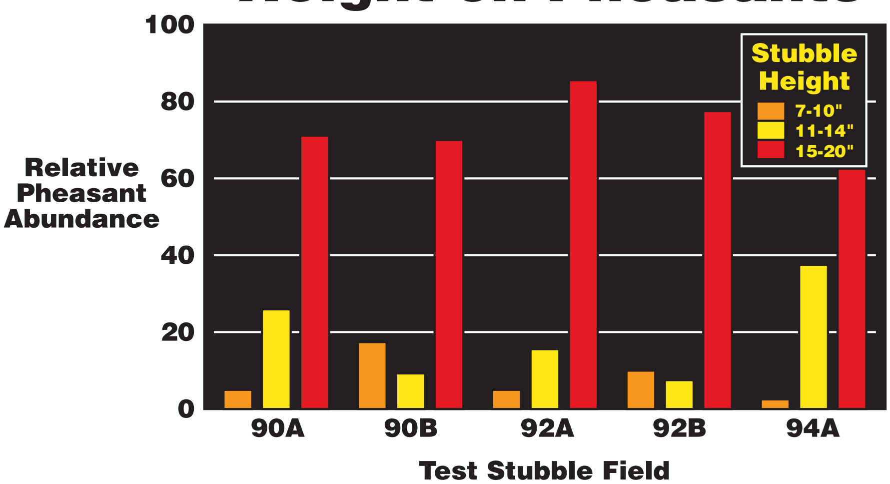
The subsequent reduction in the stubble's quality for winter cover was no less dramatic. Research conducted in the early 1990's showed that herbicide-treated wheat stubble harbored an average of only 16 percent of the pheasants found in traditional weedy wheat stubble. The same was true for many smaller species of wildlife.

Advances in agricultural engineering and genetics also had an effect. As combines became more powerful and efficient, it became possible for harvesters to lower combine headers in an attempt to cut even the shortest tillers in the wheat stand. Over the same period, wheat breeders had created and popularized strains of wheat that were shorter and more resistant to lodging than earlier varieties. The net result of these changes was shorter wheat stubble and poorer wildlife habitat. Studies showed that untreated stubble 7-10 inches tall supported an average of just 11 percent of the winter pheasant use as occurred in untreated stubble 15-18 inches tall.

In less than two decades, this combination of post-harvest herbicide application and shorter height caused wheat stubble habitats in western Kansas to lose most of their capacity to produce or sustain pheasant populations.

Other research indicated that even the addition of Conservation Reserve Program (CRP) grasslands could not compensate for this loss of weedy wheat stubble. CRP fields offered little in the way of food to pheasants and averaged only 37 percent of the winter pheasant use as was supported by weedy wheat stubble. Prospects for High Plains pheasants seemed grim.

Effect of Wheat Cutting Height on Pheasants



A New Approach

Progress in any field always builds upon previous knowledge. And so it was that several agronomic principles gleaned from earlier High Plains research provided the foundation for a new approach to the wheat-fallow rotation:

(1) Studies have shown there is typically little moisture left in the soil after wheat harvest and, while some years are exceptions, it's difficult to store much soil moisture during the summer after wheat harvest. Factor in the relatively high amount of runoff from summer thunderstorms and the evaporation caused by hot, windy conditions, and it's easy to understand how late summer soil moisture storage is limited.

(2) Moisture from snow accounts for less of our overall annual precipitation than rain, but snow's value for crop production is proportionally greater than it might appear. About 80 percent of the moisture we receive from snow actually penetrates deep enough into the soil that it can be effectively stored for availability to the next crop. That's 3 to 4 times the "moisture storage efficiency" obtained from an average August thunderstorm. Of course, storing soil moisture from snow requires that the snow be held on the field. If high winds blow the snow off a field, then little or no moisture will be stored.

(3) Overall, the greatest amount of soil moisture storage on the High Plains occurs in the spring when precipitation is most frequent, and soil and air temperatures remain relatively cool. Frequent precipitation in spring means that the moisture from the latest rain will help force remaining moisture from previous rains deeper into the soil. Cooler spring soil and air temperatures slow evaporation from the soil, yielding a greater chance that moisture will accumulate.

From a pheasant's perspective, the choice is obvious. Compared to sprayed wheat stubble (left), weedy stubble provides pheasants better concealment, a physical barrier to predators, more food, and far superior protection from the weather. The increased amount and height of residue provided by broad-leaved weeds can also aid in moisture conservation.

(4) There is a positive relationship between the amount of surface residue (dead plant matter) and the efficiency with which moisture is stored in the soil. Plant residues cushion the impact of raindrops on the soil, preventing the break up of soil particles that can seal the soil surface. With plenty of residue, the soil surface remains porous and can take in moisture more rapidly. What's more, residue also helps keep wind from reaching the soil surface, reducing evaporative moisture losses. The bottom line on the High Plains is simple; the more residue on the soil, the better the soil moisture conservation.

(5) Taller and more upright plant residues are more effective in fostering soil moisture storage. There are two main reasons for this. Anchored, upright residue can catch and hold much more snow, particularly when wind accompanies the snowfall. During warmer periods, upright residue is also much more effective at reducing wind at ground level, and that translates into less evaporation. Pound for pound, anchored, upright residues are more effective than flattened residues at conserving moisture: the taller the better.

(6) An extra inch of stored soil moisture has been estimated to increase High Plains wheat yields by four to six bushels per acre. With that much grain yield in the balance, it's clear that farmers must try to minimize moisture losses to the wind; whether that's moisture lost to snow blowing off their fields or moisture lost to evaporation during the growing season.

With those six principles in mind, a new approach to wheat-fallow was developed. What if we let weeds grow after wheat harvest? Weed growth would sacrifice much of any soil moisture left unused by the wheat, plus some of that which might otherwise be stored in late-summer. But weed growth also provides tall residue that, when added to the stubble, could catch more snow and reduce evaporation better than either tilled or sprayed stubble alone. Could the late summer moisture sacrifice from growing weeds be outweighed by the subsequent winter and spring moisture-conserving benefits of this added, taller residue? How might this affect future grain yields? Would the input savings from not spraying or tilling stubble between wheat harvest and spring be enough to justify growing weeds?

To be sure, maximizing the moisture-conserving benefits of this taller, weedy residue would require that it remain both anchored and essentially undisturbed during

Agronomic research at the Kansas State University's Southwest Research-Extension Center at Tribune compared Conventional-Till, No-Till, and Delayed Minimum-Till (DMT) variations of the wheat-fallow rotation for yield and profitability. While the No-Till system produced the greatest grain yields, the DMT system was most profitable. The Conventional-Till system, with it's post-harvest tillage, produced the poorest yields and almost no profit.

spring, when the potential for moisture storage is greatest. To do that, a spring herbicide treatment would be necessary.

The Research

To answer these questions, research was designed and conducted at the Kansas State University Southwest Research-Extension Center at Tribune. The new wheat-fallow system used no post-harvest tillage or herbicide application, leaving the wheat stubble undisturbed until the following spring. Once weed growth resumed in spring, a single contact herbicide application was used to control that growth while maintaining the weedy residue anchored and upright through early summer. Any subsequent weed control operations (usually three) needed in summer were performed with subsurface tillage using sweeps (undercutters). This summer subtillage also served as seedbed preparation for the next crop. The new wheat-fallow modification was dubbed Delayed Minimum-Till or DMT.

Work began in 1995, and for six cycles, the DMT system was compared to two other more typical wheat-fallow systems. In the Conventional-Till system, weeds were controlled after wheat harvest and throughout the following spring and summer with subsurface tillage using sweeps. This involved two sweep operations between wheat harvest and frost, plus five more passes the following spring and summer. The No-Till system required five herbicide applications to control weeds throughout the 14 month fallow period: two treatments between harvest and frost, plus three more the following spring and summer.

Everything else was kept the same for each of these three wheat-fallow systems. Each system was randomly assigned to four of the 12 test plots, with buffers between them. Having two sets of these 12-plot areas allowed harvest data to be collected every year of the study. Each plot was fertilized, seeded, and harvested in the same way. And each received the same late winter herbicide application to the green wheat for cool-season weed control. Soil moisture was sampled using a hydraulic probe shortly after harvest, in the fall, in spring, and again prior to wheat seeding.

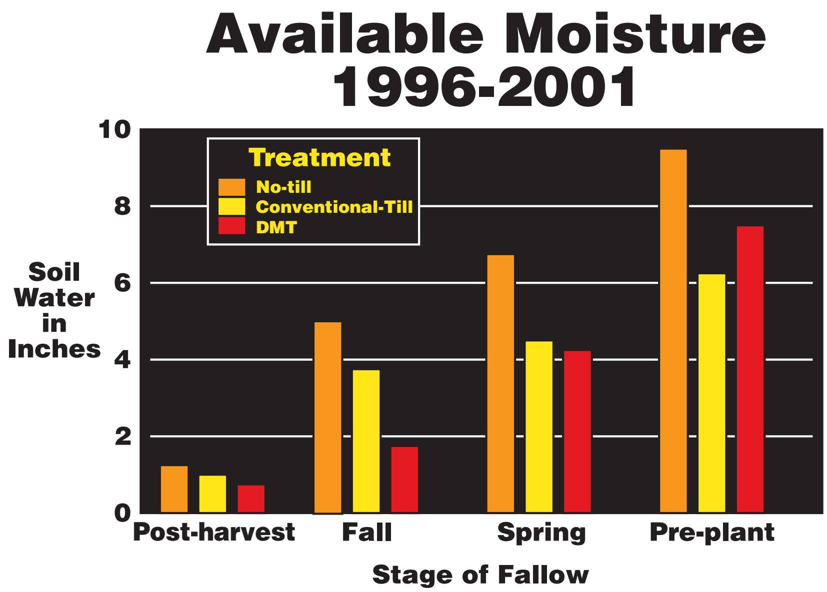
The Results

Wheat yields in 1996, the first harvest year, were surprising. The DMT system proved to be the top yielder at 42 bushels per acre. That was 6 bushels better than the 36 bushel yield in the No-Till system and double the 21 bushel yield of the Conventional-Till system. In terms of profitability, the DMT system returned $118 per acre compared to less than $8 for the Conventional-Till system and $60 for the No-Till system that year.

The last harvest year of the research, 2001, was a counterpoint to 1996. That year, the DMT system was the poorest yielder and least profitable. The fallow period preceding the 2001 harvest provided virtually no significant winter or spring moisture. Predictably, the DMT system wasn't able to compensate for the moisture lost to post-harvest weed growth, given there was no moisture to store, with a resulting net loss of just over $5 per acre.

While these extremes were instructive, it's the long-term averages that count. The No-Till system ultimately yielded the best, averaging 53 bushels per acre over six years. The DMT system still faired well, with a 44 bushel average, and the Conventional-Till system came in with an average of about 37 bushels per acre. The No-Till system was the top yielder in 5 of the 6 years of the study, with the DMT system best in 1996. Perhaps most significantly, the Conventional-Till system, with it's post-harvest tillage, yielded the worst in 5 of the 6 years.

The soil moisture data clearly explain these results. Because the No-Till system controlled weed growth during all phases of the 14-month fallow and maintained erect, anchored residue, it had the most stored soil moisture through the first fall, in spring, and at planting time. The Conventional-Till system prevented moisture loss to



Even during stressful winter conditions, the weedy stubble provided by the DMT wheat-fallow system offers an abundance of micro-habitats that pheasants can use.

post-harvest weed growth, but was not very effective at storing moisture thereafter because the stubble was repeatedly disturbed and no longer anchored. As expected, the DMT system had the least available soil moisture by the first fall because weeds had been allowed to grow after harvest. But by spring, the extra upright residue provided by DMT had compensated for the moisture lost to weed growth. At planting time, the DMT system had 1 inch more moisture stored in the soil compared to the Conventional-Till system. That extra inch nicely accounted for the seven-bushel yield increase of DMT over the Conventional-Till system.

If it's just wheat-yield bragging rights you're after, then read no further. But every farmer knows that the real bottom line is not yield; it's profit. And that's where the DMT system stood out, thanks to the cost cutting benefits of skipping post-harvest weed control. Troy Dumler, a Kansas State University agriculture economist based in Garden City, handled the economic analysis. He calculated the average net return for the DMT system at $39 per acre and DMT was the most profitable system in 4 of the 6 years. The No-Till system averaged a little over $30 and was most profitable in 2 years. Despite being the top yielder, the No-Till system's profitability suffered from high input costs. The Conventional-Till system came in with an average net return of just $3 per acre and was least profitable in 5 of 6 years.

If there was only one concept to be learned from this research, it's that post-harvest tillage of wheat stubble is a great way for High Plains farmers to cut their own financial throats. But another important lesson is that post-harvest weed growth is not detrimental to profit in the wheat-fallow system. The benefits gained by avoiding post-harvest expenses and growing additional residue will usually outweigh the loss of some post-harvest moisture. And that doesn't even take into account the wildlife benefits the DMT system can provide.

Favorable for Pheasants!

The DMT wheat-fallow system is about as good for pheasant production and survival as any High Plains cropping system could be. Provided the stubble is tall enough (> 15 inches), the weed growth that occurs after wheat harvest can offer ideal brood habitat. Little chicks are exceptionally vulnerable to weather extremes, insufficient food availability, and predation. Weedy stubble offers a favorable microclimate that's more humid, cooler on hot days, and warmer on cool days. Insect availability is high. Also, the overhead canopy provided by the weedy stubble not only conceals chicks, but also provides a structural barrier to predators. Simply stated, chick survival is high in undisturbed weedy stubble.

Over winter, the combination of broad-leaved weeds and tall wheat stubble provides excellent protection from cold winter winds at ground level, where pheasant live. Weedy stubble fields virtually always offer adequate cover, even in the worst of blizzards. Wind driven snow may drift shut the upwind side of a weedy stubble field, but most of the field further downwind will still furnish plenty of quality microhabitats that pheasants will find and exploit during severe conditions. Even if they're able to spot a pheasant in this cover, avian predators will find it difficult to crash through the rigid stems of weeds such as kochia and sunflower. Weed seeds produced the previous summer contribute a vital source of food that supplements the waste grain left by the combine. Being able to forage within this well protected habitat, instead of leaving to find food, further reduces a pheasant's exposure to predation. Again, their survival is enhanced.

Wheat-fallow, as it was traditionally practiced, had one very significant flaw when it came to pheasant production. Weed control in spring is absolutely critical for soil moisture storage during fallow, and that control was typically accomplished with tillage. Particularly in years when conditions slowed growth of the green wheat, hens place many nests in the previous year's wheat stubble. Any nests present in stubble are sure to be destroyed by disking or other forms of surface tillage. Some nests will survive subsurface tillage with an undercutter, provided no treaders are attached, but this alternative still leaves much to be desired.

At least 15 species of birds are known to nest in wheat stubble. New weed growth after wheat harvest helps shade and conceal this mourning dove nest.

The DMT system virtually solves this problem by controlling weeds with an herbicide during spring. Inevitably some nests will be crushed by the spray rig's tires, but this loss amounts to roughly 5 percent. That's nothing compared to over 50 percent loss with subtillage or 100 percent nest destruction with a disk.

While DMT clearly offers great advantages to pheasants, the wildlife benefits are certainly not limited to this one species. Past studies on the High Plains documented at least 15 bird species nesting in weedy wheat stubble. Research in Kansas also detected more species and much greater winter wildlife abundance in weedy wheat stubble than in stubble where weeds had been controlled after wheat harvest.

Spraying or tilling stubble after harvest creates ideal conditons for germination of volunteer wheat. Such conditions may harbor the wheat curl mite, carrier of the wheat-streak moasic virus. Permitting broad-leaved weeds to grow in stubble after harvest tends to limit germination and growth of volunteer wheat.

Other Considerations

Compared to Conventional-Till wheat-fallow, DMT offers several other agronomic benefits. The reduction in tillage and the added residue in the DMT system helps conserve organic matter in the soil. Organic matter is critical not only in allowing the soil to accumulate and hold moisture, but it also helps growing plants take up moisture.

Of course, the reduction in tillage and the added residue provided by DMT improves erosion control tremendously compared to the Conventional-Till system. That's true for both wind- and water-caused soil loss. The No-Till system may slightly outperform DMT in this regard because the residue is never tilled.

The taproots of broad-leaved weeds can provide other generally overlooked benefits. Taproots are capable of penetrating hardpans, a compacted layer of soil created by repeated tillage operations. The soil channels and improved soil structure left by decomposed taproots not only allow better moisture penetration but also help crops tap into that moisture. Weed taproots can also extract nutrients from deep subsoils, releasing them close to the soil surface when weeds decompose.

Broadleaved weeds in DMT tend to suppress the germination and growth of volunteer wheat. That's important because volunteer wheat harbors the wheat curl mite, the carrier of the Wheat-Streak-Mosaic virus.

In contrast, post-harvest tillage or spraying operations create an ideal situation for volunteer wheat germination; all that's needed is one significant rain. In practice, post-harvest weed control almost inevitably necessitates a second control treatment to kill the volunteer wheat released by the first treatment.

Some farmers have concerns that weed seed will build up in the DMT system and eventually cut grain yields. This concern isn't supported by the evidence. A 27-year study done in the Texas Panhandle, showed that yields in wheat-fallow were unaffected by letting weeds go to seed. Efforts to reduce weed seed banks in the soil almost inevitably lead to shifts in the types of weeds that grow and virtually never eliminate of all types of weed seed. Successful elimination of one weed species simply opens the door for other species. The weeds that result from such shifts often cause more problems than the species they replaced.

High Plains farmer Bruce Rosenbach believes the DMT system will pay off on fuel savings alone

Who Should Use DMT?

Farmers who currently use wheat-fallow are the best candidates for implementing DMT. The DMT system offers an opportunity to substantially increase profits over conventional wheat-fallow systems with little or no investment in new equipment, with reduced expenses, and with a very low chance of crop failure.

But DMT wheat-fallow isn't for everybody. Many High Plains producers have already made substantial investments in expensive no-till equipment and are committed to more intensive cropping systems with row crops. Given favorable moisture conditions, more intensive systems offer more profit potential than DMT. However, these intensive systems also require greater inputs and financial risk. That's particularly so if drought or excessive mid-summer heat significantly impacts row-crop yields.

DMT's greatest applicability is to drier areas of the High Plains where more intensive cropping systems are less feasible. But even in High Plains regions with somewhat more precipitation, DMT may have greater potential on less productive soils than row crops.

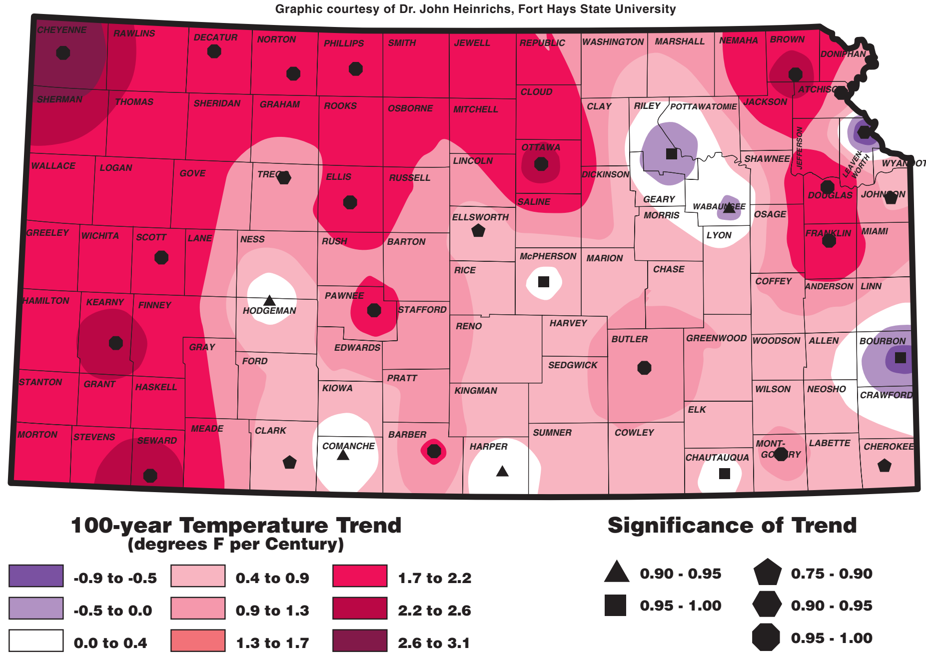
If long-term temperature trends continue, the High Plains may experience increasing frequency and severity of drought. Dr. John Heinrichs of the Fort Hays State University Department of Geosciences in Hays has analyzed 1901-2000 temperature and precipitation trends in the state of Kansas. He found that, over the last century, temperatures on the High Plains of western Kansas have increased an average of more than 2 degrees Fahrenheit. Precipitation also increased in some areas, but warmer temperatures will increase evaporative moisture losses, potentially creating drier overall conditions. These trends suggest that DMT wheat-fallow could play an increasing role in High Plains agriculture.

If producing wildlife, particularly pheasants, is important to a High Plains landowner, then DMT wheat-fallow should be given serious consideration. More landowners and producers are placing greater emphasis on wildlife production on their High Plains croplands. These landowners treasure the chance to offer their families and friends a great place to continue the hunting tradition.

Implementing DMT wheat-fallow is a great way to boost pheasant numbers on the High Plains. Not only will DMT produce far more birds, but these fields are also likely to attract pheasants from surrounding lands. Integrating practices like strip cropping and federally-subsidized grass wind strips, grassed terraces, or other buffers into a DMT system can create maximum hunting potential and financially solid models of soil and water conservation. If you own or manage cropland on the High Plains and pheasants matter to you, take that first step and contact us. We'll be glad to help.

Temperature Trends 1901-2000

Graphic courtesy of Dr. John Heinrichs, Fort Hays State University

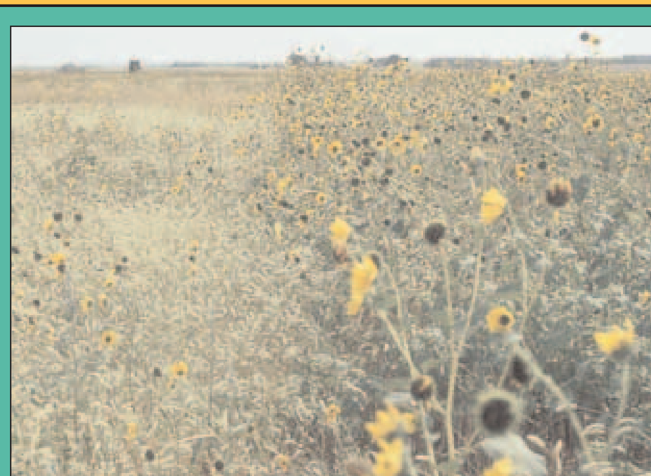


DMT Wheat-Fallow: Step by Step

Planting: Select wheat varieties adapted for your area with enough height potential to produce stubble at least 15 inches tall. Shorter varieties may not provide enough residue or stubble height for subsequent moisture conservation, wildlife habitat, or erosion control. Fertilize as needed.

From Planting through Spring: If control of cool-season broad-leaved weeds is needed, treat with non-residual herbicides (e.g. 2,4-D and Banvel) in late winter or early spring. Do not use herbicides with residual activity because such herbicides (e.g. sulfonylureas) will prevent subsequent growth in the stubble of broad-leaved weeds most preferred by wildlife. Residual activity herbicides are more likely to shift weed species from relatively benign warm-season species (e.g. sunflower) to more difficult-to-control species, especially grasses.

Harvest: Set conventional combine headers no lower than two-thirds the height of the primary wheat heads. If at all possible, resulting stubble should be a minimum of 15 inches tall. Little grain is present in low-level tillers and the quality is often poor. Setting the combine header too low forces the machine to process excessive straw which decreases threshing efficiency. This can cause a net loss of grain. Cutting wheat too short will also slow harvest, increase fuel consumption, accelerate parts wear, and increase the chance of combine breakdown. Tell custom harvesters to "keep the headers high!" This will also benefit them. Consider harvesting with a stripper header, particularly if wheat is less than 24 inches tall. Harvest fields inside-out giving young wildlife a better chance to escape machinery.



Combine header height makes a difference in subsequent moisture conservation and weed growth. Test cuttings revealed interesting results. Grassy weeds were more common in short-cut stubble, but sunflowers dominated the tall stubble at right. Tall stubble better reduces evaporation, leaving more moisture for plant growth and better pheasant habitat.

Taller stubble enhances moisture conservation by catching more snow and reducing evaporative moisture loss. A doubling of wheat-stubble height from 8 to 16 inches can increase pheasant use up to tenfold if broad-leaved weeds are permitted to grow after harvest. Taller stubble fosters more benign weeds, like annual sunflower. Shorter stubble tends to increase grassy weeds and Russian thistle.

Use of a stripper header leaves stubble nearly as tall as unharvested wheat. If broad-leaved weeds are allowed to grow in stripped stubble, the resulting cover provides tremendous pheasant habitat.

After Harvest: Do nothing. Unless an exceptional amount of soil moisture remains after wheat harvest, post-harvest weed control reduces profitability in the wheat-fallow system. Post-harvest weed control must be avoided if wildlife is important to the producer. Weed control at this time reduces chick survival and will decrease pheasant numbers in the stubble during fall and winter by an average of more than 80 percent.

Allowing broad-leaved weeds to grow after harvest will remove some moisture. But moisture subsequently gained as a result of the extra residue and increased height typically compensates for moisture lost to weed growth after harvest. Surface or subsurface tillage of wheat stubble, after harvest or in the fall, will decrease overall moisture storage, reduce yields, and minimize profit. Post-harvest herbicide application can increase yields but is not cost-effective in wheat-fallow.

Taller wheat stubble trapped much more snow than the short stubble on these test plots.

Early Fall: If bindweed control is needed, apply 2,4-D plus Tordon, Landmaster plus Tordon, or other appropriate herbicides soon after the first frost. Bindweed moves nutrients to its roots in early fall, so herbicides applied at this time are effectively translocated, resulting in optimum control. Early fall bindweed treatment will not significantly damage stubble habitat quality as desirable broad-leaved weeds have completed most growth by this time. Spot spray only affected bindweed areas to minimize habitat damage and reduce treatment costs.

Winter: Do nothing. Weedy stubble will effectively capture snow. Moisture in snow is much more efficiently stored in the soil profile than summer rains. Weedy stubble provides excellent winter cover for pheasants and many species of songbirds.

Spring: Spray the stubble/weed residue with a non-selective herbicide such as glyphosate (Roundup) after weeds have begun growth. This controls new weeds and maintains anchored, erect residue on the field for maximum moisture conservation when moisture storage potential is greatest. Avoid spring tillage because this loosens and reduces surface residues at exactly the time when undisturbed stubble is most valuable for moisture conservation. Spraying for spring weed control also minimizes nest destruction that would otherwise occur if tillage was used. Keep the stubble/weed residue undisturbed at least through June. A second non-selective herbicide treatment to control the next flush of weeds will optimize moisture conservation and extend the period of wildlife use through mid-summer.

Summer: Use subtillage, preferably with an undercutter, as needed for weed control after mid-summer. Potential for further moisture storage declines during the summer months due to hot, often windy conditions. When tilling, work the field "inside-out" to give young wildlife their best chance to escape the operation. Tilling a field from the outside edges inward tends to force broods toward the middle, where chicks may be lost through repeated exposure to the tillage . Late summer surface tillage with a disk is acceptable, if desired, for seedbed preparation. Remember to select taller varieties at planting time.

photo by Mike Blair

In the DMT wheat-fallow system, spraying for spring and early summer weed control permits most nests to survive and maintains anchored, upright residue when it's most needed for fallow soil moisture storage.

INPUTS VERSUS RETURNS:
THE BIG PICTURE

In Wheat-Fallow

IF ALL YOU CARE ABOUT IS

YIELD

THEN NO-TILL WHEAT FALLOW IS FOR YOU

BUT WHEN

YOU FACTOR IN THE COSTS OF

INPUTS

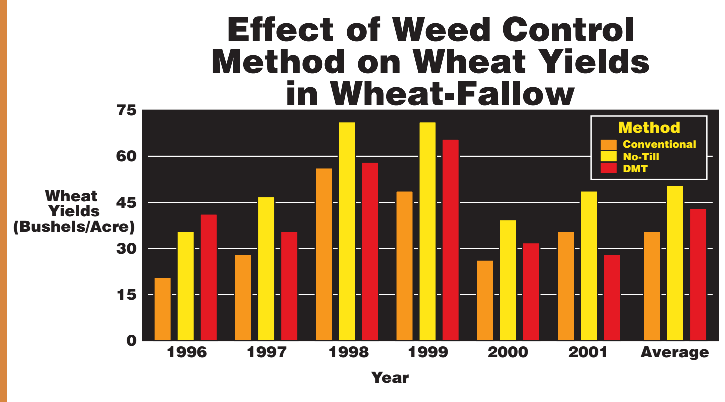
NO-TILL WHEAT-FALLOW IS THE MOST EXPENSIVE

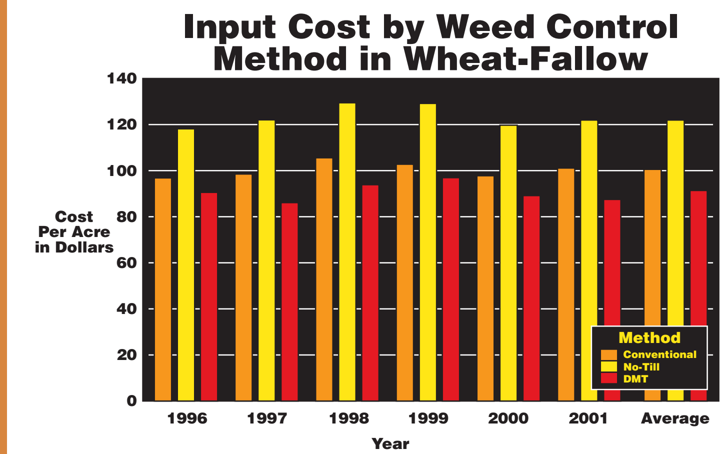
SO

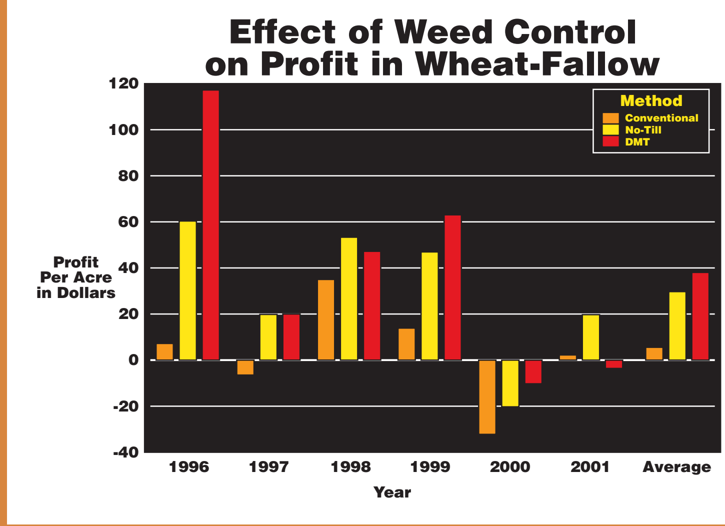
IF WHAT MATTERS MOST IS INCREASING YOUR

PROFIT

THEN LET THE WEEDS GROW AFTER WHEAT HARVEST AND SPRAY IN SPRING







INPUTS VERSUS RETURNS: THE BOTTOM LINE

Economic comparison of three wheat-fallow cropping systems tested at the KSU Southwest Research and Extension Center at Tribune, Kansas, 1996-2001. The No-Till **(NT)** system utilized herbicide weed control throughout the 14-month fallow period. Sweep tillage was used for weed control throughout the fallow period in the Conventional-Till **(CT)** system. The Delayed Minimum-Till **(DMT)** system used no post-harvest weed control, one herbicide treatment for initial weed control in spring, and sweep tillage for the remainder of the fallow period.

Inputs

	NT	CT	DMT	
Seed	$4.00	$4.00	$4.00	$ / unit
Rate	50	50	50	0.08 / lb.
Fertilizer	$28.56	$28.56	$28.56	$ / unit
N - Rate	70	70	70	0.23 / lb.
P - Rate	42	42	42	0.21 / lb.
Applications	1	1	1	$3.64 / ac.
Herbicide	$60.74	$6.75	$16.02	$ / unit
Landmaster	44	44	44	0.156 / oz.
Atrazine	0.6	0.0	0.0	2.69 / lb.
Fallow Appl.	5	0	1	
Banvel	2.0	2.0	2.0	0.72 / oz.
2,4-D	4.0	4.0	4.0	0.123 / oz.
Ally	0.05	0.05	0.0	24.24 / oz.
Gr. Wt. Appl.	1	1	1	
Total Appl.	6	1	2	$3.61 / ac.
Tillage / Planting	$5.83	$41.74	$21.22	
Sweep	0	7	3	$5.13 / ac.
Drill	1	1	1	$5.83 / ac.
Non-harvest Costs	$99.13	$81.05	$69.80	
Harvest				
Base	1	1	1	$13.20 / ac.
Extra Charge	20	20	20	0.13
Hauling				0.127

Harvest Costs

Year	NT	CT	DMT
1996	19.85	16.00	21.39
1997	22.42	18.31	19.85
1998	29.10	24.99	25.25
1999	29.10	22.94	27.31
2000	21.14	17.54	18.82
2001	23.96	20.11	18.31
Avg.	24.26	19.98	21.82

Total Costs

Year	NT	CT	DMT
1996	118.98	97.05	91.19
1997	121.55	99.36	89.65
1998	128.23	106.05	95.05
1999	128.23	103.99	97.10
2000	120.27	98.59	88.62
2001	123.09	101.16	88.11
Avg.	123.39	101.03	91.62

Returns

Yields (bu/ac)

Year	NT	CT	DMT
1996	36	21	42
1997	46	30	36
1998	72	56	57
1999	72	48	65
2000	41	27	32
2001	52	37	30*
Avg.	53.2	36.5	43.7

Price (Avg.)

Year	NT	CT	DMT
1996	4.98	4.98	4.98
1997	3.06	3.06	3.06
1998	2.53	2.53	2.53
1999	2.45	2.45	2.45
2000	2.45	2.45	2.45
2001	2.76	2.76	2.76
Avg.	3.04	3.04	3.04

Gross Returns

Year	NT	CT	DMT
1996	179.28	104.58	209.16
1997	140.76	91.80	110.16
1998	182.16	141.68	144.21
1999	176.40	117.60	159.25
2000	100.45	66.15	78.40
2001	143.52	102.12	82.80
Avg.	153.76	103.99	130.66

Net Returns

Year	NT	CT	DMT
1996	60.30	7.53	117.97
1997	19.21	-7.56	20.51
1998	53.93	35.63	49.17
1999	48.17	13.61	62.15
2000	-19.82	-32.44	-10.22
2001	20.43	0.95	-5.31
Avg.	***$30.37***	***$2.95***	***$39.05***

The Bottom Line