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Virginia Soybean Update

Volume 10, No. 4 **June 2007**

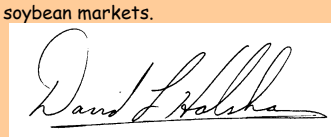
Dear Reader,

I held off on publishing this newsletter until the weekend to see if we received rain. It looks like we received ¾ to 3 inches of rain throughout Virginia. That's good! The question of planting into dry soils seems to arise at least every other year. So even with the rain, the first article may be useful to you in the future. Let's hope we're not again discussing this after wheat is harvested.

The second article relates to no-till planting. Most of you have been doing it for years, but I've found that even those experienced no-tillers occasionally forget the principles of making planters and drills work properly. Dr. Bobby Grisso has joined us in this issue to remind us of those principles.

I'm printing a few questions that I've received in the last month. Maybe you've wanted to ask a similar one.

The market is still looking good. It's actually better than when I wrote the last newsletter. I imagine that the demand for ethanol and biodiesel will continue with $3 gasoline. In the long run, the high fuel prices may be a good thing, at least for our corn and soybean markets.



Extension Soybean Specialist

In This Issue

Planting into Dry Soils - Recipe for Failure or Success?

This season seems to be shaping up to be a dry one. Dry weather during the vegetative stages is not as big of concern as during the reproductive stages. But, this is only true if we can get the crop out of the ground and establish a uniform and adequate plant population.

Small grains have extracted most of the available soil moisture, so double-crop soybeans could not only face a surface soil moisture deficit, but also a sub-surface deficit. Double-crop soybean need early-season moisture more than May-planted soybean because they are a leaf area deficit crop. In other words, that crop needs every drop of moisture it can get to put on enough leaves before bloom. In short, we need rain!

Should you delay planting until we get rain? From the standpoint of risking a poor stand, I'd say yes; but only through the first week of June. After about June 10, yield begins dropping rapidly with each day delay in planting. After mid-June, the risk changes from one of poor emergence to that of late planting. This latter risk increases with the number of acres left to plant. If you have large acreages left to plant (either full-season or double crop), then you may want to consider planting into the dry soils.

My general recommendation is to wait for rain, but planting into completely dry soils is an option. The danger is field variability. Some parts may be dry; others may have enough moisture to bring the crop up. Either way, the crop will be OK. If the seed doesn't imbibe any water, it will likely remain viable and germinate once the soil moisture situation improves. If the crop emerges, the roots will usually keep seeking moisture. The transition areas are the concern. Why? In these areas, seed may swell and begin to germinate. But, there may not be enough moisture to sustain germination. Then, the seed may die. I think that it's worthwhile to review the germination and emergence process here to better understand your choices.

Germination in soybean is triggered once the seed reaches a moisture content of 55%. Then after imbibing this water, the seed coat splits and then the radical (root) emerges. Until the roots find soil moisture, the seedling is dependent on seed moisture to continue germination and eventually emerge. The critical seed moisture content is 20%. If seed moisture remains above this, then germination will continue. If it falls below this, then the seed could, but not necessarily, die. Death will depend on how long the seed has been imbibing water, whether the seed coat has broken, and whether the radical has emerged.

If the seed has imbibed water for only a short period (say 6 to 12 hours), then the seed will have swelled, but it's not likely that the seed coat would have broken. If the moisture content of the seed then drops back to less than 15% moisture, germination will not be affected. Seed scientists actually use a similar process to "prime" seed for better germination. You may have done this with some garden seed. Those primed seed will store for months as long as they are stored at 10-15% moisture. This happens more than you think when planting into dry soils. We may think we are putting the seed into dry earth, but there is a significant amount of

Continued on next page

moisture in parts of the field. In those areas, the seed will swell then dry back down quickly.

If the seed has imbibed water for 12 to 24 hours, then the seed coat will likely break. The radical has not yet emerged, so the danger of the seed dying is less. In this instance, emergence could be reduced 30 to 40% of what was expected. Still, this doesn't mean we have to replant. Research shows that we can lose up to half of our stand and not see a large yield reduction. But, with poor emergence comes non-uniform stands, which is more of a problem than low plant populations. Gaps greater than 2 feet or portions of the field not emerging will cause much greater yield loss than low uniform stands.

The worst-case scenario is that the radical emerges and seed moisture drops back to 10 to 15%. Then, the seed will die. Stand will be severely reduced and re-planting will likely be necessary.

So, what do we do? If the number of acres left to be planted is not large, then wait for the rain. Large yield loss from delayed planting will not begin until mid-June

After mid-June, we need to reconsider this strategy. On average, we'll lose about ½ of a bushel per day delay in planting. Such a yield loss is not guaranteed, nor is it guaranteed that yield loss will begin by mid-June. The amount of yield loss and the date the decline will take place is highly dependent on the weather conditions in July and August. Good soil moisture at planting and adequate rainfall afterwards will help insure adequate canopy development, therefore less yield loss from delayed planting.

But, I don't imagine that we have an adequate supply of soil moisture in most areas, especially after small grain harvest. Unless we get several inches of rain between now and July to recharge the subsoil, we should assume that the young plants will be struggling to produce leaf area. Timely double-crop planting may be more important than ever.

Come mid-June, if you have large acreages remaining to plant, my suggestion is to go ahead and plant into the dry soil and wait for a rain. Only if you can get your entire crop planted within a few days after the rain can you economically justify waiting for the rain. Of course planting into dry soils is dependent on whether you can get the seed into the ground. On a hard (not compacted) soil, it will take nearly 500 pounds of down-pressure per planting unit to penetrate the soil to the proper depth. Depending on your equipment, you might not be able to achieve this. Even if you can transfer this amount of down-pressure to the planting units (most no-till planters and drills are capable of this), you will have to add lots of weight, especially to a drill.

There is concern about "baking" the seed. This is a legitimate concern if the soil is bare. But the wheat straw show give some shade and cover to keep the soil temps down. All the seed won't die from the heat. Fewer plants per acre will have less of a yield impact than a week or two delay in planting.

Of course, these recommendations will be highly dependent of our rainfall. There is a chance of rain this weekend (June 3). Let's hope we get it. That will solve many potential problems.

Cut the Residue
Penetrate to the Proper Depth
Insure Soil-to-Seed Contact

Bobby Grisso & David Holshouser

One of the most enjoyable experiences of serving as an Extension Specialists in Nebraska was interacting with Mr. Paul Jasa, agricultural engineer and one of the world's foremost authorities on setting planters and drills in reduced- and no-tillage conditions. It seems he could take any planter or drill, modify it slightly, and then set it to plant through nearly any amount of residue. While in Nebraska and with Paul's help, we planted through 10+ tons/acre of switchgrass residue that has accumulated from 10 years of CRP and through nearly the same amount of residue left from 220 bushel corn. Simple adjustments allowed the same planter or drill to plant in any soil, regardless of clay content or hardness/compaction. Paul stressed three principles (or steps) for no-till planting: 1) cut the residue; 2) penetrate the soil to the proper seeding depth, and 3) insure good soil-to-seed contact. When you think about it, these principles are intuitive. But, performing each of them (in order) is sometimes a challenge. To some, the steps are easier said than done. But, by keeping these principles constantly on our mind, we've found them to greatly assist us when modifying or adjusting a planter/drill for difficult no-till conditions.

With continued dry weather, planting soybean into high-yielding barley or wheat may present a challenge. There could potentially be a lot of residue and the soil might be hard. But, following the three principles above and understanding how to achieve them will result in good soybean stands.

Step 1: Cut the Residue

Condition of the Field and Residue. Management of the small grain residue and weed control are key factors for successful no-till equipment operation. If residue and weed issues are not managed, then the ability of the planter or drill to perform its functions is greatly limited.

The residue has to be uniformly spread behind the combine. The planter/drill will not perform correctly if the combine has left a narrow swath of thick residue and chaff. The first step of cutting the residue cannot be accomplished under these conditions. Therefore, spread the residue! Better yet is to use a stripper combine header. Less residue on the surface means there is less to cut. Even with a stripper header, the chaff must be spread. We don't really cut through the piles of chaff. Instead we till it into the seed slot; thereby fouling up the third step of insuring good soil (not chaff)-to-seed

contact. Chaff in the seed zone will only pull moisture away from the seed.

Another key is weed control. If standing weeds exist, the planter/drill must cut and move extra living plant material through the system. Weeds that have a head start on the crop will compete for light, water, and nutrients more than weeds emerging with the planted crop. Therefore, weeds need to be controlled before crop emergence or soon afterwards to prevent yield loss.

Allow the residue to dry and become crisp before planting. Planting too early in the morning is one of the biggest mistakes that we make. Regardless if the planter is set right or not, cutting wet or tough residue is a challenge that might not be overcome. Remember, 75% of the yield is established when you put the seed into the ground. Don't get in a big hurry; allow the residue to dry.

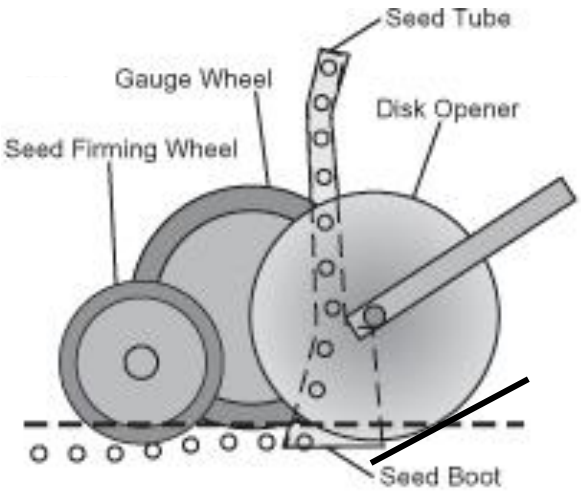
A final comment about residue management, that shouldn't have to be spoken, is warranted– **Don't burn the straw!** The straw is a valuable resource. Burning will remove any nitrogen and carbon and send it up in the air. This adds to pollution and throws away probably our two most important resources in producing a good crop and improving soil quality. If you don't have the planter to perform the steps to be listed, then consider bailing the straw. And, please don't underestimate your or your planter/drill's ability to get the seed into the ground.

Adjust the disk openers. For double-disk openers, maintain approximately 1 to 1½ inch of contact between the two disks. Adjustment washers are found in the double-disk opener assembly, which allow some adjustment to compensate for wear. Machine bushings located on the spindle between shank and disc blade can be added or removed as required to maintain contact. As the blade diameter decreases because of wear, it will be necessary to remove the machine bushings. If 1 to 1½ inch of blade-to-blade contact cannot be maintained after removing machine bushings, if blade diameter is worn below the manufacturer's recommendations, or if the blade edge is bent, chipped, or jagged, the blade should be replaced.

Operators of no-till planters/drills with offset double-disk openers need to watch the leading edge of the double-disks for significant wear. Single-disk openers are also subject to similar wear. Essentially, the leading edge of the disk takes the abrasion and wear of cutting straw or stalks and penetration into the soil. The leading and trailing disks typically are two different parts and cannot be interchanged. As the double-disk openers wear, check the gap between them. If a gap opens between the double-disks, they will push residue into the furrow and have less ability to cut the residue. For offset double-disk openers, a business card-width gap should be maintained to prevent the trailing disk from cutting into the leading disk blade.

Check end play of the disk opener by shaking it from side-to-side. With the single-row ball bearings, some end play will be normal. The disc is stabilized by the contact between the double-disk openers. However, if end play is excessive and the bearing sounds dry when turned, replace bearing/hub assembly or complete disc assembly. Also, check to see that the bearing hubcap is in place. Replace the hubcap if it is lost or damaged.

Adequate down pressure is most important. You may think that we're skipping to Step 2 before we finish our discussion on cutting the residue. You're partly right, we are – sort of. Keep in mind that you much approach these steps in order; but, practices and adjustments within each step may overlap. To adequately cut the residue, we must penetrate the soil to the proper depth (Step 2). Why? This is because we want the coulters and/or disk openers acting like a pair of scissors. The below illustration may help. Note that the coulter is running at the proper depth and the contact angle between the coulter and the soil is about 45^{O}. At this angle, the cutting is scissor-like and residue will be cut. Think about the way a pair of scissors cuts. When open too wide, it doesn't work. Nor would the scissor work well if you disassembled the tool and tried to press the two cutting edges together at the wrong angle. Keep in mind that the size of the coulter will affect this angle; bigger is usually better.



Step 2: Penetrate the Soil to the Proper Seeding Depth

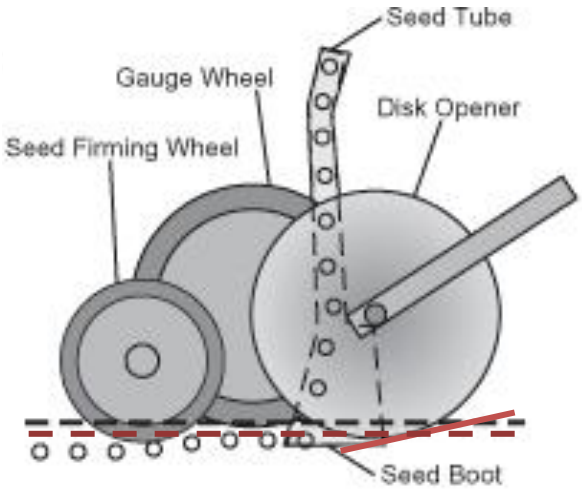
The primary differences between conventional planter/drill systems and those designed for conservation tillage systems are down pressure and weight. Since openers and soil engaging devices must deliver more down pressure to penetrate firmer no-till soils and cut the residue, conservation planter/drill systems include heavy-duty down-pressure devices, are built heavier, and have the ability to carry much more weight than conventional tillage systems.

Individual planting units should be equipped with heavy down-pressure springs. In some conditions, the amount of down-pressure required to penetrate the soil will require 500 pounds per planting unit. Usually down-pressure springs are adjustable and multiple springs can be added if insufficient pressure is achieved. Only after adequate down-pressure is achieved are we ready to add weight to the planter/drill. **Adding weight by itself will not ensure penetration to the proper seeding depth.**

Add sufficient weight to the planter to ensure penetration of the coulters and seed furrow openers into untilled soil, and to keep the seed-metering drive wheels on the ground.

Let's do some weight calculations. We have a 15-row 15-inch planter. We've achieved at least 400 pounds of down-pressure per row unit with two heavy duty down-pressure springs not quite set for maximum down-pressure. So, 15 units x 400 lbs/unit = 6,000 pounds. Does the planter weigh enough, or do we need to add weight? Now, consider a 15-foot drill with 24 7.5-inch spaced units. With this number of units, we need at least 9,600 pounds (24 x 400) to make the drill work correctly.

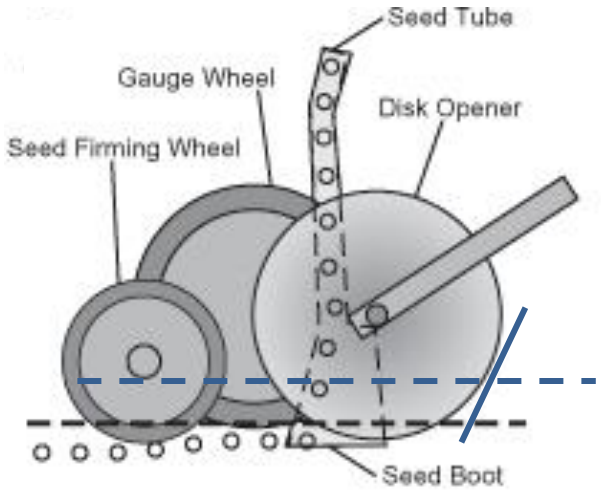
Here are a couple of common scenarios. Let's assume that we don't have adequate down pressure. The scenario would look something like this (the dashed red line is the soil surface):



First, we would not cut the residue because the angle of cut is wrong. We would however be pushing the residue into the seed furrow. Residue in the seed furrow prevents good soil-to-seed contact (Step 3). In addition to the seed drying out due to the residue in the seed furrow, we have a shallow planted seed.

Soybean seed depth should be between ¾ to 1¼ inches. If topsoil moisture is lacking, use the deeper placement, but never plant deeper than 1½ inches. If topsoil is adequate shallower seed placement may speed up emergence, but probably won't make much difference under warm soil conditions. Just make sure that the seed is in contact with moist soil. Placement depth is controlled by the gauge wheels (but only if we can penetrate the soil with adequate down-pressure and weight). Ideally, these should be adjacent to the disk opener. If controlled by the seed firming/closing wheel, then uniformity of seed depth could be erratic.

Now, let's consider too deep of a placement from improper adjustment (figure with blue lines). Not only will this delay and possibly prevent emergence, we will not likely cut the residue. Instead, we will be pushing it. Notice the angle created by running the planter too deep (and I've seen planters/drills run deeper than what is illustrated). There is no scissors action. Pushing the



residue causes planters, and especially drills to drag up piles of residue.

Another thing to keep in mind is different soil types within a field. If the planter/drill moves out of heavier soil into a lighter soil or if the planter moves from compacted land to that which is not compacted, the planter will tend to sink and begin dragging up residue. The same principle applies; we begin cutting too deep and pushing the residue. Never set the planter on the field edges where the soil is more likely to be compacted or in an unrepresentative soil. Wide gauge wheels usually helps with this. Wide gauge wheels, drill units that do not run side-by-side and high clearance will go a long ways towards reducing residue dragging when in a field with highly-variable soil types.

Although not necessary, coulters can be added in front of the planter openers to ensure residue cutting. Like double-disk openers, the cutting angle must be correct. For adequate coulter penetration, weight may have to be added to the carrier. Some planter/drills use a weight transfer linkage to transfer some of the tractor weight to the coulters to ensure penetration. Because coulters are usually mounted several feet in front of the seed opening/placement device (in the case of coulter caddies even further), many use wide-fluted coulters. A pivoting hitch or a steering mechanism will keep the seed openers tracking in the coulter slots.

Step 3: Insure Good Soil-to-Seed Contact

Good soil-to-seed contact cannot be achieved unless the first two steps are performed correctly. If the first two steps were carried out correctly, the last step will be much easier.

Press Wheels and Depth Control. There are two methods for seed-depth control on most no-till planter/drill systems: 1) setting the depth from a gauge wheel adjacent to the seed furrow device or 2) adjusting press wheel pressure behind the seed furrow openers. The disadvantage of any system using the press wheel for depth control is its distance from the seed opener. As the distance increases there is a greater possibility that irregular terrain will influence both depth control and the

press wheel's ability to provide good soil-to- seed contact. Therefore, depth control from an adjacent gage wheel is preferred. In either case, keep adequate pressure on the gauge or press wheel to force the openers into the soil to the proper depth. A harrow behind a drill ensures seed coverage and redistributes residue for effective conservation measures.

Regardless of the depth control, wide-flat press wheels are unacceptable for no-till since they will ride on the firm soil adjacent to the seed furrow and will not firm the seed into soil. On the other hand, a wide press wheel equipped with a rib that runs on each side of the seed furrow or a rib that runs directly over the furrow to press the seed works well. Another option is to use a pair of angled press wheels behind the opener to close the seed furrow at the same time. When using angled press wheels, make sure that pressure is not placed on the seed furrow to the point that a ribbon of soil moves the seed up. If available, adjust the angle such that the angle of the press wheels meets at the seed depth. Most planters are set for 1¾ inches for proper soil-to-corn seed contact. Therefore, they will have to be adjusted for soybean, cotton, or other more shallow planted crops. Press the seed, not the soil below the seed.

Sufficient weight must remain on the press wheels to ensure firming of the seed into the soil. Wet soil is easily compacted and care must be taken not to over pack the soil, making it difficult for seedling roots to penetrate the soil. In dry soil conditions, extra closing force may be needed. The key is to evaluate seed-to-soil contact, not the top of the seed-vee. As long as the contact is maintained, something as simple as a harrow that acts to close the top of the vee and pull light residue cover back over the vee may be all that is needed. This is a common practice on drills that use a narrow press wheel.

Cut the Residue, Penetrate the Soil, and Insure Soil-to-Seed Contact

These three principles will make you successful at no-tilling soybeans, or any crop for that matter. More detailed information can be found in the Virginia Cooperative Extension publication 442-457, "Planter/Drill Considerations for Conservation Tillage Systems." Contact your local county extension office to obtain a copy. Or you can view and obtain a copy on the web at http://www.ext.vt.edu/pubs/bse/442-457/442-457.html.

Questions & Answers:

The following are a few questions that have been addresses to me over the past couple of weeks. Usually if one asks, others would like to know the answer as well.

Q: Should I keep on planting into dry soils?

A: No.

Q: Do I need a fungicide seed treatment for double-crop soybeans?

A: No. Fungicide seed treatments are generally needed when emergence is delayed due to cool and moist soils. The longer the seed stays below the ground, the more likely it will be attacked by a fungus. With double-crop plantings, plants will usually emerge within a week.

Q: Should I keep on planting into dry soils?

A: Yes.

Q: What does molybdenum deficiency look like?

A: Molybdenum (Mo) is the least abundant nutrient in the soil, but is essential for all plants. Fortunately, it is the nutrient needed in the smallest amount by soybean. Plus, our soils have enough of it to meet the soybean crop's needs. Mo is involved in N metabolism in the plant. It is involved in transforming nitrate N (NO_3) to usable ammonia N (NH_3). Mo is also essential for N fixation; if Mo is unavailable to the roots, nodulation will be slowed and not effective. Finally, Mo is important in transforming N to protein. So, Mo deficiency will look exactly like nitrogen (N) deficiency because that's basically what it is.

Q: If Mo is needed in such a small amount and the soil has enough of it to meet the soybean's needs, why do I have a Mo deficiency? How do I correct it?

A: Mo becomes unavailable for uptake under acid soil conditions (less than 5.8). In most cases it appears when the pH is 4.8 to 5.4, or less. So, the answer is to lime the soil to a pH between 5.8 and 6.2. Lime will take about 6 months to become effective. If applied now, the full benefit of the lime would not be realized in this year's soybean growing season. Even so, if you know the soil is acidic at planting, put the lime on. Then, apply Mo as a seed treatment at 1 oz of elemental Mo per acre. Mo can also be applied as a foliar spray at ½ lb/acre.

Q: Should I keep planting into dry soil?

A: Maybe, it depends….

Q: I have clover encroaching on the edges of my Roundup-Ready soybean fields. My burndown of Roundup + Valor turned it a little yellow, but did not kill it. Is there anything I can add to my glyphosate to control this "weed"?

A: There is nothing to add to the glyphosate to improve control. On these field edges, use 1.5 lbs ae/A of glyphosate. In the off-season, control the weed with 2,4-D or dicamba. *(Thanks to Henry Wilson and Scott Hagood for their input here!)*

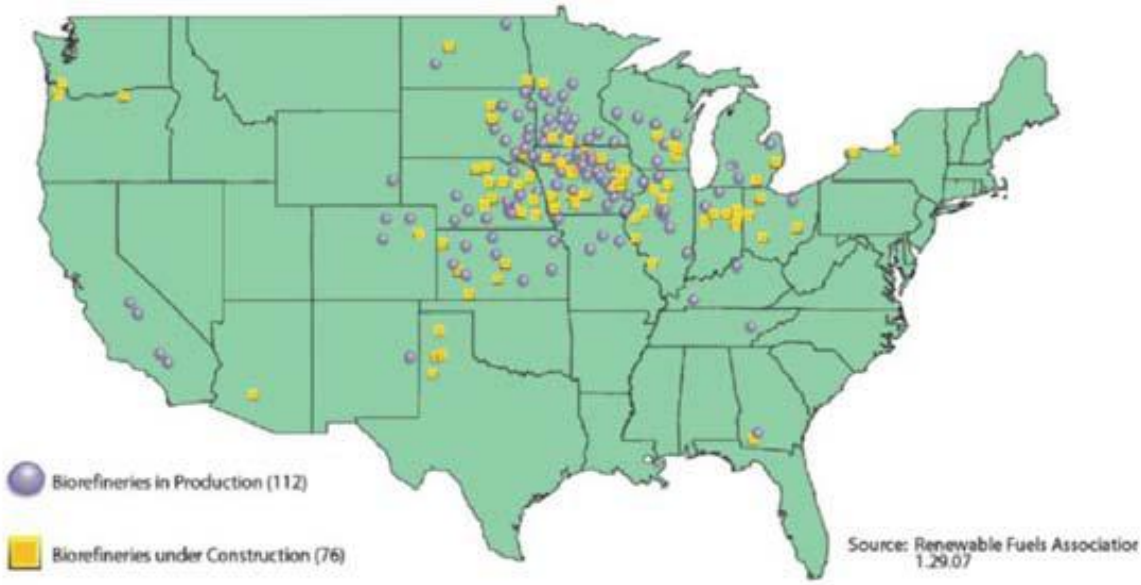
Q: Should I keep planting into dry soil?

A: Maybe I should write an article about this….

Fact Sheet on Fuel Ethanol

An extension factsheet on fuel ethanol has been published by Zhiyou Wen, John Ignosh, and Jactone Arogo. The publication is to response the recently increasing interests across the nation in using domestic, renewable fuel ethanol. Nationwide, it is expected that a 20% replacement of petroleum usage will happen over the next ten years. This is equivalent to 35 billion gallons of alternative fuel use by 2017, with fuel ethanol playing an important role in this transition. Fuel ethanol can be blended with gasoline (from 10-85%), and thus reduce the amount of gasoline used. In the United States, corn kernels are commonly used for producing fuel ethanol, and thus reduce the nation's dependence on foreign oils. The purpose of this publication is to disseminate the basic knowledge of fuel ethanol and address some myths and answer some questions about fuel ethanol before consumers use this type of fuel. It starts with the explanation of some terminologies about fuel ethanol, and then coves engine warranty, fuel performance, environmental benefits, energy balance, U.S. annual production, tax incentives. The current status of fuel ethanol development in Virginia was also discussed. Find the factsheet at: http://www.ext.vt.edu/pubs/bse/442-884/442-884.html.

Figure 2. U.S. ethanol refinery locations



Making Your Own Biodiesel

Biodiesel is another renewable fuel which has drawn a great attention in Virginia. It is an excellent alternative fuel for diesel engines. Biodiesel is made from agricultural products grown within the Commonwealth and can be used by Virginia farmers. It is most commonly made from oil extracted from soybeans, one of the top agricultural products in Virginia, and there is a lot of interest in biodiesel production across Virginia. In a previous extension publication (http://www.ext.vt.edu/pubs/ageng/442-880/442-880.html) by BSE extension specialists, the basics of biodiesel has been discussed, including the ASTM standard; the engineer performance and engineer warranty; storage; cold temperature concern; and tax incentives. In response to the broad interest in making biodiesel by small producers/home brewers, BSE extension specialists developed a factsheet describing the detailed protocols to make biodiesel. In summary, the biodiesel can be produced from a variety of pure vegetable oil (soybean, canola, sunflowers); rendered animal fats; or waste cooking oil. The oil is converted to biodiesel through a chemical process called transesterification. Glycerin is removed as a byproduct of the reaction, and the resulting fuel can be blended with petroleum diesel, or used directly as a neat fuel. The produced biodiesel should be evaluated according to the protocols outlined in the Biodiesel Standard ASTM (American Society for Testing and Materials) D6751 before use. This new publication presents the procedures for producing biodiesel, with particular emphasis on small-scale production. For detailed information go to http://filebox.vt.edu/users/rgrisso/Papers/Ext/Make_Biodiesel.pdf.

Join the Virginia Soybean Association

Tommy Hines, VSA Membership Chair

Being the state membership chairman for the Virginia Soybean Association (VSA), I am asking for your support again to help make the Association even better. The VSA is working very hard to help with the usage of soybeans in the state and we need your support.

The VSA is your policy representative before Virginia's State Legislature. Recent efforts include voicing concerns and disagreement with such issues as: new nutrient management regulations proposed by DCR; new water withdrawal regulations proposed by DCR; eminent domain; estate tax; biofuels legislation allowing tax credits for production of 10 million gallons or more; transportation issues affecting agriculture; and soybean rust monitoring. These are just a few of the policy issues your Association has undertaken this year for soybean producers throughout the Commonwealth.

The American Soybean Association and your state Association office are your advocates on all national issues which impact every producer in the country. These issues include fair trade; farm bill; energy, and biodiesel. **This important policy work (federal and state) is paid for by your membership in your state and national soybean associations and cannot come from check-off dollars.** Check-off funds can only be used for education, domestic and international marketing, new uses/new products development and research, production research, and food assistance programs.

Membership in the VSA at year end totaled 264 members. We would like to get our membership up to at least 300 members so to have a better representation of Virginia farmers. I know sometimes memberships get misplaced or things happen that we can't control, but if a former member, please consider rejoining. If you have never been a member, I encourage you to join a great organization.

On the next page, you'll find a membership application. Please help support your Virginia Soybean Association. Make checks payable to VSA. Mail the application with payment to VSA, 151 Kristiansand Drive, Suite 115 E & F, Williamsburg, VA 23188.

Membership Application – Virginia Soybean Association (*Affiliated with the American Soybean Assoc.)*

Name: _____ Date: _____

Farm/Company Name: _____ Spouse's Name: _____

Address: _____

City: _____ State _____ Zip: _____

County: _____ Phone: _____

Age Category: (Please ✓ one) ___ 30 or under ___ 31-45 ___46-59 ___60 or above ____ Acres Farmed

Occupation: (Please ✓ one) ___ Farmer ___Elevator ___Finance ___Extension ___Agribusiness ___ Other

Dues Enclosed: ___ 1 Year Membership - $60.00 ___ 3 Year Membership - $165.00

Mail Application and Dues to:

Virginia Soybean Association, 151 Kristiansand Drive, Suite 115 E & F, Williamsburg, VA 23188

Recruiter: _____ County: _____