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Labor Day Update

Dear Growers and Agents

This special Labor Day advisory is intended to provide you with some research-based information that may assist your decision-making as far as how to best handle this current drought situation with reference to land preparation, fumigation and strawberry planting.

Planting time is just around the corner, and hopefully by late Sept and early October, we will be back in a more normal rainfall pattern, and growers will not be under quite so much pressure as they are at the moment with land preparation and fumigation decisions.

But, if you have "doubts" about whether the rainfall situation will improve that much by late September, **NOW** is the time to anticipate the potential need to switch some, or a portion of your fresh dug bare-root planting stock order to plugs. Fresh dug plants use about 8x as much water per plant as plug plants for establishment (see table below).

Water requirement	Fresh dug bare-root[1]	Plug transplant[2]	Cut-off plant
Per acre (gallons)	174,000	21,000	10,000
Per plant (gallons)	11.6	1.4	0.7

[1] Calculated as follows: 0.8 inch/day of continuous irrigation for 8 hours (1/10th/hr) for 8 days, or 6.4 inches x 27,152 (acre inch of water) = 173,772 (rounded to 174,000).
[2] Calculated as follows: 2 hrs of drip irrigation per day for 5 days = 10 hrs; the drip system applies 35 gpm, or 2100 gallons/hr x 10 hrs = 21,000 gallons
[3] Cutoffs are not very widely used in NC, but based on limited experience with cutoffs (no tops or leafy parts, just crown and root), it would be reasonable to project even less water use than for plugs because of cooler fall temperatures in mid and late October plus these plants do not have a real canopy until later in October and early Nov.

Plugs are used almost exclusively in all western areas of the state and foothills, as fresh dug bare-root plants are not usually available until the 3rd week of September at the earliest, and heavier volumes of fresh dugs are not really available from nurseries until the 4th week of September and early October. Plugs are generally favored in the piedmont over fresh dugs for ease of handling (less perishable), and they are easier to transplant.

Fresh dugs are used most extensively in eastern areas of the state as well as in the Sandhills. Fresh dugs are cheaper (about ½ the cost of plugs), and for growers with an experienced labor force for transplanting, they are a good option, especially if water is not limiting, but they do require about 8.3 x as much water as plugs for establishment.

Cutoffs have generally not been recommended for most of the state as these are not available for transplanting until mid-October. However, in a recent research trial at Clayton Central Crops, we did get a rather surprising result with cutoffs in terms of yield performance that was not that much less than plugs, and fruit size that was actually better!

Fig. 1. Photo comparison of plug (left) with cutoff (right)

Research at NCSU In the season just past (2006-2007), we achieved some remarkable results with later planting dates in general (see Table 4). There seemed to be virtually no penalty for planting plugs on 11-October vs. 3-October, and even on 18-Oct we had a marketable yield of 18,600 lb/A with plug plants. But, the real surprise for us was the yield performance of the cutoff plants set on 18-Oct: 21,300 lbs/A and the berry size was excellent.

Table 1. How planting date influenced Chandler strawberry marketable yield at Clayton Central Crops Research Station, 2006-2007 (Study sponsored by the Arkansas Strawberry Growers Association)

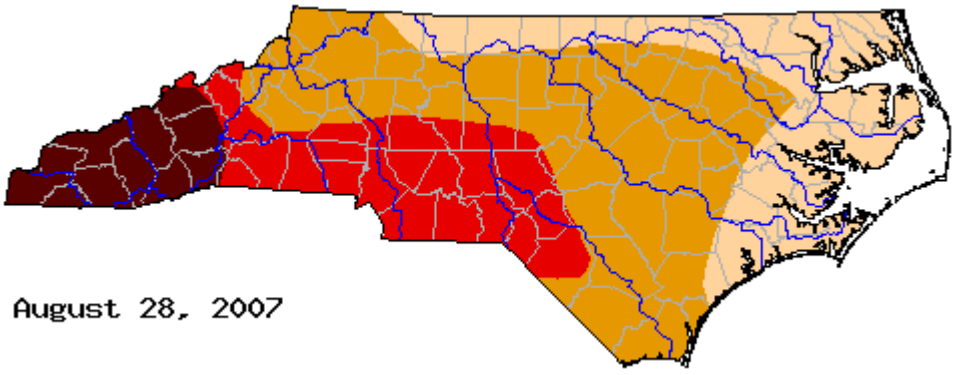
Clayton - planting date	Plug plants yield (lb/A)	Plug plants berry size (g)	Cutoffs yield (lb/A)	Cutoffs berry size
3 Oct	23,600	14.1	Not available	NA
11 Oct	23,400	15.8	Not available	NA
18 Oct	18,600	17.5	21,300	17.6
24 Oct	12,900	16.4	18,700	18.0

What to do? If your current water supply is satisfactory for establishing fresh dugs, then no change is recommended. But, if you are seriously short of water, then it really may be sensible to contact your plant supplier(s) this week. The near term forecasts aren't very promising – see next section.

Plugs are the best alternative to fresh dugs. Plugs are a proven alternative to fresh dugs -- we don't have that much real experience with cutoffs at this point, but we are definitely interested in testing them again next season at Clayton. My worry with cutoffs is that if we have an abnormally cool fall, the cutoffs may be a disaster at Clayton (this location is in a transition piedmont/cp). We have had some very cold falls (e.g. fall of 2002), and in those years we do see great benefit to "sticking" with your normally recommended planting window for fresh dugs and plugs (plugs can usually be set about 5 days later than fresh dugs). In the data reported in Table 1 (above) please keep in mind that the 2006-2007 season was unusually mild (except Easter!), and a plug planting date of 11 October at Clayton was just as good, if not better than 3 October.

Plugs take 4 weeks to propagate, and under warmer conditions can be done in 3 ½ weeks. Thus, if you were to enter an order for plugs on 7-Sept-07, they should definitely be ready for planting in the first week of October, and possibly "a bit" sooner. I personally like the tips being cut at this time of year vs. earlier weeks of cutting in the summer – you will not see nearly so many runners forming in the fall from tips cut this late. This may be a needless exercise and waste of time if we should get some good rains in September, but, in call the head meteorologist at SkyBit last Thursday, I did not get any indication that this is going to be the case – we should probably anticipate more dry weather ahead.

The US Drought Monitor of North Carolina (**http://www.ncdrought.org/**) list the entire state in some level of drought. Western counties are under extreme drought with most of the remaining counties classified in moderate to severe drought



Brown – exceptional drought
Red – extreme drought
Light brown – severe drought
Tan – moderate drought
Source: http://www.ncdrought.org/

More dry weather ahead this week: In checking the AWIS forecast for precipitation probability over the next 7 days, and at least through late in the week (towards next weekend) these values are very low (i.e. little likelihood of rain), and these probability values for selected locations are shown below.

It is going to be very critical in all areas of the state to carefully manage whatever rainfall we get in September for land preparation and fumigation operations! These topics were covered in last week's advisory, but I will say a few more words in this advisory about the value of fumigation.

Table 2. AWIS Weather Services, Inc.
7 Day Probability of Precipitation Forecast
Produced at Mon Sep 3 08:32:06 AM CDT 2007

For the 24hr period ending 6pm Central Standard Time of the indicated day, except the first day of the morning forecast which is for the 12hr period ending 6pm Central Standard Time.

STATION	Mon 09/03	Tue 09/04	Wed 09/05	Thu 09/06	Fri 09/07	Sat 09/08	Sun 09/09	Mon 09/10
Western North_Carolina								
Asheville_Munic	5	5	10	16	21	34	42	39
Charlotte	0	5	10	15	22	23	32	33
Gastonia-Gaston	1	3	10	15	23	24	33	33
Hickory	0	5	10	14	17	30	42	39
	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon
Jefferson_AP_NC	1	6	10	15	19	35	45	40
Mount_Airy-Moun	1	4	9	11	18	31	41	38
Central North_Carolina								
Asheboro	1	3	9	12	19	23	34	34
Burlington-Burl	1	4	8	10	17	25	36	36
Chapel_Hill-Hor	1	4	7	10	15	23	34	35
Clinton_NC	9	3	5	9	16	18	27	31
Concord_NC	1	3	10	14	21	24	33	34
Elizabethtown_NC	10	2	4	9	15	17	26	30
Fayetteville_AP	0	5	5	10	15	19	28	32
Goldsboro_NC	7	3	5	9	16	19	29	33
Greensboro	0	0	9	11	18	26	37	36
Lexington-David	1	4	9	13	20	25	36	35
Lincolnton_AP	0	6	10	14	17	28	40	39
Louisburg_NC	2	4	6	9	16	21	33	35
Oxford_NC	1	4	7	10	16	23	35	37
Raleigh-Durham	0	0	7	10	16	22	33	35
Rocky_Mount-Wilson	0	0	5	9	17	20	31	35
Roxboro_AP	1	4	7	10	16	25	36	37
Salisbury-Rowan	1	3	9	13	20	25	35	35
Sanford_NC	1	3	7	10	16	21	32	34
Smithfield_AP	4	3	6	9	16	20	30	34
Southern_Pines	1	3	7	11	17	21	30	32
Southport_NC	24	4	2	8	16	16	25	29
Whiteville_NC	13	2	3	9	15	17	26	30
Winston-Salem	1	4	9	11	18	27	38	37
Eastern North_Carolina								

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon
Ahoskie-Tri-Cou	5	4	4	9	18	20	31	36
Cape_Hatteras_AG	20	10	2	7	18	17	24	31
Cherry_Point	17	3	3	8	17	17	25	31
Edenton-Northea	7	4	3	8	18	19	27	35
Elizabeth_City	0	5	3	8	19	18	27	35
Greenville_AP_NC	10	10	4	9	17	18	28	33
Jacksonville	18	3	3	8	17	17	25	31
Jacksonville_(A	16	3	4	8	16	17	26	31
Kenansville-Dup	12	3	5	9	16	18	27	32
Kinston_AP	10	3	4	9	17	18	28	32
Manteo/Dare_Co	7	4	2	7	19	17	25	34
New_Bern	20	10	3	8	17	17	26	31
Roanoke_Rap_AP	3	4	5	9	18	21	33	37
Washington-Warr	10	3	4	8	18	18	27	33
Wilmington_AP_NC	10	10	3	8	16	16	25	30

The rainfall summaries over the last 30 days for most areas of the state are particularly worrisome, and right here in Raleigh we are -2.99 inches below the average for August, and -5.7 inches for the year (Table 2). But, other areas of Wake County like Apex, the deficit for the year is -10.4 inches, and just a little further south in the Sandhills, Carthage is -21.75 inches!

Table 3. AWIS Weather Services, Inc. - Auburn AL
North_Carolina Rainfall Summary ending the morning of 8/31/2007 for selected areas (Produced at 1018 AM CDT Fri Aug 31 2007)

LOCATION	7 DAY TOTAL	LAST 30 DAYS TOTAL	LAST 30 DAYS DFN	LAST 60 DAYS TOTAL	LAST 60 DAYS DFN	SINCE JAN 1ST TOTAL	SINCE JAN 1ST DFN
Apex	0.00*	0.88*	-3.29	3.84	-4.75	21.41	-10.40
Asheville_Munic	2.09	2.84	-1.70	7.69	-1.24	24.10	-8.92
Burlington_AG	0.00*	0.30*	-3.82	0.97*	-7.62	12.89*	-18.70
Carthage	1.20*	1.39*	-3.01	2.64*	-6.72	11.18*	-21.75
Charlotte	0.25	0.41	-3.19	2.42	-4.99	20.50	-9.02
Clinton	0.16	1.15	-4.61	6.91	-5.61	22.17	-15.56
Elizabeth_City	0.96	4.09	-0.99	5.13	-5.28	19.40	-14.74
Elizabethtown	3.77	4.86*	-0.31	8.40*	-2.84	22.98*	-11.26
Greensboro	0.59	1.36	-2.38	3.74	-4.37	20.00	-9.27

Fumigation decision-making: In last week's advisory I noted the dilemma being faced by growers in Western NC and the Foothills regarding fumigation and trying to still plant by mid-Sept. Obviously, if growers in these regions have not fumigated by this date, it may be best to simply omit the fumigation and try to use what water resources you have remaining for land preparation this week, and then planting the following week. If you do still decide to fumigate this week, be sure to observe important plant-back restrictions

for 50% methyl bromide:50% chloropicrin (14 days). Thus, you are now looking at planting in the third week of September under the best of circumstances if you still go ahead with fumigation. Also, remember that the soil must be moist for the fumigant.

I have assembled some information on "yield effects" from ***not*** including fumigation at Clayton Central Crops over the last 7 years – I realize that Clayton (southeast of Raleigh) is not a mountain location, but the work we have done at this location with fumigants and methyl bromide alternatives is quite extensive, and it is very interesting to note that in most years we observe an important yield reduction associated with no fumigant.

Table 4. A "synopsis" of how fumigation has influenced strawberry marketable yield at Clayton Central Crops Research Station, 2000-2003 (lbs/acre).

Clayton - season of study	Methyl Bromide 67:33	14 gal Telone C-35	Iodomethane (called Midas)	No fumigant (control)
2000-2001	27,334	27,350	**28,757**[1]	23,536
2001-2002	33,750	**37,010**	34,362[2]	33,006
2002-2003[4]	13,513	13,512	**14,995**[3]	8,766

[1] Formulation: methyl iodide 60%: chloropicrin 40% (200 # rate in-the-bed w/shank injection)
[2] Formulation: methyl iodide 75%: chloropicrin 25% (200 # rate in-the-bed w/shank injection)
[3] Formulation: methyl iodide 50%: chloropicrin 50% (200 # rate in-the-bed w/shank injection)
[4] In the 2002-2003 season we had a later planting date of 10/8/02 (normally one week earlier), and the fall was abnormally cool -- but, this was still an exceptionally poor yield! These yield data are averaged over 3 planting dates (27-Sept, 4-Oct, and 11-Oct).

Table 5. More recent years of testing at Clayton with and without preplant fumigation (marketable yields in lbs/A)

Clayton - season of study	Methyl Bromide 67:33	Iodomethane (called Midas)	No fumigant (control)	Fumigant benefit vs. MeBr:pic	Fumigant benefit vs. Midas
2004-2005	28,010	26,511[1]	22,313	5,697	4,198
2005-2006	28,574	30,475[2]	20,176	8,398	10,299
2006-2007	31,515[3]	32,030[4]	23,005	8,510	9,025

[1] Formulation: methyl iodide 98%: chloropicrin 2 % (75 # rate in-the-bed w/shank injection)
[2] Formulation: methyl iodide 50%: chloropicrin 50% (200 # rate in-the-bed w/shank injection)
[3] Rate for methyl bromide was 175 # rate in-the-bed w/shank injection (previous years we used 200#)
[4] Formulation: methyl iodide 50%: chloropicrin 50% (175 # rate in-the-bed w/shank injection)

In reviewing our last three years of work at Clayton, it is important to note that we have had a very positive response in each of these seasons to preplant fumigation. In these trials we did not have an annual rotation for the trials in 2005-2006, and 2006-2007, and it is very interesting to note the substantially higher benefit from pre-plant fumigation where this is no rotation out of plasticulture strawberries.

In summary: The state continues to be in serious drought situation, with some areas in extreme drought (western counties in the mountains), and near term forecasts are not very promising for significant rainfall amounts.

- **Immediate step for growers with fresh dug plants ordered -** if the situation in your farm area does not look very promising for rain in the next few weeks, and you are presently planning to use fresh dug bare-root plants, it may be a very good idea to re-think that situation right away. Fresh dugs require about 11.6 gallons/plant or 174,000 gallons/A for establishment. Plugs require significantly less water for plant establishment ~ 1.4 gallons/plant or around 21,000 gallons/A, and there is still time to call plant propagators to see about changing a portion of your fresh dug order to plugs – but, this is the final week to do that! Plugs take 3 ½ to 4 weeks to produce.
- **WNC land preparation for bed making** - at least 0.6 – 0.75 inches of water/A are required from irrigation, or rainfall, to prepare land for bed-making. In western counties and foothills, some type of arrangement will have to be made to apply this amount of water presently if you wish to plant by mid-Sept. Fumigation is now out of the question for most growers in the western sections of the state who wish to plant by mid-Sept, and have not done so by now (you cannot meet plant-back requirement). Western growers should try to rotate to a field that was not in strawberries last season if you cannot, or were not able fumigate because of the extreme drought in your area.
- **Growers in the piedmont** will need to do land preparations in the next week if they are still shooting for a 3rd week in September planting date and wish to allow for 2 week plant-back requirement with methyl bromide.
- **Growers in eastern areas** have more time (additional week) and at Clayton we are now shooting for fumigation in the third week of September, with planting in 2nd week of October. We have seen some benefits to slightly later planting dates for plugs at Clayton, and if the fall is relatively "normal" or above average in temperature, it is our view that planting Chandler on October 10/11 (vs. around Oct 3rd or 4th) should not be a problem.
- **Above average temperatures for next 90 days -** right now we are still looking at an above average temperature situation for the next 90 days, and in the event it does become cooler than normal, we do have a row cover option in late fall.
- **Staggering varieties** - Camarosa should be set ahead of Chandler by several days if possible, and Sweet Charlie is usually set a full week ahead of Chandler.
- **Fumigant benefit is greatest on land not being rotated** - on sites where strawberries were grown in 2006-2007, fumigation is likely to have a very significant influence on yield performance. We have experienced drops in yield of about 1/3rd in recent years at Clayton where we have not fumigated on land that has been in continuous strawberry production.

Questions and Answers

Sampson County

Q1. We have a grower who is interested in possibly planting strawberries this fall on a plastic mulch bed that has already had cantaloupes this summer (beds were formed and fumigated in May 2007). There simply is not enough water at this farm location for irrigation of the land right now to make fresh beds. What is your opinion of this?

A1. One of the main considerations is the condition of the plastic mulch bed and drip irrigation tape, and since this bed is still fairly new, I am not opposed to the idea at all. Obviously it is a good idea to remove as much of the crop residue as possible from the top of the beds before planting strawberries in mid-October. You also have enough time to consider a fumigant treatment through the drip system – nematodes could be an issue. You may wish to fertilize the plugs while in the trays before setting, and then begin to do some very light drip fertigation about 10 days after transplanting. It may be worth thinking about setting the crop slightly earlier than your normal window if you do not do any fumigation.

Good luck!

Barclay Poling, Extension Specialist and Professor (Small Fruits)
Dept. of Horticultural Science
Box 7609
252 Kilgore Hall
NC State University
Raleigh, NC 27695-7609
919-515-1195 office
919-418-9687 cell
919-515-2505 fax