

## 3. PEANUT PRODUCTION PRACTICES

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Successful production of quality peanuts requires growers to plan an effective production and marketing program and to implement that program on a timely basis during the season. Each cultural practice and marketing decision must be effectively integrated into the total farm management plan to produce optimum profits from the whole farm. In recent years, yields have increased significantly, with several records set since 2011. Several factors have contributed to high yields and include improved genetics, production of peanut on soils that are adapted to peanut production, long rotations that minimize impact of disease, availability of plant protection products for virtually all pests, equipment and technology, and skills of farmers and their support staff who manage peanut extremely well. In North Carolina, weather conditions can have a major impact on yield, given that only 15 percent of acreage is irrigated. But given good weather conditions, 2 tons per acre is the new average yield, and yields of 5,000 pounds per acre are not uncommon in North Carolina.

### STAND ESTABLISHMENT

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Soil temperatures need to be above 65°F for germination to proceed at an acceptable rate. Large-seeded Virginia market type peanuts planted under favorable moisture and temperature conditions will show beginning radicle (root) growth in about 60 hours. If conditions are ideal, sprouting young seedlings should be visible in seven days for smaller-seeded varieties like Bailey and in 10 days for larger-seeded varieties like Wynne.

Peanuts should not be planted until the soil temperature at a 4-inch depth is 65°F or above at noon for three days. Favorable weather for peanut germination should also be forecast for the next 72 hours after planting. The soil should be moist enough for rapid water absorption by the seed. The planter should firm the seedbed so there is good soil-to-seed contact. Growers should establish at least four plants per foot of row, regardless of variety. This goal generally means setting the planter to deliver five seeds per foot of row. Peanuts can emerge from depths as low as 3 inches. As long as seed quality is good and seed is treated with fungicide for protection from soilborne pathogens, peanuts can emerge under less than ideal conditions.

### VARIETY SELECTION

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Yield and quality are two major factors that influence variety selection. Growers with significant disease history may need to choose a variety with disease tolerance or resistance. Planting at least three varieties with differing maturity

dates will permit efficient use of limited harvesting and curing capacities. Planting varieties with different genetic pedigrees reduces the risk of crop failure because of adverse weather or unexpected disease epidemics. In recent years, Bailey II is rapidly becoming the most dominant variety in North Carolina. As with Bailey, there is concern that heavy reliance on one variety will increase risk, which is often minimized by planting a group of varieties on each farm.

The selection of a variety should be based on more than one year's data. Performance of our most popular peanut varieties from reports prepared by Dr. Maria Balota's PVQE (Peanut Variety and Quality Evaluation) program is presented in Table 3-1. Varietal characteristics are listed in Table 3-2. Disease reaction of varieties can be found in Chapter 6, "Peanut Disease Management."

**Table 3-1. Percentages of FP, ELK, SMK, Total Kernels, Pod Yield, and Financial Return for the Major Virginia Market Type Varieties**

Variety	% FP	% ELK	% SMK	Total Kernels (%)	Yield (lb/acre)	Financial Return (\$/acre)
Bailey	87	41	63	72	4,988	902
Bailey II	88	47	65	73	4,961	914
Emery	93	49	65	72	4,832	874
Sullivan	88	43	63	72	4,648	822
Walton	88	42	64	72	5,000	890
Wynne	92	43	62	71	4,641	804

\*Data are from Balota (PVQE director) et al. from all trials in the PVQE testing program from 2018 to 2020. Financial return is calculated using the loan rate price.

**Table 3-2. Varietal Characteristics**

Factors	Bailey II	Emery	Sullivan	Walton	Wynne
Growth habit (R = runner; SR = semi-runner)	SR	SR	R	SR	SR
Heat unit requirement	2,650	2,650	2,650	2,700	2,700
Comparative days to optimum maturity	0	0	0	+4	+4
Seed per pound	600	535	575	600	450
Need for calcium (M = moderate; H = high)	M	H	M	M	H

**Heat unit requirement** = degree day accumulation (56°F base and a 95°F ceiling) required to reach optimum maturity, assuming adequate soil moisture for sustained growth and development.

In comparative days to optimum maturity, – = optimum maturity for the variety occurs prior to 0; + = optimum maturity for variety occurs after 0.

## VARIETY CHARACTERISTICS

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**Bailey II** is a large-seeded Virginia market type peanut with resistance to several key peanut diseases. This variety offers tolerance to *Cylindrocladium* black rot (CBR), Sclerotinia blight, tomato spotted wilt virus (TSWV), and stem rot. Seed size for Bailey II is small compared with all other Virginia market types.

**Emery** is a large-seeded, high oleic variety that offers resistance to several key diseases in peanut. Vine growth is intermediate between Bailey and Sullivan. Pods and kernels for this variety are larger than those for Bailey but smaller than those for Wynne.

**Sullivan** is a large-seeded Virginia market type that possesses the high oleic trait and offers some resistance to some of the key diseases found in peanut in North Carolina. This variety does not have excessive vine growth like Bailey and has yielded well in many trials. Pod size is larger than Bailey but not as large as Wynne.

**Walton** is a large-seeded Virginia market type that possesses the high oleic trait and expresses a degree of drought tolerance. This variety also yields well relative to other Virginia market types when dug early. Seed for this variety will not be available until after the 2023 season.

**Wynne** is a large-seeded Virginia market type possessing the high oleic trait like Sullivan and offers resistance to some of the key diseases. Pod size is larger than all Virginia market types.

## SELECTING AND MANAGING SOIL RESOURCES

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Peanuts are best adapted to well-drained, sandy loam soils, such as Norfolk, Orangeburg, and Goldsboro sandy loam soils. These soils are loose, friable, and easily tilled, with a moderately deep rooting zone for easy penetration by air, water, and roots. A balanced supply of nutrients is needed. Soil pH should be in the range of 5.8 to 6.2. Peanuts grown in favorable soil conditions are healthier and more able to withstand climatic and biotic stresses.

### *Crop Rotation*

A long crop rotation program is essential for efficient peanut production. The peanut plant responds to both the harmful and beneficial effects of other crops grown in the same field. Research shows that long rotations are best for maintaining peanut yields and quality. Benefits and potential problems associated with crops typically found within peanut-based cropping systems can be found in Chapter 6, "Peanut Disease Management." Research conducted at the Peanut Belt Research Station demonstrates the benefits of long rotations with corn and cotton.

In recent years, there has been interest in crop yields, especially grains, when transitioning out of traditional peanut rotations. Results indicate that corn, cotton, soybeans, and wheat are not affected by rotation to the extent that peanuts are affected. Sweetpotato is a good rotation crop for peanut, while some decreases in peanut yield have been observed when peanut follows sage. Growers should plant corn, cotton, or grain sorghum for at least one year following sage before planting peanut. In a recent experiment, results indicated that for every increase in years where cotton separated peanuts and soybeans in the rotation, peanut yield increased by approximately 6 percent. Yield of peanut following four years of cotton was 6,010 pounds per acre. When soybeans preceded peanuts in four, three, or two years, peanut yields decreased to 4,440, 5,030, or 5,500 pounds per acre, respectively. When only one of the four preceding years was planted in soybeans, peanut yield was 5,670 pounds per acre.

## FERTILIZING PEANUTS

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### *Lime*

Peanuts grow best on soils limed to a pH of 5.8 to 6.2, provided other essential elements are in balance and available to the plant. Dolomitic limestone is the desired liming material because it provides both calcium and magnesium. Strongly acidic soils reduce the efficient uptake and use of most nutrients and may enhance the uptake of zinc to potentially toxic levels. The efficiency of nitrogen fixation is reduced in acid soils. Molybdenum is an essential element in biological nitrogen fixation, and it can be limiting at low soil pH. Soils too high in pH are not desirable because some elements are less available to the peanut plant, and incidence of Sclerotinia blight may be greater. Manganese deficiency is often observed in fields that are overlimed. Some research has demonstrated that higher rates of calcium sulfate (gypsum or land plaster) can reduce peanut yield when soil pH in the pegging zone is relatively low (Table 3-3).

Collecting a soil sample correctly is important. In most cases, the average pH for the field is used to determine how much lime to apply to increase soil pH. The recommendation is to lime for an average pH of 6.2 when the average pH for the field is determined. This will decrease the likelihood of having portions of the field that are below a pH of 5.8. Table 3-3 demonstrates that not only does a pH of less than 5.8 result in lower yields but also that yields can decline even more when gypsum is applied to soils with a low pH. For example, when soil pH is increased from 5.6 to 6.0, peanut yield increased by 6 percent. When gypsum was applied at the recommended use rate (referred to as the 1.0x rate in the table) to soil at pH 5.6, yield was 26 percent lower, compared with soils with a pH of 6.0.

**Table 3-3. Peanut Response to Soil pH and Gypsum Rate<sup>a</sup>**

Approximate Soil pH	Peanut Yield Relative to Gypsum Rate		
	0	0.5x	1.0x
	Percent of Maximum Yield		
4.5	42 f	55 e	55 e
5.2	55 e	56 e	59 e
5.6	78 c	78 c	69 d
6.0	84 b	97 a	95 a

<sup>a</sup>Means followed by the same letter are not significantly different at p = 0.10. Data are pooled over three years.

These results remind us that soil pH should be maintained around 6.0 and that gypsum should be applied at rates not exceeding those currently recommended for Virginia market type peanuts. Increased broiler production in North Carolina and use of manure as a fertilizer source have increased concern over micronutrient toxicity. Several peanut fields have exhibited severe and yield-limiting zinc toxicities. These toxicities are increased in fields with low pH because zinc is more available at a lower pH. Maintaining soil pH at about 6.0 is important in minimizing the adverse effects of zinc, and growers are cautioned not to overload fields with high levels of waste products. Micronutrient levels can build up quickly. Peanuts generally are able to tolerate a zinc index of 250. However, zinc toxicity can occur with lower index values if soil pH is low.

*Nitrogen*

Roots of peanuts can be infected by *Bradyrhizobia* bacteria. Nodules form on the roots at the infection sites. Within these nodules, the bacteria can convert atmospheric nitrogen into a nitrogen form that can be used by plants through a process called biological nitrogen fixation. This symbiotic relationship provides sufficient nitrogen for peanut production if the roots are properly nodulated. Growers should inoculate their peanut seed or fields to ensure that adequate levels of *Bradyrhizobia* are present in each field. The data in Table 3-4 are from multiple locations and years and give an indication of the possible response of peanuts to inoculant applied as a liquid or granular in the seed furrow.

While peanut response to rotation is often predictable, response to inoculant and rotation combinations is less predictable. Therefore, peanuts should be inoculated in all years regardless of previous rotation history to minimize risk and maintain yield. The economic value of inoculation is demonstrated in these trials (Table 3-4). Assuming a commercial inoculant cost of \$8 per acre, economic return in new peanut fields at \$535 per ton was 51 times higher than the cost of the inoculant. A five-fold increase in economic return over inoculant cost was noted in fields with a recent history of peanut production.

**Table 3-4. Peanut Yield Response and Economic Return at a Price of \$535 per Ton in Fields without a History of Peanuts versus Fields with Frequent Plantings of Peanuts (1999 – 2017) (Trials were conducted in North Carolina, South Carolina, and Virginia with Virginia market type varieties.)**

Inoculant Use	New Peanut Fields		Fields with a Recent History of Peanuts	
	Yield (lb per acre)	Economic return (\$ per acre)	Yield (lb per acre)	Economic return (\$ per acre)
No inoculant	3,460	5	4,280	227
Inoculant	4,660	323	4,450	268
Difference	1,200	318	170	41
Number of Trials	52	52	43	43
Years	1999 – 2017		1999 – 2017	

Generally, a peanut plant with 15 nodules on the tap root by 40 days after emergence has adequate nodulation. Oftentimes foliar symptoms of nitrogen deficiency will be apparent by this time if nodulation is not effective. Later in the season the plant will need many more nodules, more than 100, for optimum growth, development, and yield. If fewer than 15 nodules are noted 40 days after emergence, especially if peanut foliage is yellow, growers should consider application of ammonium sulfate.

Commercial inoculants can be added to the seed or put into the furrow with the seed at planting. In-furrow inoculants are available in either granular or liquid form. When inoculants are applied directly in the seed furrow, either as a spray or granular, it is essential that the product reach the bottom of the seed furrow so that infection occurs as the root system develops. Some growers have had difficulty in obtaining nodulation because soil moved in the seed furrow after seed drop but before inoculant spray or granules entered the seed furrow. Delivering granular or in-furrow sprays above seed placement also will compromise effectiveness of systemic insecticides and fungicides.

In addition, shallow planting along with in-furrow spray inoculants has performed poorly under hot and dry soil conditions. Peanuts are capable of emerging from depths of at least 3 inches; therefore, it is advisable to plant deep to protect sprayed inoculant from breakdown caused by high temperatures. Direct applications of nitrogen to peanuts are not generally needed. However, application of nitrogen fertilizers can increase yield, but only when peanuts are not nodulating and nitrogen deficiency is obvious. Research indicates that 90 to 120 pounds actual nitrogen per acre as a single application may be needed to obtain yields similar to adequately nodulating peanuts when a true nitrogen deficiency exists. Economic return on investment of inoculant and various rates of ammonium sulfate are also compared in Table 3-5 at a peanut price of \$560/ton and fertilizer cost of 29 cents/

pound ammonium sulfate. While a rate of 90 pounds of nitrogen is the most economically effective, in some trials 120 pounds of nitrogen were needed when late-season rainfall was excessive. Lower rates also may be effective but perform inconsistently. Research also suggests that ammonium sulfate is a more effective source than ammonium nitrate. Split applications may be more efficient than a single application. Best results are obtained when applications are made early in the season. Peanuts grown on deep, sandy soils often respond to nitrogen fertilization and may lap middles more quickly, even when inoculation is adequate. Rapid canopy closure results in cooler soil temperatures in the pegging zone. When soils have high temperatures, pegs cannot survive. Deciding whether or not to broadcast the suggested use rate of ammonium sulfate can be challenging when the deficiency is sporadic and the failure is not complete. Table 3-6 is designed to help determine the economic return if only a percentage of the field is expressing a nitrogen deficiency. There are also times when the deficiency may not show up until later in the growing cycle. Table 3-7 is designed to help determine what rate of ammonium sulfate to apply based on the range of days after planting relative to when the deficiency becomes apparent. Less nitrogen is needed when the deficiency becomes noticeable later in the growing cycle than if the symptoms are observed earlier in the season.

**Table 3-5. Peanut Response from 14 Trials to Inoculation and Ammonium Sulfate at 571 lb/acre (120 lb actual N/acre) Applied when Nitrogen Deficiency Is First Visible**

<b>Inoculant</b>	<b>Ammonium Sulfate</b>	<b>Pod Yield (lb/acre)</b>	<b>Net Return (\$/acre)</b>
No	No	3,530 c	20 c
Yes	No	4,850 a	353 a
No	Yes	4,550 b	271 b

Means followed by the same letter are not significantly different at  $p < 0.05$ .

**Table 3-6. Peanut Response to Ammonium Sulfate (AMS) Applied in Mid-June to Early July and Estimates of Financial Return on Broadcast Applications to Correct a Nitrogen (N) Deficiency**

Percent of Field that is N Deficient	Rows with N Deficiency (8 Planter Units)	Yield Based on Research	Actual Pounds not Realized due to N Deficiency	Value of Peanuts not Realized at a Price of 25 cents/lb	Financial Return from a Broadcast Application of AMS at 500 lb/acre at a Cost of 29 cents/lb (\$145/acre)
12	1	4,420	122	31	-114
23	2	4,306	245	61	-84
38	3	4,148	367	92	-53
50	4	4,062	490	123	-22
63	5	3,940	612	153	8
75	6	3,818	734	184	39
88	7	3,696	856	214	69
100	8	3,574	978	245	100

**Table 3-7. Ammonium Sulfate Rate Needed Relative to When a Nitrogen Deficiency is Observed**

Days after Planting	Ammonium Sulfate Rate (lb/acre)
70 or less	500
71 to 100	400
101 to 130	300
More than 130	200

In some years, excessive rain can cause peanuts to yellow, and growers may consider applying nitrogen to address this issue. In most instances peanut nodulation will become active after fields dry. Unless nodulation is very poor, there is no value in applying nitrogen in this situation.

On sandy fields with little to no nitrogen from the previous crop, growers often apply a modest amount of nitrogen to soil to enhance early-season growth. This practice has limited value in fields with some nitrogen remaining from previous crops. The “starter” fertilizer is generally broadcast with preplant fertilizer, although a separate application can be made early in the season. Growers need to use caution when applying products in furrow. We do not recommend applying fertilizer in the seed furrow at planting. Some products containing fertilizer and other growth enhancers are available, and a limited number of growers are convinced of their value. Small-plot research in North Carolina has shown little to no value with these applications in terms of yield. Before applying them on a large scale, we suggest you make sure

there is information available on how these products can affect stand establishment. Peanut seed is expensive, and there is a limited time for replanting if a stand is not established.

*Potassium and Phosphorus*

The most efficient and easiest way to apply potassium is to apply it to the crop preceding peanuts. This practice usually increases the yield of the preceding crop and allows the potassium to leach into the area where the peanut root system obtains most of its nutrients. However, if NC Department of Agriculture and Consumer Services soil test recommendations indicate that potassium and phosphorus are needed, then the appropriate levels of these nutrients should be applied.

Many growers and researchers feel that high levels of soil potassium in the fruiting zone (the upper 2 or 3 inches of soil) result in more pod rot and interfere with the uptake of calcium by pegs and pods, which results in a higher percentage of “pops” and calcium deficiency in the seeds. If the potassium level is high in the fruiting zone, a higher rate of gypsum may be needed. However, research shows that when soil pH is below the recommended level, application of higher rates of gypsum can adversely affect yield.

Most of the peanut soils in North Carolina have adequate levels of phosphorus for good peanut production. Once a medium or higher level of phosphorus is achieved, it remains stable over a number of years. The addition of phosphorus-containing fertilizer to peanuts is generally not needed if it is applied to other crops in the rotation. However, soil testing is the only way to be sure.

Soil index values for potassium are provided in Table 3-8. Previous research indicates that the critical level of potassium for peanuts is a potassium index value of approximately 20.

**Table 3-8. Potash Recommendations for Peanuts as Related to Potassium Soil Test Index (K-I), Agronomic Division—NCDA&CS\***

Soil Test K-I	Potash (K <sub>2</sub> O) pounds/acre
0	150
10	120
20	90
30	70
40	40
50	30
60	10
70	0

\*From *Crop Fertilization Based on North Carolina Soil Tests* ([www.ncagr.gov/agronomi/pdf/files/oobook.pdf](http://www.ncagr.gov/agronomi/pdf/files/oobook.pdf)); based on Equation 15 for calculating rates of fertilizer.

### Calcium

Perhaps the most critical element in the production of large-seeded Virginia market type peanuts is calcium. Lack of calcium uptake by peanuts causes “pops” and is often reflected as darkened plumules in the seed. Seeds with dark plumules usually fail to germinate.

Calcium must be available for both vegetative growth and pod growth. Calcium moves upward in the peanut plant but does not move downward. Thus, calcium does not move to the peg and pod and developing kernels through roots. The peg and developing pod absorb calcium directly from soil, so it must be readily available in the soil.

Adequate soil calcium is usually available for good plant growth but not for pod development for good quality peanuts. It is important to provide calcium in the fruiting zone through gypsum applications. Gypsum should be applied to all Virginia market types, regardless of the soil characteristics or soil nutrient levels. The calcium supplied through gypsum application is relatively water-soluble (compared to other calcium sources) and more readily available for uptake by peanut pegs and pods. Each pod must absorb adequate calcium to develop normally.

Gypsum product materials vary in elemental calcium content. Studies show that all forms of gypsum effectively supply needed calcium when used at rates that provide equivalent calcium levels uniformly in the fruiting zone. General recommendations for application rates are given in Table 3-9.

**Table 3-9. Gypsum Sources and Application Rates**

Source	% CaSO <sub>4</sub> *	Application Rate (lb/acre)	
		Band (16 – 18 in)	Broadcast
USG Ben Franklin	85	600	—
USG 420 Granular	83	—	1,215
USG 500	70	—	1,300
Super Gyp 85	85	—	1,200
TG Phosphogypsum	50	—	2,000
Agri Gypsum	60	—	1,800
Gyp Soil	85	—	1,200
Gyp Master	68	—	1,500

\*Guaranteed analysis percentage in registration with North Carolina Department of Agriculture and Consumer Services.

The use of gypsum on large-seeded peanuts is very effective in improving peanut seed quality and grades. Some research data indicate that high rates of gypsum may control or reduce the pod rot disease complex. Gypsum should not be broadcast before land preparation or before planting because too much rain may leach the calcium below the fruiting zone.

Best results are obtained when gypsum is applied in late June or early July. The availability of calcium supplied by gypsum application is also influenced by the amount of rainfall. Moisture is needed to make gypsum soluble and calcium available to the peanut fruit. In unusually dry years, peanuts may show symptoms of calcium deficiency, even when recommended rates of gypsum are applied.

Increasingly, there are questions concerning the need to apply gypsum as supplemental calcium to peanuts. Sometimes peanuts do not respond to supplemental calcium. Sometimes peanuts respond well to half the amount given in Table 3-9. The interactions of environmental conditions, seed size, soil series, native fertility, and soil moisture are unpredictable. However, for a consistent response over a wide range of soil characteristics and weather conditions, the full rate of gypsum is recommended for Virginia market types. Growers are encouraged to evaluate peanut response to gypsum on their own farms before leaving off this input or reducing rates below those presented in Table 3-9. Data from 12 trials (Table 3-10) indicate that gypsum at rates below those recommended in Table 3-9 can, in some cases, be effective. However, for consistent response across all environments, we recommend the 1.0X rate presented in Table 3-9. While soil tests from samples collected in the pegging zone are reliable for deciding if calcium should be applied to runner market types, soil test results are not reliable for determining calcium needs of large-seeded Virginia market types.

**Table 3-10. Pod Yield Following Application of Gypsum at 0.5 and 1 Times (x) the Recommended Use Rate for Virginia Market Types**

Pod Yield (lb/acre)	No. of Trials	Pod Yield (lb/acre)		
		No Gypsum	0.5x Gypsum	1.0x Gypsum
Actual yield	12	3,970	4,510	4,590
Increase in yield over no-gypsum control	—	—	540	620

Excessive rainfall can occur during June and July after gypsum has been applied. If rainfall exceeding 5 inches occurs over a short period of time within a few weeks after gypsum is applied, growers should consider applying a rate of 0.5 times the normal use rate to make sure sufficient calcium is in soil during the entire period of reproductive growth. Likewise, if growers cannot get into fields to apply gypsum on time due to wet soils, gypsum still needs to be applied even if application is delayed until early to mid-August. While liquid calcium products are available, they are not a substitute for gypsum.

There is also a question of whether or not the gypsum rate needs to be increased for extremely large-seeded Virginia market type varieties, such as Wynne. Results from previous research indicated that a rate of gypsum 1.5 times the recommended rate did not increase pod yield over the normal use rate in most experiments. While the data did indicate that a large-seeded variety was more responsive to gypsum

than a smaller-seeded variety, there was no advantage to applying gypsum at rates exceeding those rates listed in Table 3-9.

In recent years, runner market type varieties referred to as “jumbo runners” have become more popular. Growers should apply at least half the rate recommended for Virginia market types (Table 3-9).

Liquid formulations of calcium do not provide adequate calcium for pod and kernel nutrition for Virginia market types at the rates currently marketed. For example, the amount of a 12 percent calcium liquid product needed to provide the equivalent rate of calcium per acre compared to USG 500 is provided in Table 3-11.

**Table 3-11. Amount of Liquid Product Needed to Provide Equivalent Amounts of Elemental Calcium per Acre**

<b>Source</b>	<b>Amount of Product Needed to Supply the Equivalent Amount of Calcium per Acre</b>
USG 500 (gypsum, 21% calcium)	1,300 pounds
Liquid (12% calcium, 11.9 lb calcium per gallon)	23 gallons

### *Manganese and Boron*

Two other elements often found to be deficient in peanuts are manganese and boron. Manganese deficiency usually occurs when soil is overlimed. Increasing the soil pH reduces the plant’s uptake of manganese. The symptom of manganese deficiency is interveinal chlorosis. A deficiency can be corrected by a foliar application of manganese sulfate. The usual practice is to apply 3.5 to 4 pounds per acre of dry material when the deficiency is observed.

Boron plays an important role in kernel quality and flavor. Boron deficiency may occur in peanuts produced on deep, sandy soils. Deficient kernels are referred to as having “hollow hearts.” The inner surfaces of the cotyledons are depressed and darkened, so they are graded as damaged kernels. A general recommendation is to apply 0.5 pound of actual boron per acre as a foliar spray in early July. Several formulations of boron are available. Some growers apply boron with their preplant incorporated herbicides, and others have boron added to their fertilizers.

**Table 3-12. Amount of Formulated Product Needed to Provide Equivalent Amounts of Elemental Boron per Acre**

<b>Source</b>	<b>Amount Needed to Supply 0.5 lb Boron per Acre</b>
Boric acid	3.0 lb
Disodium octaborate (Solubor, 17.5% boron)	2.8 lb
Liquid (9.0% boron)	2.2 qt

Growers are advised to make sure boron and manganese sources provide sufficient elemental boron. Several liquid boron and manganese formulations are available. Although liquid sources are more convenient to use than some dry products, some of the liquid products contain only a fraction of the needed boron or manganese. The amount of formulated product needed to supply 0.5 pound of elemental boron per acre is provided in Table 3-12. Similarly, the amount of formulated manganese product needed to supply 1.0 pound of manganese per acre or two applications of 0.5 pounds of manganese spaced 10 to 14 days apart is provided in Table 3-13. Lower rates of boron or manganese are often applied for “maintenance.” Growers should make sure the product they purchase supplies the amount of boron or manganese the plant needs.

**Table 3-13. Amount of Formulated Manganese Products Needed to Provide Equivalent Amounts of Elemental Manganese per Acre**

Source	Amount Needed to Supply 1.0 lb Manganese per Acre
Manganese sulfate (Techmangum, 27% manganese)	3.7 lb
Manganese sulfate (8% manganese)	1.2 gal

The percentage of element (in this case, manganese or boron) or the weight of the element per unit volume of product can be used to determine the amount of liquid product needed to correct a nutrient deficiency. For example, if 1 pound of manganese is needed per acre, the following formulas can be used to determine the amount of 8 percent water-soluble manganese product needed per acre.

**Step 1.** Figure the weight of manganese per gallon by multiplying the percentage of manganese in product in pounds by the weight of product in pounds per gallon:

$$\% \text{ manganese in product} \times \text{lb product per gal} = \text{lb manganese per gal}$$

**Step 2.** Figure the gallons of manganese product per acre by dividing the desired amount of manganese in pounds per acre by the weight of the manganese per gallon:

$$\frac{\text{desired lb manganese per acre}}{\text{lb manganese per gal}} = \text{gal manganese product per acre}$$

**Example:**

**Step 1.**

$$0.08 \times 10.5 \text{ lb manganese sulfate per gal} = 0.84 \text{ lb manganese sulfate per gal}$$

**Step 2.**

$$\frac{1 \text{ lb manganese per acre desired}}{0.84 \text{ lb manganese per gal}} = 1.2 \text{ gal 8\% manganese product per acre}$$

## LAND PREPARATION

Historically, peanut growers have planted into conventionally prepared seedbeds to obtain a smooth, uniform, residue-free seedbed for planting. The effectiveness of burial of old crop residue and weed seed in the long-term suppression of soilborne pathogens and short-term suppression of some weed problems was noted when the moldboard plow was used. However, only 6 percent of acres were treated this way, based on a 2019 survey in North Carolina (Table 3-14), in part because newer plant protection products are very effective. There is also a growing trend toward reduced-tillage crop production in North Carolina, and some growers are successfully using these practices for peanut. There has also been a significant decrease in the number of growers using secondary tillage. Changes in tillage systems over the past decade are presented in Table 3-14.

**Table 3-14. Percentage of Farmers Using Certain Tillage Practices on at Least a Portion of Their Farms**

<b>Tillage</b>	<b>1998</b>	<b>2004</b>	<b>2009</b>	<b>2014</b>	<b>2019</b>
Disk	90	78	71	75	79
Chisel	25	23	27	12	21
Moldboard plow	58	17	7	5	6
Field cultivate	75	55	42	44	53
Rip and bed	49	39	40	55	48
Bed	44	35	32	25	35
Reduced tillage	10	23	41	20	31

There is concern about stratification of nutrients in reduced-tillage systems. For example, repeated applications of potassium in reduced-tillage cotton may result in excessive amounts of this nutrient in the pegging zone when peanuts are planted in a reduced-tillage system. Growers are encouraged to test soils for excessive potassium levels and incorporate this nutrient with tillage, if needed.

Many peanut growers bed their peanut fields either in the fall or the spring. Many growers prefer planting on raised beds rather than flat planting. The beds often give faster germination and early growth, provide drainage, and may reduce pod losses during digging. While reduced-tillage systems can be as successful as conventional-tillage systems, reduced-tillage systems often have less consistent yields than conventional-tillage systems. However, most peanut production has shifted to sandy soils that respond more favorably to reduced-tillage systems.

Because of concern about digging losses on finer-textured soils, it is recommended that beds be established in the fall with a grass cover crop with peanuts strip-tilled into previously prepared beds. Previous research demonstrated that wheat, cereal (cover crop), rye, oats, and triticale can serve equally well as wheat when

used as a cover crop grown the winter and spring prior to planting peanuts, if peanut is strip-tilled. A risk advisory index has been developed to assist growers in deciding the risk of peanut yield in reduced-tillage systems being lower than yield in conventional-tillage systems (Table 3-15). Research also suggests that prior cropping history generally does not affect peanut response to tillage. However, peanuts are often more responsive to tillage systems, primarily because of the digging requirement. The risk advisory index has been modified from the initial version. A positive value indicates that yield was higher in conventional tillage than in reduced tillage. Diversity in soil series across fields creates a challenge in using the index. For example, some fields in the coastal plain of North Carolina contain Norfolk, Goldsboro, and Raines series throughout the landscape.

**Table 3-15. Advisory Index for Determining the Risk of Peanut Yield in Reduced-Tillage Systems Being Lower Than Yield in Conventional-Tillage Systems**

Category	Scoring Criteria	Your Score
<p><b>Soil series</b> Pod loss on finer-textured soils, such as those on the Roanoke and Craven series, is often greater than on coarser-textured soils, such as Conetoe and Wanda series, regardless of tillage system. Difficulty in digging can increase when these soils become hard in the fall if rainfall is limited.</p>	<p>Roanoke and Craven — 40 points Goldsboro and Lynchburg — 20 points Norfolk — 10 points Conetoe and Wanda — 0 points</p>	<p><b>Soil series</b> <b>Your score:</b></p>
<p><b>Tillage intensity</b> Peanut response to reduced-tillage systems is invariably correlated with the degree of tillage. Efficient digging can be difficult when peanuts are planted in flat ground in reduced-tillage systems. Although fields may appear to be flat and uniformly level, often fields are more rugged than they appear, and setting up the digger to match unforeseen contours in the field can be difficult. Strip tillage into flat ground is a better alternative than no tillage into flat ground, although digging peanuts planted on flat ground can be more challenging regardless of the tillage system. Strip tillage into preformed beds often results in yields approaching those of conventional tillage.</p>	<p>No tillage into flat ground — 35 points Strip tillage into flat ground — 10 points Strip tillage into stale seedbeds — 0 points</p>	<p><b>Tillage intensity</b> <b>Your score:</b></p>
<p><b>Risk of yield being lower in reduced tillage than in conventional tillage:</b></p>	<p>35 or less — low risk 40 to 50 — moderate risk 55 or more — high risk</p>	<p><b>Total index value</b> <b>Your score:</b></p>

## PLANTING

Varieties grown in North Carolina can require as many as 160 days for full pod maturity, depending upon soil moisture and temperature. Along with yield and market grades, planting date can affect disease and insect development (see chapters 5 and 6). Less damage from thrips and lower incidence of tomato spotted wilt virus have been associated with later plantings. Peanut yields are often the highest when peanuts are planted in mid-May. However, in some years peanuts planted later can yield well. Conditions in the fall, especially night temperatures, can have a great impact on yield when they prevent peanut pods from reaching optimum maturity.

Table 3-16 provides data for the variety Bailey during 2019 and Bailey II and Walton in 2020 exposed to four or five planting dates when peanut was dug at optimum maturity based on pod mesocarp color. When averaged over planting dates in 2020, pod yield for Bailey II was 3,581 lb/acre compared with 3,483 lb/acre for Walton. These results reflect growing conditions that enabled peanuts in 2019 to yield well because of the warmer temperatures throughout much of the growing season but especially in September and October. In contrast, cooler temperatures in September and October most likely prevented later-planted peanuts from reaching optimum maturity. In 2021, Emery yielded more than Bailey II, Sullivan, and Walton. Bailey II and Sullivan yielded the same. Sullivan and Walton also yielded the same, while Walton yielded less than Emery.

**Table 3-16. Influence of Planting Date on Peanut Yield During 2019 –2022\***

Planting Date	2019 Bailey	2020 Average		2022 Bailey II
		of Bailey II and Walton	2021 Bailey II	
Early May	4,955 b	4,117 a	3,788 a	5,429 a
Mid-May	6,123 a	4,098 a	3,233 abc	4,467 b
Early June	6,352 a	3,704 b	3,467 ab	4,173 bc
Mid-June	4,650 b	3,053 c	3,089 bc	3,833 c
Late June		1,633 d	2,607 c	1,740 d

\*Means within a year followed by the same letter are not statistically different at  $p < 0.05$ .

### *Seeding Rates and Twin Rows*

Table 3-17 provides the conversion of seed per foot of row to pounds per acre necessary to establish the desired plant population for a given variety. Germination percentage is not considered in this conversion, but it should be considered when planning planting. Row spacing also affects seed planted per acre and cost of production. The same in-row population is needed for row spacings of 30, 36, and 38 inches. Table 3-18 shows the number of seed required to achieve a desirable plant population for 30- and 36-inch rows.

In the southeastern U.S., less tomato spotted wilt virus has been associated with twin row plantings than with single rows. Similar results have been observed in North Carolina. Higher plant populations and closer row spacings often result in fewer symptoms of virus. Seeding peanuts in narrow rows or at extremely high seeding rates has not increased yield over twin row plantings that establish a plant population of five plants per foot of row (sum of both twin rows). Although higher seeding rates are needed, and higher rates of in-furrow insecticide and inoculant are required, twin rows tend to produce a greater taproot crop rather than a limb crop. This tendency can improve uniformity of harvested peanuts, and in a dry season when peanut vines do not lap, this can result in higher yields. One of the detriments of twin row plantings, especially with the higher plant populations, is excessive vine growth, which can make digging more difficult.

Research conducted in North Carolina in recent years has shown no yield advantage to twin row plantings compared with single row plantings. However, some growers on sandy fields experience lapping of rows more quickly with twin row plantings, and they tend to have cooler soil conditions for initial pegging, which prevents loss of the earliest pegs.

**Table 3-17. Approximate Pounds of Peanut Seed Required per Acre to Provide 3, 4, and 5 Seeds per Foot of Row on 36-inch Rows**

Variety	Seed/lb	Pounds per Acre (36-inch rows)		
		3 Seeds/ft	4 Seeds/ft	5 Seeds/ft
Bailey	600	72	95	120
Emery	535	76	102	135
Runner market types	650	64	87	110
Sullivan	575	76	101	126
Walton	575	76	101	126
Wynne	500	87	116	145

**Table 3-18. Relationship Between In-row Plant Density (Seed per Linear Foot of Row) and Total Number of Seed per Acre on 30-inch and 36-inch Rows**

Seed per Linear Foot	30-inch Rows	36-inch Rows
4	69,696	58,080
5	87,120	72,150
6	104,544	87,126

## IRRIGATION

Having adequate water available throughout the peanut life cycle is important for optimal plant growth and development. Drought or flood can have tremendously negative impacts on peanut yields and quality. Likewise, pest infestation and

severity of damage from these pests are influenced by available water, either in the form of rainfall or irrigation. Understanding how environmental conditions and, in particular, irrigation, affect pest complexes is important in developing appropriate management strategies. Although less than 20 percent of North Carolina peanut acreage is irrigated, irrigation is a powerful production tool. Irrigation minimizes risk and enhances consistency of yield. In addition, irrigation improves consistency of pesticide performance and in many ways the predictability of pest complexes. The major production and pest management practices employed in North Carolina peanut production are listed in Table 3-19, with brief comments on how irrigation or ample rainfall affects efforts to manage pests or supply peanuts with adequate nutrition. Research supported by the North Carolina Peanut Growers Association has been conducted to determine the feasibility of subsurface drip irrigation. While there are many logistical issues associated with this approach, data collected at Lewiston-Woodville in corn, cotton, and peanut indicate that this approach to irrigation is feasible. As expected, corn yield was affected more than cotton or peanut yield by irrigation. Peanut yield was maintained more effectively than cotton in dry years without irrigation. These data give a good indication of yield under growing conditions where water is not limiting relative to dry-land production for these crops.

**Table 3-19. Impact of Irrigation on Production and Pest Management Strategies**

<b>Production or Pest Management Practice</b>	<b>Benefits of Irrigation or Optimum Rainfall</b>
<b>Land preparation</b>	Helps in establishment of seedbeds, either conventional or reduced tillage.
<b>Seed germination</b>	Ensures germination of seed when existing soil moisture is marginal for complete stand establishment.
<b>Weed management</b>	Irrigation or adequate rainfall activates preemergence herbicides and minimizes plant stress. Less moisture stress often enhances control by postemergence herbicides and enables peanut to recover more rapidly from herbicide damage.
<b>Insect management</b>	Important for activation of in-furrow insecticides. Improves plant growth and root establishment, which is important in absorption of in-furrow insecticides. Improves peanut recovery from early-season insect damage and insecticide phytotoxicity. Increases likelihood of southern corn rootworm survival and subsequent damage to pods but can protect against damage from lesser cornstalk borer. Minimizes potential damage from corn earworms and armyworms by establishment of a dense canopy that can withstand damage from feeding. Reduces the likelihood of spider mite damage by keeping spider mite populations low.

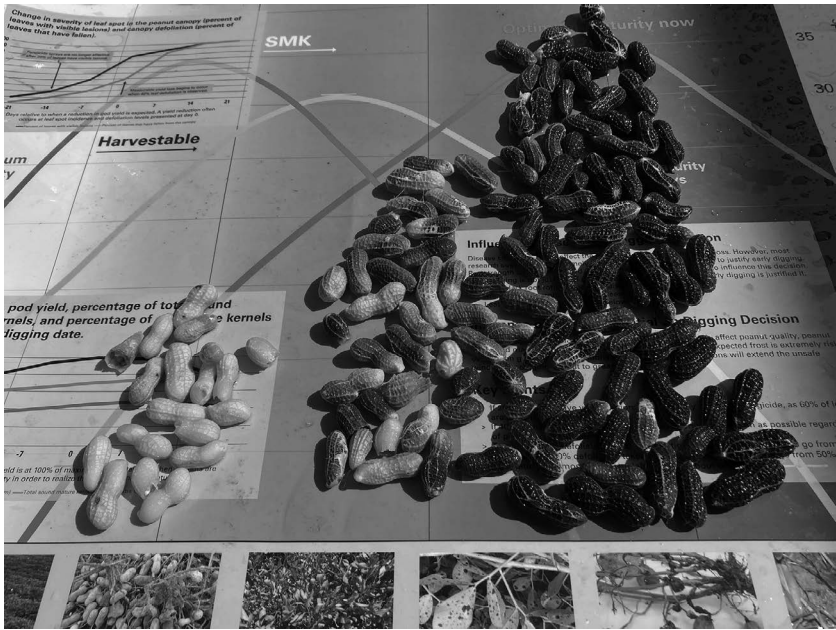
**Table 3-19. Impact of Irrigation on Production and Pest Management Strategies**

<b>Production or Pest Management Practice</b>	<b>Benefits of Irrigation or Optimum Rainfall</b>
<b>Disease management</b>	Wet conditions early in the season can favor infection of peanut by <i>Cylindrocladium</i> black rot (CBR), but can minimize potential for crown rot. Irrigation increases likelihood of having a favorable microclimate for development of many foliar and soilborne pathogens. A dense canopy that is supplemented by irrigation increases humidity within the canopy and minimizes airflow, all of which favor pathogen and disease development. Symptoms associated with tomato spotted wilt virus of peanut are often more pronounced when peanuts are growing under dry and especially hot conditions. Timely irrigation will reduce plant stress and possibly enable plants to withstand tomato spotted wilt virus, <i>Diplodia</i> collar rot, and charcoal rot more effectively than non-irrigated, water-stressed plants.
<b>Pod maturation</b>	Irrigation buffers against extremes in moisture and reduces stress (heat and drought), which allows normal flower production and kernel development. Maturation is more predictable and generally earlier. Limited rainfall during reproductive growth often causes delays in maturation and establishment of “multiple crops” or “split crops” on the same plant. Sufficient rainfall is critical for complete kernel development and pod fill. Limited soil moisture during flowering can reduce pegging. Irrigation modeling programs often include soil temperature as a trigger for irrigation during pegging.
<b>Supplemental calcium</b>	Kernels need adequate calcium to become mature and completely developed. Irrigation buffers against drought, which reduces calcium concentration in soil water and mass flow movement into developing pegs.
<b>Digging</b>	Ability to supply soil water to improve digging conditions reduces hardness of soil, which improves digging efficiency and minimizes pod loss during the digging process.

**DETERMINING MATURITY**

Maturity affects flavor, grade, milling quality, and shelf life. Not only do mature peanuts have the quality characteristics that the consumer desires, but they are also worth more to the producer. However, the indeterminate fruiting pattern of peanuts makes it difficult to determine when optimum maturity occurs. The fruiting pattern can vary considerably from year to year, mostly because of the weather. Therefore, each field should be checked before digging begins.

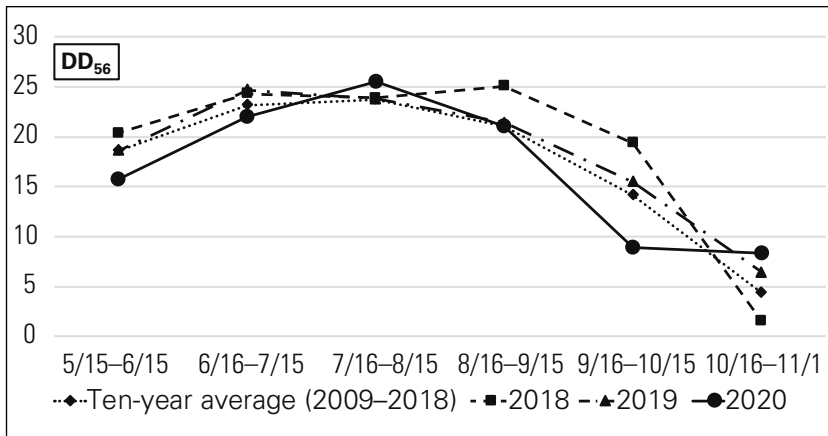
The hull-scrape method, currently the most objective method, requires the use of a peanut profile board that is available at county Extension centers. A version of the peanut profile board was developed for Virginia market types grown in the Virginia-Carolina region (Figure 3-1). It is important to follow a specific maturity prediction



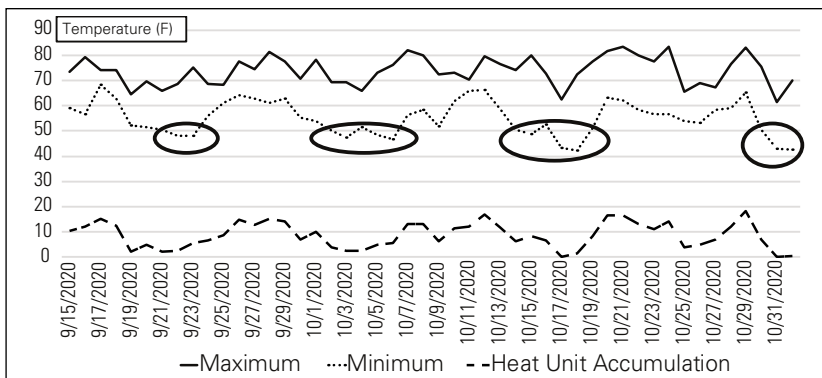
**Figure 3-1. The peanut profile board shown above was developed for Virginia market types.**

method to achieve maximum dollar value for peanuts. Also, expression of the high oleic trait is lower in immature kernels compared to kernels that are older and more fully developed. To ensure the benefits and uniformity of high oleic expression in the cultivars Emery, Sullivan, and Wynne, digging peanut as close as possible to optimum maturity is advised.

Heat units, or growing degree days (DD), can be a means of determining maturity. One growing degree day (base 56°F) accumulates when the average daily high and low temperature is 57°F. A ceiling of 95°F is used, as temperatures above 95°F can cause plant stress. If the average daily high and low temperatures were 76°F, then 20 growing degree days accumulate for that day. Research has shown that 2,650 to 2,700 growing degree days are needed for Virginia market types to mature if soil moisture is not limiting. Average heat unit accumulation for 2009 to 2018 compared to data from 2018, 2019, and 2020 is presented in Figure 3-2 to contrast the major differences in growing seasons. Peanut planted in early to mid-June 2019 were able to yield relatively well, in part due to the higher than normal accumulation of heat units from August 16 through October 15. However, yield was negatively affected in 2020 because of the cooler temperatures in September and October and nights with temperatures in the mid-to-high 40°F range (Figure 3-3). Pod maturation generally ceases in the fall when night temperatures are in the mid-to-high 40°F range for two nights in a row. Even though day temperatures may increase considerably, the plant



**Figure 3-2. Heat Unit Accumulation (DD<sub>56</sub>) at Lewiston-Woodville.**



**Figure 3-3. Maximum and Minimum Air Temperatures and Heat Unit Accumulation, September 15 to November 1, 2020, Lewiston-Woodville, NC**

seldom recovers from these cooler nighttime temperatures; this scenario occurred in the northern portion of the North Carolina coastal plain during 2020 in late September and again in early October. Many of the peanuts that were not mature by late September matured at a very slow pace for the remainder of the fall..

Research during 2016 and 2017 compared yield of Bailey, Wynne, and Sullivan planted in mid-May and dug September 10 and 20, and October 1 and 10. Maturity of these varieties varied little when comparing pod mesocarp color, and there was no interaction between variety and digging date. When averaged over varieties, delaying digging from September 10 to September 20 resulted in a substantial yield increase.

More recently, in digging trials at Lewiston-Woodville in 2021, yield of the varieties Bailey II, Emery, and Sullivan was similar across four digging dates beginning in

early September through mid-October. The optimum digging date for all varieties was October 5 compared with yields when dug September 8 and 23 or October 15. Optimum maturity for the variety Walton occurs at least several days to a week after Bailey II, Emery, and Sullivan.

A slight decrease was noted when peanuts were dug October 1, with a more substantial loss observed for October 10. Percentages of extra-large kernels and total sound mature kernels increased when peanuts were dug September 20 or later compared with digging September 10. Data from six years of research at Lewiston-Woodville with the variety Bailey also demonstrate the value of waiting until peanut are at optimum pod maturity before digging. Yield increased from 4,070 pounds per acre to 5,345 pounds per acre over a 28-day period from September 7 to October 5. At a selling price of \$500 a ton or 25 cents a pound, each day digging is delayed until optimum maturity results in an increase in economic value of \$11 per acre (increase in yield of 45 pounds per acre per day.) In 2020, peanut yield was higher when peanut was dug on October 5 compared with digging on September 11 or September 23.

At harvest, growers should follow the weather forecast closely and not dig peanuts when freezing temperatures are expected. It is also important to have adequate harvesting and curing equipment so that the peanut crop can be handled within a reasonable period of time. At least three days (72 hours), and in many cases more than three days, are needed between the time of digging and frost to allow sufficient drying to prevent freeze damage. Peanut frost advisories are available from the North Carolina State Climate Office ([products.climate.ncsu.edu/ag/peanut-frost/](https://products.climate.ncsu.edu/ag/peanut-frost/)). Digging and harvesting the 2020 peanut crop was a major challenge. As we moved into late October, the risk of freeze damage (Seg 2 peanuts) increased dramatically. The risk was compounded by fog and heavy dew that slowed drying of pods and vines and kept fields wet in some areas, which caused significant delays in digging. Although it is expensive due to subsequent drying costs, it is possible to pick peanuts within the first few days after digging if a frost or freeze is imminent. After three days, vines become too tough to thresh and harvesting must be delayed.

Digging and harvest capacity for growers are important to consider. The speed at which growers can plant peanuts is not the same as the time and labor it takes to dig, combine, dry, and haul peanuts. Most crops require a one-step process to harvest, while peanuts require two stages. Soil conditions during digging must be ideal to effectively remove peanuts from the soil and invert vines. Growers need to realistically determine the amount of time these operations will require.

With respect to digging, it is estimated that with four-row equipment and six-row equipment, 30 and 40 acres can be dug per day if growers dig for 10 hours a day driving at 3 mph with no interruptions. A six-row self-propelled combine can harvest 20 acres in a day driving at 1.5 mph, while four-row and six-row pull-type combines can harvest 15 to 20 acres in a day, respectively. Weather conditions can have a

tremendous impact on the number of hours peanut can be dug and combined in a given day, and the estimates provided here relative to time represent a best-case scenario.

In research conducted at Lewiston-Woodville during 2018, each increase in ground speed of 1 mph above 2 mph resulted in a loss of approximately 225 pounds per acre when a KMC digger was used. Growers can determine if a higher loss from digging more rapidly is acceptable if that allows greater acreage to be covered, especially if poor weather conditions are expected or a frost is in the forecast. In 2020 research, there was no difference in yield when comparing digging speeds between 2 mph and 4 mph. However, in 2021, research yield loss was substantial when the ground speed for digging was increased from 2 mph to 4 mph.

The decision to dig prior to optimum pod maturity rather than risk experiencing greater disease while peanut continue to mature can be stressful. When diseases are controlled well during the season, there is greater flexibility in deciding when to dig. The threshold for early digging is high and is discussed in more detail in Chapter 6. Peanut should be dug when 40 percent to 50 percent leaf defoliation occurs, regardless of pod maturity. In the new peanut profile, we provide information on when digging prior to optimum maturity is advised based on plant health and disease severity and incidence. We also provide information on when additional fungicide applications are warranted based on the percentage of lesions in the canopy. Generally, once 25 percent of leaves in the canopy have visible lesions, fungicides are no longer effective; at this level of severity, at least 60 percent of leaves are already infected. The fungicides we currently use are not curative. You can view the profile information in *Determining Peanut Pod Maturity and Estimating the Optimum Digging Date* at [content.ces.ncsu.edu/determining-peanut-pod-maturity-and-estimating-the-optimum-digging-date](http://content.ces.ncsu.edu/determining-peanut-pod-maturity-and-estimating-the-optimum-digging-date). Laminated, full-size versions of the profile chart are available at your local NC State Extension center.

## **RUNNER MARKET TYPES**

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There is some demand for runner market type peanut production in North Carolina. Part of this interest is related to market demand and sheller operations in the region. Runner production is also appealing to some growers because of potential savings in production of runners compared with Virginia market type peanuts (approximately 110 pounds of seed for runners versus 125 to 160 pounds of seed for Virginia market types and lower requirements for supplemental calcium by runner market types). Yield response to Virginia, Runner, Spanish, and Valencia market types planted in early June 2017 to 2021 are provided in Table 3-20. Each variety was dug at optimum maturity.

**Table 3-20. Yield of Virginia, Runner, Spanish, and Valencia Market Types Grown in North Carolina During 2017 – 2021 when Dug as Close to Optimum Maturity as Possible**

Variety	Market Type	Fatty Acid Profile	Breeding Program and State	Yield (lb/acre)				
				2017	2018	2019	2020	2021
Bailey II	Virginia	High oleic	NC State, NC			6670 ab	3,768 a	3,987 abc
Bailey	Virginia	Normal	NC State, NC	3811 ab	4380 ab	5908 be		
Sullivan	Virginia	High oleic	NC State, NC	4636 a	4623 a	6116 abc	4,202 a	3,660 c
Emery	Virginia	High oleic	NC State, NC	4538 a	4395 ab	6370 abc	4,046 a	4,573 a
Walton	Virginia	High oleic	Virginia Tech, VA, and University of Florida, FL				3,818 a	3,710 c
VENUS	Virginia	High oleic	USDA–ARS, OK	3642 ab	4005 ab			
Contender	Virginia	High oleic	ESDA-ARS, OK			4601 d		
TUFrunner 297	Runner	High oleic	University of Florida, FL				4,230 a	4,154 abc
TUFrunner 511	Runner	High oleic	University of Florida, FL				4,186 a	4,492 ab
Florida 07	Runner	High oleic	University of Florida, FL	3896 ab	4041 ab			
Florunner 331	Runner	High oleic	University of Florida, FL	3651 ab	4591 a	6751 a		
TifNV-High O/L	Runner	High oleic	USDA-ARS, GA					3,904 bc
Lariat	Runner	High oleic	USDA–ARS, OK	4008 ab	4595 a	5622 c		
OLé	Spanish	High oleic	USDA–ARS, OK	3890 ab	3883 b	6261 abc		
NuMex-01	Valencia	High oleic	New Mexico State University, NM	3242 bc	3041 c		2,210 b	
NuMex-02	Valencia	High oleic	New Mexico State University, NM			3159 e		
Olin	Spanish	High oleic	Texas A&M University, TX				2,200 b	

Means within a year followed by the same letter are not significantly different at  $p < 0.05$  based on Fisher's Protected LSD test.

## **PLANT GROWTH REGULATORS**

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Apogee and Kudos (prohexadione calcium) are registered for use in peanuts. Research has demonstrated that prohexadione calcium improves row definition, which can lead to increased efficiency in the digging and inversion process. Prohexadione calcium should be applied when 50 percent of vines from adjacent rows are touching. Sequential applications (7.2 ounces per acre followed by 7.2 ounces per acre) spaced two to three weeks apart are generally needed. Include crop oil concentrate and nitrogen solution (UAN) or ammonium sulfate with prohexadione calcium. Depending upon growing conditions, soil fertility, frequency of rainfall and irrigation, and variety selection, row visibility obtained in mid-August may not be sufficient through digging. Research suggests that in addition to increased row visibility, prohexadione calcium minimizes pod shed and pod loss during digging and harvesting operations. While prohexadione calcium always improves row visibility, this characteristic has not always translated into yield increases. Many growers use GPS tracking during the digging operation, and this can decrease pod loss substantially. Reduced digging losses and improved pod retention have been associated with yield increases following prohexadione calcium.

A vast amount of small-plot research has been conducted in North Carolina to determine peanut response to prohexadione calcium. In recent years, most of the results from those experiments have shown no yield advantage to using prohexadione calcium. Yet, at least 50 percent of growers in North Carolina apply the products Apogee or Kudos at least once to Virginia market types. In several recent peer-reviewed articles, significant responses to Apogee were observed in large-scale trials compared with small-plot research.

The morphological or growth habit of Sullivan is different from that of Bailey II in that its foliage is less robust than Bailey II's growth habit. This characteristic may minimize the need for prohexadione calcium in terms of row visibility. However, many growers are applying prohexadione calcium to Sullivan when 50 percent of vines from adjacent rows are touching. Unlike Bailey II, Sullivan does not always require a second application two to three weeks later.

## **ORGANIC PEANUT PRODUCTION**

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Producing peanuts that meet certified organic criteria set by the USDA with restrictions set by the Organic Materials Review Institute (OMRI) can be challenging compared with peanut produced using conventional technologies (synthetic pesticides and fertilizers). However, demand for organically produced peanut is strong, and markets are available. The two major production-oriented challenges with the organic approach to production are obtaining adequate plant stands and effectively controlling weeds. While disease, insect, and nematode control can be

difficult to achieve, in most instances impacts of insects and nematodes, and in some cases in-season diseases, are not catastrophic but can reduce yield substantially.

In contrast, the need to plant seed that is not treated with effective fungicides and the difficulty in controlling grassy weeds can result in complete crop failure. Growers interested in producing peanut using organic principles should plant when soil conditions favor rapid emergence of seedlings. Fields with low infestations of weeds should be selected.

Challenges also exist from a post-harvest perspective. The certification process does not end in the field but carries through all processing steps. This can be a major constraint to organic adoption because current shellers in the Virginia-Carolina region are too large to invest in transitioning their plants to a relatively small volume of peanut for organic certification. For example, Hampton Farms markets several products that are certified organic, but all production is in New Mexico because of shelling and processing logistics and certification requirements at the post-harvest level.

A comprehensive chapter on organic peanut production in North Carolina can be found in *2019 Peanut Information* or the online NC State Extension guide, *North Carolina Organic Commodities Production Guide*, AG-660 (available at [content.ces.ncsu.edu/north-carolina-organic-commodities-production-guide](https://content.ces.ncsu.edu/north-carolina-organic-commodities-production-guide)).

## **ADDITIONAL EDUCATIONAL MATERIALS**

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The NC State Extension peanut portal ([peanut.ces.ncsu.edu](https://peanut.ces.ncsu.edu)) contains information that can be used to make decisions about peanut production and pest management. There is also an archive of educational videos and screencasts (PowerPoint presentations with voiceover) for the peanut production course at NC State. Contact David Jordan for access to these resources.

**RESULTS FROM LARGE-PLOT ON-FARM TESTS**

A dump cart with a weigh scale was purchased in 2021 with partial funding from the North Carolina Peanut Growers Association for large-plot, on-farm testing (Figure 3-4). In 2021, ten on-farm trials using this equipment were conducted across North Carolina. Results from these trials are provided in Tables 3-21 through 3-24. Results from 2022 trials will be posted on the NC State Extension peanut portal ([peanut.ces.ncsu.edu](http://peanut.ces.ncsu.edu)).



**Figure 3-4. A Peanut Dump Cart with a Weigh Scale Was Used in Large-Plot Testing.**

**Table 3-21. Peanut Yield from Variety Trials Conducted in North Carolina with Farmers and NC State Extension Agents in 2021 <sup>a</sup>**

Variety	Counties, NC State Extension Agents, and Farms			
	Bertie Billy Barrow David Leggett	Chowan Matthew Leary Beech Fork Farms	Columbus Lydia Miles Ellis Jordan	Martin Lance Grimes Ben Cowin
Bailey II	6006 a	5335 a	5967 a	6567 a
Emery	6112 a	4991 a	6026 a	6566 a
Sullivan	5973 a	4990 a	5924 a	6646 a
Walton	6105 a			
Wynne	6118 a			

<sup>a</sup> Means followed by the same letter in a type of trial and county are not statistically different.

**Table 3-22. Peanut Yield from Seeding Rate Trials Conducted in North Carolina with Farmers and NC State Extension Agents in 2021 <sup>a</sup>**

Seeding Rates (No. per foot of row)	Counties, NC State Extension Agents, and Farms		
	Bertie Billy Barrow Joey Baker	Martin Lance Grimes Geoffrey Corey and Sons Farm, Inc.	Northampton Craig Ellison Mike and Brandon Belch
4 (5.1*)	6729 a	5790 a	6219 a*
5 (5.5*)	6869 a	5915 a	6296 a*
6 (6.0*)	6727 a	5820 a	6410 a*

<sup>a</sup> Means followed by the same letter in a type of trial and county are not statistically different.

**Table 3-23. Peanut Yield from Apogee Trials Conducted in North Carolina with Farmers and NC State Extension Agents in 2021 <sup>a</sup>**

Apogee	Counties, NC State Extension Agents, and Farms	
	Columbus Lydia Miles Ellis Jordan	Martin Lance Grimes John David Williams
No sprays	6035 b	4414 b
One spray		4950 ab
Two sprays	6221 a	5276 a

<sup>a</sup> Means followed by the same letter in a type of trial and county are not statistically different.

**Table 3-24. Peanut Yield from a Digging Speed Trial Conducted in North Carolina with Farmers and NC State Extension Agents in 2021 <sup>a</sup>**

Digging speed	County, NC State Extension Agent, and Farm
	Columbus Lydia Miles Ellis Jordan
2.6 mph	6520 a
4.0 mph	5735 b

<sup>a</sup> Means followed by the same letter in a type of trial and county are not statistically different.