Chapter 14

Harvesting Practices

By W. T. MILLS AND L. E. SAMPLES[1]

Harvesting is a broad term used to describe the operations necessary in removing the peanut pods from the soil and preparing them for market. Peanut harvesting is a complex operation requiring timely and precise practices. The peanut plant is unique in that it produces aerial flowers but underground fruit as illustrated in Fig. 1. The fruiting habit is indeterminate resulting in a wide range of kernel maturity and moisture content at digging time. These factors, along with climatic and other factors, contribute to the complexity of peanut harvesting.

Peanuts did not emerge as a commercially valuable crop until the development of production and havesting equipment in the early 1900's made it possible to expand the acreage significantly. The havesting practices developed in the early 1900's remained virtually unchanged for forty years.

Early 1900 Harvesting Practices

These practices consisted of digging, shaking and stacking, and picking. Digging consisted of plowing the plants out of the soil with a horse-drawn mold board plow as shown in Fig. 2, or a similar tool. As tractors were developed, plows, or improved blades, were mounted on the tractor to dig peanuts. The objective of digging was to to loosen the soil around the nuts so the plant could be lifted by hand without losing the nuts.

Shaking and stacking, a dirty, backbreaking job, was all hand work as shown in Fig. 3. The wilted peanut plants were picked up by hand and shaken to remove the dirt from the peanut pods and roots. The plants were stacked above the ground around

[1]W. T. Mills is Market Research Manager, Lilliston Corporation, Albany, Georgia, and L. E. Samples is Extension Engineer-Peanut Mechanization, Cooperative Extension Service, University of Georgia, Tifton, Georgia.

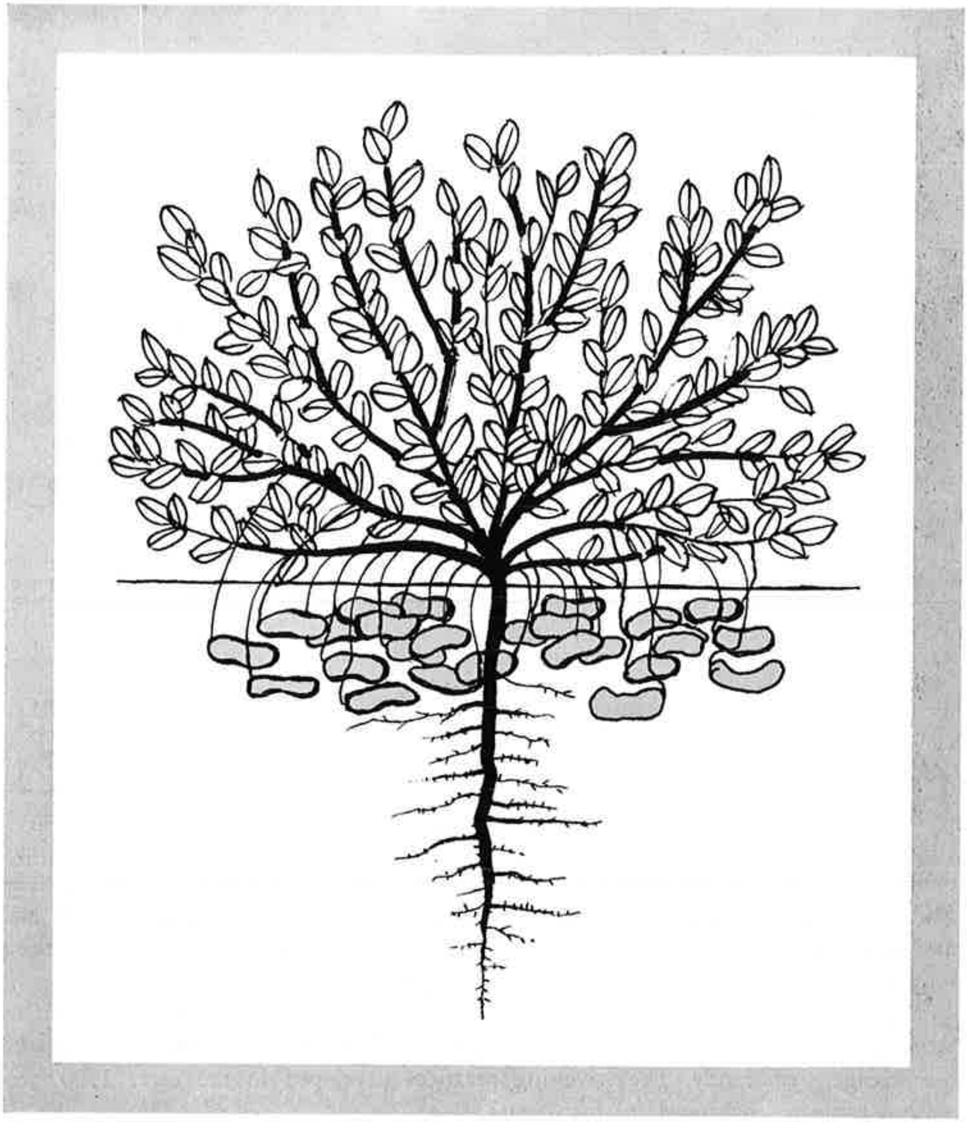

Figure 1. Peanut Plants are Unique in that They Produce Aerial Flowers and Underground Fruit.

poles that were placed in the ground about 18 inches deep. The pods were placed to the inside to protect them from rain and ainmals. The purpose of stacking was to allow the nuts to dry from the initial moisture level of approximately 50% to a safe storage level of 10%.

Picking began when the peanut kernels reached a moisture content of 10% or less. The early peanut-picking machines, being stationary, were set up in the middle of the field and the stacked peanut plants were transported to the picker on mule-drawn sleds or special wagons as illustrated in Fig. 4. The peanut plants were hand fed into the picker with forks. Horses, stationary engines, and later, tractors were used to power these machines which picked the pods from the plants. The picked and cleaned pods were discharged from the picker into tubs, or other type containers, and then sacked for marketing.

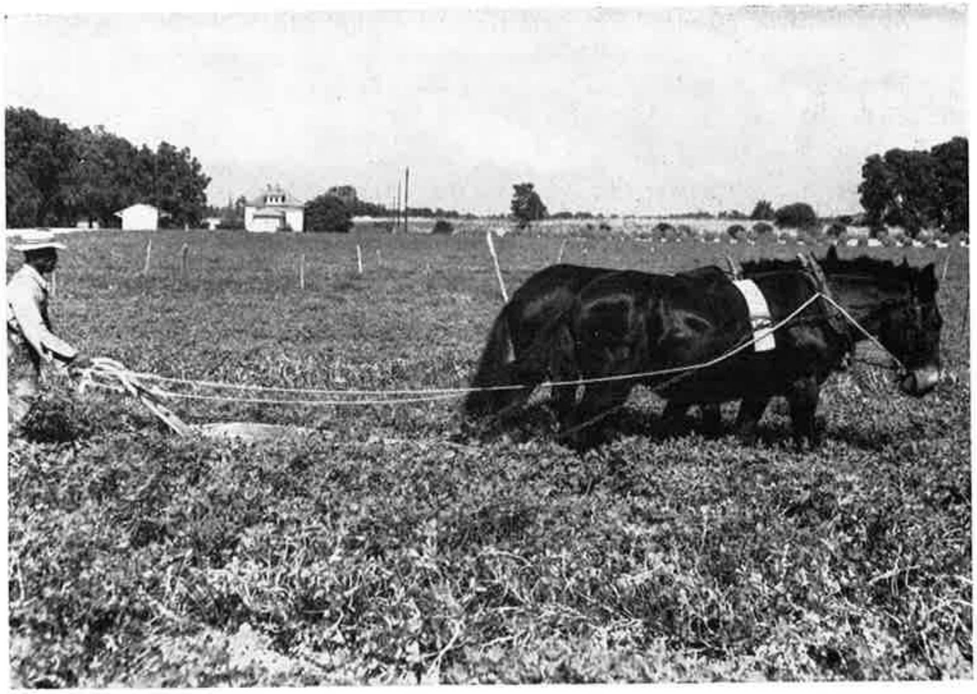

Figure 2. Mule-drawn Moldboard Plow Used in Early 1900's to Dig Peanuts.

Figure 3. After Digging, Dirt Was Shaken Out and Plants Stacked Around Poles to Cure.

Approximately 30 man-hours were required to dig, stack and pick each acre of peanuts. As the years passed, equipment improvements and additions were developed that increased the efficiency of the harvesting practices, but made very little change in the practices themselves.

Harvesting Practices Change in the 1950's

Two pieces of equipment were developed in the late 1940's that resulted in major changes in harvesting practices. The first piece of equipment, a peanut shaker-windrower, shown in Fig. 6, picked up the peanut plants after they were dug, shook out the dirt, and placed two rows of plants into a windrow to cure. This was a drastic change from the stacking practice, and was not fully adopted by all growers for some fifteen years. The shaker-windrower was pulled behind, and powered by, a tractor. The tractor generally had peanut plows mounted on the front so that the entire digging, shaking and windrowing operation could be accomplished in one trip through the field.

The second piece of equipment was a peanut combine. Pulled behind a tractor and powered by an air-cooled engine, the peanut combine picked up the peanut plants from the windrow after they had dried to a safe moisture level, picked off the pods, and deposited the cleaned pods into sacks as shown in Fig. 7.

These two pieces of equipment reduced the man-hours required to harvest an acre of peanuts from 30 man-hours per acre to 4 man-hours per acre, and were quickly put into use by the peanut growers in the Southeast and Southwest in 1950 and 1951. This equipment began to be used in the North Carolina-Virginia area in 1954.

The windrow method, as this harvesting practice is called, led to the development of controlled drying of peanuts. In the late 1950's, peanut combines were improved

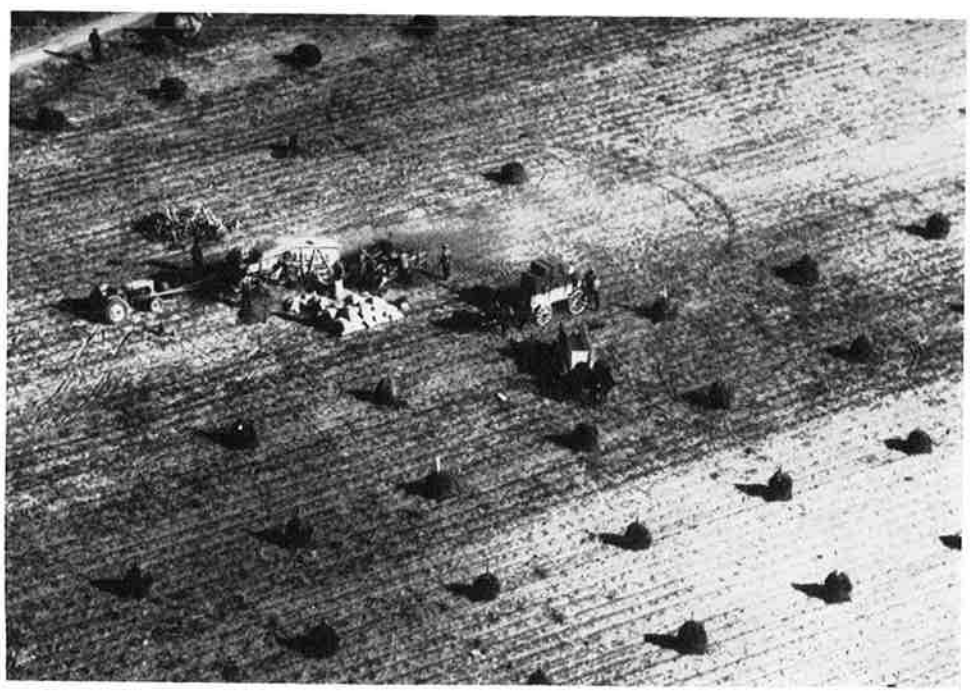

Figure 4. Cured Plants Were Threshed with Stationary Peanut Pickers.

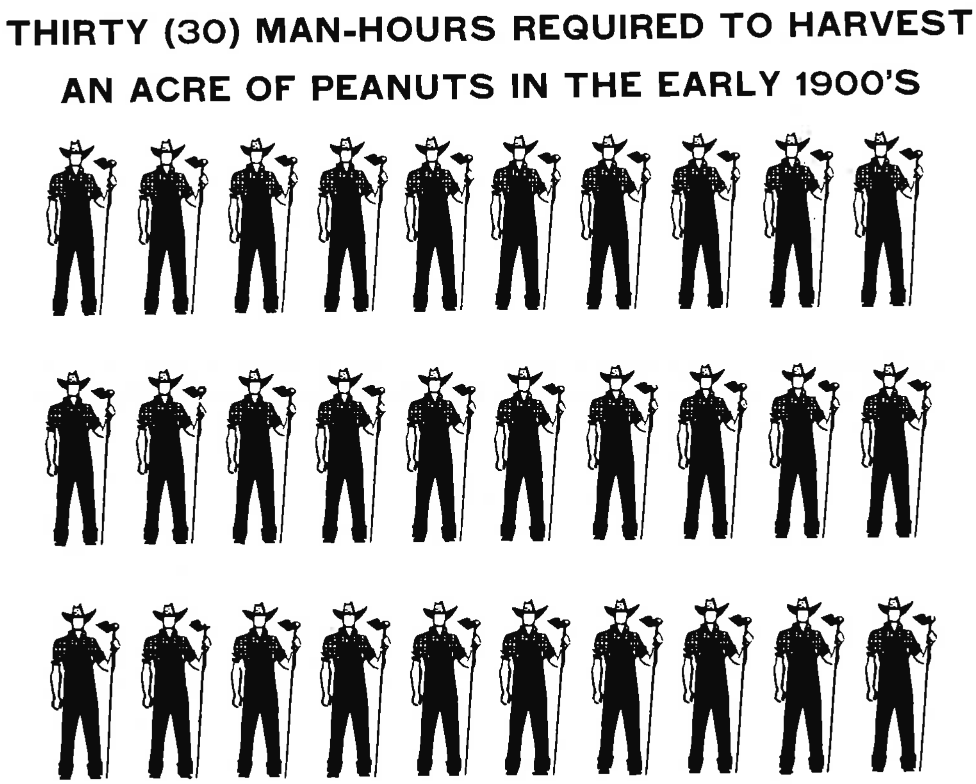

Figure 5. Man-Hours Required to Harvest an Acre of Peanuts in Early 1900's.

Figure 6. Equipment Was Developed in the Late 1940's to Shake Out the Dirt and Windrow the Plants.

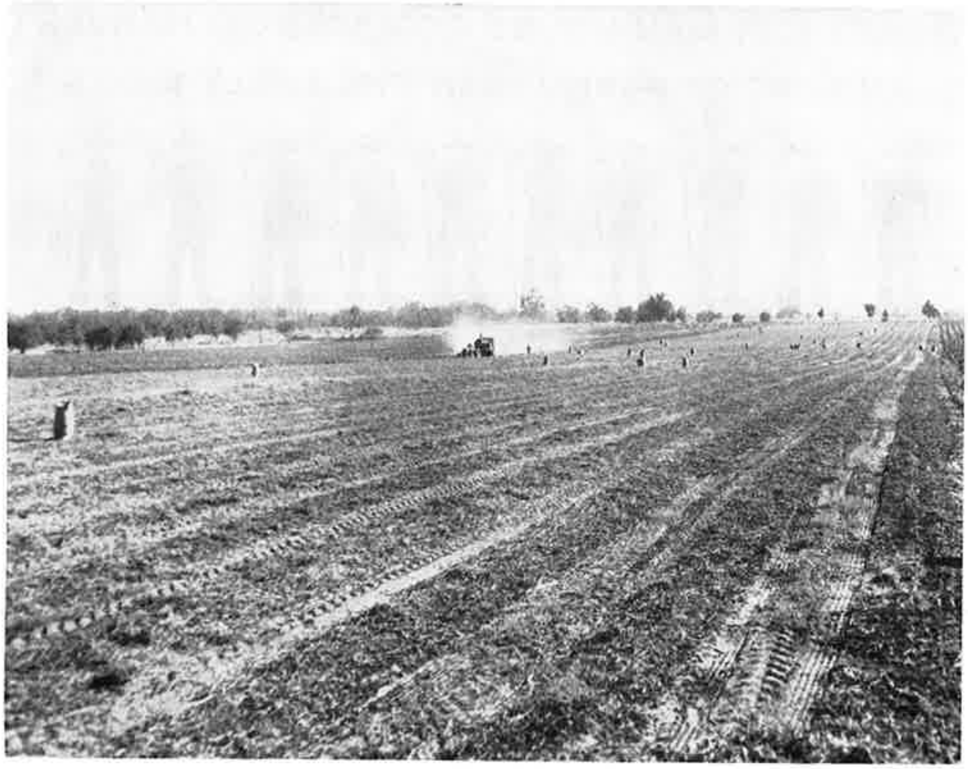

Figure 7. Combines Were Developed to Pick the Peanuts and Deposit Them in Bags.

so that they could efficiently pick medium to high moisture peanuts from partially green plants. The higher moisture pods were then placed in a curing structure and heated air passed through the pods to reduce the moisture content to a safe moisture level for storage. This development reduced the time the windrows were in the field by 50% in most cases and thereby significantly lessened the risk of weather damage.

Another Significant Change in the 1960's

The shaker-windrower, developed in the late 1940's, and the improved digger-shaker-windrowers that were developed during the 1950's and 1960's, placed the vines in a random orientation within the windrow. The peanut pods on the various plants could be found throughout the windrow with some pods in contact with the soil, some pods above the soil, some pods shaded, some pods totally exposed to the sunlight, and combinations of all of the above.

In the 1960's digger-inverters were developed in the Texas-New Mexico area that dug the peanuts, inverted the plants, and placed them in a windrow with all the pods on top of the windrow where they were exposed to full sunlight and air circulation. Initially these digger-inverters were used only on the late south Texas crop where air temperatures were cool and drying conditions poor. During the 1960's research tests were carried out in all the peanut growing areas to determine the effects of the inversion process on peanut quality. By the late 1960's the results of these research programs had established that this inversion process, as shown in Fig. 9, offered the

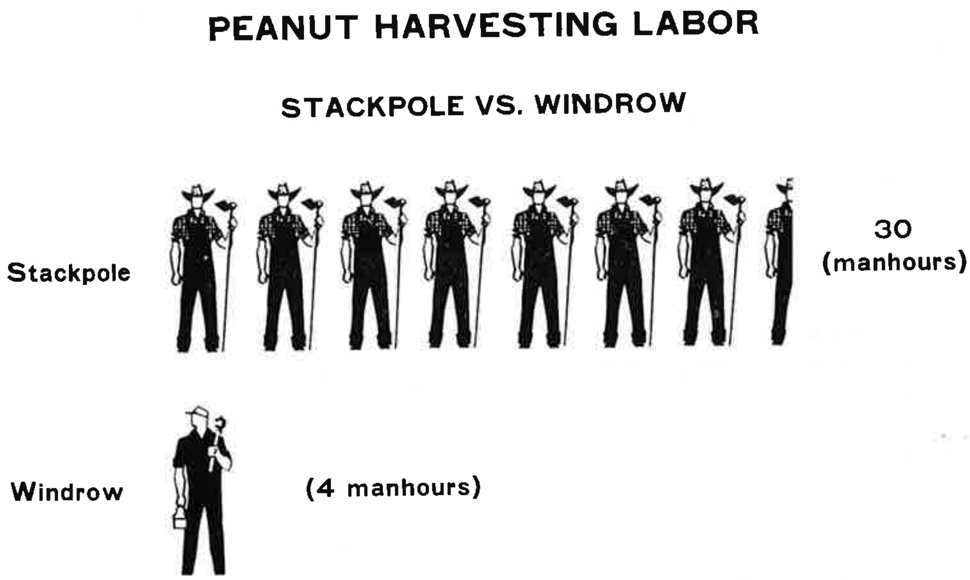

Figure 8. Peanut Harvesting Labor — Stackpole vs. Windrow.

Figure 9. Inverted Plants Place Pods in Improved Curing Environment.

peanut producer a significantly improved practice. Advantages of this practice over the random windrow were:

(1) Faster pod drying rate, particularly under adverse weather conditions.
(2) More uniform drying of all pods.
(3) Reduced pod loss from shattering.
(4) More dirt removal from the plants.
(5) Easier combine pick-up and threshing.
(6) Reduced weather risk.

The initial digger-inverters successfully operated in only a rather narrow range of soil and vine conditions. When new, improved digger-shaker-inverters were perfected in 1968, peanut growers in all the growing areas began to adopt this practice. By 1971, the inverted windrow concept was a recommended practice in all the peanut growing states and over 65% of the growers were using this practice.

Current Harvesting Practices

Pre-Harvest Preparation

Smooth fields of well-drained sands or loamy sands favor both production and high recovery rates during harvest. The selection of specific soil types is more important in peanut production than in most other crops because of the direct influence of soil type on harvest losses. Pre-harvest treatment of fields was rarely practices in early culture during the early 1900's. Growers now use cultural practices that prevent compaction of soil around plants, control weeds and grass more efficiently, and maintain

Figure 10. Clipping Peanut Vines Prior to Digging.

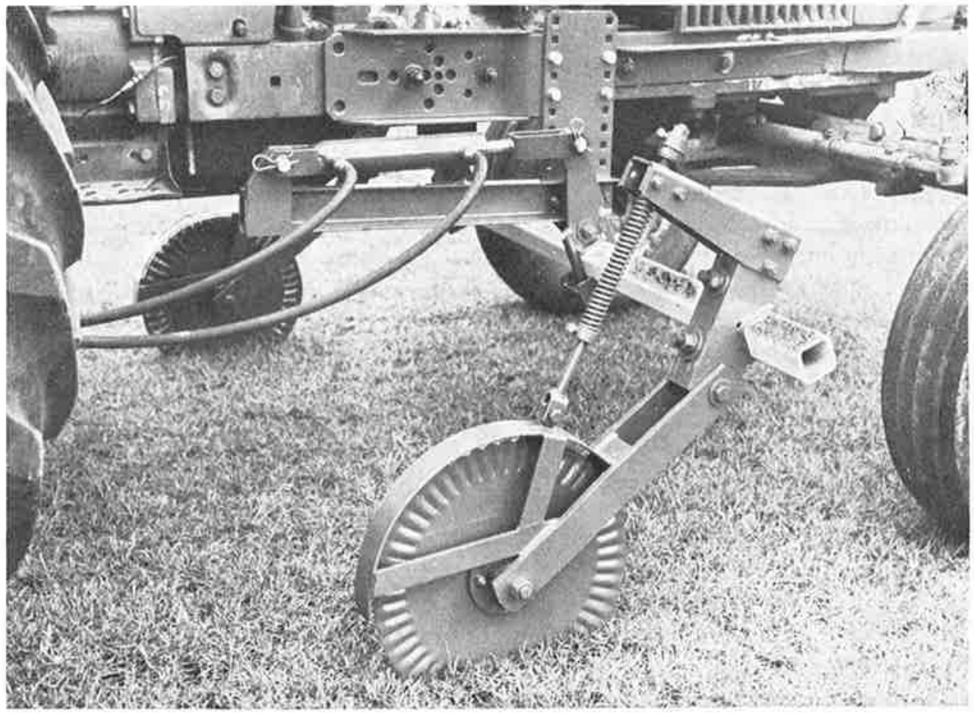

Figure 11. Coultering Peanut Vines Prior to Digging.

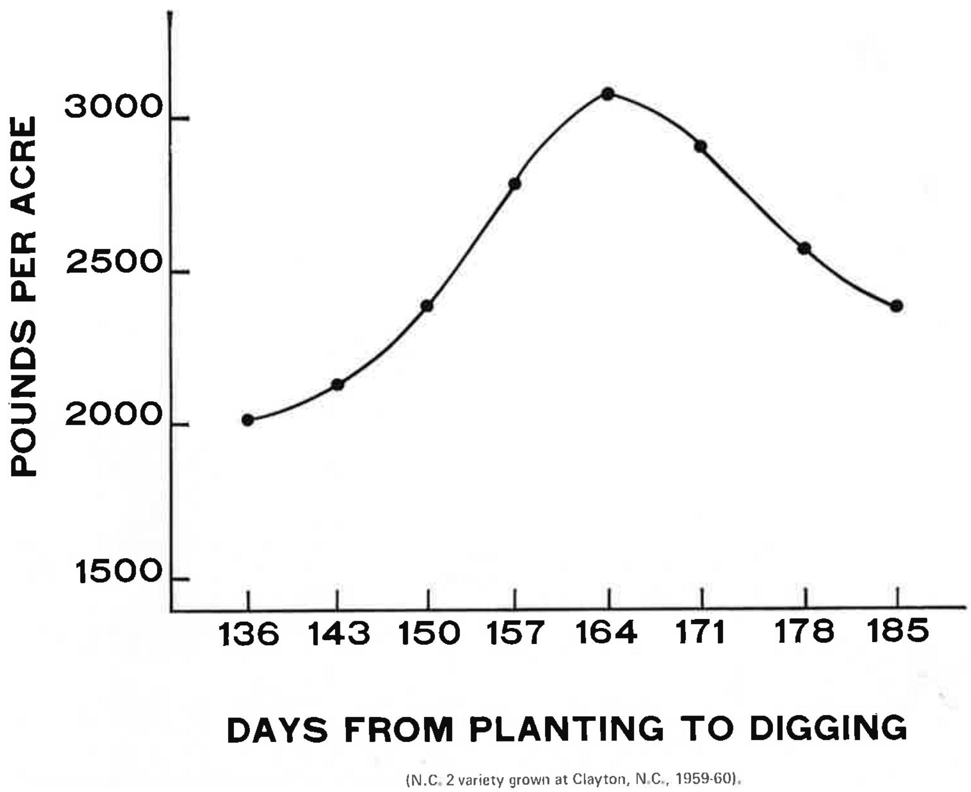

Figure 12. Typical Yield Curve Reveals Optimum Time to Dig.

clean borders at ends of peanut rows to allow efficient use of digging and harvesting machinery.

Current peanut varieties under ideal conditions produce dense, heavy foliage. Vine clipping as shown in Fig. 10, is commonly practiced to reduce the amount of foliage entering the combine which aids in separation efficiency. Branches of prostrate growing varieties often lap in the middle and present a problem in separating plants according to a row regime at harvest. For these varieties, coultering often precedes the digging operation as illustrated in Fig. 11. All blades used for coultering or vine clipping must be sharp and must cut cleanly without dragging to prevent pod loss. Vines should be clipped immediately before digging with a rotary cutter set to remove the top 1/3 of erect type and the top 1/2 of the prostrate type varieties. Excessive vine clipping which removes too much foliage must be avoided, as too short plants are not handled efficiently by havesting machinery.

Digging-Shaking-Windrowing

Peanuts should be dug when the maximum number of pods are mature. The wide range of maturity among the peanut pods on an individual plant, along with the fact that the pods are underground makes the decision as to when to dig the crop a difficult one indeed. This optimum digging period is illustrated in Fig. 12 and is about 10 days in length. The number of days from planting to the optimum digging time varies with varieties and with weather conditions. The peanut grower must therefore

Figure 13. Tractor Powered Digger-Shaker-Windrower.

Figure 14. Tractor Powered Digger-Shaker-Windrower that Inverts the Plant.

Figure 15. Tractor Powered Peanut Combine with Bulk Holding Tanks for the Picked Nuts.

Figure 16. Combine Bulk Tanks Unloading into Drying Trailer.

inspect the pods from several plants in each field at three to five day intervals during the last few weeks of the growth period to determine the optimum digging time for each field.

Optimum soil moisture for efficient digging would be comparable to that desired for good cultivation. Wet soil is difficult to separate from pods and roots, whereas soil with optimum moisture will crumble readily. Penetration of hard dry soil is difficult and the unmounted ends of the digger blades tend to rise into the pod zone resulting in severe pod losses.

Although the digger-shaker-windrower, which places the plant in a random windrow as illustrated in Fig. 13, was still being used by some growers in 1971, approximately 65% of the growers had made the transition to the newer digger-shaker-inverter and the inverted windrow. The digger-shaker-inverter as shown in Fig. 14, consists of special digging blades to loosen the soil and cut the taproot, a pick-up and elevating mechanism to lift the plants and shake the dirt loose, and a windrowing inverting component to turn the plants upside down and place two rows together in a windrow.

Re-shaking the windrow is commonly practiced under wet digging conditions in an effort to remove additional soil from the plants before combining. The windrows are usually re-shaken the first or second day after digging, using a digger-shaker-windrower, or a digger-shaker-inverter with the inverting component removed. The decision to re-shake the windrow depends upon the tendency of the pods to fall off of the plant. Generally, the longer the plants have been in the windrow, the greater is the tendency for the pods to fall off.

Combining

While some growers follow the extreme practices of combining high-moisture, freshly-dug peanuts on one hand, or bone-dry peanuts on the other, the most common practice is to start combining when the kernel moisture is from 20% to 25% (wet basis). Research results, supported by field experience, indicate less damage occurs when peanuts are picked within this moisture range.

Peanuts should not remain in the inverted windrow any longer than the time required to bring the pod moisture down to 20%, as overexposure of the pods in the windrow sometimes permits moisture removal to become too rapid. This condition results in poor milling qualities and increases the tendency of the pods to be shelled in the combining process.

Most peanut combines are tractor-drawn and tractor-powered as shown in Fig. 15. Combines consist of a pick-up section for lifting the plants from the windrow into the combine; a picking section for removing the pods from the plant; a cleaning section for removing the foreign material from the picked pods, and a storage section for bulking the picked and cleaned pods.

When the combine storage tanks become full, the peanuts are dumped into trucks or trailers as shown in Fig. 16, for transport to the curing facility.

Curing

Initial curing of plant and pods is usually done by allowing plants to dry in the windrows naturally under existing ambient conditions. Plants wilt quickly; plant stems,

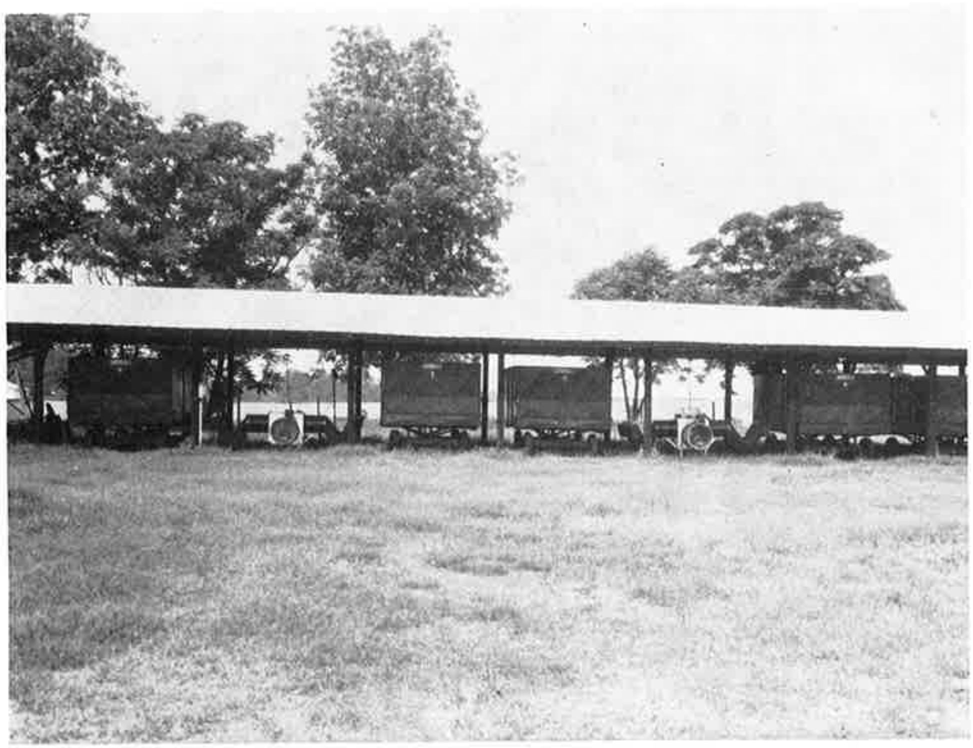

Figure 17. Drying Trailers Used to Cure Peanuts.

pod stems and pods lose moisture very fast after tap root is cut. Plants are allowed to remain in the windrow until whole pod moisture drops down to approximately 20-25% wet basis.

After combining, the peanuts are placed in a curing facility where low humidity air is forced through the peanuts to evaporate the excess moisture. It is a common practice to use a drying wagon as shown in Fig. 17, to transport the peanuts from the combine thus eliminating the need to unload and load the peanuts at the curing facility.

Curing is a critical operation that can influence flavor, milling quality, seed quality, as well as final moisture content. Current curing practices include the following:

(1) Control air temperature to prevent kernel temperature from exceeding 95° F.
(2) Control humidity to keep drying rate from exceeding ½% per hour.
(3) Terminate drying air to achieve a final moisture content between 7-10%.

Curing practices are treated in more detail in the following chapter.

REFERENCES

Stokes, C. M., and Reed, I. F., *Agricultural Engineering* 4, 175-177 (1950).
Shepherd, J. L., and Kenny, W. D., Unpublished Paper on Developing a Peanut Combine Harvester (1950).
Mills, W. T., and Dickens, J. W., N. C. Bulletin 405 (1958).
Pierce, W. H., and Mills, W. T., N. C. Bulletin 413 (1961).
McGill, J. F., and Samples, L. E., Ga. Bulletin 640 (1969).