BULLETIN

OF THE

AGRICULTURAL AND MECHANICAL COLLEGE
OF TEXAS

N. S. Vol. 2 JANUARY, 1915 NO. 3

EXTENSION SERVICE

BULLETIN E. S. 3

PEAS AND PEANUTS

BY

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J. C. BURNS, Professor of Animal Husbandry.
WILMON NEWELL, Professor of Entomology.
A. H. LEIDIGH, Experiment Station Agronomist in Charge of Soil Improvement.
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Published quarterly by the Agricultural and Mechanical College of Texas

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VON BOECKMANN-JONES CO., PRINTERS, AUSTIN, TEXAS
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PEAS AND PEANUTS.

This bulletin is issued in answer to many direct inquiries and in sequence of a previous bulletin on "Money Crops in Place of Cotton," which laid some stress upon peas and peanuts as money crops of promise for several sections of Texas.

There is reason to fear that without the exercise of intelligent forethought and preparation for marketing the output of peas and peanuts, farmers may find themselves at harvest time in possession of another surplus crop which would not sell for a profit. It would avail nothing for the farmer to escape low priced cotton only to become victimized by low priced peas and peanuts.

But peas and peanuts can be fed to live stock, which experience proves to be the most profitable method of selling feed crops.

Therefore, this bulletin contains advice about feeding as well as producing.

Another important consideration is the protection of peas from weevil in order that they may be held for profitable marketing. This subject is carefully treated and should have thoughtful attention.

Still another important matter is the crushing of peanuts in order to develop a wider and more stable market. That, also, is treated, and the studies and observations herein recorded are recommeded to the special consideration of cotton seed oil mills. With a reduced cotton output, oil mills will find it to their advantage to look to peanut crushing as means of utilizing their plants. This Department is now in correspondence with oil mills and is hopeful that many mills will be prepared, by harvest time, to crush peanuts.

The Department is endeavoring also to arouse interest among business men in the establishment of plants for the processing and storing of peas.

Most important of all is organization among farmers by neighborhoods and counties for intelligent cultivation, for processing and for marketing. Peas and peanuts cannot be sold like cotton, for which there is more or less demand at every railroad station at any hour in the day. They must be sold in bulk, or they must be fed to live stock, in order to obtain the best results. To this end it is necessary for farmers in every community to organize.

If a hundred farmers in a community plant five acres each and undertake to market separately at the convenience of each, they are apt to be disappointed in the returns. But if they organize and work together they may be sure of receiving the best possible results. As an organization they can easily obtain aid from the College in any particular problem of cultivation, for while the College could not send an instructor to each farmer, it could send one to a group of one hundred farmers, and through the Demonstration Agent in the county the organization can be advised from time to time as to methods of cultivation, processing and marketing. Moreover, with a known acreage in a com-

munity—say 500 acres in the case we are supposing—capital can be induced to establish a processing plant for preserving peas or a crushing plant for handling peanuts. In like manner, a hundred farmers feeding these products to live stock, could sell their live stock in carload lots and receive far better returns than if they sold separately.

Through organization and co-operative selling, the farmers can succeed with diversified crops; without it, success is uncertain. But as to the uncertainty of returns, we submit that nothing is more uncertain at this time than the price of cotton in 1915.

The College Extension Service; the new State Warehouse System, of which the Honorable F. C. Weinert, Austin, is the general manager, and the State Department of Agriculture, of which the Honorable F. W. Davis, Austin, is commissioner, will all be glad to render aid in effecting organization where there is not already a local organization which can be utilized.

This bulletin is prepared in some haste because of the urgency of the season, and it is not to be taken as the College's "last word" on peas and peanuts. Investigation will be continued in the field of feeding and converting these crops, and as time permits and occasion invites there will be other advice and full information for those who are interested in this phase of Texas agriculture and industry. It is suggested that inquirers may save time by applying for information directly to the County Demonstration Agent, to whom this Department will communicate any new facts that may be developed.

The extension service will appreciate any suggestions for further investigations and will be glad to answer any particular inquiry that may be submitted.

CLARENCE OUSLEY,
Director of Extension Service.

THE COWPEA.

A. H. LEIDIGH,
Agronomist in Charge of Soil Improvement, Texas Agricultural Experiment Station.

Our system of farming in Texas has led the farmer to pay far too little attention to the growing and use of grasses and legumes as soil improvers and for live stock feeding. We are neglecting the best, and at the same time the most profitable means of improving our soils and our farming business as a whole. One of the important crops we are neglecting to use is the cowpea.

This brief article on cowpeas is written for the farmer who raises the crop. The feeding of the crop is not discussed. (See article, by Prof. Burns, on feeding peas and peanuts, elsewhere in this bulletin.)

The cowpea is a hay crop, a pasture crop and a soil improvement crop. As its use for the above purposes increases there will be an ever-increasing demand and market for its seed as planting seed. We may say, therefore, that in addition to its value for feed and fertility when used on the farm, the crop has two features that put it on the market as a money crop. These are, first, as hay; second, as seed.

Some varieties of cowpea seed are used as food, so the use of the seed may be divided into two parts, as follows: First, as planting seed; second, as a food product for human use.

It is not usually possible to secure the largest hay crop from the cowpea and also get a large seed crop at the same time. Neither is it possible to secure each of the above and also give the soil the full value of the fertility contained in the crop. Therefore, before planting cowpeas, the farmer should have in mind the purpose to which the crop will be put when harvested. The various ways of producing and handling the crop in the different sections of the State are briefly discussed in what follows:

In sections 1 and 2,* use old fields for this crop, since it is a builder up of run down soil. Do not use fields that become waterlogged every time it rains. Plow five to eight inches deep in the fall or winter, turning under all trash and burning nothing. On deep sands, do not plow deeply, unless clay can be reached at six to eight inches, in which case turn some of the clay up. Leave the land rough over winter and, if obtainable, scatter manure and humus-forming material on the field.

After February 1, give tillage with the harrow, the disk, the cultivator, or the "buster," to keep down weeds, to break up the surface crust, and to permit the land to absorb and hold moisture. If plowing is not done until in the spring, the field should be worked down within a short time after plowing. With this crop, as with almost any other crop, it is important to give a great deal of cultivation and surface work during the spring, before the seed is planted.

Varieties.—There are several good varieties of cowpeas. The New Era, the Groit and the Brabham are doubtless the best for hay, and, of course, for seed purposes. The various white seeded varieties are

*Extension Service Bul. N. S., Vol. 2, No. 2, "Money Crops in Place of Cotton." See may. P. 8.

used for food. Of these the Blackeye is the most popular. As a green manure crop almost any sort is satisfactory. Although many prefer the Whippoorwill or other trailing varieties, it seems best to use the same sorts as are being used for hay. Before planting in the field, the planting seed should be tested to see if it will grow. In a fair sample of seed at least sixty out of every one hundred seeds should sprout; if less grow, one had best get other seed, or plant very thickly.

For a main hay crop or for a pasture crop, plant "broadcast," or with a grain drill, using 60 to 100 pounds of seed to the acre, planting on or soon after April 1. Cover the seed not over two inches deep in cold, wet soil or three inches deep in warm, rather dry soil.

For a seed crop, plant at the above time, in rows 36 inches apart, dropping the seed so as to get a stand of plants about three inches apart in the row; this should use 10 or 15 pounds of seed to the acre.

As a late catch crop, coming after some other crop has been harvested, such as after potatoes or garden crops, or after small grain, cowpeas may be grown for hay, for pasture or for green manure. Many farmers say that this cannot be done. It is being successfully done where the field is prepared at once after the other crop is out of the way. Either disk or plow to a depth of three or four inches and plant at once, putting the seed down on firm soil. Frequently it will be best to prepare the ground as above and plant in rows at 20 to 30 pounds of seed to the acre. If planted in rows the crop must be cultivated.

Cowpea plants are easily injured by disease. Disease, if present, may be made more destructive by working while the leaves are wet with dew or rain. Cultivation of cowpeas in rows should be commenced while the plant is small and continued as long as the vines will allow it. Set the cultivator to go rather deep, say, three to five inches, at the time of the first cultivation. Then, as the season progresses, cultivation may go to this depth with no fear of reaching the roots, since roots will not grow in the soil mulch.

Saving the Hay.—The crop is ready for hay or pasture when the first pods begin to ripen. Some farmers like to divide the field into small blocks and let the stock eat up the crop one small section at a time. Others turn stock into the whole field. The hay is cut with the mower and raked with a hay rake. The best practice seems to be, as soon as the dew is off, to cut only what it will take the force at hand a day to put up. As soon as well wilted, which will require a day, in hot weather, the crop is raked into small windrows. After these have cured for a day or more, they may be turned, "flipped over backwards" with the horse rake, or they may be roughly shocked. After this has been done, cure the hay until no water may be twisted from it. This may necessitate turning a few times. If a mow is available, place the cured hay in the mow. If mow room is scarce or not available, one of two methods of baling may be followed. The crop, if very dry, may be baled from the shock. Otherwise it will be best to stack in long narrow ricks with a pole foundation, or to place in small round stacks, using a tree or pole for a center. From these the hay may be baled after about a month has passed. The cured hay is very valuable, being equal to alfalfa of the same grade and worth $10 to $20

the ton for feeding purposes. It should be fed on the farm where produced, if this is possible.

The Seed Crop.—The cowpea seed crop is saved in two ways. The small grower may pick the pods one or more times and then mow, graze or plow under the vines. The picked pods may be beaten out and "winded." A better method is to purchase a pea huller at a cost of about $25.00. A partnership machine is advised where several growers in the same neighborhood are growing planting seed. Whenever a considerable acreage of peas is grown for seed it is best to secure a pea thresher, the smaller sizes of which cost $200.00 to $300.00. Where the thresher is used, the crop is cut with a mower or with a bean harvester and either threshed when cured in the field or threshed from the stack. The straw from such crop is usually worth at least one-third the price of a fairly good grade of pea vine hay.

Cowpea seed for planting seed is worth from $2.00 to $5.00 the bushel on the market in the spring. The production of planting seed has never been large enough to supply the demand. There is a very large demand for the New Era and the Groit varieties in Oklahoma and in west Texas, which will aid in keeping the price well above the cost of production in East Texas. Yields of ten to twenty bushels to the acre should be obtained. The Texas Agricultural Experiment Station has tested a large number of varieties and placed pure seed of the best kinds with farmers who make a specialty of producing planting seed for the market.

If not properly protected in seed tanks or seed houses, and unless properly fumigated or treated by heating, the weevil will entirely destroy the seed. (See special article, by Prof. Newell, on this subject.)

With Other Crops.—As a hay crop, cowpeas are frequently planted with Johnson grass, millet, sorghum or Sudan grass. All of these mixtures are reasonably satisfactory. As a general rule it is possible to produce a greater total tonnage by raising each crop separately. The two kinds of hay may then be mixed when fed, if that is desired.

When desirable, cowpeas may be grown at the rate of a plant every three or four inches in a single row in the middles in the corn field. Such planting will produce considerable fertilizing elements for next year's crops which go on that field and will produce some seed. If planted after the corn is knee high, no damage to the corn crop is probable.

As a green manure crop, cowpeas are plowed under when fairly well matured but while still green. Sometimes it is necessary to roll or disk the field before the vines can be successfully handled. Where grown for seed and later used for green manure, it seems probable that the greatest all around money value for the present year and fertilizer value for the future is to be secured.

On sandy lands the crop sometimes is affected with wilt. This is prevented by the use of varieties resistant to it. The Iron cowpea is the best for such soils. Crop rotation may be also of some assistance in controlling this disease.

Root rot, erroneously known in some localities as alkali, kills cotton, cowpeas and other crops, when it attacks them. Deep plowing and crop rotation will lessen its destructiveness. Where this disease is

bad, corn, sorghum and small grain should be alternated with the cotton crops or the cowpea crops.

Fertilizers.—Occasionally, in some locations, the cowpea crop responds to an application of potash fertilizers. As most Texas soils do not need potash it is advised that none be used, unless experience shows it to be of value on the farm under consideration.

Phosphate fertilizers are usually beneficial to any crop grown in these parts of Texas. They may be applied to cowpeas to advantage. The amount to use depends upon conditions, varying from 100 to 400 pounds of acid phosphate to the acre.

For whatever purpose the cowpea is used, it will doubtless be found advantageous to pasture some of it, or to feed part of the hay on the farm. While the hay will sell for ten to twenty dollars a ton, it is poor agriculture to sell hay to your competitor who feeds it. This is especially true with cowpea hay, one ton of which contains nine to ten dollars worth of nitrogen alone. The farmer who feeds this crop will get practically all of this back in the manure pile. The arrangement of fields and pastures so that the growing of several other crops in addition to cotton and the maintenance of live stock on the farm may be done to best advantage, necessitates farm planning. To get full benefit of a diversity of crops, the same crop should not be on the same land two years in succession. Corn, cotton or a sorghum crop best follows cowpeas; they will grow better because they follow cowpeas. Such a plan gives a rotation of crops and if properly carried out will enable the farmer to grow two crops on part of his field each year, besides saving materially in labor. His labor also will be distributed more evenly over the year than is the case in one crop farming.

In section number 3 cowpeas are grown in practically the same way as in sections numbers 1 and 2. As there is less rainfall in the western counties, the crop there should be more generally grown in rows and cultivated than is the case in sections 1 and 2. One of the greatest uses for cowpeas in this section is as a catch crop following small grain.

In sections 4, 5, 6 and 7, either dry farming or irrigation is practiced and the cowpea is justly popular because of its drouth resistance. It will be found very valuable to use as a green manure crop after vegetables in sections 6 and 7. In sections 4 and 5 it may be planted on fall listed, or fall plowed, land which has been leveled and worked down in the spring. In the southern part of section number 6, planting may be done as soon as the ground is well warmed up, and in sections 4, 5 and 7, it may have to be delayed until well along in May or to the first of June. In dry regions the seed may be placed three or even four inches deep, if that depth is necessary to reach moist soil. Practically all of the crop in these sections should be planted in rows and well cultivated.

Summary.—The cowpea crop is well adapted to all of Texas.

As a feed or soil improvement crop it is best not to sell the hay which should be fed on the farm.

The hay is high in feeding value and should sell at a good price.

The seed crop is valuable and may be produced at a profit.

The vines remaining after the seed is picked should be plowed under.

THE ESSENTIAL FACTORS IN THE PROFITABLE PRODUCTION OF PEANUTS.

BY J. OSCAR MORGAN, PROFESSOR OF AGRONOMY.

The peanut is an annual plant belonging to the pea family. Like all other legumes it is a soil improving plant. It makes its growth in the warm season and is easily killed by frost.

This plant is peculiarly different from the other common legumes in that it bears its fruit underground. The flowers are produced above ground, being borne on stems originating from the axils of the leaves. These flower stems turn downward and after the flowers have been pollinated, or fertilized, the stems or "pegs" enter the soil and subsequently develop the nuts. The fruit is really not a nut. It is a ripened pod, corresponding to the bean or pea pod and contains edible seeds.

Varieties.—The Spanish peanut is the most valuable variety for Texas conditions owing to its high yielding qualities. It is the earliest of American varieties and is admirably adapted for growing on stubble land following the harvesting of small grain. The branches grow upright and the pods cluster closely around the base of the plant. The pods are very short and slender, usually containing two nuts. This variety is more easily cultivated and harvested than the trailing varieties.

Another small podded variety which has been grown some in Texas is the "Tennessee Red." This variety is a good yielder and the nuts are said to keep longer in the soil than those of Spanish peanuts. However, the Tennessee Red peanuts have a very low market value owing to the red color of the peas. This variety is of considerable value as a pasture crop for hogs.

Other varieties that are little grown in Texas are: The "Virginia Bunch," a large podded, erect-growing peanut; the "Virginia Runner," a large podded trailing variety, and the "North Carolina," a variety somewhat similar to the Virginia Runner except that the plants are not so large and vigorous and the pods and peas are both smaller.

Soils.—The peanut will grow on a rather wide variety of soils. It will not thrive on low, wet soils or soils that are distinctly acid. Nuts of the highest market quality are produced only on rather light colored sandy or loamy soils. Highly colored clay soils stain or discolor the nuts, thereby reducing their market value. When grown as stock foods, however, the color of the shell is of no importance and high yields are often obtained from the heaviest clay soils.

Preparing the Seed-bed.—Clay soils or soils on which there is considerable vegetable matter are preferably plowed in the fall for peanuts. This permits the vegetable matter to decompose before the crop is planted. Soils thus plowed should be thoroughly disced in the spring before planting.

Sandy or loamy soils are usually plowed in the late winter or early spring. It is best that they be plowed at least a month before planting. This permits the seed-bed to settle and also hastens the germination of weed seeds which can then be easily and cheaply destroyed by means

of the harrow before planting. The depth of plowing will depend somewhat upon the character of the soil and the time of plowing. In general, clay soils should be plowed deeper than sands. Care must be exercised, however, to see that an excessive amount of inert subsoil is not plowed up at any one time. Clays that have been plowed shallow in previous years should be deepended gradually by plowing from one to one and a half inches deeper each year than was practiced the preceding year until the proper depth is reached. Very deep plowing should be avoided if done a short while before planting. See that the soil is thoroughly pulverized by means of the harrow before the crop is planted.

Barnyard Manure.—It is usually unwise to apply stable or barnyard manure directly to the peanut crop for two important reasons:

1. Barnyard manure usually contains large quantities of weed seeds which greatly interfere with peanut production.

2. The use of manure also has a tendency to produce a too rank growth of tops and also a large percentage of "pops" or poorly filled pods. The best practice is to apply the manure to the preceding crop, thus giving it time to thoroughly decompose and become a part of the soil in which form it is very beneficial to peanuts.

Fertilizers.—On sandy and loamy soils the peanut responds readily to the use of commercial fertilizers. It must be remembered, however, that the peanut is a legume and consequently the fertilizer should contain little or no nitrogen, as this element is secured from the air. On very poor soils it has been found advisable to add a small quantity of nitrogen, say 30 or 40 pounds of Nitrate of Soda per acre, at the time of planting to nourish the plants until they develop sufficiently to secure their nitrogen from the air.

In general the fertilizer mixture that gives best results for peanuts is 250 pounds of acid phosphate and 50 to 75 pounds of muriate of potash per acre.

All fertilizing materials should be applied before or at the time of planting the crop. The best method is to apply them in the drill and thoroughly mix them with the soil before planting.

Lime.—A considerable amount of lime in the soil is necessary for peanuts. Soils deficient in lime produce low yields and also a rather large percentage of unfilled pods. Most sandy and loamy soils are deficient in lime and for this reason soils of this character usually receive an application of from 600 to 1000 pounds of slacked lime per acre at least two weeks before planting the crop. This lime should be spread broadcast and thoroughly harrowed into the soil.

Planting.—On well drained soils, peanuts should be planted level. The usual practice is to open furrows 30 or 36 inches apart in which the fertilizers are drilled, if these materials are to be used. The fertilizers are best distributed by means of a common fertilizer distributor. They are often distributed by hand. It is well to have a cultivator or some other suitable implement follow the fertilizer distributor to better mix the fertilizers with the soil.

Soils that are not well drained are usually ridged for peanuts. This is done by means of a small turn-plow or other suitable implement. The ridge is formed immediately over the fertilizer and should be

partially harrowed down or flattened by means of a fine-tooth harrow before planting. The peanuts may be planted by hand or by means of a Community planter which can be bought for $15.00.

The large podded varieties should be hulled before planting. Small podded varieties such as the Spanish variety are usually planted in the pod. When planted in the pod, germination may be hastened by soaking the peanuts in water for a few hours just before planting. Approximately two bushels of unhulled seed or one-half bushel of hulled peanuts are required to plant an acre. The plants should be left from seven to twelve inches apart in the row, depending on the variety. The large podded varieties should have the greater spacing. Planting should not be done until the soil has become thoroughly warm in the spring. Little is to be gained by planting peanuts in a cold soil.

Cultivation.—The cultivation of the peanut crop may well begin before the plants are up by running a weeder or section-harrow diagonally across the rows. After the plants are well up, tillage by separate rows begins. There is little difference between the cultural methods for peanuts and for such crops as corn, peas, etc. It is especially important that such implements be used as will keep the soil thoroughly pulverized close to the plants. This facilitates the entrance of the fruit stems or "pegs" into the soil. Cultivators with small points on the side next to the row are quite satisfactory for this purpose. Hoeing should be done only when necessary to keep down weeds and grass.

Harvesting.—The greatest value of the peanut crop to Texas farmers is as a pasture crop for hogs. When used for this purpose the hogs should be allowed to harvest the crop. When grown for the market, the crop should be dug before frost. The proper stage of maturity for harvesting is indicated by the tendency of the pods about the base of the plant to shed, and the vines to turn yellow.

Various methods of harvesting peanuts for the market are practiced. In many cases the plants are merely plowed from the ground with a one-horse turning plow and afterwards separated from the soil by hand. Another and very common method is to remove the moldboard from a turning plow and run the plowshare under the row on each side at a sufficient depth not to sever the pods from the vines. The side from which the moldboard is removed is kept next to the row. The plants are lifted by hand or by means of forks, and the dirt carefully shaken from them. They are then thrown in small piles to dry. The potato digger may be very satisfactorily used in harvesting peanuts.

Stacking.—As soon as the plants have sufficiently dried, which requires about three or four hours, they are put in small stacks. Poles about seven feet long are driven securely in the ground. Around the base of each pole a few pieces of short poles are placed to keep the peanuts off the ground. The peanuts are stacked with the vines out and the nuts in next to the pole. The stacks should be made rather slender and tapering toward the top to shed water. Each stack is usually capped with grass to protect the nuts.

Picking.—Peanuts should not be picked from the vines until the pods have become dry and the peas firm. A better grade of peanuts will be secured if picking is deferred until late autumn. The greater part of the crop is picked by hand. Machines are in use for picking

peanuts. They are profitable where the crop is grown extensively. Most machines have a tendency to crack a portion of the pods. Names of manufacturers of picking or threshing machinery will be furnished on application.

The picked pods should not be exposed to dampness as this discolors them, reducing their market value.

CONTROL OF WEEVILS IN PEAS AND BEANS.

BY WILMON NEWELL, STATE ENTOMOLOGIST.

One of the greatest difficulties encountered in raising peas, beans, and cowpeas, is the damage done to the seed in storage by weevils. Weevil-infested peas and beans are not only unsuitable for food, but only a small per cent. of them will germinate when planted. It is not true that the weevil larvae avoid the "germ" when working in the seeds. The germ is eaten as readily as other portions, and even where it is left untouched, injury to the remainder of the kernel or seed so reduces the amount of plant food that, though the seed germinates after planting, it produces only a weak and inferior plant.

In Texas, the farmer has three principal weevils to contend with, the common bean weevil, the cowpea weevil and the four-spotted bean weevil.

The common bean weevil lays its eggs while the crop is still ungathered, inserting the eggs through holes cut in the pods or through openings made by the natural drying and splitting of the pods. At harvest time the weevil larvae are carried in with the beans and continue their development after the crop is sacked or placed in bins. Here also the maturing weevils lay their eggs upon the dry seed and these in turn continue their damage. A generation is produced about every three or four weeks. The bean weevil does not restrict itself to beans, but also attacks cowpeas and other peas as well.

The cowpea weevil prefers the cowpea, but also attacks beans. Its habits and mode of development are similar to those of the bean weevil.

The four-spotted bean weevil is somewhat smaller than the two mentioned above, but differs from it only in that it will not work in peas or beans which are thoroughly dried or cured. The two former weevils work readily in any pea or bean seed, no matter how dry or well cured it may be.

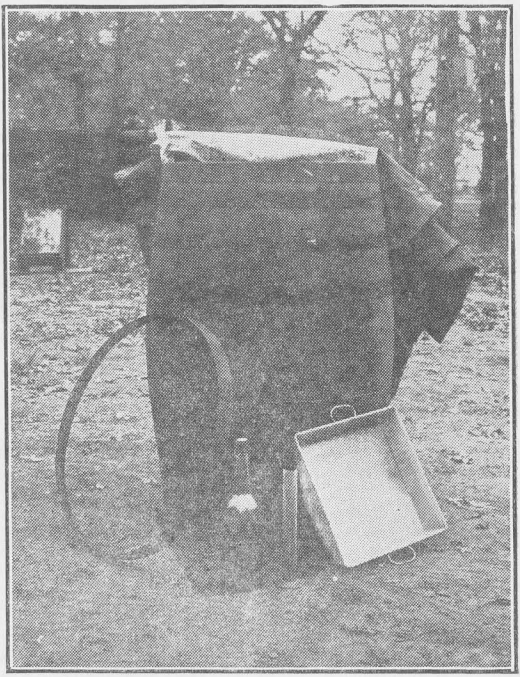
The farmer does not need to concern himself with the question of which species of weevil is at work in his peas for the measures to be taken in destroying them are the same with all. Besides, he will usually have at least two kinds in his peas at once.

Remedial Measures.—Prevention of damage is far better than cure, for peas or beans once well infested cannot be restored to good condition, even by killing the weevil in them.

As the peas and beans are invariably infested when gathered, they should be fumigated as soon as harvested and before being stored away or sold. Carbon bisulphide, or "highlife," is the only suitable substance to use for this fumigation.

Where only a few bushels, or less, are to be treated, the writer prefers to use a simple and inexpensive outfit consisting of a tight whisky or alcohol barrel, a 12x12-inch iron baking pan, a few large sheets of newspaper, a piece of heavy canvas or a tarpaulin and an extra barrel hoop somewhat larger than the open end of the barrel. Such an outfit is shown in the accompanying illustration on page 16.

The peas or beans to be fumigated are placed in the barrel and on top of them is placed the shallow iron pan. It matters not whether the barrel contains a few quarts of seed, or whether it be filled to within 6 inches of the top. Sufficient space should always be left so that the top edges of the pan, when placed on top of the seed, are at least 3 inches below the top edge of the barrel. The canvas or tar-



An inexpensive outfit for fumigating peas and beans with carbon bisulphide.

paulin is next smoothly folded into a square somewhat larger than the top of the barrel and the three or four thicknesses of the newspaper laid out flat, ready for covering the barrel. The amount of bisulphide, accurately measured, is now uncorked, poured quickly into the iron pan, the paper laid smoothly over the open end of the barrel, on top

of it the folded canvas and the latter then forced down snugly and smoothly by putting on the extra iron hoop. The barrel should be left unopened for twenty-four hours when the seed may be immediately removed and sacked in tight sacks to prevent re-infestation. The ordinary whisky barrel, of 52 gallons capacity, contains approximately seven cubic feet of space and the proper charge for this is one fluid ounce (30 cubic centimeters) of carbon bisulphide.* One should not guess at the amount. A glass measuring vessel, graduated to either cubic centimeters or fluid ounces, should be purchased from a druggist or dealer in photographic supplies and each charge should be carefully measured. The importance of this cannot be overestimated, for too small a charge of the liquid will fail to kill the weevils, while *too heavy a charge will destroy the germinating power of the seed.*

Immediately after fumigating, the peas should be sacked in bags of very tight mesh, such as canvas, free from holes, so that weevils cannot gain access to the seed for the purpose of laying eggs to start a new infestation. Properly fumigated and sacked, no more weevils should appear, but, nevertheless, the owner should open the sacks and examine the seed at least once in every three weeks and if signs of weevil work are noticed, re-fumigate the seed, using the same method as above.

There is no danger in handling carbon bisulphide except that all fire, such as lamps, lanterns, lighted pipes and cigars, etc., must be kept a safe distance from where it is kept or used. The vapor from it is highly explosive when coming in contact with fire. It will not explode from a sudden jar or rough handling. In general, one should use the same precautions as with gasoline, but should remember that the bisulphide changes to a gas more rapidly and the gas sinks to the ground instead of rising. It is well to have the fumigating barrel out of doors, at least 50 feet from the nearest building, keeping it there at all times and doing all fumigating in it there. Bad weather does not interfere with this plan, for the canvas cover will shed all rain water—if it does not, it isn't a tight enough cover to fumigate with.

Precautions at Planting Time.—"Weevily" seed does not germinate well and even when it germinates the plants are deficient in vigor on account of the reduced food supply for them within the seed itself. If possible, only sound, non-infested peas should be used for seed. Where this is not to be had infested peas, before planting, should be thrown lightly into water when the badly infested ones will float. These can be discarded and only the heavy ones which sink to the bottom of the vessel used for planting.

Fumigating Large Quantities.—Peas or beans stored in bins, either loose or in sacks, can be fumigated by practically the same method, except that the building or bin containing them must be made practically air-tight beforehand. Where the seed are in a tight bin the latter may be covered with tarpaulins or blankets to confine the gas, the covering being supported above the iron pans sufficiently to allow the free evaporation of the liquid. This is easily accomplished by means of a stick stuck down into the seed by each pan, the top of the stick remaining about six inches out of the seed.

*Equivalent to approximately nine pounds of bisulphide per 1000 cubic feet of space.

The cubic contents of the bin should be carefully ascertained. Multiply its width, in feet, by its length and this product by its height and the resulting figure will be the number of cubic feet in it. As in the case of the barrel fumigation, nine pounds of the bisulphide should be used to each 1000 cubic feet of space. This rule applies regardless of whether the bin is full or only part full. If there are cracks in the bin or building that allow any escape of gas, a little more of the liquid should be used to make up for that lost through leakage.

Fumigation of buildings, or in buildings, is fraught with much more danger than fumigating in barrels or tanks outside, mainly on account of the difficulty in keeping all smokers out of the building and away from it and also on account of the larger quantity of bisulphide causing the gas to spread to a greater distance. Where it is possible to fumigate out of doors, using barrels, we strongly urge that it be done in this way, even if several barrels have to be used or several days taken to complete the fumigation of all seed.

For the use of merchants and seedsmen handling peas in large quantities, we recommend the use of a galvanized iron tank or cistern with a tight fitting top. This can be placed sufficiently distant from buildings to obviate all danger to the latter. The cubic contents of such tanks are easily figured and the proper charge of bisulphide computed from the above directions.

Carbon bisulphide should be obtainable from any druggist at a price varying from 18 to 20 cents per pound. The manufacturer's price on bisulphide in quantity, at the factory, is usually ten cents per pound, with a charge for shipping tank of about two cents per pound. Where much bisulphide is to be used in a neighborhood money will be saved by the farmers clubbing together and ordering the bisulphide direct from the maker. The writer of this will be glad, on request, to place anyone in touch with the manufacturers.

Heat for Destroying the Weevils.—It has been found by Dr. F. H. Chittenden, of the Bureau of Entomology, United States Department of Agriculture, that a temperature of 145 degrees (Fahrenheit) will kill all weevils in the seed without injuring the germinating power. In the case of peas which are not intended for planting purposes a slightly higher temperature will do no harm.

As the four-spotted bean weevil rarely breeds in peas or beans which are old and thoroughly dry, a thorough drying and curing of the seed by means of dry heat would probably prevent future reinfestation. There is no reason, however, for supposing that such a treatment would in any way protect the seed against reinfestation by the common bean weevil or by the cowpea weevil.

Weevils may be destroyed by pouring scalding water over the peas or beans. The hot water should be immediately poured off and the peas or beans spread out and thoroughly dried before storing away.

Kerosene Treatment.—The Oklahoma Experiment Station recommends the following method of killing the weevils with kerosene: "Spray the peas, evenly and thinly spread on a canvas or floor, with kerosene at the rate of 1 pint to 10 bushels or 600 pounds of peas. An atomizer, hand spray pump, or very fine sprinkler should be used, after which the peas should be shoveled so as to bring the treated and untreated seed together until all have an equal coating of the kerosene."

PROTECTION OF PEANUT SEED FROM MOLES AND POCKET GOPHERS.

BY WILMON NEWELL, STATE ENTOMOLOGIST.

One of the most serious troubles encountered by the grower of peanuts is the destruction of the seed by moles and pocket gophers, the latter being often called "salamanders."

The fresh dirt mounds of the "salamander" are easily located in the field and the animals are readily poisoned or trapped. One should go to a fresh mound, dig down in it a few inches until the open tunnel is encountered and place in this a piece of raw Irish potato poisoned with arsenic, Paris green or strychnine. Straw or sticks should then be placed over the hole and enough dirt put on to exclude all light.

In trapping these animals a steel rat trap, with spring jaws, is used. The freshly made mound is dug open as before and the tunnel followed down to where it branches, about five or six inches below the top of the ground. Here, at the intersection of the tunnels, a hollow place is scooped out large enough to hold the trap and deep enough so that the top of the trap, when set, is on a level with the floor of the runway. The chain of the trap is attached to a small stake driven conveniently near. A board is then placed over the hole and dirt put on to exclude all light. No dirt should be placed on the trap jaws. In most cases the animals will be found in the trap the following morning.

Moles are not so readily disposed of, but many of them can be successfully killed with the spring mole traps upon the market, these being set over the fresh runways in such a manner that the mole pushes up a lever when passing through the runway, only to be pierced by a sharp spike released by the lever.

The peanut seed can be quite effectively protected, until after germination, by soaking it, before planting, in a twelve per cent. kerosene emulsion. In this treatment the hulls must not be removed from the seed. The unhulled peanuts are placed in a barrel and just covered with the 12 per cent. emulsion, a board or rack being placed on top with just sufficient weight to keep them submerged. They should be allowed to stand for about 12 hours, or over night, when it will be found that the hulls have absorbed nearly all of the liquid. They should be planted at once, while the odor of kerosene is still strong upon them. Treatment of the shelled peanuts with kerosene emulsion would be likely to prevent germination.

The kerosene emulsion is made as follows:

Shave one pound of laundry soap (or soft soap) into one gallon of soft water (rain water). Have the water boiling hot. As soon as the soap is all dissolved *remove the solution from the fire* and add it to two gallons of kerosene. At once agitate the material *violently*. Continue for at least five minutes. This is best done by the use of a bucket spray pump, turning the hose or nozzle back into the bucket or tub so that the material is constantly pumped vigorously through

the pump. In a few minutes a smooth, creamy emulsion is formed, without any free oil. This will get thicker as it cools, but if properly made no free oil will separate out. This is the "stock solution" and will keep indefinitely if sealed from the air. Do not try to make the emulsion by stirring with a paddle, or similar means, for this does not cause sufficiently violent agitation to thoroughly emulsify the oil.

Each gallon of this "stock emulsion" should be diluted, and thoroughly mixed, with four and one-half ($4\frac{1}{2}$) gallons of rain water and it will then contain 12 per cent. of kerosene.

THE FEEDING VALUE OF COWPEAS AND SPANISH PEANUTS.

BY JOHN C. BURNS, PROFESSOR OF ANIMAL HUSBANDRY.

The cowpea is valuable both as a hay and a forage crop. The hay, if properly cured, is relished by horses, cattle, and sheep, and its feeding value is equal to that of alfalfa. Like alfalfa it is relatively rich in protein and is, therefore, especially suited to combine with starchy feeds, such as corn, kafir, maize and feterita, in forming balanced rations.

The high value of the peas, or fruit, for hogs was demonstrated in tests at the Alabama and South Carolina Experiment Stations. Fed seperately, cowpeas proved equal to corn in the Alabama tests and superior to it in the South Carolina test. In the tests at the Alabama Station 100 pounds of gain were produced from 481 pounds of cowpeas, while a similar gain required 487 pounds of corn. A mixture of equal parts of corn and peas, however, proved considerably more effective than either fed separately, the combination resulting in a saving of 10 per cent. to 17 per cent. of feed. Such evidence only serves to emphasize the advantage of a balanced ration. Unless peas are very abundant and grain, such as corn, kafir, maize and feterita, is abnormally high in price, it will, as a rule, be found an advantage to supplement peas with grain to the extent of one-half to three-fourths of the ration.

One of the best methods of utilizing cowpeas is to pasture them with cattle, sheep or hogs, and thereby save the labor of harvesting, and return the fertility of the crop to the soil in the form of manure. This should be done when most of the pods are well filled out, but while the vines are still green, at which time practically the whole plant will be consumed. Though the vines are not, as a rule, consumed to the same extent by hogs as by cattle and sheep, yet the crop stands in the front rank among those suited for hog pasture. For growing hogs from 1½ to 2 pounds of grain, and for fattening hogs from 2½ to 3 pounds of grain per 100 pounds of live weight per day should be fed in connection with cowpea grazing for the best results.

The Spanish Peanut.—There can be little doubt that one of the most profitable methods of marketing this crop is to dispose of it through livestock raised on the farm. Peanut vine hay, which may be obtained by mowing the vines after the nuts have matured, and curing them by the ordinary method of making hay, is in the class with alfalfa and cowpea hay in feeding value. Its nutrients are even better proportioned from the standpoint of forming a balanced ration in itself than are those of alfalfa or cowpea hay. It forms a very satisfactory roughage for horses, cattle and sheep.

The seeds, or peanuts, themselves, constitute one of the richest feeds produced on the farm. They are especially valuable as a feed for hogs, and, being very rich in digestible fat or oil, they are used to the best advantage during the fattening period. However, they also contain a high percentage of digestible protein and, therefore, prove very satisfactory for growing hogs, too.

In order to make an accurate determination of the feeding value of Spanish peanuts for hogs, the Texas Experiment Station conducted a test in 1908 in which six pigs averaging 43 pounds at the start were fed exclusively on Spanish peanuts for a period of 91 days, the nuts being separated from the vines in order to ascertain definitely the quantity fed. The results of this test show that the amount of peanuts required per 100 pounds of gain in live weight was only 296½ pounds. This remarkably good showing is further emphasized when we consider that the average results of tests at nine different stations in the United States show that 537 pounds of shelled corn were required to produce 100 pounds of gain, and that in no instance was the requirement for such gain less than 479 pounds.

According to the above figures, an acre of Spanish peanuts of a yield of 40 bushels, allowing 30 pounds to the bushel, would produce approximately 405 pounds of pork, which, if valued at 7 cents per pound, would amount to $28.35. These results seem to be entirely in accordance with those obtained by other Southern Experiment Stations, that have made experiments along this line.

It is to be understood, of course, that the foraging method is decidedly the most economical way of utilizing peanuts for hogs for the same reasons that were given in the case of the cowpeas. The use of some grain, such as corn, in connection with peanuts for hogs is an advantage mainly in improving the quality of the pork. The fat of hogs fattened exclusively on peanuts is soft and oily, due to the high percentage of oil in the nuts, and is, therefore, of inferior quality to the firm fat produced by corn. However, peanut pork is otherwise satisfactory and especially desirable in flavor. In order to overcome to a large extent the soft, oily condition, one of two things is recommended. Either feed from 1½ to 2 pounds of corn per 100 pounds of live weight per day in connection with peanut pasture, or take hogs off of peanuts and feed corn practically altogether for about three weeks previous to marketing. Though not quite as good for finishing as is corn, kafir, maize or feterita may be used if corn is not available. If peanuts are abundant, however, and grain is high in price, the most profitable results will, as a rule, be obtained without the use of any grain whatever.

Peanut Cake or Meal is the by-product resulting from the manufacture of peanut oil. It is really the peanut kernel after most of the oil has been extracted. Since the meal is merely the ground cake, it contains the same amount of food nutrients as the latter, unless adulterated after being ground. The peanut hull, which accumulates in large quantities at peanut oil factories and which is sometimes used for adulterating, possesses no feeding value and should be guarded against. Peanut cake or meal is a very concentrated feed, especially rich in crude protein, and is fully equal to high grade cottonseed meal in feeding value. In fact the quantities of food nutrients in the two feeds are practically the same. Peanut meal or cake, though not having been used to much extent in this country, is used more extensively in European countries, as a part of the ration for all kinds of live stock, seemingly with good results.

PROCESSING AND MARKETING.

H. M. ELIOT, RURAL ORGANIZER.

PEAS.

Prof. Newell has discussed the habits of weevils and the method of protecting beans and peas against them. His methods apply especially to peas that are to be used for seed. (See his article elsewhere in this bulletin.) It remains for me to discuss marketing methods. The following facts have been gathered from interviews with wholesale grocery men and with pea warehouse men at Athens, Texas. While this discussion is not intended to exhaust the subject of marketing peas, enough will be said to guide any community or group of farmers or housewife in the matter of caring for peas which are to be placed upon the market or used in the home.

The pea industry in Texas is most highly developed in the farming community surrounding Athens. In this vicinity the farmers place on the market annually from twenty-five to thirty carloads of black-eyed peas (30,000 pounds to the car). The individual farmer as a rule grows from five to ten acres. Upon the sandy lands of that section the yield is from eight to ten bushels. As the farmer receives in an ordinary year from $1.50 to $1.75 a bushel for his peas, he may expect an acre return of from twelve to twenty dollars. These returns may be increased by feeding to live stock. (See article by Prof. Burns in this Bulletin.) After the peas are picked and hulled they are sold to buyers in Athens. As the weevil so readily destroys peas, their buying and marketing has become a specialized industry. To check the weevil two processes are employed by dealers in Athens. They will be referred to in this discussion as the "Coffee Roaster Process" and the "Carbon Bisulphide Process."

Coffee Roaster Process.—Mr. J. B. Henry of Athens, Texas, handles peas by the roasting process. His plant consists of a one-story warehouse 44x136 feet in which are installed a cleaner (or fan) costing $35.00, a roaster (coffee) costing $300.00, and a simple system of elevators. The larger part of the floor space is used for storage. The power to operate the machinery is furnished by an electric motor (a five horsepower gasoline engine may be used). Mr. Henry values the building and equipment at $5,000.00. Next year this valuation will be increased to $7,000.00 by the installation of several more roasters. As the peas are brought to this plant they are put into a hopper holding 500 pounds. This constitutes "a run." They are carried to the fan and the dirt is blown out of them; next they are conveyed to the roaster where they remain from 25 to 45 minutes until they are properly dried; they are then sacked and are ready to ship. After they are thus processed they will keep through the winter but may develop weevil in the following summer as will California peas.

Mr. Henry would like to have good processes of handling peas come into general use as he says it would help him in his business. He is willing to teach, free of cost, the processing of peas to men who wish

to learn his method. As he is increasing the capacity of his plant, he will be able to handle peas from other sections next season and would desire to do so until the industry in the new sections has reached a point where it will be economical for communities to construct warehouses and plants of their own.

The Carbon Bisulphide Process.—Mr. J. A. Murchison of Athens, Texas, has a warehouse 30x60 feet and a fanning mill with an elevator attachment run by a small electric motor. He cleans the peas and puts them into open top sugar barrels, then pours into each barrel, twice a week during a period of three or four weeks, one-half ounce (about) of carbon bisulphide (highlife). The bisulphide evaporates immediately and as it is heavier than air it settles into the barrel. No top is used. As the peas begin to come in about July 25th it is August 20th before they are ready to go on the market. Peas thus processed do not develop weevil before October 1. From October 1 to March 1 the weather is cold enough to prevent the weevil from developing (unless the peas are stored in a warm room). If the peas are kept after warm weather begins, they should be treated with bisulphide at two to four weeks intervals until sold.

Handling Peas by the Trade.—Because of this liability of weevil invasion, it is necessary that whoever carries peas in stock be prepared to protect them. It is very simple and inexpensive for a wholesale house or a retail store, or the housewife, to apply the necessary preventives. However, the present process of handling the Texas pea by the trade is for the wholesaler to take the order of the retailer and then have the pea warehouseman ship direct in 2 to 25-bag lots at such intervals as will keep the retailer supplied and yet not permit weevil invasion. Peas are also shipped by the warehouseman in carload lots direct to wholesalers.

Seed Peas.—In either of the two processes described above the seed germ will be damaged to such an extent as to make the peas unfit for seed. The only reliable method of processing peas without injuring their value for seed is the method described by Prof. Newell elsewhere in this Bulletin.

PEANUTS.

Peanuts were introduced into the United States in the early colonial days, but were not grown as a money crop until after 1870. From this time until 1889 the industry developed slowly. Its growth during the last twenty years is told in the following table taken from the United States census:

Year.	Bushels produced.
1889	3,588,143
1899	11,964,109
1909	19,415,816

An increase in production from 3½ million bushels in 1889 to 19½ million bushels in 1909 shows that peanuts have been very popular with the farmers who have grown them.

The more recent history of the peanut industry in Texas may be told through the growth in number of peanut shelling plants. The first one

in the state was built at Terrell seven years ago. It was destroyed by fire two years later and was rebuilt at Denison. Four years ago the plant at Texarkana was built. Three years ago plants were constructed at Cleburne, Mansfield and Brownwood, and two years ago one was built at De Leon. This does not exhaust the list of shelling plants recently constructed in the state, as there are now a total of thirteen. This rapidly growing industry has brought a new crop into many communities. These communities must learn how to care for the crop, how to harvest it, and how to handle it in such a way as to place it upon the market in first class condition. The farmer is also interested in the processes through which this crop passes from his farm to the consumer.

Picking and Cleaning.—Beginning with the harvesting of the peanuts, the farmer must exercise special knowledge if he is to bring his crop to market in the best condition. That special care must be exercised in picking and cleaning peanuts is clearly set forth in the following quotation from a farmers' bulletin on peanuts published by the United States Department of Agriculture:

"Peanuts for market should be cured in the shock at least three or four weeks before picking. If the weather is dry and windy immediately after the harvesting, the curing process will be more rapid, but should the weather conditions be unfavorable during this period the pods will ripen more slowly. Too rapid curing is not desirable, as the pods are likely to shrivel and discolor. Peanuts should not be picked from the vines until the pods have become dry and the peas firm and nutty, with the immature ones more or less shrunken. As a rule very little is to be gained by early marketing, and a better grade of peanuts will be secured if picking is deferred until late autumn. If the pods are not well protected in stacking, many will be destroyed by the common blackbird. In some sections it is necessary to pick as early as possible to prevent heavy loss from the ravages of field mice and rats while the peanuts are in the shock.

"If peanuts are not well stacked the pods are liable to become discolored by the heavy fogs and driving rains of late autumn. The stacks should not be opened or the vines handled during the wet weather.

"At no time after the curing process should the peanut pods be exposed to water, or even dampness, as the shells invariably become darkened and discolored by the addition of moisture. When properly cured the shells will be covered with a fine, dry dust, and where this dust becomes moistened it adheres and forms a brownish spot. If the peanuts show the least trace of dampness after their removal from the vines, they should be spread on a floor or stored in a well ventilated building until thoroughly dry. Many of the large growers have provided narrow cribs similar to those employed for the storage of corn, and the peanuts are kept in bulk until sold. When the pods are thoroughly dry they may be put into bags as they come from the machine, and either hauled direct to the cleaning factory or stored in small lots."

After the peanuts are thus cared for and finally sold, they are shipped to the peanut shelling plant where they go through shelling and cleaning machinery and finally emerge ready to be shipped to candy factories and peanut butter factories.

The Peanut Shelling Plant.—When they arrive at the sheller they

are first dumped into a hopper, then conveyed to a dust reel, which takes out all of the dirt and dust. This is done in a separate room to keep the dust from the factory. The peanuts, at the end of this dust reel, are dumped into spouts or conveyors and carried to a toboggan fan or blow fan, which ejects all of the "snaps" from the good nuts. They are conveyed from this fan to a stick-shaker, where a large part of the sticks and rocks will be taken out. From the stick-shaker they pass to a picking table, where all foreign matter which may have passed the shaker is removed by hand. From the end of this table, they are conveyed directly to the sheller, where the hulls are removed and the peanuts are separated into grades. (Grade number one consists of peanuts not split apart; grade number two are the split ones.) The number one's pass directly to the picking tables where they are hand picked ready for market. Number one peanuts are used for making either butter or candy. Number two peanuts are used for making candy. The damaged peanuts are fed to hogs.

A peanut shelling plant represents an investment of from $4,000.00 to $20,000.00 depending upon the size of the plant and the completeness of its equipment. The following is an inventory of the equipment and the buildings of one of the smaller shelling plants of the state:

2 small shellers, at $150.00	$ 300.00
2 fans, at $90.00	180.00
15 hand pickers, at $18.00	270.00
1 grader (hand made)	35.00
Total	$ 785.00

This machinery is run with an engine used in another plant. In case a plant must furnish its own power a small electric motor may be used or a two-horse gasoline engine will furnish enough power to turn the above machinery. We may add then: One gasoline engine, $100.00.

This machinery was installed in a building 75x40 feet valued at $900.00. In addition, a warehouse 75x40 feet was rented to store peanuts in. This is valued at $900.00. The total cost of this plant, not including the cost of installing the machinery nor the cost of the peanuts that must be carried in stock, is $2,685.00.

Peanut Butter.—The output of the peanut shelling plant goes to the peanut butter factory and to the candy factory. The process of making peanut butter is simple and the machinery required is comparatively inexpensive. The peanuts are first roasted in a common coffee roaster and while hot are run through the blanching machine. The blancher removes the thin red covering and the seed germ which is slightly bitter. They then are ground and put into small jars. A capping machine puts a cap on, sealing the jar air tight. The machine is so constructed as to produce a vacuum under the cap. During the process of preparation one-half of one per cent. of salt is added.

The following machinery is required in making peanut butter on a large scale:

Roaster, costing	$ 65.00
Blancher, costing	225.00
Grinder, costing	85.00
Sealer, costing	250.00
Total	$625.00

There will be an added cost for installation together with the use of 20 feet square of floor space.

As peanut butter has been upon the market for a period of only six or seven years, the public has not become accustomed to its value as a food; nor has the wholesale and retail trade become thoroughly accustomed to handling it. The chief objection, from the standpoint of a customer, is that the oil separates from the butter and rises to the top. This is assumed to be a sign of deterioration in quality. Such a conclusion, however, is not correct, as the large percentage of oil in peanuts makes it only natural for the oil to rise to the top as cream rises to the top of milk. The oil can be mixed back into the butter without difficulty. The wholesale trade, however, has tried to meet this objection in two ways: First, by having the butter shipped directly from the peanut butter factory to the retailer in small lots; second, by having butter-making equipment in the wholesale grocery plant and making the butter after the order comes in. This puts the butter upon the market in absolutely fresh lots and at a minimum freight charge.

Made in the Home.—Peanut butter may be easily made for home use in small quantities as follows: Roast peanuts at a moderate temperature until well done. Rub in hands until hulls are removed and nuts are in halves. Grind through coarse plate of meat grinder, then through the peanut butter plate. Grind until very fine. Add one-fourth teaspoonful of salt to each cup of meal. If the mixture has not enough oil from the nuts to make a thick paste, add butter, olive oil or peanut oil in small quantities for the proper consistency. Peanut butter has a high nutritive value, 25.8 per cent. protein, and is an excellent substitute in the diet for lean meat, which has 21.3 per cent. protein. Due to the small amount of sugar and starch, it is highly recommended as a food for diabetes.

Peanut Candy.—While peanut butter has been on the market for only a short time, and is only now beginning to establish its value as a food, the peanut candy trade is well developed and large quantities of peanuts are consumed in this way. In preparing this candy a few candy factories have shelling plants of their own. Most candy makers, however, buy peanuts already shelled and work them up into candy. At least sixteen varieties of peanut candies are upon the market. Of these varieties a few contain peanut butter. This butter is sometimes made by the candy plant itself, and sometimes is purchased.

Salted Peanuts.—Still another use for shelled peanuts is in the manufacture of salted peanuts. For this purpose the peanuts are put, unroasted, into cocoanut oil or peanut oil and cooked until properly done. They are then salted while cooling and drying.

Peanut Oil.—According to a statement by Dr. G. S. Fraps, State Chemist, peanut oil belongs to the same class commercially as olive oil and cottonseed oil. It is sometimes mixed with olive oil to make an

oil that will sell cheaper than olive oil. It is also mixed with cottonseed oil in order to improve the quality of the cottonseed oil for certain purposes. A great portion of the peanut oil consumed in the United States comes from Marseilles, France. Peanut oil is also manufactured in Germany and Belgium. The peanuts from which this oil is made are grown in Africa. Peanut oil, from the first pressing, is of the best quality. Subsequent pressings yield oil of lower grades. The first pressing yields an oil that is very valuable as a salad oil on account of its taste, its pleasant odor, and its fluidity. Peanut oil is also used as a lard substitute, and is superior to olive oil for "deep frying." It can also be used for other purposes for which oils are used.

Food Value.—Peanuts consist of about 25 per cent. hulls and 75 per cent. meats. Dr. Fraps says that the meats have approximately the following composition:

Protein	25.8 per cent.
Fat	38.6 per cent.
Crude fibre	2.5 per cent.
Nitrogen-free extract	21.9 per cent.
Water	9.2 per cent.
Ash	2.0 per cent.

Peanut Cake.—The value of peanut cake as a food for stock is shown by the accompanying table, which gives an analysis of pure peanut cake, peanuts crushed with the hulls, cottonseed meal, and wheat bran. It will be seen that peanuts compare very favorably with cottonseed meal.

	Protein.	Fat.	Crude Fiber.	Nitrogen Free Extract.
Pure Peanut cake	47.60	8.00	5.10	23.70
Peanut cake with hulls	30.46	10.87	24.49	21.84
Cottonseed meal	44.84	8.66	9.08	25.29
Wheat bran	17.48	3.83	8.69	54.54

Because of this high value of peanuts as a human food and as a live stock feed, several of our Texas oil mills operating cold press machinery have experimented with the manufacture of peanut oil by the use of the cottonseed oil machinery. It has been found to work very successfully when the peanuts are crushed with the shells on. Crushing without the shells gums up the machines. One oil mill man, who has done considerable experimenting, reports that a bushel of peanuts will produce from three quarters of a gallon to one gallon of oil and fifteen pounds of cake. He is able to run about a carload of peanuts a day. As the percentage of oil contained in the peanuts is very high this will yield about the same number of gallons of oil as a day's run with cottonseed. The chief difficulty which the mills have met so far is their inability to get peanuts in large enough quantities to enable them to run their mills at an economical cost. Peanuts for crushing purposes should be well dried.

Marketing Peanuts.—In that the use of peanuts is so varied and the value as both human food and live stock feed, as compared with other feeds, is so high, there is no question that the market under

normal conditions will go on developing and the farmer will be able to find ready sale for peanuts. How, then, should the farmer handle his marketing problem? Peanuts will be marketed principally through hogs, through peanut shelling plants and cotton oil mills. The farmer acting alone will find it difficult to sell to these agents in an economical way. Farmers, therefore, in all peanut growing districts, should form co-operative associations, build inexpensive but properly constructed warehouses, and be prepared to hold the peanuts for a good market and to sell them in carload lots. In this way they will be able to interest all prospective purchasers of peanuts, sell to them in an economical manner and be assured of the highest market price. As these peanuts warehouse associations may be organized under the permanent warehouse bill, warehouse receipts may be used in obtaining credit for the purpose of carrying the crop until the time when it may be sold to the best advantage.

The Extension Department at the Agricultural and Mechanical College will furnish upon inquiry a list of the companies who manufacture peanut tools and machinery.