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Popcorn Production and Marketing

K. E. Ziegler
Iowa State University

R. B. Ashman
Purdue University

G. M. White
University of Kentucky

D. S. Wysong
University of Nebraska

Reviewers

M. A. Hanna
University of Nebraska
Seed Research Committee
Popcorn Institute, IL

R. L. Nielsen
Purdue University

M. S. Zuber
University of Missouri

Although U.S. commercial popcorn production has always been centered in the Corn Belt, the major growing areas within this region have shifted over the years. Up to the mid 1940s, Iowa was the number one producer, with both production and processing plants concentrated in the western part of the state. Then, as popcorn hybrids began replacing open-pollinated varieties, production shifted eastward, first to Illinois and then to Indiana. Another major shift occurred in the mid 1970s when production jumped back to the west, so that Nebraska is now the leading popcorn producer.

Total U.S. popcorn acreage over the 5-year period 1977-81 averaged 189,000 acres per year, with 55 percent of that total in Nebraska and Indiana, and another 25 percent in Iowa, Ohio, and Illinois. Popcorn yields (measured as pounds of shelled corn per acre) for the years 1977-1981 averaged 2,846 pounds which, at 65 pounds per bushel, is equivalent to about 44 bushels per acre. Among states, Nebraska usually reports the highest yields because of its high proportion of irrigated acres. On a weight basis, popcorn hybrids can be expected to yield a little less than half as much as dent corn hybrids.

This publication presents an overview of popcorn production practices for both commercial and home use purposes. Discussed are the management considerations involved in growing, harvesting, conditioning, and storing the crop, plus a brief review of marketing alternatives.

Hybrid Selection

Popcorn growers shifted from open-pollinated varieties to hybrids for some of the same reasons that dent corn growers did—namely, improved yield and better standing ability. Additional major advantages for going to popcorn hybrids were better popping expansion and more uniform kernel type and maturity.

Popcorn moves through commercial channels in three kernel types: white, small yellow, and large yellow. White popcorn characteristically has a rice-shaped kernel, while yellow popcorn kernels are pearl-shaped. The three kernel types meet different needs within the industry, and growers and/or processors must take that into consideration when selecting hybrids.

In performance trials, a hybrid is usually identified as one of the above types, although some medium-kernel yellows are now available that meet either the small- or large-kernel requirements after grading. No industry standards have been developed for kernel size determinations; but a commonly used measure is based on number of kernels in 10 grams and defines kernel size as follows: 52-67 = large, 68-75= medium, and 76-105= small.

Another major consideration in hybrid selection is maturity. Maximum popping potential of a hybrid can be achieved only if it reaches full maturity. Any factor that prematurely terminates plant development (e.g., drought stress, disease, frost, etc.) will reduce popping potential, and may result in a crop not marketable as popping corn. Therefore, growers should select only those hybrids that can be expected to mature before frost in their particular growing area. If planting must be delayed much past normal dates, consider an earlier-maturing hybrid or an alternative crop.

Some popcorn hybrids are dent-sterile and cannot be pollinated by ordinary types of dent or sweet corns. In popcorn seed fields where the harvested crop is to be used as seed for the following year's crop, dent sterility is important because it prevents outcrosses to dent corn. Corn harvested from plants grown from outcrossed seed has very poor popping ability. Thus, if the ears from these outcrossed plants are not sorted out before shelling, it is virtually impossible to remove all kernels from these ears in the cleaning and grading operation. This adversely affects the quality and appearance of the total crop. For this reason, dent-sterile hybrids are especially desirable where popcorn is to be field-shelled.

In popcorn production fields where the harvested crop is to be used for popping, isolation from other types of corn is unnecessary, even if the popcorn is not dent-sterile. Pollen from other corn does not have any effect on the popping ability of popcorn hybrids.

The "right" popcorn hybrids must meet the needs of both grower and consumer. The grower wants high yields, strong stalks, and good disease resistance; the consumer wants popped corn that's tender, good tasting, and free from hulls. Current commercial hybrids involve some compromise among these requirements.

A large portion of commercial popcorn acreage is contracted with growers by popcorn processors. In most instances, the contracts specify that the processor will determine the hybrids to be used. Growers producing uncontracted popcorn may, of course, grow any hybrid they choose. Sources of information about hybrids include state Extension Services, popcorn seed companies, or the current "Hybrid Popcorn Performance Trials" from the Agricultural Experiment Station, Purdue University, West Lafayette, IN 47907.

Soil Type

Although there is little experimental data regarding effects of soil type on popcorn production, grower experience has shown that any soil type suitable for dent corn should produce a good popcorn crop. However, experience also indicates that popcorn is likely to perform better on medium- to coarse-textured soils (coupled with adequate rainfall or supplemental irrigation) than on fine-textured, poorly drained soils for at least two reasons:

1. Popcorn seed germinates more slowly than dent corn, and the seedlings grow more slowly; thus, medium- to coarse-textured soils, which warm slightly faster than fine-textured soils, should improve germination, emergence, and seedling establishment.
2. The popcorn root system is less extensive than that of dent corn; thus, high-clay-content and/or poorly drained soils foster weak, shallow rooting that reduces yields and increases lodging.

Soil Fertility

Research information on the response of popcorn hybrids to soil fertility levels is also limited. It often has been recommended that growers apply the same types and rates of fertilizer to popcorn as they would to dent corn. The limited data available clearly show that, while popping expansion was not affected by different rates of nitrogen (N) applied to the soil, yields were increased nearly threefold at the highest N rate used. These same data also suggest that the yield response of popcorn hybrids to increased nitrogen levels off at lower N rates than for most dent corn hybrids.

Many experienced popcorn growers apply somewhat less fertilizer than recommended for dent corn, reasoning that, since yields are lower, less fertilizer is needed. This is probably a safe practice at comparable plant densities; but it may not apply if popcorn is grown at significantly higher plant densities.

Any dent corn fertilizer program being adapted to popcorn production should take into consideration popcorn's relatively poor standing ability. Very high rates of N can compound lodging problems, especially if less-than-recommended rates of potash are used. Also, because popcorn seedlings grow more slowly than dent corn, the application of starter fertilizer is probably of greater importance.

Planting

Timely planting of popcorn is very important because of its slow germination and seedling growth and because it must reach harvest maturity (defined in harvesting section) for maximum popping expansion. Careful seedbed preparation is also important because seed size is so small. A clod-free seedbed with good tilth will ensure coverage of the seed placed just deep enough (1-2 inches) to be in contact with moist soil. For plate planters, special plates are required, and recommendations of the equipment manufacturer should be followed.

Little information is available concerning the effects of plant density on the performance of popcorn hybrids. Commonly, seeding rates for popcorn are higher than for dent corn because of its smaller plant size and lower yield per plant. However, if plant populations are too high, the relatively poor stalk strength of popcorn hybrids can result in severe lodging. Generally, a 0 to 25 percent increase over the recommended dent corn plant densities should be considered for most soils and cultural practices. Both seed size (number of kernels per pound) and grade should appear on the popcorn seed bags.

Weed Control

The same weeds that commonly infest dent corn fields are also found in popcorn fields. Yield losses will occur when popcorn has to compete with weeds for the nutrients, light, and moisture essential to maximum growth and development. Also, certain weed species may serve as alternate hosts for disease and insect pests of popcorn.

Cultural methods for weed control in popcorn are similar to those used for dent corn. For chemical control methods, consult your county Extension office or popcorn company agronomist. Follow your state's recommendations, and apply as directed on the herbicide label.

Insect Control

Most, if not all, of the insects that attack dent corn can also attack popcorn. Here is brief review of the insect problems that might be encountered.

Soil insects. Of this group, the most damaging are those that attack the popcorn crop after emergence. They include the northern and western corn rootworms, wireworms, grubs, and two species of cutworms.

Rootworm larvae actively feed on the roots, frequently in numbers heavy enough to prune the root structure so that damaged plants lodge; adult beetles emerge in late summer and feed on silks, pollen, and ears. Wireworms, grubs, and cutworms live in the soil and cause stand losses by feeding on the roots or lower stem tissue; infestations in a field are usually spotty and are seen as wilted and dying plants.

Foliar and stem insects. Of this group (which includes aphids, earworms, armyworms, leaf beetles, mites, corn borers, and grasshoppers), the most destructive on popcorn is the European corn borer. This insect normally has two generations per year. In June or July, the first-generation larvae feed on leaf surfaces, midribs, and collars, then bore into the stalk. Then in late summer and fall, the second generation larvae feed on leaf sheaths and bore into stalks and ear shanks, causing serious losses through dropped ears and broken stalks.

To protect against insects that attack germinating seeds, plant only insecticide-treated popcorn seed. If soil insects are suspected to be at economic levels, application of an appropriate soil insecticide at planting should control them. (The crop history of the field can indicate if control measures will be needed or not).

Once popcorn plants are established, they should be routinely monitored for economic levels of various stem borers, whorl- and ear-feeding insects, rootworm beetles, and spider mites. Properly timed insecticide applications should give satisfactory controls. Carefully follow your state recommendations and the specific information on the product labels regarding application, safety, and restrictions.

Disease Control

As with weeds and insects, popcorn is likewise subject to the diseases common to dent corn. Fortunately, not all of these diseases are of economic importance and may pass from year-to-year without notice. A few, however, are widespread and can substantially reduce yield and quality if conditions are optimum for infection.

Seed rots and seedling diseases. Some soil and seed-borne fungi may infect germinating kernels either before or after emergence. These diseases are generally favored by cool (50-55°F), wet soils, mechanical injury to the seed coat, and excessive planting depths. Post-emergence symptoms include wilting and chlorosis of the leaves and/or rotting of the stem at the soil line.

Stalk and root rots. These diseases are often the most destructive in popcorn. Symptoms are usually first noted when the crop nears physiological, maturity. The disease complex is generally caused by several fungal and/or bacterial pathogens rather than by a single causal agent. Yield losses are the result of infected plants having poorly filled ears or lodged plants and dropped ears that escape harvest.

Leaf spots and blights. Of this group, northern, southern, and yellow leaf blights, anthracnose, and Goss's bacterial wilt are the most serious in popcorn. The leaf blight pathogens are widespread, while the anthracnose and wilt are generally restricted to certain regions. Primary infections occur from infected crop residue on the soil surface, especially in fields that have been in continuous corn. Damp, cloudy weather, moderate to warm temperatures, and frequent light rains favor secondary spread of these pathogens.

Rusts and smuts. While these diseases occur wherever popcorn is grown, rarely are they of economic importance. Rusts usually appear after pollination and 10-14 days after stormy, turbulent weather. Common smut is easily recognized as enlarged swellings (galls) on the stem, tassel, or developing ear. (On the leaves, however, they usually remain small, hard knots.) When mature, the galls rupture to release a mass of black spores. Head smut attacks the floral organs and, less commonly, the leaves; infection occurs during the seedling stage, with the fungus then being distributed systemically to the apex of diseased plants.

Ear and kernel rots. Many pathogenic and some saprophytic fungi can invade maturing ears, particularly under humid conditions. Insect or bird damage also enhances the development of ear decay fungi. In addition to kernel quantity and quality loss, some colonizing fungi can be associated with the formation of mycotoxins, which are hazardous to human and animal health. However, in popcorn this does not occur frequently.

Nematodes. Of the 40 species of nematodes that have been reported as parasites on corn roots in the United States, only five or six are of economic importance in popcorn. Nematodes cause damage directly by feeding on or in the roots, and indirectly by wounding the root tissue to allow entrance of other soil microbes.

Satisfactory control of popcorn diseases involves a combination of sound cultural practices, which include crop rotation, proper fertilization, proper management of crop residue, use of disease-resistant hybrids, and appropriate applications of chemical treatments. Consult state recommendations for specific practices tailored to fit local situations.

Irrigation

Popcorn requires 18-24 inches of water during the growing season. About 125-150 pounds of grain are produced for each acre-inch of water received (assuming other growth factors are not limiting). In general, if irrigation is needed to grow dent corn, then it will also be needed for profitable popcorn production.

As with dent corn, water deficiency during any period of the popcorn plant's growth can reduce yield; however, drought and high temperatures during tasseling and silking are the most detrimental. Thus, supplemental moisture at this stage of plant development usually offers the greatest return.

There are few popcorn-growing regions where moisture is not short at some period during the crop's development. Therefore, local climatic conditions, water availability, and the individual producer's economic situation are the determining factors in whether or not to use irrigation for popcorn production.

Harvesting

Much popcorn acreage today is harvested by combine, despite the fact that there is likely to be more kernel damage, and thus a reduction in popping volume. Processors who want maximum popping volume may contract with farmers to harvest their popcorn on the ear. While this usually increases production costs, it also usually results in a higher quality popcorn having higher potential popping volume. Combined popcorn can give satisfactory popping volumes if it is harvested at the correct moisture content by a properly adjusted combine.

Combine-harvesting. Combine-harvested popcorn should have a field moisture of between 14 and 18 percent, with the optimum being 16-17 percent. Above 18 percent moisture, shelling losses are high and there is much physical damage to the kernels. Below 14 percent, the kernels are too susceptible to impact damage from combining and associated handling operations; and as already mentioned, kernel damage lowers popping volume.

Combine settings are different for popcorn than for dent corn, and adjustments must be made when switching to popcorn. The cylinder speed, concave clearance, and other adjustments should be set to provide a balance between shelling efficiency, machine losses, and degree of physical damage to the popcorn. Slower cylinder speeds and wider concave clearances reduce kernel damage. A combine operated at or near its rated capacity will produce less kernel damage than when operated at relatively low levels of throughput. Further "fine tuning" will also likely be needed to account for specific harvest conditions, harvest moisture, and popcorn hybrid.

Ear harvesting. With a heated forced-air system to dry the ears promptly to a safe storage moisture, popcorn can be harvested at 25 percent moisture. Such a system must be so designed that the drying process does not affect the potential popping volume of the popcorn. With an unheated forced-air system or naturally ventilated storage, ear-harvested popcorn should field-dry to at least 20 (preferably 18) percent moisture before picking. Once reaching 18 percent, it should be harvested promptly to minimize field losses.

Like combines, ear pickers can also damage popcorn kernels if not operated properly. Special rubber snapping rolls are available for ear harvesting of popcorn; they cause less damage than the steel ones used for dent corn picking.

Hand harvesting. The home gardener or small, non-commercial producer can hand-harvest pop corn anytime after it reaches physiological maturity (approximately 35 percent moisture). Well-ventilated storage must be available to allow the ears to dry without molding.

Factors other than moisture content can influence when to harvest a given popcorn crop. These include incidence of disease, insect and bird damage, and freezing temperatures. Popping volume is not affected by a light frost once moisture content drops below 30 percent; but it could be significantly reduced by a hard freeze when kernel moisture is above 20 percent. On this basis, it may sometimes be better to harvest and artificially dry popcorn than risk a hard freeze. Below 20 percent moisture, freezing apparently has little or no effect on popping volume.

Conditioning

To be high-quality, popcorn must be free of microbial contamination and insect and rodent damage. Aside from that, the most important factor influencing the economic value of popcorn is popping volume—i.e., the volume of popped flakes produced from a given weight of unpopped kernels. Processors may reject popcorn that does not meet some specified minimum popping volume.

Popping volume is affected somewhat by harvesting and handling practices, and by the moisture history of the popcorn prior to popping; but the primary factor is the moisture content of the kernels when popped. Studies have shown that maximum popping volume is produced at moistures ranging from 13.0 to 14.5 percent, with 13.5 percent being optimum. Data also indicate that popcorn must be initially dried to at least 13.5 percent moisture before it attains maximum popping volume. After that moisture can increase to 15 percent without significantly decreasing popping volume. Overdried popcorn (11 percent or below) can be rewetted to 13.5 percent moisture, but it will not recover the maximum popping volume it had on initial drydown to 13.5 percent.

Conditioning combine-harvested popcorn. Popcorn combine-harvested below 18 percent moisture can usually be conditioned (i.e., dried down to the proper moisture) without spoilage by using an in-bin forced-air drying system. Such a system should supply approximately 2 cubic feet of drying air per minute per bushel of stored grain. This will not overdry the popcorn, unless the season is unusually dry—i.e., relative humidity (RH) often below 60 percent.

In areas where RH above 80 percent is expected for extended periods, a minimum amount of supplemental heat (producing no more than a 7-9°F temperature rise) can be provided, if it can be controlled by a reliable humidistat set at 60 percent RH and activated only when the outside RH exceeds 80 percent.

In areas where outside RH is consistently below 60 percent, it may be advantageous to condition popcorn in unheated air portable-batch- or continuous-flow-type dryers before storage. If operated and monitored properly, this type of system prevents the overdrying problems that can occur with an instorage drying unit.

Conditioning ear-harvested popcorn. Popcorn mechanically harvested on the ear at 20-25 percent moisture content must be dried promptly to prevent mold growth in storage. Storage structures should incorporate high-volume forced-air ventilation systems to insure uniform drying in all areas of the crib. The high volume of uniform air flow is the key to keeping mold growth down; but provision for supplemental heat during periods of higher humidity, as was recommended for shelled popcorn, is also desirable.

Ear popcorn conditioned by heated forced air needs to be monitored frequently to prevent any overdrying or too rapid drying, which would reduce potential popping volume. Moisture content can be checked using a commercially available electronic moisture tester either calibrated for popcorn or supplied with a conversion chart for popcorn.

Ear popcorn harvested at 20 percent moisture or below can usually be stored in naturally ventilated cribs. Natural ventilation should dry the popcorn to a moisture content near that desired for popping without any overdrying problems. To insure that air will move freely through the stored popcorn, cribs should be no more than 3-4 feet wide, and the popcorn itself clean and free of husks and other residue. Once ear popcorn has dried to below 16 percent, it can be shelled then conditioned to the correct popping moisture. This may be done with a forced-air system similar to that previously described.

Re-conditioning overdried popcorn. If popcorn has been overdried, it can be rehyrated to the desired moisture content but, as mentioned above, it will not fully recover its initial popping volume. Usually the best way is to move 70-85 percent RH air through it over a long period (i.e., from a week to several months, depending on air flow rate and amount of rehydration needed.) Another way is to blend the over-dried popcorn with high-moisture popcorn to produce a desired "average" moisture.

Blending, however, does not always provide satisfactory results. One requirement in blending is an accurate knowledge of both the moisture contents of the lots being blended and the blending flow rates to insure that the desired average moisture content of blended popcorn is attained. Even then, the moisture levels of the blended grains will not be exactly the same at equilibrium. The higher-moisture grain will always maintain a slightly higher moisture content than the lower-moisture grain in the blend. However, a difference of less than 1 percent will not have a measurable effect on popping volume.

Heated-air drying is generally not recommended for popcorn because of problems with overdrying, non-uniform drying and occurrence of stress cracks from too rapid drying. Its use, however, may be necessary to prevent spoilage or speed the drying process. If so and to minimize the amount of stress cracking, drying air temperatures should be in the 90-100°F range, with 120°F being the maximum. Higher quality popcorn can be expected if drying is done in several stages, with a 12-24 hour tempering period between stages to allow for moisture redistribution within the kernels. An alternative to this is a two-stage combination drying system where a heated-air dryer is used to reduce moisture content to approximately 17-18 percent, then a natural-air or low-temperature drying system finishes the conditioning process.

Storage

For best storage, the moisture content of popcorn must be low enough to prevent significant fungal and microbial activity, but not so low as to adversely affect its popping volume. Popcorn at 14.5 percent moisture can be safely stored over winter and into early spring. For longer term storage, it should be dried to 13.5-12.5 percent.

Aeration systems similar to those used for dent corn should be provided for shelled popcorn storage bins to prevent moisture migration and help maintain grain quality during storage. Ear popcorn cribs must allow good natural ventilation and be designed to prevent rain and snow from getting into the popcorn.

Before storing a new crop, all bins and cribs should be cleaned and treated for insects; the grain can also be treated as it is put into storage. Use only those insecticides approved for this type of application, and apply according to manufacturer's recommendations. Popcorn that has not been treated with an insecticide must be watched carefully for any sign of insect activity, particularly if it is to be stored after the weather warms up in the spring. An aeration system will tend to reduce insect activity in the winter by keeping the grain near the average outside temperature. Storage in refrigerated warehouses will prevent damage~by stored grain insects.

All cribs and bins for popcorn storage should also be rodent proofed. To do this, keep the surrounding area free of weeds and trash, which can harbor rats and mice, and apply as necessary an approved rodenticide to prevent problems from developing in the storage facility.

Marketing and Economics

As with any specialty crop, marketing and economics are extremely important considerations in profitable popcorn production. The grower considering a large acreage must be familiar with marketing outlets for the crop and the economics involved.

Generally, three markets are available for good quality popcorn—processor-contracted acreage, open-market sales and local sales. However, since not all harvested popcorn may be marketable as popping corn, thought should be given to alternative uses or outlets.

Processor-contracted acreage. Most popcorn is grown under contract to processors. This acreage is adjusted annually to the processors' estimated needs as determined by market analysis. Normally, these estimates are very close to actual demands, which tends to stabilize the popcorn market. Most contracts specify that a grower plant a certain number of acres with a certain hybrid for a certain price per 100 pounds of popcorn delivered. As an alternative to firm pricing, some processors write contracts using the commodity price of corn on the Board of Trade on a given day, thus allowing the grower some flexibility in the system. By keeping abreast of popcorn supply and demand as well as the price of dent corn and soybeans, processors are able, under normal conditions, to contract popcorn at prices that provide a reasonable profit for the successful grower. Hence, growing contracted popcorn should be competitive with growing dent corn.

Open-market sales. A popcorn grower who plans to sell on the open market assumes the risk of fluctuations in price. A year or so of high popcorn prices relative to dent corn not only tempts regular popcorn growers to increase their acreage, but also attracts new growers—the result often being over-production, low prices and financial loss. Thus, it is unwise, especially for the novice, to plant a large acreage of popcorn immediately following a year of high prices.

An open-market grower must be aware of current acreage and crop conditions, as well as probable market demand and carryover. The grower should be prepared, financially and storage facility-wise, to hold the crop for an extended length of time. Good quality popcorn stored under good conditions will keep indefinitely, allowing the grower to wait for a price that ensures a profit.

Local sales. This market alternative requires a longer-term commitment to popcorn production. Depending on the level of involvement, it can entail becoming a popcorn processor on a small scale. Success in the local sales market depends on the ability of the grower, as both producer and merchant, to grow and process a high-quality product and utilize proper packaging. Growers lacking in any of these areas will likely not fully satisfy their direct sales customers, and sales will drop rapidly, especially in light of the number of competitive popcorns readily available in stores.

Alternative outlets. If the crop is not marketable as popping corn, it can be ground and fed to livestock or poultry. Any outlet for unmarketable popcorn that provides some monetary return on the crop will lessen the shock of the financial loss.

Home Garden Production

All that is required to grow popcorn for home use is adequate space and a little gardening know-how. Most seed catalogs list popcorn varieties for home gardeners. To find one that grows best under your conditions, try several over a couple of years; and keep testing new ones as they come on the market. Maturity is important in variety selection because popcorn that does not reach full maturity before frost will have very poor quality.

Plant popcorn according to package directions. It is better to plant several short rows side by side than one long row. Also, do not plant sweet corn and popcorn in the same garden; if they happen to shed pollen at the same time, the sweet corn quality might be reduced. Popcorn requires adequate nitrogen and should be fertilized accordingly.

Harvest popcorn only after the kernels are hard and the husks completely dry. After picking, remove the husks and store the ears in bags that allow air movement so ears can dry. Each week, shell a few kernels and try popping them.

When they pop well, shell the remaining ears and store in moisture-proof containers. Because popcorn can become infested with several types of insects, refrigeration is the best long-term storage.

Determining if moisture content is optimum for the best popping volume is a difficult problem. If the popcorn is "chewy" after popping, it is probably still too wet; so allow the kernels to dry some more, popping a sample every couple of days until the flakes are no longer chewy.

Popcorn that pops poorly with many unpopped kernels is probably too dry and needs moisture. Start by adding one tablespoon of water to a quart of popcorn, mix well a couple of times that day, then after 2-3 days try popping another sample. Continue this procedure until the popcorn pops well.

Utilization

Popcorn is sold either as a plain or flavor-added popped product, or as an unpopped product in moisture-proof containers ranging from plastic bags and sealed jars to ready-to-use containers both for conventional and microwave popping. Popcorn flavor is enhanced to individual tastes with the addition of salt and butter. There is no end to the uses of popcorn. One recipe book lists 200 different recipes.

Nutritionally, it is one of the best all-around snack foods, providing 67 percent as much protein, 110 percent as much iron, and as much calcium as an equal amount (by weight) of beef. An average 1.5 ounce serving of popcorn supplies the same energy as two eggs; and a cup of unbuttered popcorn contains less calories than half a medium grapefruit. In addition, it's good for the teeth; and the hull is excellent roughage, comparing favorably with bran flakes or whole wheat toast.

The Oklahoma Cooperative Extension Service
Bringing the University to You!

The Cooperative Extension Service is the largest, most successful informal educational organization in the world. It is a nationwide system funded and guided by a partnership of federal, state, and local governments that delivers information to help people help themselves through the land-grant university system.

Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

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- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
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