



Food Storage

PLANNER

Information on
Grains & Legumes
By Revelar, Inc.

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Introduction & Disclaimer

This information, gathered from our own experience and various sources, is not intended to be the comprehensive work on food storage. Rather, this is designed to introduce the novice to food storage. For further information on home canning and storage, consult your local library.

DISCLAIMER: Safe and effective food storage requires attention to detail and proper equipment and ingredients. Revelar, Inc. makes no warranties and assumes no responsibility for errors or omissions in the text, or damages resulting from the use or misuse of information contained herein.

Grains

Wheat

Wheat comes in different varieties. Each variety is more or less suitable for a given purpose based on its characteristics. The most common classifications for wheat varieties are spring or winter, hard or soft, red or white.

Hard

The hard wheats have kernels that tend to be small, very hard and have a high gluten content. Gluten is the protein in grains that enables the dough made from them to trap the gasses produced by yeast fermentation and raise the bread. Low gluten wheat does not produce as good a loaf as high gluten wheat, though they can still be used for yeast breads if necessary. As a general rule, hard varieties have more protein than soft varieties.

Soft

The soft varieties have kernels tending to be larger, plumper and softer in texture than hard wheats. Their gluten content is less and these are preferred in baking, quick breads, pastas, and breakfast cereals.

Season

Winter wheats are planted in the fall, they winter in the field and are harvested the next summer. Spring wheats are planted in the early spring and are harvested in the fall. Red wheats comprise most of the hard varieties while white wheats comprise most of the soft. Recently, hard white wheats have been developed that are suitable for raised bread making. Some feel the hard white varieties make a better tasting whole wheat bread than the hard red.

The most commonly stored are the hard red varieties, either spring or winter, because of their high protein. They should have a protein content of no less than 12%, with higher the better. The hard white spring wheats are still relatively new and are not yet widespread. They have the same excellent storage characteristics as the hard red wheats.

Amaranth

Amaranth is not a true cereal grain at all, but is a relative of the pigweeds and the ornamental flowers we know as cockscomb. It's grown not only for its seeds, but for its leaves that can be cooked and

eaten as greens. The grain is high in protein, particularly the amino acid lysine which is limited in the true cereal grains. The grains can be milled as-is, or the seeds can be toasted to provide more flavor. The flour lacks gluten, so it's not suited for raised breads, but can be made into any of a number of flat breads. Some varieties can be popped much like popcorn, or can be boiled and eaten as a cereal, used in soups, granolas, and the like. Toasted or untoasted, it blends well with other grain flours.

Barley

Barley has short, stubby kernels with a hull that is difficult to remove. Excluding barley intended for malting or animal feed, most of this grain is consumed by humans in two forms. The most common is the white, highly processed "pearl" barley that has had most of its bran and germ milled off along with its hull. It is the least nutritious form of barley. The second form it's found in is called "pot" or "hulled" barley and it has been subjected to the same milling process as pearled, but with fewer trips through the polisher. Because of this, it retains more of the nutritious germ and bran. Unless you are prepared to try to get the hulls off we don't recommend buying barley still in the hull. Barley can be milled into flour, but its low gluten content will not make a good loaf of raised bread. It can be combined with other flours that have sufficient gluten to make good raised bread or used in flat breads. Barley flour and flakes have a light nutty flavor that is enhanced by toasting. Whole barley is commonly used to add thickness to soups and stews.

Buckwheat

Buckwheat is another of those seeds commonly considered to be a grain, but which is not a true cereal. It is a close relative to the docks and sorrels. The grain itself is a dark, three cornered seed resembling a tiny beechnut. It has a hard, fibrous hull that requires a special buckwheat huller to remove it. Here in the U.S., it is most often used in pancakes, biscuits and muffins. In eastern Europe and Russia it is known in its toasted form as kasha. In Asia, it's often made into soba or noodles. The flour is light or dark depending on how much of the hull has been removed before grinding. Dark flour is far superior nutritionally as you might expect, but it also much more strongly flavored. Like amaranth, it's high in lysine, an amino acid commonly lacking in the true cereal grains.

Corn

Corn is the most common grain crop in the U.S., but it is mostly consumed indirectly as animal feed or even industrial feedstock rather than directly as food. Nevertheless, it comes in an amazing variety of forms and, like wheat, some of them are better suited for a particular purpose than others. The varieties intended to be eaten as fresh, green corn are very high in sugar content and do not dry or store well. Much of the corn grown in the "Corn Belt" of the US is corn feed for cattle and other purposes. The other varieties are the flint, dent, and popcorns. All of them keep well when they have been properly dried. To a certain extent, they're all interchangeable for purposes of grinding into meal (sometimes known as polenta meal) or flour (very finely ground corn, not cornstarch), but some make better meal than flour and vice versa. As a general rule of thumb, the flint varieties make better meal as they have a grittier texture than the dent corns which make better flour. If meal, hominy and hominy grits (commonly called just "grits") are what you are most interested in, use the flint type. If you intend to make corn masa for tortillas and tamales, then the dent type is what you want. Popcorn is what you need if you want to pop it for snacks and it can also be ground into meal or flour. It makes a decent meal, but it's just a bit gritty for flour. Yellow dent corn seems to be the most commonly available variety among storage food dealers.

Popcorn is one form of a whole grain available to nearly everyone in the U.S. if they know where to look. It is usually sold in 25# or 50# bags. Since it's meant to be eaten it's safe for food. To be at its most poppable, this corn needs to have a moisture content between 13.5%-15.5% which makes it just a little too moist for ideal storage. A small amount of drying will need to be done before it's packed away. If wanted for popping later, it can always be re-hydrated by sprinkling a small amount of water on the kernels, shaking vigorously and allowing it to be absorbed.

Once you've decided between flint, dent or popcorn, you now have to decide upon it's color: There are yellow, white, blue, & red dried varieties. The yellow and white types are the most common by far with the blues and reds mostly being relegated to curiosities, though blue corn has been gaining in popularity these last few years. It should be kept in mind that white corn does not have the carotene (converts into vitamin A) content of yellow corn. Since vitamin A is one of the major limiting vitamins in long term food storage, any possible source of it should be utilized so for this reason I suggest storing yellow rather than white corn. Additionally, much of the niacin content of corn is chemically bound up in a form not available for human nutrition unless it has been treated with an alkali. If grits, hominy or corn masa (for torillas and tamales) are not a part of your diet and you're storing corn, it is a very good idea to begin to develop a taste for some or all of these alkali treated forms of corn foods.

Millet

Millet is an important staple grain in North China, and India, but is little known as a food in the U.S, mostly being used as bird feed. The grain kernels are very small, round, and usually ivory colored or yellow, though some varieties are darker. The lack of gluten and a rather bland flavor may account for the anonymity of this grain here, but it's alkaline content is higher than other grains and makes it very easy to digest. It also has a higher iron content than any other grain but amaranth. It swells a great deal when cooked and supplies more servings per pound than any other grains. When cooked like rice it makes an excellent breakfast cereal. Though it has little gluten of its own, it mixes well with other flours.

Oats

Though the Scots and the Irish have made an entire cuisine from oats, they are still mostly thought of in the U.S. as a bland breakfast food or intended for horses! It is seldom found as a whole grain, usually being sold processed in one form or another. Much like barley, oats are a difficult grain to separate from their hulls. Besides their longtime role as a breakfast food, where they can be made very flavorful with a little creative thought, oats make an excellent thickener of soups and stews and a filler in meat loafs and casseroles. Probably the second most common use for oats in America is in cookies and granolas. Listed below in order of desirability for storage are the forms of oats most often found in this country. Rolled and cut oats retain both their bran and their germ.

Oat Groats

These are whole oats with the hulls removed. They are not often found in this form, but can sometimes be had from natural food stores and some storage food dealers. Oats are not the easiest thing to get a consistent grind from so producing your own oat flour takes a bit of experience.

Rolled Oats

These are also commonly called "old fashioned", "thick cut" or "porridge" oats. To produce them, oat groats are steamed and then rolled to flatten. They can generally be found wherever oats are sold. They take longer to cook than do the quick cooking oats, but they retain more flavor and nutrition.

This is what most people will call to mind when they think of oatmeal.

Quick Cooking Rolled Oats

These are just steamed oat groats rolled thinner than the old fashioned kind above so that they will cook faster. They can usually be found right next to the thicker rolled oats.

Instant Rolled Oats

These are the "just add hot water" or microwave type of oat cereals and are not at all suited for a long term food storage program. They are practical in 72-hour kits for short term crises.

Whole Oats

This is with the hulls still on. They are sold in seed stores and sometimes straight from the farmer who grew them. Unless you have some means of getting the hulls off, I don't recommend buying oats in this form. If you do buy from a seed supplier, make certain that they have not been treated with any chemicals that are toxic to humans.

Quinoa

With the highest protein content of all grains, this is our favorite (We spend a good deal of time in Peru)! Quinoa is found in the Andes and grows at high altitudes. Quinoa is yet another of the grains that is not a true cereal. It's botanical name is *Chenopodium quinoa* (pronounced "keen-wah"), and is a relative of the common weed Lambsquarter. The individual kernels are about 1.5-2 mm in size and are shaped rather like small flattened spheres, yellow in color. When quinoa is cooked, the germ of the grain coils into a small "tail" that lends a pleasant crunch. It makes an excellent soup. This exotic grain should be thoroughly washed before cooking in order to prevent the cooked product from tasting bitter. There are several varieties of quinoa that have color ranging from near white to a dark brown. Quinoa is found in health stores.

Rice

Rice is the most commonly consumed food grain in the world. The U.S. is the leading exporter of it, though we actually only produce about 1% of the global supply. Much like wheat and corn, rice comes in a number of varieties, each with different characteristics. They are typically divided into classes by the length of their kernel grains—short, medium and long.

Short Grain Rice

Short grain rice is a little softer and bit moister when it cooks and tends to stick together more than the longer rices. It has a sweeter, somewhat stronger flavor than long grain rice.

Medium Grain Rice

Medium grain rice is not very common in the States. It has flavor like short grain rice, but with a texture more like long grain rice.

Long Grain Rice

Long grain rice cooks up into a dryer, flakier dish than the shorter grains and the flavor tends to be blander. It is the most commonly found size of rice on the grocery shelves. Each of these may be processed into brown, white, parboiled or converted and instant rices.

Brown Rice

This is whole grain rice with only the hull removed. It retains all of the nutrition to be found in rice and has a pleasant nutty flavor when boiled. From a nutrition standpoint it is by far the best of the rices to put into storage, but it has one flaw: The essential oil in the germ of the rice is very susceptible to oxidation and soon goes rancid. As a result, brown rice has a shelf life of only about six months from the date of purchase unless given special packaging or storage processing. Freezing or refrigeration will greatly extend its storage life. It's also possible to purchase brown rice from long term food suppliers specially packaged in air tight containers with an inert nitrogen atmosphere. In this kind of packaging, (if properly done), the storage life of brown rice can be extended for years.

Converted Rice

Converted rice starts as brown rice which undergoes a process of soaking and steaming until it is partially cooked. It is dried and then polished to remove the bran and germ. The steaming process drives some of the vitamins and minerals from the outer layers into the white inner layers. This makes it more nutritious than polished white rice, but also makes it more expensive.

White Rice

This is raw rice that has had its outer layers milled off, taking with it about 10% of its protein, 85% of its fat and 70% of its mineral content. Because so much of the nutrition of the rice is lost, white rice sold in this country has to be enriched with vitamins that only partially replaces what was removed.

Rye

Rye is a well known bread grain in the U.S., though not as popular as wheat. It has dark brown kernels longer and thinner than wheat, but less gluten. Bread made from this grain tends to be somewhat dense unless gluten is added (often in the form of a lot of wheat flour) with color that ranges from pale to dark brown. German pumpernickel, made with unrefined rye flour and molasses, is the blackest, densest form. Rye makes for excellent variety in the diet.

Sorghum

Sorghum is probably more widely known here in the States for the syrup made from the juice squeezed from the canes of one of its many varieties. Also widely called "milo", it is one of the principle cereal grains grown in Africa. Its seeds are somewhat round, a little smaller than peppercorns, with an overall brown color with a bit of red and yellow mixed in. The varieties called "yellow endosperm sorghum" have a better taste. Sorghum is a major feed grain in the Southwestern part of the U.S. and is where the vast majority of the national milo production goes to. Like most of the other grains, sorghum is low in gluten, but the seeds can be milled into flour and mixed with higher gluten flours or made into flat breads, pancakes or cookies. In Asia, it is cooked and eaten like rice, while in Africa it is ground in meal for porridge. It's also commonly brewed into alcoholic beverages.

Triticale

Triticale is a hybrid between wheat and rye. This youngest grain combines the productivity of wheat with the ruggedness of rye and has a high nutrition value. Triticale kernels are gray-brown, oval shaped larger-than-wheat kernels and plumper than rye. It will make a raised bread like wheat flour will, but the gluten is a bit weak so wheat flour is often added to strengthen it. Because of the delicate nature of its gluten, excessive kneading must be avoided. Use it the same way as wheat or rye.

Legumes (Beans)

Black Beans

Also known as turtle beans, these small, dark-brownish black, oval-shaped beans are well known in southwestern black bean soups. They are very commonly used in Central and South America and in China. They tend to bleed very darkly when cooked so they are not well suited to being combined with other beans, lest they give the entire pot a muddy appearance.

Black-Eyed Pea

Although there is tremendous variation among the many varieties of field peas eaten throughout the Southern United States, it is black-eyed peas that are the most commonly known nationwide. The coloring of field peas is as varied as the rest of the legume family, with black-eyed peas being small and oval-shaped with an overall creamy color and, of course, their distinctive black-eye. Dried field peas cook very quickly and combine very tastily with either rice or cornbread.

Chickpeas

Also known as the garbanzo bean or ceci pea (or bean), it tends to be a creamy or tan color, rather lumpily roundish and larger than dried garden peas. Many have eaten chickpeas, even if they've never seen a whole one. They are the prime ingredient in hummus and falafel and are one of the oldest cultivated legume species known, going back as far as 5400 B.C. in the Near East.

Kidney Beans

Just like the rest of the family, kidney beans can be found in wide variety. They come in both light and dark red color in their distinctive kidney shape. Probably best known here in the U.S. for their use in chili, they figure prominently in Mexican, Brazilian and Chinese cuisine.

Lentils

Lentils are an odd lot. They don't fit in with either the beans or the peas and occupy a place by themselves. Their shape is different from the other legumes being roundish little discs with colors ranging from muddy brown, to green to a rather bright orangish-red. They cook very quickly compared to the larger beans and have a distinctive flavor. They are much used in Asian cuisine from India to China. They make an excellent soup.

Lima Beans

In the Southern U.S., they are also commonly called butter beans. They are one of the most common beans found in this country in all manner of preservation from the young small beans to the large fully mature type. Their flavor is pleasant, but a little bland. Their shape is rather flat and broad with colors ranging from pale green to speckled cream and purple.

Peanuts

The peanut, commonly known outside the U.S. as the groundnut, is not actually a nut at all, but a

legume. Peanuts are another odd species not much like the more familiar beans and peas. Whatever their classification they are certainly not unfamiliar to U.S. eaters. Peanuts have a high protein percentage and even more fat. They are one of the two legume species commonly grown for oilseed in this country, and are also used for peanut butter, boiled and roasted peanuts. Many Central and South American, African and Chinese dishes incorporate peanuts so they are useful for much more than just a snack food or cooking oil.

Pinto Beans

The Pinto is the most commonly eaten beans in the U.S. at an average of 3.5 pounds per person. Stereotypically bean shaped, it has a dappled pattern of tans and browns on its shell. Pintos have a flavor that blends well with many foods.

Soybeans

An entire university could be founded on the culinary and industrial uses of the soybean. It is by far the legume with the highest protein content in commercial production as well as being the other legume oilseed producer alongside the peanut. The beans themselves are small, and round with a multitude of different shades. Although the U.S. grows a very large percentage of the global supply of these beans, we actually consume virtually none of them directly. Most of them go into cattle feed, are used by industry or exported. What does get eaten directly has usually been processed in some form or fashion. Soybean products range from tofu, to tempeh, to textured vegetable protein and hundreds of other uses. Although they are very high in protein, they don't lend themselves well to just being boiled until done and eaten the way other beans and peas do. For this reason, if you plan on keeping some as a part of your storage system (and you should) you would be well served to begin to learn how to process and prepare them now when you're not under pressure to produce.

Nutrition

Unless one is willing to spend a great deal of money on preserved meats, a food storage system not including a quantity of legumes is simply incomplete. There are few non-animal foods that contain the amount of protein to be found in dried beans, peas, and lentils. The varieties commonly available in this country have protein contents ranging from 20%-35%. As with most non-animal proteins, they are not complete in themselves for purposes of human nutrition, but become so when they are combined with the incomplete proteins found in grains. It is for this reason that grains and legumes are so often mentioned together. In cultures all over the world, it is common to find the two served together at a meal, making a complete protein, even when those doing the serving have no understanding of nutrition at all.

During the lean years of the Great Depression, beans were tagged "poor man's meat" because of their protein power at pennies per pound. Beans are a source of Niacin, Thiamin, Riboflavin, B6 vitamins and many other nutrients as well. They are also rich in complex carbohydrates and fiber. All of these nutrients are necessary for normal growth and for the building of body tissues. Beans are high in potassium which is required for the normal functioning of nerves and muscles. A cup of cooked beans contains more potassium than a banana. In fact, beans have more calcium and iron per cup than three ounces of cooked meat but contain no cholesterol and with less calories. Beans are the best source of folate and are excellent sources of minerals and vitamins. High in fiber

they have good cancer fighting characteristics and have been specifically linked to lower the risk of colon cancer.

Recent research has brought to light that beans have 'anti-aging' agents or antioxidants found in the seed coat. There are eight flavonoids in the outer bean layer, six of which are particularly strong antioxidants. Because of new research, we are learning that beans have a perfect nutrient base for people interested in weight loss. They also aid in reducing cholesterol, improve digestion and, as already mentioned, are an aid in cancer prevention.

Preparing Legumes

Beans can be eaten raw, sprouted or cooked. They can even be ground into a flour and in this form beans cook up in two or three minutes into a hearty soup. But this is not all, for the more adventurous among us, beans can be juiced into milk, curdled into tofu, fermented into soy sauce or made into transparent noodles called vermicelli. Truly, beans rival the versatility of wheat in what you can do with them. Here are some of the different processes in preparing beans for eating.

Soaking

This step isn't completely necessary, however, there are some real advantages. A shorter cooking time is probably the biggest advantage. Figure about an extra hour of cooking time for beans that are not pre-soaked. Beans should be soaked for at least 6 hours. During this time, the beans will absorb water until they have increased in volume and weight about 3 times. You should add 5 times as much water as dry beans. Soaking also leaches some of the gas producing properties out of the bean. But for this to work, you need to discard the soaking water and replenish it with fresh water before cooking. The longer you soak them the less gassy beans will be. You can also drain the water after 12 hours, then rinse and re-drain them every 12 hours for 2 to 3 days until the sprouts are as long as the bean. This not only dramatically increases the vitamins in the beans but also removes some of the gas producing qualities. After you have sprouted them as described above, cook them like regular soaked beans. You can also quick soak beans by boiling them for 10 minutes first, then setting them aside for two hours. As with a cold soak, you should discard the soaking water and replace with it fresh water before cooking them. Boiling the beans kills the seeds so don't expect them to sprout after you've heated them.

1 lb. dry packaged beans = 2 cups dry = 6 cups cooked beans.

Cooking Beans

After soaking, most people cover the beans with water then boil them. This can take anywhere from 30 minutes to 2 hours, depending on the bean. You should check them for softness every 15-30 minutes then pull them off the heat when they've reached their desired softness. But you can also throw them in a crock pot in the morning and let them go until the evening. Beans ground into a flour cook up almost instantly into a soup or paste, depending on how much water you use. If you've boiled your beans for several hours and they still haven't softened, it's probably because they are old. Older, air stored beans 5 or more years old get 'hardened' and may never soften up. There are two ways of getting around this. You can put them in a pressure cooker for 45-60 minutes and this should do the trick, or you can grind them. Incidentally, normal beans that aren't 'hard' cook in about 20 minutes in a pressure cooker. Hardened beans still contain much of their nutrition.

After your beans are cooked, add your flavorings, meat, vegetables or whatever you are adding to make the bean dish you are preparing. Don't add these ingredients while the beans are cooking as there are many ingredients that will increase the beans' cooking time before they become soft. This includes the acidic foods which include tomatoes, lemon juice, vinegar and similar ingredients. Adding a bit of cooking oil, butter or margarine to the cooking beans will help to keep the foaming down as they cook. Consider cooking a double batch and freezing the beans not used immediately. Beans soaked for 12 hours or more often have a more uniform shape than quick soaked beans. You may need to increase the cooking time if your water is overly hard or you live at high altitudes. Cooked beans will store nicely in your refrigerator for a week and they freeze nicely for a minimum of 6 months.

What Are The Different Beans Used For?

Adzuki	Japanese dishes.
Anasazi	Can be used in place of Navy, Pinto, Great Northern, or Kidney beans.
Black-eye	Rice dishes and southern cuisine.
Black Turtle	Latin American dishes, soups, refried beans, salsas.
Garbanzo	Soups, salads and Mexican dishes; Hummus and falafel. Coffee substitute.
Great Northern	Soups, baked beans.
Kidney	Soups, salads, sandwiches, chili, dip, or over rice.
Lentils	Soups, raw sprouts, stirfried sprouts, meatless patties, Ethnic food.
Lima	Vegetable side-dish or added to soups and casseroles.
Mung	Sprouts, vermicelli or transparent noodles.
Navy	Baked beans, soups, casseroles, ethnic dishes.
Pink	Used to make chili. Good substitute for pinto or kidney beans.
Pinto	Chili, refried beans, dips.
Small Red	Chili, salads.
Soy	Soy milk, tofu, soy flour, TVP, sprouts, tempeh, miso, soy sauce, natto.

Beans Giving You Gas?

Beans have a reputation of producing gas. There are several things you can do to minimize or eliminate this. First, pick a bean that is not as gas-producing as the others. Gas is produced when the intestinal tract doesn't adequately digest beans. Here is a scale of beans sorted according to their gas producing qualities (1=more gas, 10=less gas):

1. Soybeans
2. Pink beans
3. Black turtle beans
4. Pinto beans
5. Small white beans
6. Great northern
7. Baby lima beans
8. Garbanzo beans
9. Large lima beans
10. Black-eyed peas
11. Anasazi beans

The most likely reason for gas is caused by a lack of enzymes needed to digest this food. As your

body gets used to eating beans, the needed enzymes are introduced and this problem disappears. There are a herbs and spices that also reduce or eliminate the gas from beans. Peppermint, spearmint, marjoram, anise, basil, caraway, carrots, dill, ginger, onions orange juice, parsley, savory, thyme and ginger are reported to have gas reduction properties to one extent or another as well. Try drinking orange juice with your bean meals. The tale of throwing a carrot in with the beans as they cook then throwing it out is also founded on successful experience. As mentioned already, you should throw out the water you've been soaking your beans in before cooking them and it's also reported that fruits shouldn't be eaten at the same meal.

Purchasing Grains & Legumes

Grains and legumes of all types may be purchased in a number of different fashions depending largely on where you live and the time of year. If you should happen to live in the area where the type of grain or legume that you are interested in purchasing is grown you may be able to purchase direct from the producer or distributor. If you are interested in doing this, you may be able to find what you want at any processing step along the way. The most basic form is called "field run" which means that it's been harvested and sold shortly thereafter. It will not have been given any cleaning or processing and is likely to be rather dirty depending upon the conditions under which it was grown and harvested.

A second basic form called "field run from storage" is grain that has been harvested and then put into storage for a time. It will have all of the dirt and detritus of field run grain and whatever it may have picked up from the silo as well.

If you want cleaner grain you should look for "pre-cleaned" which means that it has been passed through fans, screens or sieves to remove chaff, smut balls, insect parts, mouse droppings and other debris.

For those of us who don't live in an area that produces the grain and legumes that we're interested in, we have to resort to the last type which is "pre-cleaned and pre-packaged". This is grain that's been harvested, cleaned and put up in bags or other containers—possibly even going so far as to already be packaged for long term storage.

Each of the above types of availability has its good and bad points. As you might expect, the more processing the product receives, the higher its price is likely to be. If you don't mind doing a little cleaning and you need to be frugal with your cash, then field run grain is the way to go.

If you have purchased your grains and legumes from a food store or a foods dealer then you needn't worry about hidden mold infections, fungicides or insecticides that are unsafe for human consumption. In the U.S. the products will have been checked at least several times by Federal and State agriculture dept's and probably by the major foods dealers as well, to insure its quality.

This is not necessarily the case when you purchase your grains or legumes direct from the farmer or elevator operator as field run or field run from storage grain. Nor is it necessarily the case if you've made the decision to utilize grains marketed as animal feed. Inspection procedures vary from nation to nation, so outside of the U.S. inquire of your supplier.

If you are buying your grains and legumes from some-place other than a food store then you need to

know the history of what it is you are buying. Straight field run grain, other than being dirty, is not likely to have had anything added to it that would make it undesirable for human consumption. There is, however, the small possibility it may have been infected with molds that would make it unsafe for eating. Field run from storage and any grade of grain not specifically advertised for human consumption may have had fumigants, fungicides or insecticides not certified as safe for human foods added to it while it was in the bin. It is important to know what it has been treated with before you buy it.

There is a fungal infection of grain called "ergot". It is attracted to rye more so than other grains, particularly if the growing conditions were damp where it was grown. This fungus causes a nervous disorder known as St. Anthony's Fire. When eaten in large quantities the ergot alkaloids can cause constriction of the blood vessels, particularly in the extremities. The effects of ergot poisoning are cumulative and lead to numbness of the limbs and other, frequently serious symptoms.

This fungal disease affects only the flowering parts of some members of the grass family, mostly rye. The fungus bodies are hard, spur like, purple black structures that replace the kernel in the grain head. The ergot bodies can vary in size from the length of the kernel to as much as several times as long. They don't crush as easily as smut bodies of other funguses. When they are cracked open, the inner broken faces are can be off-white, yellow, or tan. The infected grain looks very different from ordinary, healthy rye grains and can be spotted easily. Ergot only rarely affects other grains. If you purchase field run rye, you should closely examine it first for the presence of ergot bodies. If you find more than a very few, pass up that grain and look elsewhere.

Most of FSP's users live in cities, hence, we recommend you shop at a granary and explain what your needs are.

Moisture Content

The moisture content of the grain or legume you want to purchase or grow has a major impact on how long you will be able to store it and have it remain nutritious and edible. Some information indicates that grain with a moisture content as high as 12% can be safely put into long term storage, but there is a risk to storing grain at that moisture level that should be understood.

The outside of each and every kernel of grain or bean you buy or grow may host thousands of fungi spores and bacteria. This is all perfectly natural and is not a reason for concern. The problem lies in that at moisture levels between 13.5% to 15% some fungal species are able to grow and reproduce. Other species require a moisture level in the 16-23% range. Aerobic bacteria (oxygen using) require a moisture level of about 20%. Raw peanuts are particularly susceptible to *Aspergillus* mold growth that produces aflatoxin and should be stored with an 8% moisture content or less.

Thus, if you have grain you want to store with a moisture content as high as 12% you are perilously close to having enough moisture to enable mold growth which could lead to the ruin of your grain. For this reason, it is suggested you keep grains and legumes to a moisture content of no more than 10%.

If you do not have a clue as to what the moisture level of your grain is here is a rough method to determine it.

Take 20 ounces of the grain or legumes in question from the middle of its bag or container (this needs

to be an actual weighed twenty ounces and not estimated). Spread the grain in a large baking dish making sure it is not more than an inch deep. Heat at 180 F for about two hours, stirring occasionally. Allow the grain to cool where it won't reabsorb moisture, the oven will do. Once cool, reweigh the grain. A one ounce loss in weight indicates the grain had roughly a five percent moisture content, 2 ounces indicates that it has a 10% moisture content, etc, etc. You might even be able to cut it as fine as a half oz loss, but I wouldn't try to take it further than that.

Obviously, this is only a rough measure, but it works and I don't have a better idea that could be used by an individual in the home. If anyone has a better way of measuring moisture levels which can be done without a lab or special equipment I'd surely like to hear it.

Cleaning it Yourself

If you've chosen to purchase field-run grain or if the pre-cleaned product you've bought isn't clean enough to suit you, you can do it yourself.

The fastest and easiest method is "fanning", a form of winnowing. This is done by pouring the grain slowly through the air stream of a fan or blower into a clean, deep container such as a cardboard box or trash can. The wind blowing through the falling grain will blow out most of the broken kernels, chaff, smut balls, etc. If you're losing too much good grain, try turning the fan down or moving it further back from the container. The deep container will cut down on the amount of kernels that bounce out. Repeat fanning as necessary until the grain is clean enough to suit or you've blown all of the lighter contaminants out. If the fanning didn't get the grain clean enough then it can be further cleaned by running it through a screen or sieve. This should be made with holes just big enough to pass an average sized grain of what it is you're cleaning. Obviously, the size of the holes will necessarily vary depending upon the kernel size of the grain. Should the kernels still not be clean enough to suit then you'll just have to resort to "hand picking" out the offending particles. Do this just prior to grinding where it can be done in small batches rather than trying to do your entire storage all at once.

If you have it in mind to wash the grain, this should not be done prior to storage, but, rather, just before use. After it's been rinsed, it should be dried immediately in the oven by placing it no deeper than 1/2 inch and heated at 150 F for an hour. It should be stirred occasionally to improve drying.

Grinding

Plan to grind your grains only a few days or hours before you need it, as it loses much of its nutritional value over a relatively short time. A popular grainmill we use is the WhisperMill by GrainMaster. They have offices in the US (Salt Lake City), Canada (Alberta), and Australia (<http://www.grainmaster.com.au/>).