other plants, and change to moths late in the spring or early in the summer. There are one or more generations a year, depending on the length of the growing season in different latitudes.

Control: Community application of the following methods is necessary for most effective control:

In order to destroy overwintering borers dispose of infested cornstalks by (1) feeding them to livestock direct, or as silage, or in finely cut or shredded form; (2) plowing them under in the fall or early spring before the moths emerge; (3) burning infested plants completely.

Plant, as late as practicable, resistant or tolerant kinds of *hybrid corn* (no immune strains are available).

Avoid sowing fall WHEAT or other SMALL GRAIN in standing corn or corn stubble. Dispose of all early *sweet cornstalks* in fields immediately after harvesting the ears, by feeding, ensiling, or plowing the cornstalks under.

Reference: U.3.

See also SUGARCANE BORER; CORN LEAF APHID.

European corn borer. (U.13.)

EUROTIA. *E. lanata* = WINTERFAT.

EUSCHISTUS. *E. impictiventris* = BROWN COTTON BUG.

EVAPORATED BUTTERMILK. *See* MILK PRODUCTS.

EVAPORATED CULTURED SKIMMED MILK. *See* MILK PRODUCTS.

EWE RATIONS. *See* SHEEP RATIONS.

EXCELSIOR. *See* RYE (variety).

EXPELLER SOYBEAN OIL CHIPS. *See* SOYBEAN.

EXPELLER SOYBEAN OIL MEAL. *See* SOYBEAN.

EXSERTED means: protruding from or projecting beyond the surrounding organs; said, for instance, of PISTILS and STAMENS.

EXTRACTED ALFALFA MEAL. *See* ALFALFAS.

EXTRACTED ANIMAL LIVER MEAL. *See* ANIMAL PRODUCTS.

EXTRACTED MEALS, such as *extracted citric acid meal, extracted penicillium meal, extracted streptomyces meal,* etc., are FERMENTATION PRODUCTS.

EXTRACTED PRESSCAKE—e.g., *extracted citric acid presscake, extracted penicillium presscake,* or *extracted streptomyces presscake*—belongs to the FERMENTATION PRODUCTS.

EXTRA EARLY SUMAC is one of the forage SORGHUMS.

EYE. *See* TUBER.

F

F = FLUORINE.—*See also* MINERAL FEEDS.

FABACEAE = LEGUMES.

FABOIDEAE, or *Papilionoideae,* are the most important subfamily of the LEGUMES (Leguminoseae).

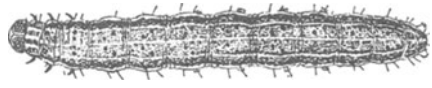
FAGOPYRUM. The genus *Fagopyrum* includes the following BUCKWHEAT species: *F. esculentum* = COMMON BUCKWHEAT; *F. emarginatum* = WINGED BUCKWHEAT; and *F. tataricum* = TARTARY BUCKWHEAT.

FAIRFIELD. *See* COMMON WHEAT (variety).

FAIRWAY CRESTED WHEATGRASS (*Agropyron cristatum*), or *true crested wheatgrass,* is a type of the CRESTED WHEATGRASS. It is characterized by bright green color and great uniformity. Compared to STANDARD CRESTED WHEATGRASS (which contains some Fairway crested wheatgrass) it is shorter (about 22 in. high), more leafy, smaller stemmed, smaller seeded, has horizontally spreading SPIKELETS and more pronounced awns.

Reference: W.16.

FALL ARMYWORM (*Laphygma frugiperda*), known mainly as an enemy of growing CORN, feeds also on many other cultivated crops (ALFALFA, SOYBEAN, COTTON, WHEATS, VETCHES, PEANUTS, GRASSES) and wild plants. The eggs are laid on plants at night and hatch in about five days. The young larvae, also called caterpillars, or "worms," feed at first near the ground, become full-grown in about twenty days,



Fall armyworm. (R.13.)

and then enter the soil for a few inches and change into pupae. The inactive pupal stage lasts about ten days. After the moths emerge from the pupal cases, they often fly many miles before the females lay eggs.

The fall armyworm—not to be confused with the (true) ARMYWORM—may have as many as six generations a year in the Gulf States, but does not survive the winter farther north.

Control: The fall armyworm can be controlled with TOXAPHENE, DDT, TDE, or with POISONED BRAN MASH containing PARIS GREEN.

Reference: U.3.

FALLOW is land that has not been planted to a crop, so as to build up its water resources and productive capacity or to destroy weeds, diseases, or pests. It may be tilled to kill weeds.

FALL-SOWN OATS.

See OATS; COMMON OAT; RED OAT.

FALSE ANTHRACNOSE OF VETCH, caused by the FUNGUS *Kabatiella nigricans*, is different from (true) VETCH ANTHRACNOSE, but resembles it closely. It is prevalent on hairy vetch in the South. The disease causes brown discoloration and girdling of stems; spots on the leaves are small and circular but tend to form elongated streaks. When the pods are heavily spotted, the fungus penetrates the seed, causing it to become infected.

FALSE SAFFRON = SAFFLOWER.

FAMILY, in TAXONOMY, is a group of closely related TRIBES and GENERA; e.g., the grass family. The names of plant families regularly end in—*aceae*; as Poaceae (rather than the older term Gramineae) for GRASSES.—*See also* ORDER.

FANWEED = PENNYCRESS.

FARGO BROME is a northern-type SMOOTH BROME.

FARGO MILO, or *Straightneck milo*, is not a true milo, but one of the kafir-milo derivatives which belong to the grain SORGHUMS.

FARM ANIMAL AND MEAT PRODUCTION. The graphs on pages 177 and 178 show the trends of farm production of livestock and meat.

FARMERS TRUST = *Mediterranean wheat. See* COMMON WHEAT.

FAT MIXING. *See* FEED MIXING.

FATS are important NUTRIENTS. The true fats are composed of FATTY ACIDS combined with GLYCERIN and may be emulsified by bile and changed to mono- and di-GLYCERIDES in the small intestine before ADSORPTION into the blood stream. When not needed immediately for ENERGY production, they are deposited in the *fatty tissues*.

Most feedstuffs of animal and plant origin contain at least small amounts of fat; feeds rich in fat may become rancid and may cause digestive disturbances. Small amounts of *animal fats* or *vegetable fats* are needed in the ration because they carry the important fat-soluble VITAMINS in the system. Swine and poultry need at least 1 percent fat, and dairy cattle need at least 3 percent in the ration.

> NOTE: *Oils* are fats in liquid form. The term "fat," when used in connection with feedstuffs or feeding, refers to either the liquid or solid form.

True fats as well as natural fatlike substances—such as ESSENTIAL OILS, WAXES, STEROLS (e.g., CHOLESTEROL and ERGOSTEROL), CAROTENE, certain fatty acids, etc.—are recovered in the *ether extract* of feedstuff analyses (because their content in feedstuffs is determined by extraction with ether); sometimes the terms crude fat, lipids, or lipoids are used instead of ether extract.

The fat content of such feeds as pet feeds, ANIMAL PRODUCTS, and MARINE PRODUCTS, shall not exceed the guaranteed amount by more than 50 percent, according to the tentatively accepted resolution of the Association of American Feed Control Officials.

As synthetic detergents have replaced soaps, considerable fat that had been used for soap has become available at reasonable prices. Experiments indicate that rations with added fat increase the rate of gain and feed efficiency of swine and poultry. The use of fat allows the feed industry to prepare rations with rather high energy and has caused a re-evaluation of other nutrient requirements. General requirements are now stated in terms of *energy levels*.

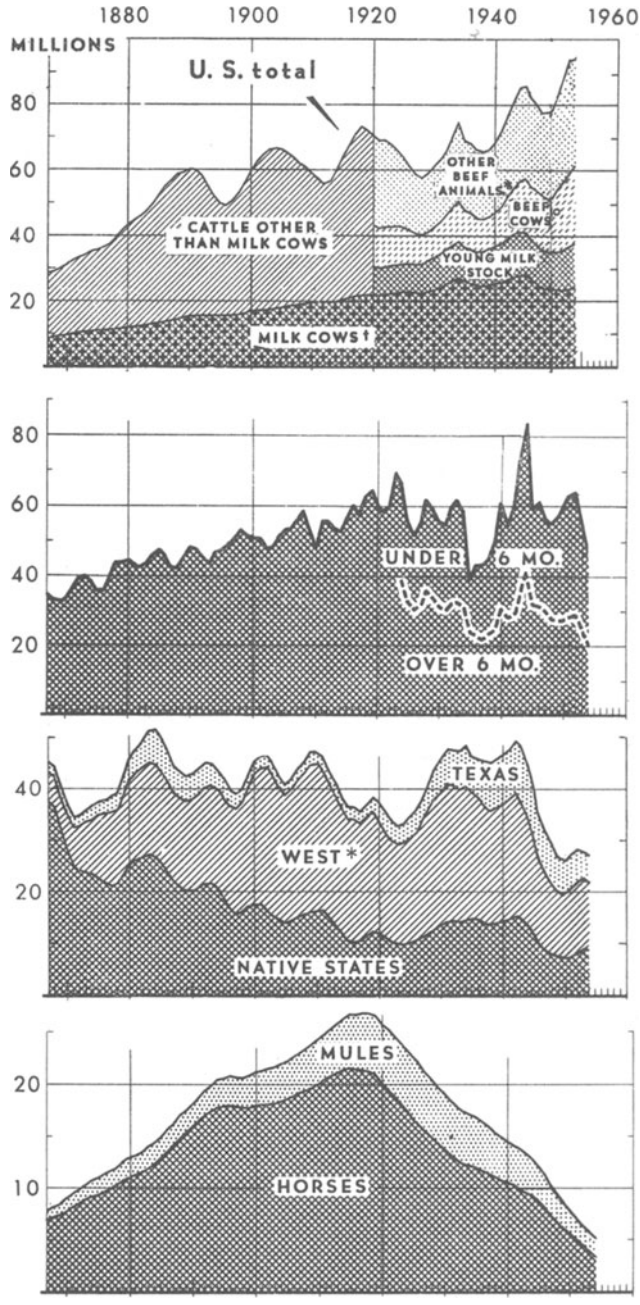
The use of fat has other advantages for

Cattle. *Heifers and calves not for milk, and all steers and bulls. °2 years and older not for milk. †Cows and heifers 2 years and older for milk.

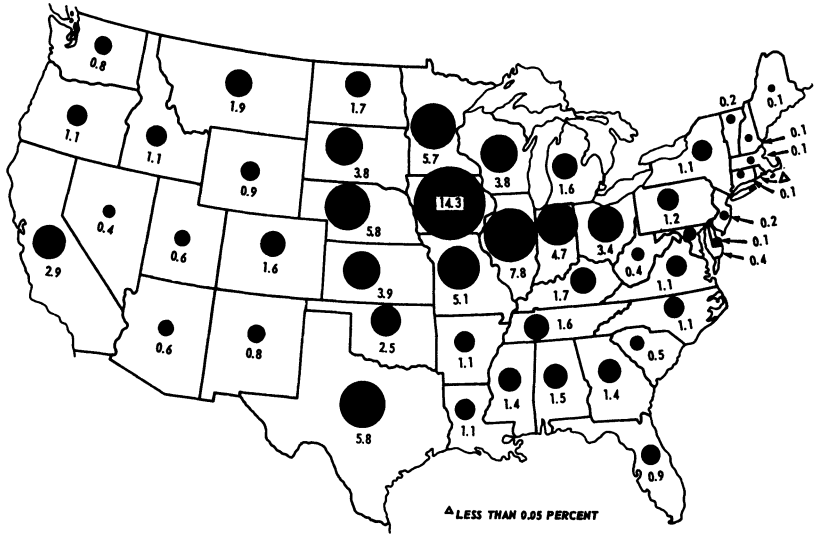
Hogs.

Stock sheep and lambs. *Eleven western states and South Dakota.

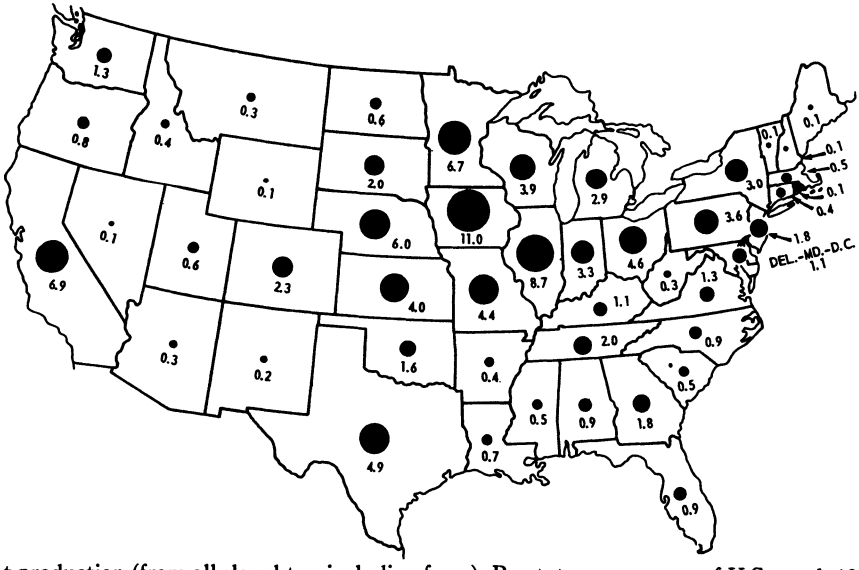
Horses and mules.



Livestock on farms, 1866-1954. (U.S.D.A.)



Farm production of meat animals. By states, as percent of U.S. total, 1955: 49,987 million lb. live weight. (U.S.D.A.)



Meat production (from all slaughter, including farm). By states, as percent of U.S. total, 1955: 25,333 million lb. (U.S.D.A.)

the manufacturer. It reduces the dust in the mill and the wear on the machinery, and it improves PELLET formation. Calculations indicate that one can pay from two to three times as much for fat as for farm grains if the fat is used for ENERGY. Many manufacturers are willing to pay more for a small amount of fat to improve the physical character of their feeds.

See also NITROGEN-FREE EXTRACT; LABELS; SOAPS; CALORIE; FATTENING; ANIMAL PRODUCTS; MARINE PRODUCTS.

FATTENING of animals has the result that their lean meat is improved in tender-

ness, flavor, and juiciness, because the FAT is stored not only in fat layers (which are of little value) but also between the fiber bundles of the muscles. Long fattening periods increase the amount and percentage of fat stored while the percentage of protein, minerals, and water is decreased although their amounts may increase slightly. These gains are very expensive in terms of feed energy. More feed is needed for maintenance of a fat animal than for a thinner animal. The fattening process is, therefore, relatively more expensive than the growing process.

The successful husbandryman will feed his animals to obtain enough fat deposition for desired flavor and tenderness but will avoid the wasteful production of excess fat that the consumer discards.

FATTENING LAMBS.
See SHEEP RATIONS; FATTENING.

FATTENING RATIONS. *See* BEEF RATIONS; SWINE RATIONS; FATTENING.

FATTY ACIDS are organic acids formed when FATS split in the small intestine. Fatty acids are sometimes neutralized to SOAPS before ABSORPTION; only a small percentage of free acids is absorbed into the blood stream.

F.D.A. is an abbreviation used for *Food and Drug Administration*, the federal agency which enforces the FDC ACT. The activities of the F.D.A. have greatly improved conditions in the *interstate* trade of feedstuffs and drugs; federal authorities, however, have no right to prevent selling worthless or misbranded products within the border of the state in which they are prepared.

The *intrastate* trade of feeds in most of the United States is regulated by state laws.—*See also* TAG; VITAMIN F.

F.D.C. ACT means: *Food, Drug, and Cosmetic Act.*—*See also* COLORS; CERTIFIED DYES; F.D.A.

Fe = IRON.

FEATHER BUNCHGRASS
= GREEN NEEDLEGRASS.

FEATHERING. *See* FOLIC ACID.

FECES. *See* BODY WASTES.

FEDERATION WHEAT.
See COMMON WHEAT (variety).

FEEBAR.
See SIX-ROWED BARLEY (variety).

FEED BARLEY = *Stravropol.*
See SIX-ROWED BARLEY.

FEED CONTROL OFFICIALS. *See* ASSOCIATION OF AMERICAN FEED CONTROL OFFICIALS.

FEED EFFICIENCY is a measure of the effectiveness of farm animals in converting feed to animal tissues. It is expressed as the ratio of the weight of feed required per unit of gain and does not consider cost of feed. In the United States, the common expression is pounds of feed per pound of gain or 100 lb. feed per 100 lb. gain. If a pig weighing 40 lb. required 485 lb. corn, 65 lb. supplement, and 5 lb. minerals to reach a weight of 225 lb., his feed efficiency is

$$\frac{485+65+5}{225-40} = \frac{555}{185} = 3.00$$

or 3 lb. feed per lb. gain. The more efficient animals and the better feeds result in lowest *feed efficiency ratios* and best feed efficiency. *Egg* or *milk efficiency ratios* are sometimes figured in as much as they are reflections of the ability of the animal to convert feed into eggs or milk.

In general, younger animals are more efficient than older ones. Animals fed moderate to high amounts of feed are more efficient than those fed minimum or maintenance RATIONS or those fed so much feed that they become wasteful.

Rations that are well-balanced usually promote better efficiency than those that are poorly balanced. In fact, it may be said that the greatest improvement that could be made in standard rations used on farms today lies not in promoting faster growth rates of animals but rather in improving the efficiency with which the animal can make gains. Rations high in energy are more efficient, although not necessarily less expensive, than rations formulated from bulky feeds.

Well-bred animals, properly managed, have superior feed efficiencies to those which are poorly managed, or of poor ancestry, or are subjected to undue stress from diseases and parasites.

Good efficiency ratios at the present time are considered to be as follows:

Poultry broilers..2.3 lb. feed per lb. gain
Swine.....3 lb. feed per lb. gain
Beef cattle and sheep.....7 lb. feed per lb. gain

Lower values have been obtained experimentally and may eventually become common in the feed lot.—*See also* NUTRITION; GROWTH; ENERGY.

FEEDING. *See* SLOP FEEDING; RATIONS; SELF-FEEDING; SWINE RATIONS; CREEP.

FEEDING BEET MOLASSES. *See* MOLASSES.

FEEDING CANE MOLASSES. *See* MOLASSES.

FEEDING CONCENTRATES. *See* CONCENTRATES.

FEEDING CORN SUGAR MOLASSES. *See* MOLASSES.

FEEDING OAT MEAL. *See* OATS.

FEED INGREDIENTS that are officially recognized among the MISCELLANEOUS PRODUCTS, are listed in the table.

Reference: F.6.

FEED INSPECTION. *See* F.D.A.; TAG; ASSOCIATION OF AMERICAN FEED CONTROL OFFICIALS.

FEEDING STANDARDS have been established to express systematically the *feed requirements* of farm animals and the *feeding values* of the different feedstuffs. Among them are the following: the ARMSBY FEEDING STANDARDS; the KELLNER FEEDING STANDARDS, the WOLFF-LEHMANN FEEDING STANDARDS, the FRAPS FEEDING STANDARDS, and the MORRISON FEEDING STANDARDS.—*See also* SCANDINAVIAN FEED-UNIT SYSTEM; PETERSEN'S RELATIVE FEED VALUES; NUTRIENT REQUIREMENTS; ENERGY.

FEEDING TANKAGE = *digester tankage. See* ANIMAL PRODUCTS.

FEEDING TANKAGE WITH BONE = *digester tankage with bone. See* ANIMAL PRODUCTS.

FEED LOTS are enclosures provided with feed, water, and shelter where animals are detained prior to shipment, during fattening, or before slaughter. *Farm feed lots* are ordinarily used for winter feeding and fattening livestock and may vary in size from a few feet to many acres. *Commercial feed lots* often operate the year around with large groups of animals coming through at all seasons of the year. Railways and other commercial carriers often provide feed lots along their rights-of-way for feeding and watering livestock that are in transit.

Successful operation of feed lots usually depends upon a convenient supply of economical feed, especially a basic roughage such as ALFALFA, BEET PULP, CORN cobs, or some by-product that is difficult to move, such as wet distillers' grain, CITRUS

Recognized English name and English synonym, if any	Article of substance indicated by the name and synonym
Anise seed	The dried ripe fruit of *Pimpinella anisum.* Stimulant, carminative, and flavoring agent.
Capsicum (or red pepper)	The dried ripe fruit of any species of *Capsicum.*
Caraway seed	The dried fruit of *Carum carvi.* Stimulant, carminative, and condiment.
Dextrose *	A refined, crystallized sugar obtained chiefly by the hydrolysis of starch or of a starch-containing substance.
Fennel	The dried, ripe fruit of *Foeniculum vulgare.* Stimulant, carminative, galactagogue, and condiment.
Fenugreek seed	The dried fruit of *Trigonella foenumgraecum.* Aromatic.
Gentian	The dried rhizome and roots of *Gentiana lüten.* Simple bitter.
Ginger	The dried rhizome of *Zingiber officianalle.* Condiment, carminative, and stimulant.
Glucose *	A sirup obtained by the incomplete hydrolysis of starch or of a starch-containing substance.
Kelp	Any of the various large brown seaweeds of the families Fucaceae and Laminariaceae. Source of iodine.
Kamala	The hair of the capsules of *Mallotus philippinensis taenifuge.*
Lactose (milk sugar)	A sugar obtained from cow's milk.
Locust bean (carob bean)	The fruit of *Robina pseudacacia.* A nutrient.

* The terms glucose and dextrose, as defined above by the A.A.F.C.O., apply to feed ingredients only; otherwise glucose is used synonymously with dextrose and refers to the crystallized sugar defined above as dextrose.

PULP, and refuse from various canning factories.

Commercial feed lots are designed to make maximum use of labor saving equipment and must be set up to control diseases and parasites without undue losses from them. If feed lots have concrete floors, they are easy to clean and lead to a considerable increase in the amount of MANURE which can be returned to land.

In areas where there is not a great deal of cold moisture falling in the winter, the only thing that is needed in the way of shelter is a wind break; in wet areas it is desirable to have sheds which are open, away from the prevailing winter wind so that the animals can remain dry.—*See also* DISTILLERS' PRODUCTS; PLANT BY-PRODUCTS.

FEED MIXING can be done in different ways:

Dry mixing—uses fast vertical, slower horizontal, or (occasionally) trunnion-type *batch mixers* of 1,000 lb. to 5 ton capacity; or it uses *continuous mixers* which are so arranged that the raw material enters the equipment at one end and the mixed feed comes out at the other.

Molasses mixing—usually a continuous process performed in large mixers of a capacity from 5 to 40 tons per hour. Using warm MOLASSES greatly reduces the relatively large amount of power needed for the mixing of dry feed with the molasses.

Fat mixing—the process of evenly distributing animal, fish, or vegetable fats and oils in various types of feeds for the purpose of increasing their fat content and, thus, their energy value and possibly also their palatability. Good results have been obtained by adding fat at 160°F. ANTIOXIDANTS are mostly added to the fats and oils; copper and alloys must not be used in fat mixing equipment.

Manual mixing on the farm is possible with a good scale, a clean, smooth barn floor, and a scoop shovel. Weigh or measure (or use bags containing known amounts of) the ingredients that go into 500 or 1000 lb. or 1 ton of the formula. When no mixer is used, the main ingredient should be spread on the floor first, forming a 2-to 5-in. layer, followed by layers of the other ingredients. The ingredient used in the smallest amount may be premixed before it is put on top of the pile. The feed is then turned three or four times with the scoop, each time forming new piles of the same size as the original one. With only a few ingredients this method is very satisfactory. For larger and more efficient operations, wagons or trucks with mixing equipment are available. The various layers of feed are run into the wagon, and the feed is mixed as the farmer drives to the pens.

FEED MOLASSES. *See* MOLASSES.

FEEDSTUFF COMPOSITION. The approximate composition of the common feedstuffs is given in the tables of the N.R.C. One of them is an alphabetical list of the more important feedstuffs with complete analyses, the other a compilation of analytical data for dry roughages, silages, and roots tubers, and for concentrates. *See* pages 182-188 for tables.

FEEDSTUFFS. *See* RATIONS; FLEXIBLE RATIONS; NUTRIENTS.

FEED SUPPLEMENTS. *See* VITAMINS.

FEED-UNIT SYSTEM.

See SCANDINAVIAN FEED-UNIT SYSTEM.

FEED VALUES.

See PETERSEN'S RELATIVE FEED VALUES.

FEELER = ANTENNA.

FENCE SILOS. *See* SILOS.

FENDLER BLUEGRASS

= MUTTON BLUEGRASS.

FENDLER CLOVER (*Trifolium fendleri*), one of the TRUE CLOVERS, is a productive native species of the West. It is of only minor importance as pasture plant.

Reference: M.3.

FENDLER THREE-AWN (*Aristida fendleriana*) is a small, tufted perennial GRASS which inhabits dry, sandy soils of deserts, plains, foothills, and mountain parks in the West. It has some forage value while green, but in midsummer or later becomes unpalatable.

Reference: U.6.

See also RANGE PLANTS.

FENNEL, the dried fruit of *Foeniculum vulgare*, is a stomach STIMULANT, CARMINATIVE, CONDIMENT, and GALACTAGOGUE.—*See also* FEED INGREDIENTS.

AVERAGE COMPOSITION OF FEEDSTUFFS[1]

Feeding Stuff	Moisture %	Protein %	Fat %	Fiber %	N-free extract %	Ash %	Calcium %	Phosphorus %	Iron %	Manganese mg/lb	Copper mg/lb	Cobalt mg/lb	Carotene mg/lb	Thiamine mg/lb	Niacin mg/lb	Riboflavin mg/lb	Pantothenic acid mg/lb
Alfalfa meal, dehydrated, 17% protein	6.7	17.8	2.8	24.2	39.7	8.8	1.7	0.2	0.033	15.0	3.1	0.05	36.0[2]	1.5	8.7	7.3	12.3
Alfalfa meal, suncured, 17% protein	7.8	17.6	2.0	23.8	38.9	9.9	1.4	0.2	.....	.....	.....	.....	24.0[2]	1.1	16.1	5.0	12.7
Alfalfa meal, dehydrated, 20% protein	7.1	20.9	2.9	19.8	38.2	11.1	1.7	0.3	0.039	28.6	7.1	0.17	60.0[2]	3.1	17.3	7.4	18.5
Alfalfa meal, suncured, 20% protein	8.1	20.3	3.2	17.8	40.3	10.3	1.4	0.2	.....	.....	.....	.....	48.0[2]	2.0	22.7	7.2	13.6
Barley, excluding Pacific Coast	10.6	12.7	1.9	5.4	66.6	2.8	0.09	0.5	0.005	8.3	5.1	0.01	.....	1.7	24.1	0.8	3.7
Barley, Pacific Coast	11.0	9.7	2.2	6.2	68.7	2.2	0.06	0.4	0.007	7.8	5.0	.....	1.8	1.8	20.0	0.6	3.3
Bone meal, raw	6.4	26.0	5.0	1.0	2.5	59.1	21.7	10.0	0.044	1.9	8.5	0.05	.....	0.1	1.9	0.5	1.0
Bone meal, steamed, special	3.3	13.4	9.7	1.1	1.2	71.3	29.3	15.1	0.080	5.1	9.0	0.03	.....	0.9	2.0	0.4	0.8
Buttermilk, dried	7.6	32.4	6.4	0.3	43.3	10.0	1.4	0.9	.....	1.5	.....	.....	.....	1.7	2.8	15.8	13.5
Corn, dent, yellow	15.0	8.9	3.9	2.0	68.9	1.3	0.02	0.3	0.002	2.3	0.9	0.01	1.33	1.7	9.8	0.5	2.6
Corn gluten meal, 41% protein	8.6	42.9	2.0	3.9	40.1	2.5	0.2	0.4	0.047	4.4	13.1	0.04	10.0	0.1	24.8	0.7	3.8
Cottonseed oil meal, 41% protein	7.8	41.2	6.2	11.2	27.7	5.9	0.2	1.2	0.008	12.9	7.7	0.06	.....	1.8	13.0	2.5	4.4
Crab meal	7.9	31.5	2.2	10.5	6.0	41.9	14.5	1.5	.....	.....	.....	.....	.....	.....	.....	2.3	3.0
Distillers dried corn grains, with solubles	6.9	28.8	8.9	9.0	41.7	4.7	0.2	0.7	.....	18.2	.....	.....	.....	2.1	36.3	3.4	5.2
Distillers dried solubles	6.9	28.0	6.7	3.3	47.6	7.5	0.4	1.4	0.050	45.4	36.3	0.09	.....	2.7	54.3	5.2	8.9
Fish meal, menhaden	6.4	62.2	8.5	0.7	4.2	18.0	5.0	3.4	0.057	10.0	3.9	0.08	.....	0.2	25.9	2.4	.....

[1] From a compilation of the Committee on Feed Composition of the National Research Council.
[2] Rough approximations since carotene content is too variable for dependable averages.

AVERAGE COMPOSITION OF FEEDSTUFFS—(Continued)

Feeding Stuff	Moisture %	Protein %	Fat %	Fiber %	N-free extract %	Ash %	Calcium %	Phosphorus %	Iron %	Manganese mg/lb	Copper mg/lb	Cobalt mg/lb	Carotene mg/lb	Thiamine mg/lb	Niacin mg/lb	Riboflavin mg/lb	Pantothenic acid mg/lb
Fish meal, sardine	6.9	67.2	5.0	0.6	5.4	14.9	4.2	2.5	0.03	10.3	9.2	0.08	.....	0.2	26.0	2.5	1.3
Fish meal, whitefish	9.6	63.0	6.7	0.1	0.1	20.5	6.8	3.7	.....	5.0	.....	.....	.....	0.4	36.0	4.0	1.4
Hominy feed, white, 5% fat	10.1	10.8	5.7	4.7	66.0	2.7	0.05	1.0	0.004	8.2	9.9	.....	.....	5.9	25.1	1.0	3.1
Hominy feed, yellow	9.5	11.1	7.1	5.8	63.9	2.6	0.05	0.7	0.024	6.9	5.7	0.02	0.5	3.8	22.6	1.0	3.5
Limestone	.....	.....	.....	.....	.....	.....	38.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Linseed oil meal, o. p., 33% protein	8.8	35.0	5.6	8.1	36.9	5.6	0.4	0.9	0.024	19.1	11.8	0.17	.....	3.9	18.9	1.9	7.5
Linseed oil meal, o. p., 37% protein	9.1	38.0	5.9	7.7	33.7	5.6	0.5	0.9	0.028	18.6	11.9	0.18	.....	2.7	14.7	1.7	8.9
Meat scrap, 52% protein	6.9	52.9	7.3	2.2	4.3	26.4	8.7	4.4	0.050	4.0	5.5	0.09	.....	0.1	27.1	2.4	2.1
Meat scrap, 60% protein	6.2	60.9	8.8	2.4	1.1	20.6	6.3	3.5	0.041	5.4	3.7	0.04	.....	0.1	23.7	2.5	2.3
Meat and bone scrap, 50% protein	6.4	50.6	10.0	2.0	2.0	29.0	9.7	4.2	.....	5.3	.....	.....	.....	.....	21.4	2.1	1.5
Milk, skimmed, dried	5.8	34.7	1.2	0.2	50.3	7.8	1.3	1.1	0.005	1.2	5.2	0.03	.....	1.5	5.7	10.0	16.0
Molasses, beet	19.5	8.4	0.0	0.0	62.0	10.1	0.08	0.02	.....	.....	.....	.....	.....	.....	22.0	.....	.....
Molasses, cane	26.0	2.9	0.0	0.0	62.1	9.0	0.7	0.08	.....	.....	.....	.....	.....	0.4	20.9	1.1	17.9
Oats, excluding Pacific Coast	9.8	12.0	4.6	11.0	58.6	4.0	0.09	0.4	0.008	19.2	2.4	.....	.....	2.9	8.2	0.4	6.8
Oats, Pacific Coast	9.8	9.0	5.4	11.0	61.1	3.7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Oatmeal, feeding	9.3	15.0	7.4	2.0	64.4	1.9	0.07	0.4	0.006	13.6	1.6	0.02	.....	3.5	4.5	0.6	6.6
Oyster shell, ground	.....	.....	.....	.....	.....	.....	37.9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Peanut oil meal, o. p., 43% protein	7.2	43.1	7.6	13.9	23.0	5.2	0.1	0.6	.....	.....	.....	.....	.....	3.3	77.5	2.4	24.1
Phosphate, defluorinated rock	.....	.....	.....	.....	.....	.....	28.3	12.3	.....	40.9	29.5	.....	.....	.....	.....	.....	.....
Phosphate, dicalcium	.....	.....	.....	.....	.....	.....	26.5	20.5	.....	.....	.....	.....	.....	.....	.....	.....	.....
Rice bran	9.0	12.8	13.1	12.7	41.7	10.7	0.08	1.4	.....	70.9	.....	.....	.....	10.3	129.1	1.4	10.3

AVERAGE COMPOSITION OF FEEDSTUFFS—(Continued)

Feeding Stuff	Moisture %	Protein %	Fat %	Fiber %	N-free extract %	Ash %	Calcium %	Phosphorus %	Iron %	Manganese mg/lb	Copper mg/lb	Cobalt mg/lb	Carotene mg/lb	Thiamine mg/lb	Niacin mg/lb	Riboflavin mg/lb	Pantothenic acid mg/lb
Rice polishings	9.7	12.7	11.4	3.5	56.6	6.2	0.04	1.1	.....	.....	.....	.....	.....	8.8	325.0	0.9	5.5
Rye, grain	10.5	12.6	1.7	2.4	70.9	1.9	0.01	0.3	0.008	37.0	3.4	.....	.....	2.0	7.1	0.7	4.2
Sorghum, kafir	10.5	11.2	2.9	2.3	71.1	2.0	0.04	0.3	0.008	7.5	3.0	0.03	.....	1.6	18.3	0.5	5.7
Sorghum, milo	10.6	11.3	2.9	2.2	71.3	1.7	0.03	0.3	0.005	5.9	7.8	0.02	.....	1.8	13.1	0.4	5.0
Sorghum, milo head chop	10.0	10.1	2.5	6.8	67.1	3.5	0.1	0.3	.....	.....	.....	.....	.....	.....	.....	0.9	.....
Soybean oil meal, 41% protein	10.2	41.1	5.3	5.5	30.4	7.5	0.3	0.6	0.017	12.3	11.1	.....	.....	.....	.....	2.5	.....
Soybean oil meal, 43% protein	9.4	43.1	5.6	5.7	30.4	5.8	0.3	0.6	.....	12.7	.....	.....	.....	.....	.....	1.5	.....
Soybean oil meal, 44% protein	9.2	44.2	5.3	5.6	29.9	5.8	0.3	0.7	0.015	14.0	7.7	0.05	.....	0.8	16.7	2.0	6.1
Soybean oil meal, solvent, ext.	9.4	46.1	1.0	5.9	31.8	5.8	0.3	0.6	0.01	13.8	6.8	.....	.....	1.4	17.1	1.4	6.2
Wheat, hard red winter	10.4	15.2	1.8	2.6	68.3	1.7	0.05	0.4	0.005	18.0	2.0	0.03	.....	2.3	24.1	0.5	6.3
Wheat, northern spring	9.9	15.8	2.2	2.5	67.8	1.8	0.05	0.4	0.005	33.0	4.9	.....	.....	2.3	28.8	0.5	6.4
Wheat, soft, Pacific Coast	10.8	9.9	2.0	2.7	72.7	1.9	.....	0.3	0.007	27.7	4.4	.....	.....	2.2	26.8	0.5	5.2
Wheat bran	10.3	16.4	4.3	9.9	53.0	6.1	0.1	1.3	0.016	56.0	4.9	0.05	.....	3.9	63.5	1.4	13.6
Wheat flour middlings	10.3	18.1	4.6	4.9	58.5	3.6	0.07	0.6	0.002	39.0	2.1	.....	.....	6.0	44.2	0.8	4.5
Wheat standard middlings	9.9	17.6	5.0	6.7	56.6	4.2	0.1	0.8	0.009	53.6	9.8	0.04	.....	5.8	44.3	0.8	9.3
Whey, dried	6.5	12.2	0.8	0.2	70.4	9.9	0.9	0.8	0.02	1.1	24.2	0.05	.....	1.8	5.1	13.0	22.4
Yeast, brewers, dried	6.3	46.8	1.2	2.8	35.7	7.2	0.1	1.5	0.014	2.4	15.1	0.08	.....	43.0	213.6	14.0	49.1

Conversion table for calculating feed formulas

1 pound = 454 grams. 1 ounce = 28.4 grams. 1 gram = 1000 milligrams. 1 milligram = 1000 micrograms.
1 microgram per gram is the same as parts per million.
1 I.U. (U.S.P.) unit of vitamin A equals the activity of 0.6 micrograms of B-carotene.
1 microgram of B-carotene equals 1.666 I.U. (U.S.P.) unit of vitamin A.

AVERAGE COMPOSITION AND DIGESTIBLE NUTRIENTS[1]

Feedstuff	Total Dry Matter	Dig. Protein	Total Dig. Nutrients	Calcium		Phosphorus		Carotene
Dry Roughages								
	%	%	%	%	*gm./lb.*	%	*gm./lb.*	*mg./lb.*
Alfalfa hay, all analyses	90.5	10.5	50.3	1.47	6.67	0.24	1.09	11.4
Alfalfa hay, before bloom	90.5	13.7	53.4	2.22	10.08	0.33	1.50	....
Alfalfa hay, $\frac{1}{10}$ to $\frac{1}{2}$ bloom	90.5	11.2	51.7	1.26	5.72	0.22	1.00	19.4
Alfalfa hay, $\frac{1}{2}$ to full bloom	90.5	10.3	50.1	....	....	....	....	9.0
Alfalfa hay, past bloom	90.5	9.2	47.6	....	....	....	....	3.2
Alfalfa meal, good	92.7	11.8	53.6	1.69	7.67	0.25	1.14	16.6
Alfalfa meal, dehydrated*	93.6	13.8	54.7	1.50	6.81	0.35	1.59	43.4
Alfalfa straw*	92.6	4.5	42.6	....	....	0.13	0.59	....
Barley hay	90.8	4.0	51.9	0.26	1.18	0.23	1.04	....
Barley straw	90.0	0.7	42.2	0.32	1.45	0.11	0.50	....
Bromegrass hay, all analyses	88.1	5.0	48.9	0.20	0.91	0.28	1.27	....
Clover hay, red, all analyses	88.1	7.1	52.2	1.35	6.13	0.19	0.86	8.6
Clover and mixed grass hay, high in clover	89.7	5.5	52.2	0.90	4.09	0.19	0.86	....
Clover and timothy hay, 30 to 50% clover	88.1	4.8	51.2	0.68	3.09	0.20	0.91	....
Corn cobs, ground	90.4	0.0	45.7	....	....	0.02	0.09	....
Corn fodder, very dry	91.1	3.8	58.8	0.24	1.09	0.16	0.73	1.8
Corn stover, very dry	90.6	2.1	51.9	0.29	1.32	0.05	0.23	....
Cowpea hay, all analyses	90.4	12.3	51.4	1.37	6.22	0.29	1.32	....
Grass hay, mixed eastern states, good quality	89.0	3.5	51.7	0.48	2.18	0.21	0.95	....
Kafir fodder, very dry	90.0	4.5	53.6	0.35	1.59	0.18	0.82	2.0
Kafir stover, very dry	90.0	1.9	51.3	0.54	2.45	0.09	0.41	1.1
Lespedeza hay, annual, all analyses	89.2	6.4	47.5	0.98	4.45	0.18	0.82	....
Lespedeza hay, annual, before bloom	89.1	7.2	49.2	1.04	4.72	0.19	0.86	22.4
Lespedeza hay, annual, in bloom	89.1	6.5	47.5	1.02	4.63	0.18	0.82	....
Lespedeza hay, annual, after bloom	89.1	3.6	39.6	0.90	4.09	0.15	0.68	....
Mixed hay, good, less than 30% legumes*	88.0	4.4	49.8	0.61	2.77	0.18	0.82	....
Oat hay	88.1	4.9	47.3	0.21	0.95	0.19	0.86	....
Oat straw	89.7	0.7	44.7	0.19	0.86	0.10	0.45	....
Pea hay, field	89.3	10.6	55.1	1.22	5.54	0.25	1.14	....
Pea-and-oat hay	89.1	8.6	52.9	0.72	3.27	0.22	1.00	....
Peavine hay, sun cured	86.3	8.6	54.2	1.48	6.72	0.16	0.73	....
Prarie hay, western, good quality	90.7	2.1	49.6	0.36	1.63	0.18	0.82	9.3
Prairie hay, western, mature	91.7	0.6	46.7	0.28	1.27	0.09	0.41	....
Sorghum fodder, sweet, dry	88.8	3.3	52.4	0.34	1.54	0.12	0.54	1.1
Rye hay*	91.3	2.8	44.7	....	....	0.18	0.82	....
Rye straw	92.8	0	42.2	0.26	1.18	0.09	0.41	....
Soybean hay, good, all analyses	88.0	9.6	49.0	0.94	4.27	0.24	1.09	....
Soybean hay, in bloom or before	88.0	12.0	52.4	1.53	6.95	0.27	1.23	....
Soybean hay, seed developing*	88.0	9.8	48.5	1.35	6.13	0.25	1.14	13.6
Soybean hay, seed well developed	88.0	10.8	52.5	1.14	5.18	0.27	1.23	....
Soybean straw	88.8	1.2	38.5	....	....	0.13	0.59	....
Sudan grass hay, all analyses	89.3	4.3	48.5	0.36	1.63	0.26	1.18	....

AVERAGE COMPOSITION AND DIGESTIBLE NUTRIENTS[1]—Continued

Feedstuff	Total Dry Matter	Dig. Protein	Total Dig. Nutrients	Calcium		Phosphorus		Carotene
Dry Roughages (*Continued*)								
	%	%	%	%	*gm./lb.*	%	*gm./lb.*	*mg./lb.*
Timothy hay, all analyses	89.0	2.9	48.9	0.23	1.04	0.20	0.91	5.3
Timothy hay, before bloom	89.0	5.4	56.8	....	....	....	....	9.2
Timothy hay, early bloom	89.0	4.1	50.8	0.41	1.86	0.21	0.95	....
Timothy hay, full bloom	89.0	3.3	48.1	0.23	1.04	0.20	0.91	4.2
Timothy hay, late seed	89.0	2.1	42.2	0.14	0.64	0.15	0.68	2.5
Timothy and clover hay, ¼ clover*	88.8	3.7	49.4	0.51	2.32	0.20	0.91	....
Vetch and oat hay, over half vetch	87.6	8.4	52.7	0.76	3.45	0.27	1.23	....
Wheat hay	90.4	3.3	46.7	0.14	0.64	0.18	0.82	....
Wheat straw	92.5	0.3	40.6	0.21	0.95	0.07	0.32	....
Silages, Roots and Tubers								
Alfalfa silage, wilted before being ensiled	36.0	4.1	21.3	0.51	2.32	0.12	0.54	21.1
Alfalfa—molasses, not wilted	26.8	2.7	15.4	0.41	1.86	0.08	0.36	14.5
Alfalfa—molasses, wilted	36.6	4.0	21.4	0.56	2.54	0.11	0.50	....
Beet top silage, sugar	31.6	2.6	14.9	0.31	1.41	0.07	0.32	5.1
Corn, dent, well matured, all analyses	27.4	1.2	18.1	0.10	0.45	0.06	0.27	6.4
Corn, dent, well matured, well eared	28.4	1.3	20.0	0.08	0.36	0.06	0.27	....
Corn, dent, well matured, fair in ears	26.0	1.1	17.1	0.09	0.41	0.06	0.27	....
Corn, dent, immature, before dough stage	20.4	0.9	13.0	....	....	....	....	....
Corn, sweet, stover (ears removed	24.0	0.9	13.0	....	....	....	....	....
Corn—canning factory waste (husks, cobs, and waste ears)	22.4	1.1	16.1	....	....	....	....	....
Grass silage, some legumes, wilted, molasses added	35.0	2.7	19.8	0.32	1.45	0.12	0.54	....
Grass silage, small proportion legumes, wilted slightly, molasses added	29.0	1.6	18.0	....	....	0.07	0.32	....
Grass silage, small proportion legumes, not wilted*	26.5	1.6	16.2	....	....	....	....	....
Mangel-wurzel	9.2	0.9	7.0	0.01	0.05	0.03	0.14	....
Pea-vine, from canneries	24.5	1.9	14.0	0.32	1.45	0.06	0.27	21.0
Potato, tubers	21.2	1.3	17.9	0.01	0.05	0.05	0.23	....
Sorghum silage, sweet	25.3	0.8	15.2	0.08	0.36	0.04	0.18	2.7
Soybean, not wilted	24.8	2.9	14.6	0.34	1.54	0.09	0.41	14.6
Soybean, wilted	33.2	3.9	19.1	0.45	2.04	0.12	0.54	....
Grains, Seeds, and By-product Concentrates								
Barley, excluding Pacific coast	89.4	10.0	77.7	0.09	0.41	0.47	2.13	....
Barley, Pacific coast	89.0	7.7	78.3	0.06	0.27	0.41	1.86	....
Beans, field or navy	90.0	20.2	78.7	0.15	.68	0.57	2.59	....
Beans, lima*	89.7	18.7	77.8	0.09	0.41	0.37	1.68	....
Beet pulp, dried	90.1	4.3	67.8	0.71	3.22	0.12	0.54	....
Beet pulp, molasses, dried	91.9	7.1	72.1	0.62	2.81	0.09	0.41	....
Beet pulp, wet	11.6	0.8	8.8	....	....	....	....	....
Bone meal, steamed	96.3	....	....	25.22	14.50	11.9	54.03	....

AVERAGE COMPOSITION AND DIGESTIBLE NUTRIENTS[1]—Continued

Feedstuff	Total Dry Matter	Dig. Protein	Total Dig. Nutrients	Calcium		Phosphorus		Carotene
Grains, Seeds, and By-product Concentrates (*Continued*)								
	%	%	%	%	*gm./lb.*	%	*gm./lb.*	mg./*lb.*
Brewers' grains, dried, below 25% protein	92.3	16.8	61.8	....	....	....	....	....
Brewers' grains, dried, 25% protein	92.9	22.1	67.1	0.25	1.14	0.49	2.22	....
Citrus pulp, dried*	90.1	3.0	73.2	2.28	10.35	0.17	0.77	....
Coconut oil meal, expeller process	92.6	17.4	80.8	0.12	0.54	0.62	2.81	....
Corn, dent, yellow, No. 2	85.0	6.8	80.0	0.02	0.10	0.27	1.23	1.3
Corn and cob meal*	86.1	5.3	73.2	....	....	0.22	1.00	....
Corn, gluten feed, 23% protein	91.4	21.3	76.3	0.68	3.09	0.82	3.72	6.1
Corn gluten feed, 25% protein	91.1	22.9	76.5	0.40	1.82	0.82	3.72	....
Corn gluten meal, 41% protein	91.4	36.5	80.2	0.20	0.91	0.41	1.86	10.0
Cottonseed, whole pressed, 28% protein	93.5	20.3	59.8	0.15	0.68	0.77	3.50	....
Cottonseed meal, 36% protein	92.2	30.4	71.9	0.19	0.86	1.13	5.13	....
Cottonseed meal, 39% protein	91.5	32.9	72.6	0.11	0.50	1.30	5.90	....
Cottonseed meal, 41% protein	92.2	34.2	73.6	0.18	0.82	1.14	5.18	....
Cottonseed meal, 43% protein	92.5	35.4	74.6	0.23	1.04	1.14	5.18	....
Cottonseed meal, 45% protein	92.4	37.1	76.4	0.27	1.23	1.09	4.95	....
Distillers' dried corn grains	92.9	20.7	82.4	0.11	1.04	0.47	2.71	....
Flaxseed screenings	91.1	9.2	57.9	0.37	1.68	0.43	1.95	....
Flaxseed screenings oil feed*	91.9	14.0	55.1	....	....	....	....	....
Hominy feed, white, 5% fat	89.9	7.7	82.9	0.05	0.23	1.03	4.68	....
Hominy feed, yellow*	90.5	7.9	85.1	0.05	0.23	0.66	3.00	4.1
Linseed oil meal, O.P., 31% protein	91.0	28.2	77.0	0.36	1.63	0.90	4.09	....
Linseed oil meal, O.P., 33% protein	91.2	30.4	77.1	0.44	2.00	0.94	4.27	....
Linseed oil meal, O.P., 37% protein	90.9	33.1	77.5	0.49	2.22	0.89	4.04	....
Molasses, beet	80.5	4.4	60.8	0.08	0.36	0.02	0.09	....
Molasses, cane	74.0	0	54.0	0.74	3.36	0.08	0.36	....
Oats, excluding Pacific coast	90.2	9.4	70.1	0.09	0.41	0.43	1.95	....
Oats, Pacific coast	90.2	7.0	71.4	....	....	....	....	....
Orange pulp, dried	87.9	6.1	78.4	....	....	....	....	....
Peanut oil meal, O.P., 41% protein	93.8	38.0	83.2	....	....	....	....	....
Peanut oil meal, O.P., 43% protein	92.7	39.2	82.0	0.16	0.73	0.54	2.45	....
Peanut oil meal, O.P., 45% protein	93.4	41.5	83.7	....	....	....	....	....
Potato meal, or dried potatoes	92.8	3.0	70.6	0.08	0.36	0.22	1.00	....
Rice bran	91.0	8.7	68.4	0.08	0.36	1.36	6.17	....
Rice polishings	90.3	9.6	82.6	0.04	0.18	1.10	4.99	....
Rye	89.5	10.0	76.1	0.01	0.05	0.33	1.50	....
Safflower seed oil meal from hulled seed	91.0	32.7	55.5	....	....	....	....	....

AVERAGE COMPOSITION AND DIGESTIBLE NUTRIENTS[1]—Continued

Feedstuff	Total Dry Matter	Dig. Protein	Total Dig. Nutrients	Calcium		Phosphorus		Carotene
Grains, Seeds, and By-product Concentrates (*Continued*)								
	%	%	%	%	*gm./lb.*	%	*gm./lb.*	*mg./lb.*
Safflower seed oil meal from unhulled seed*	91.0	15.7	39.1	....	....	....	....	....
Safflower seed*	93.1	14.0	86.8	....	....	....	....	....
Sorghum, Kafir	89.5	9.1	80.7	0.04	0.18	0.33	1.50	....
Sorghum, milo	89.4	8.8	80.1	0.03	0.14	0.27	1.23	....
Sorghum, milo, head chops	90.0	7.7	77.2	0.14	0.64	0.26	1.18	....
Soybeans	90.0	33.7	87.6	0.27	1.23	0.62	2.81	....
Soybean oil meal, 41% protein	89.8	34.5	76.4	0.26	1.18	0.59	2.68	....
Soybean oil meal, 43% protein	90.6	36.2	78.7	0.28	1.27	0.61	2.77	....
Soybean oil meal, 44% protein	90.8	37.1	78.6	0.30	1.36	0.66	3.00	....
Soybean oil meal, solvent extracted	91.6	42.4	78.5	0.29	1.32	0.63	2.86	....
Wheat, hard, red, winter	89.6	12.8	80.0	0.05	0.23	0.41	1.86	....
Wheat, northern, spring	90.1	13.3	80.7	0.05	0.23	0.41	1.86	....
Wheat, soft, Pacific coast	89.2	8.3	80.0	....	....	0.29	1.32	....
Wheat bran	89.7	13.3	66.4	0.14	0.64	1.30	5.90	....
Wheat flour middlings	89.7	15.9	79.0	0.07	0.32	0.65	2.95	....
Wheat standard middlings	90.1	14.6	78.0	0.14	0.64	0.78	3.54	....

* Where no digestion coefficients were available or where the available data were too few to be reliable, the digestion coefficients for comparable feeds were used.

[1] From a compilation of the Committee on Feed Composition and the Committee on Animal Nutrition of the National Research Council.

FENUGREEK SEED is the dried fruit of *Trigonella foenumgraecum.* It is used as an AROMATIC to flavor feeds (rather than as a drug).—*See also* FEED INGREDIENTS.

FERBAM = FERMATE.

FERGUSON 922. *See* RED OAT (variety).

FERGUSON BARLEY is a winter variety of the SIX-ROWED BARLEY.

FERMATE, or *ferbam,* is *ferric dimethyl dithiocarbamate;* it is used for control of BLACKPATCH and other FUNGUS DISEASES.

FERMENT. *See* FERMENTS.

FERMENTATION (sometimes referred to as *sweating*) is any transformation of complex organic substances (such as CARBOHYDRATES, e.g., various sugars) by the action of the ENZYMES of micro-organisms, such as YEAST or bacteria, into more simple compounds. Thus, DIASTASE hydrolyzes starch to sugar; INVERTASE converts sucrose (cane sugar) into dextrose and levulose; in *alcoholic fermentation,* alcohol and carbon dioxide are formed from starch (of grain) via sugars by the action of ferments contained in yeast.—*See also* HAY; INVERT SUGAR; FERMENTS.

FERMENTATION INDUSTRY BY-PRODUCTS include DISTILLERS' PRODUCTS, BREWERS' PRODUCTS, so-called FERMENTATION PRODUCTS, YEAST, DRIED GRAINS OR VINEGAR DRIED GRAINS, and such VITAMIN products as *dried fermentation solubles* and *condensed fermentation solubles.*

FERMENTATION PRODUCTS is a broad term which includes all FERMENTATION INDUSTRY BY-PRODUCTS, but in the terminology of the feed industry is limited to products obtained in the manufacture of *antibiotics* and organic acids, especially *citric acid.*

Officially recognized are the following:

Extracted . . . presscake—the filtered and dried MYCELIUM obtained from . . . fermentation. (For label identification the source must be indicated in the blank spaces as

PENICILLIUM, STREPTOMYCES, CITRIC ACID, etc.).

Extracted . . . meal is ground . . . presscake. (The source must be indicated as penicillium, streptomyces, citric acid, etc.).

Dried extracted . . . fermentation solubles —the dried extracted broth obtained from penicillium, streptomyces, citric acid, etc. fermentation, as the case may be.

Dried extracted . . . meal and fermentation solubles—the filtered and dried mycelium and dried extracted broth obtained from . . . fermentation. (The source shall be indicated as penicillium, streptomyces, citric acid, etc.).

References: F.6; E.12.

FERMENTS—a term often used synonymously with ENZYMES—consist of enzymes in association with the living organisms or with substances produced by the latter. Ferments are capable of causing *fermentation* of other substances, apparently without undergoing chemical changes themselves.—*See also* VITAMINS; INVERTASE; DIGESTIVE TRACT.

FERRIC DIMETHYL DITHIOCARBAMATE is a white powder, slightly soluble in water. It is the active ingredient in the fungicide FERMATE.

FERRIC OXIDE. *See* RED IRON OXIDE.

FERRIC PHOSPHATE
= IRON PHOSPHATE.

FERROUS CARBONATE
= IRON CARBONATE.

FERROUS SULFATE
= IRON SULFATE.

FERTILE means: fruit-producing or capable of proper functioning in reproduction.

FERTILITY is the ability (1) of plants and animals to reproduce sexually or (2) of soils to provide the chemical compounds needed for the growth of specified plants.

Self-fertility and *pseudo-self-fertility* are terms applied to any plant possessing complete units of reproduction; e.g., RED CLOVER.

FERTILITY VITAMIN. *See* VITAMIN E.

FERTILIZATION means (1) the union of the male nucleus (pollen) of a plant with the female cell (egg); (2) the union of sperm and ovum (egg) following insemination of animals; and (3) the addition to the soil of those elements or compounds that are needed for the nutrition of plants.—*See also* PASTURE MANAGEMENT; FERTILIZER.

FERTILIZERS are chemical compounds, added to the soil for the purpose of improving its nutrient content; they enable plants to grow faster and bigger, thus increasing the crop yield.

LIME is often not considered a fertilizer because it contributes rather to the improvement of the soil than to the nutrition of the plants. Similarly, MANURE is generally not included in the term fertilizer, even though it possesses plant-food and soil-improving values; it is rather considered an *"indirect fertilizer."*

So-called *commercial fertilizers* are either *organic* (by-products from packing houses, fisheries, oil mills, breweries, etc.) or *inorganic.* The latter may contain many constituents, but their value depends chiefly on three essential plant-food elements: NITROGEN, PHOSPHORUS, and POTASSIUM.

The *mixed fertilizers* consist of more than one of these three essential elements. Their content is expressed in three numbers, with the first referring to the percentage of nitrogen, or *N;* the second to that of phosphorus, expressed as P_2O_5 (phosphorus pentoxide); and the third to potassium, expressed as K_2O (potassium oxide—often misnamed *"potash"*).

Mixed fertilizers, widely used on farms, are the following: (a) *without nitrogen*—0-9-27, 0-10-20, 0-12-20, 0-14-10, 0-14-14, etc.; (b) *complete fertilizers*—2-12-6, 2-12-12, 3-12-12, 4-8-4, 4-12-4, 6-6-6, etc. Fertilizers containing only one plant food, too, are expressed in the same manner—e.g., 0-45-0, indicating that the particular product contains 45 percent P_2O_5, but neither nitrogen nor K_2O.

The chemical analysis, as expressed in the three numbers, is not sufficient: the *qualitative* composition of the mixed fertilizers, too, must be known: the same percentage of P_2O_5 may refer to practically insoluble (natural) rock phosphate, to more readily soluble superphosphate, or to very soluble ammonium phosphate. Thus, when buying mixed fertilizers, it is necessary to consider the actual cost of their total plant-food ingredients rather than

the cost per bag or per ton.—*See also* CALCIUM; AMMONIUM; BASIC SLAG; GYPSUM.

FESCUE FOOT = FESCUE LAMENESS.

FESCUE LAMENESS, or *fescue foot,* is a disease condition affecting cattle. It has been recognized in Colorado, Missouri, Kentucky, New Zealand, and Australia. The disease is chiefly a problem connected with blizzard conditions and injudicious management. Fescue lameness affects hungry, probably vitamin-A starved animals, that have access to TALL FESCUE pasture at its peak stage of growth. Eating large amounts of any strain of this grass may in a short time cause the condition, which is characterized by a lameness and apparently circulatory disturbance of, especially, the hind feet, ears, and tails. If the animals are taken off the fescue as soon as the first signs appear, complete recovery occurs.

NOTE: Recent cases were seen in Missouri where cattle were running to silage and hay and had access to fescue pasture that was chiefly stand-over from last season's growth. The animals lost ears, tails, as well as hooves.

Reference: C.5.

FESCUES (*Festuca* spp.) compose a very large genus of which there are about 100 species in temperate or cool zones. They vary in texture and growth and comprise a versatile group of varying uses.

The annual species are weedy, but the perennials are excellent for forage and turf. The fescues cultivated as pasture GRASSES can be classified as the *broad-leaf* and the *fine-leaf* species.

Of the broad-leaf species that currently are most widely used, MEADOW FESCUE and TALL FESCUE (also known as *reed fescue* and under numerous common names, such as *King fescue, giant fescue, ditch fescue,* or *tall bank fescue*)—and the latter's two strains *Alta fescue* and *Kentucky 31*—are outstanding. Of the fine-leaf species, SHEEP-FESCUE is perhaps the most useful; *red fescue* (or *creeping red fescue*) and its not-creeping variety, *chewings fescue,* are used mainly for lawns and turfs.

References: H.1.

See also MUTTON BLUEGRASS; ANNUAL LESPEDEZAS; SAGEBRUSHES; BLOAT; PASTURE PLANTS; RANGE PLANTS; BUNCHGRASS.

Illustrations: See MEADOW FESCUE; RED FESCUE; SHEEP FESCUE.

Fescue. Plant and spikelet. (H.47.)

FESTUCA. The *Festuca* spp., commonly known as FESCUES, include *F. elatior* = MEADOW FESCUE; *F. arundinacea* = TALL FESCUE; *F. ovina* = SHEEP FESCUE; *F. rubra* = RED FESCUE (and its not creeping variety *F. rubra* var. *commutata,* or *chewings fescue*).

FETERITA. *Standard feterita, Spur feterita,* and *Dwarf feterita* are grain SORGHUMS.

FIBER is threadlike, tough tissue derived from plants, animals, or minerals.

In feed analysis, the term *crude fiber* (or, for short, fiber) indicates the content of CELLULOSE and related carbohydrates which form the cell walls of the plants with protective LIGNIN and which animals—and particularly swine—can digest only partly, and this under waste of much energy. No mammal can digest an appreciable amount of lignin.

The higher the fiber content of a feed, the lower its feeding value. STRAWS are very high in fiber, as are ROUGHAGES in general; CONCENTRATES are lower in fiber content; CORN contains only about 2 percent fiber, wheat slightly more, but BARLEY and OATS have tough hulls that cause a fiber content two to four times that of corn.—*See also* NITROGEN-FREE EXTRACT; LABELS.

FIBROUS means: composed of FIBERS.

FIELD BEANS are LEGUMES and resemble in many respects the SOYBEAN. They belong to a number of genera, the most important of which includes the *edible beans* of the *Phaseolus* spp., e.g., the COMMON BEAN with its more than 50 varieties (among them the Navy bean and Pinto), the TEPARY BEAN, MUNGBEAN, and LIMA BEAN.

These and other edible beans are successfully grown on both irrigated and non-irrigated lands under a variety of soil and climatic conditions in 21 states of the United States, but a major part of the crop is in fairly distinct areas of 7 states.

Beans are a concentrated direct food and are high in protein, phosphorus, iron, and vitamin B_1. They fit well into rotations on many farms and are an important cash crop; both the straw and the cull beans can be used as feed for livestock.

Cleaning and grading of beans are almost always done at the "bean house." The cull beans are either returned to the grower for livestock feeding or sold to feeders or feed dealers.

Cull beans—the *damaged beans* which are sorted out from the first-quality beans —can be used satisfactorily for livestock feeding, but their feeding value is less than would be expected from the chemical analysis. They are not very palatable to stock, and their digestibility is not high when they are fed raw, especially to hogs. Cull beans often include such waste as coarse bits of stem, small stones, and dirt.

Cull beans can well be fed to sheep for they will sort out the beans from trash. *Whole cull beans* are satisfactory for lamb fattening, if they are not more than 20 to 25 percent of the grain mixture; a larger quantity may be unpalatable and cause scouring. It is especially difficult to keep the animals eating large amounts of beans in the summer, possibly because cracked beans soon become rancid.

Pods and leaflets of the mungbean which belongs to the field beans.

If the cull beans are not too "trashy," they can be fed to other livestock. They should be cooked or steamed and mixed with grain if fed to hogs or steers. *Ground cull beans* can be fed to dairy cows as a substitute for other protein supplements, but they should not be more than a fifth of the concentrate mixture. If they are mixed with more palatable feeds—such as ground CORN, ground OATS, or LINSEED OIL meal—the cows are more likely to clean up the feed. More *cooked beans* can be fed to dairy cows, but cooking is rather expensive and may not be justified.

Bean straw can be used for feeding

purposes. The bean land is often rented to sheepmen after the harvest, and the sheep are *pastured* a few days on the straw.

Bean straw, in many bean-growing districts, is used for feeding sheep, cattle, or horses. Its feeding value varies widely, but straw of a good grade, especially if fed with some legume hay, may be considered worth about half as much per ton, in terms of net energy, as ALFALFA or CLOVER hay. In the West it is used mainly for wintering livestock and to a limited extent in fattening rations.

Bean straw, when fed as the sole roughage in a lamb-fattening ration, does not produce satisfactory gains, since the lambs are inclined to eat so much bean straw that they scour severely.

Cracked and unthreshed beans in the straw add to the feed value and unused or surplus straw can be thrown into the feed lot to help build up the manure.

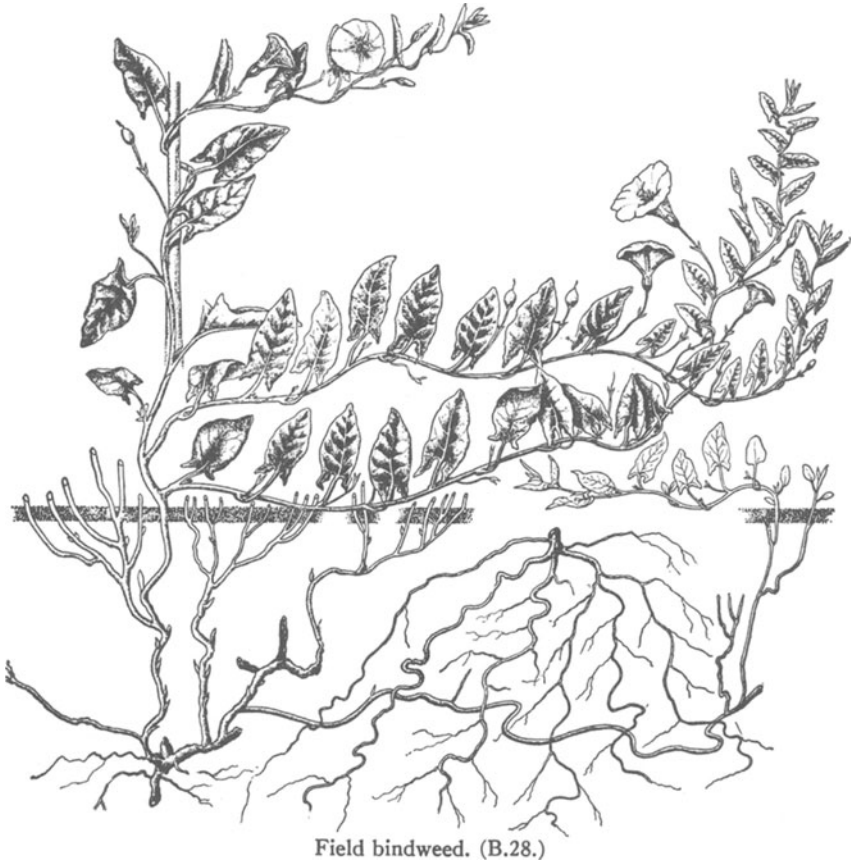
Dangers: Ewes eating cull beans have given birth to lambs that became stiff.

Reference: M.45.

See also STRAW; VITAMIN E.

FIELD BINDWEED (*Convolvulus arvensis*), commonly called *bindweed*, is one of the bindweeds which in many respects is similar to the closely related morning glory.

Field bindweed is a perennial with bell-like flowers and arrow-shaped 1 to 2 in. long leaves. The plants spread rapidly—the creeping roots may grow 1 in. a day—and often penetrate the soil to a depth of more than 20 ft. The smooth stems form vines which grow up to 6 ft. in length, spreading and twining over the ground or climbing up WHEAT, OAT, BARLEY, SOR-



Field bindweed. (B.28.)

GHUM, or other plants in the field, thus becoming noxious weeds, especially in the Midwest and the western states. The encapsulated seeds of bindweeds may remain in the ground for several years before they germinate.

Control: Intensive fallow usually eliminates the bindweed in two seasons or less, provided cultivations to a depth of 4 or 5 in. are carried out at the proper time and with the proper implements which will cut completely all bindweed shoots and thus prevent additional food storage in the root system.

Cultivation operations should be every two weeks until the bindweed has been weakened and emerges more slowly. The interval then may be safely lengthened to three weeks.

SODIUM CHLORATE is a most satisfactory soil sterilant. Bindweed stands may be greatly reduced (but rarely eradicated) with 2,4-D.

References: H.42; P.23.

FIELD DODDER (*Cuscata pentagona*, also known as *C. arvensis*) is one of the most destructive of all the DODDERS. It shows little preference as to the plants which it attacks. The stems of this species are pale yellow in color, a characteristic which is useful when determining the parasitic plant in the field. It grows in most parts of the United States, but causes the greatest damage east of the Mississippi River. Its seed is a common impurity in RED CLOVER and ALFALFA seed.

Reference: H.19.

FIELD MICE. If a growth of ALFALFA is left standing in the fall, a large population of mice of different species may be attracted to the field. They attack also PROSO, SUBCLOVER, shocked grain (corn, grain sorghums), and many other crops.

Control: Pieces of hollow tile or tin cans laid on their sides may be placed along fence rows and baited with STRYCHNINE-POISONED GRAIN to protect trees or other crops from mice that may be living in fields.

References: G.7; R.3.

See also RODENTS.

FIELD PEA (*Pisum arvense*) is a LEGUME. The plants are annual and have slender succulent stems 2 to 4 ft. long, which ascend with support.

Field pea. (M.3.)

A cool growing season is necessary for the field pea, as high temperatures are much more injurious than frosts and are most disastrous when they occur when the pods are setting. These climatic requirements limit the successful production of the field pea as a summer crop to the northern states and Canada. The legume may, however, be grown as a winter crop in the southern states. Its moisture re-

quirements are less exacting than its temperature requirements, but it does best where rainfall is fairly abundant. In the northern Great Plains a rainfall of 15 in. is sufficient to produce a good crop, while 20 in. rain in Kansas, Nebraska, or Colorado is inadequate.

Field peas are grown for forage and seed in New York, Michigan, Wisconsin, Minnesota, eastern North Dakota, South Dakota, Montana, Idaho, Oregon, and Washington, and for a cover crop and green manure in the southeastern part of the Cotton Belt and in the Pacific Northwest.

Well-drained clay loams of limestone origin, or soils that are neutral or of low acidity, are best suited to the field pea, although it does well on fertilized sandy loam soils. Heavy, black soils, rich in humus, tend to produce a heavy growth of vines with comparatively few pods and result in a large tonnage of hay.

In the northern United States it is advantageous to fall-plow the land for field peas because of the necessity for early seeding. Fall-plowed land should be disked as early as possible in spring and smoothed down with a drag harrow in case the seed is to be planted with a drill.

In the southern states the largest acreage of winter legumes follows COTTON, in which case very little or no preparation of the soil is necessary. Other crops, such as tobacco, PEANUTS, COWPEAS, SOYBEANS, and melons, leave the soil in good condition, and only little preparation of a seedbed is necessary following these crops.

In the North, field peas must be planted early enough in the spring to set pods before the warm weather of summer arrives. The young plants are not harmed by light frosts. In the northern part of the Cotton Belt, seeding should be done, if possible, during the last half of September, and in the southern part, early in October.

Field peas are best sown with a grain drill. Where that is not available, they may be sown broadcast and covered with a disk, spike-tooth harrow, or cultivator. The peas should be planted from 2 in. deep (in clay loam) to 4 in. (in sandy soil). When field peas are seeded with GRAIN, the common practice is to mix and sow them in one operation.

Seed more than two years old is liable to have low germination. In purchasing seed the grower should endeavor to obtain seed of the current season's crop that is accompanied by analysis tags, showing the purity and germination of the seed.

The use of fertilizers with field peas is not recommended for most regions of the northern United States. In the Cotton Belt of the Southeast it is often essential. If the soil is poor the use of 200 to 400 lb. superphosphate or 300 to 600 lb. basic slag and 50 lb. sodium nitrate or ammonium sulfate is advisable. In the Pacific Northwest gypsum applied at the rate of 50 to 100 lb. an acre, increases yields on most soils.

For best results, field peas must be inoculated. This is especially true in the more recently developed farming districts. INOCULATION can be accomplished by the use of commercially available pure cultures or by the use of soil from a field that has recently grown field peas.

> NOTE: Commercial fertilizer, unless it is basic slag, should not come in contact with inoculated seed, as it may injure the inoculating organism. However, barnyard manure is effective in inducing inoculation, and its use is recommended.

When used as a *green manure* to precede annual crops, field peas should be turned under about two weeks before the planting of the annual crop. In the South, where field peas are used most largely for this purpose, earlier plowing is advised if the field peas have made sufficient growth.

When field peas are planted for *pasturage*, either alone or with SMALL GRAIN, they give best results when allowed to mature before the animals are turned in, so the entire plant may be utilized. This is the common practice in parts of the Rocky Mountain states, where such pastures are usually grazed by sheep. Animals pasturing on field peas should be confined—by movable fences—to one portion of the field at a time. A good crop will usually fatten from 10 to 15 lambs per acre, each animal gaining about 8 lb. a month; hogs,

if not obliged to gather their food over too large an acreage, will make an average daily gain of 1 lb. More rapid gains may be made by hogs when a limited quantity of CORN or BARLEY and a supplementary protein are fed in addition to the peas. Access to a mineral mixture should also be provided.

To assure continued substantial gains, the fattening animals must be moved to a new field as soon as peas become scarce, and stock animals must be used for cleaning up the field.

The proper time to cut field peas for *hay* is when most of the pods are well formed. When they have been seeded with grain, the varieties of field peas and grain should be so chosen that the crop can be harvested at the most favorable period of maturity for both.

When grown for hay, field peas are usually mixed with OATS, RYE, or barley. These mixtures stand up much better and make harvesting easier. The presence of grain in the crop also causes it to cure more quickly. Hay yields of field peas alone, or in mixture with grain, range from 1 to 3 tons per acre.

When grown for hay, the field pea works into a rotation very nicely, because it is removed from the field early in the year, thus allowing ample time for a thorough preparation of the soil during the fall. The feeding value of field pea hay is about the same as that of ALFALFA.

Field peas make good *silage* when grown in mixture with a small grain and cut when the grain is nearly mature. Such silage has a high feeding value and has given excellent results when used for fattening cattle and sheep.

The field pea should be cut for *seed* when the pods are mature and the seed is firm. It is not well, however, to wait until the vine and pods both are dry, since then the loss of shattering and WEEVIL damage is sure to be large.

The threshing of field peas is usually done with a grain separator or combine. Where the field peas are not sold for seed purposes, but are intended wholly for livestock feeding, no precautions are necessary since cracked seed then is not objectionable.

Dangers: The *fungus* diseases ASCOCHYTA BLIGHT COMPLEX—namely ASCOCHYTA FOOT ROT and ASCOCHYTA BLIGHT OF PEA—and the closely related LEAF AND POD SPOT, LEAF BLOTCH, POWDERY MILDEW, PEA ANTHRACNOSE, FUSARIUM WILT OF FIELD PEA, various ROOT ROTS (especially FUSARIUM ROOT ROT), and the same fungus which causes DOWNY MILDEW OF VETCH affect field peas as do BACTERIAL BLIGHT OF PEA and the *virus* disease MOSAIC. Among the *insect* enemies are PEA WEEVIL, PEA APHID, and the PEA MOTH. A nematode causes ROOT KNOT.

Varieties: The most important field peas grown for feed follow:

Agnes and *Canadian Beauty* are recommended for pasture and hay in Colorado. Canadian Beauty is also suited for the Great Lake states.

Alaska and *Blue Bell*, or *Blue Prussian*, are grown in the Pacific Northwest.

Austrian Winter is the most winter-hardy variety; it is grown in the Pacific Northwest and (almost exclusively) in the southern states where fall planting is practiced.

Chancellor, *Chang*, *French Gray* (which matures earlier than the Austrian Winter), *Marrowfat*, *Multipliers*, and *Scotch* are recommended in the Great Lake states.

Reference: M.24.

See also STRAW; CANADIAN FIELD PEAS.

FILAMENT is the STALK of a STAMEN on which is borne the pollen-bearing ANTHER.

FILAREE = ALFILERIA.

FINE BENTGRASSES include COLONIAL BENT.—*See also* BENTGRASSES.

FINETOP SALTGRASS = ALKALI SACATON.

FINGERGRASSES (*Chloris* spp.) form part of the forage for grazing animals on ranges in the Southwest and in the Hawaiian Islands. RHODESGRASS is an important representative of this genus.—*See also* RANGE PLANTS.

FINISHING RATIONS. *See* BEEF CATTLE RATIONS; RATIONS.

FINNEY MILO is one of the grain SORGHUMS.

FIORIN. *See* REDTOP.

FIRE ANTS are useful because they feed on VELVETBEAN CATERPILLARS and on the eggs of this insect pest.

FISHER BROME is a southern-type SMOOTH BROME.

FISHERY BY-PRODUCTS include (1) the various MARINE PRODUCTS obtained in canneries and other fish-packing factories and (2) *whale products* which—because the whale is a mammal—are officially listed as ANIMAL PRODUCTS.—*See also* BY-PRODUCT FEEDSTUFFS; SHARK MEAL.

FISH FACTOR. *See* U.G.F.

FISH-LIVER AND GLANDULAR MEAL. *See* MARINE PRODUCTS.

FISH-LIVER OILS are good sources of VITAMINS A and D. VITAMIN A is obtained from the cod, halibut, salmon, and shark; VITAMIN D_3, from the cod, sardine, and other fish. Oils from different fish vary in vitamin content. The amount of fish-liver oil to be added to rations (especially in winter months), depends on the potency of the type of fish oil available.

The vitamin A in fish oils is not stable—it is easily destroyed on oxidation. Buy only fresh oils and do not store unused rations for long periods of time.

Dangers: Rancid fish-liver oil not only contains little or no vitamin A but also destroys VITAMIN E. If rancid oil is fed to young ruminants, *white muscle disease* of calves or *stiff lamb disease* may result.

FISH MEAL. *See* MARINE PRODUCTS.

FISH RESIDUE MEAL. *See* MARINE PRODUCTS.

FISSION means: splitting into parts. *See* BACTERIA.

FLAG SMUT OF WHEAT—one of the most virulent STRIPE SMUTS—is caused by the FUNGUS *Urocystis tritici*. In the United States the range of the disease is gradually increasing. Although it has not become severe in any locality in this country, its persistence in certain major WHEAT-producing areas is a potential danger.

Flag smut appears as long black stripes running lengthwise on the leaf blades and on the upper parts of the stems of the plants. Infected plants have dwarfed stalks that seldom produce heads. Usually the entire plant is affected, although partly infected plants are not uncommon in certain varieties. When infected leaves dry, they split along the black streaks and free the black powdery spores of the smut fungus. The spores are blown to nearby plants or fall to the ground, where they may be spread by the feet of animals and men and by machinery. When infected wheat is being harvested or threshed, flag smut spores are carried to the sound wheat kernels from infected plants. This smut lives over in the soil, or may be carried on wheat seed. Infection of the young wheat seedling takes place when the seed germinates. After entering the seedling, the fungus MYCELIUM grows inside the stem and leaves of the plants. Infected plants can be detected early by the black streaks on the leaves before the jointing of the plant begins.

Control: Flag smut can be controlled by crop rotation, seed treatment with CERESAN M, and growing of resistant varieties.

The flag smut spores in the soil usually do not survive when wheat is not grown on the land for one year. Flag smut persists only in winter-wheat areas where a mild winter climate prevails and continuous wheat culture is practiced.

Reference: L.10.

See also COMMON WHEAT.

FLAKED CORN. *See* CORN.

FLAMBEAU. *See* SOYBEAN (variety).

FLAVOR. *See* MEAT QUALITY.

FLAVORING AGENTS are sometimes added to feedstuffs because it is thought that they increase the palatability of the feed; ANISE SEED is widely used for this purpose. Many experts doubt, however, that flavoring agents have any value in making animals perform better.—*See also* FEED INGREDIENTS.

"FLAX" (*Linum usitatissimum*) is the name under which the cultivated *Old World Flax* is generally known. It is the most important of all the FLAXES; it is grown for fiber (linen yarn) or for seed.

Flax is a winter annual in warm climates. It reaches 1 to 3 ft. height, has a short taproot, a main stem, and branches with leaves and flowers; the latter develop into bolls which include the seeds.

Flaxseed, more often called LINSEED, con-

tains about 40 percent linseed oil. After the oil has been extracted from flaxseed, the residue is pressed into cakes or ground into linseed oil meal for livestock.

Reference: U.6.

See also ALFALFAS; DODDERS; CHINCH BUGS; WHEAT STEM SAWFLY; FLAX STRAW; FLAX PLANT BY-PRODUCTS.

FLAXES (*Linum* spp.) are common sights in the West and occur on well-drained to dry soils. They are, as a class, low in forage value and their palatability rates from worthless to fair for sheep, somewhat lower for cattle; and horses seldom touch them.

Species: There are about 100 flax species, some of which are known to be poisonous to livestock, e.g., the *New Mexican flax* and the *stiffstem flax*. Most important among all flaxes is the *Old World flax*, commonly referred to as (cultivated) "FLAX."

Reference: U.6.

See also STRAW; FLAX STRAW.

FLAX PLANT BY-PRODUCT,—i.e., the leftover portion of the FLAX plant after removal of seeds, bast fiber, and part of the shives (defibered stems)—has only little feed value.

FLAX PLANT FEED. *See* LINSEED.

FLAXSEED = LINSEED.

"FLAXSEED" is the PUPARIUM of the HESSIAN FLY; this term is used because the puparia of this insect pest resemble flaxseeds in size and color.

FLAXSEED SCREENINGS OIL FEED. *See* LINSEED.

FLAX STRAW of good quality can be used in place of oat straw as roughage for wintering cattle.

Caution: Do not feed flax straw if it contains immature seeds because they yield PRUSSIC ACID.

FLEABANE. *See* WHITETOP FLEABANE.

FLEA BEETLE = GARDEN FLEA HOPPER. —*See also* CORN FLEA BEETLE.

FLEXIBLE PROTEIN SUPPLEMENT. *See* SWINE RATIONS.

FLEXIBLE RATIONS. Animals require NUTRIENTS, not *feedstuffs*, and should receive RATIONS designed to meet their needs for all known nutrients and recognized "factors." In addition, the rations should be palatable, properly balanced physically and chemically, suitable for the animal that eats it, free of dust, free of objectionable odor, nontoxic, easy to feed and handle, and economical.

Naturally most sample formulas will be based on feedstuffs that are common to the area where the rations will be formulated.

After a feedstuff has appeared in recommended rations for several years, many people begin to regard it as essential. Thus, many people believe that dairy cows must have some bran; horses some oats; fat steers some oil meal, and poultry some milk products. Each of these feeds is good for the animal indicated, but with our present knowledge of nutrition we can replace them by other feedstuffs, or combinations that will give equally satisfactory results.

Purified VITAMINS, MINERALS, and AMINO ACIDS as well as large quantities of FATS and SUGARS also can be effectively used to make the ration formulator less dependent on natural feeds.

Thus, the discoveries in the area of nutritional requirements and those in the area of production can be utilized to give great flexibility to rations. The feed manufacturer and the livestockman do not have to be bound by obsolete formulas which require certain feedstuffs that may be scarce or expensive during certain times of the year.—*See also* RATION FORMULATION.

FLIES are two-winged INSECTS; they are dangerous, because they carry many animal diseases, but only a few flies are dangerous to plants; e.g., the HESSIAN FLY. Some flies are beneficial to plants; e.g., the parasitic WINTHEMIA, CELATORIA, and PHOROCERA species.—*See also* RICE LEAF MINER; SORGHUM MIDGE; GARDEN WEBWORM; ROBBER FLIES.

FLINT CORN. *See* CORN.

FLOAT is (1) a plank clod masher or (2) a land leveler.

FLORAL means: of, or pertaining to, a flower or other plant.

FLORET is a diminutive flower, especially one of the readily detachable flowers of a grass SPIKELET.

FLORIDA BEGGARWEED (*Desmodium purpureum*)—one of the so-called *tick clovers*—is a plant attaining a height of 4

to 7 ft. The main stem is branched rather sparsely and is noticeably pubescent (hairy). In thick stands the branches are reduced and the lower ones absent. The leaves are trifoliolate with large ovate leaflets. Racemes of rather inconspicuous flowers terminate the main stem and lateral branches. The small seed is borne in a joined pod (loment).

Florida beggarweed is a short-lived perennial in frostless regions; but it behaves as an annual in most parts of the United States. It is particularly adapted to the Coastal Plains area of the southern states. In Florida, southern Georgia, and Alabama it has been used as a regular and volunteer crop; under favorable conditions, it will make a fair vegetative growth as far north as the Great Lake states.

In composition, Florida beggarweed is comparable to most of the common LEGUME hay crops. It is of considerable value for grazing in late summer and when fed in this way, is very fattening. For green manure it serves best on sandy loam soils in rotations where a volunteer crop can be handled. The seed of beggarweed is readily eaten by quail.

On poor sandy soil or soil low in fertility an application of manure or commercial fertilizer greatly increases the growth of Florida beggarweed. On lands not previously fertilized 200 lb. superphosphate, 75 lb. potassium chloride, and 50 lb. sodium nitrate or ammonium sulfate can be used to advantage.

A moderate rainfall is essential to good growth even though the plants will stand as much drought as the average farm crop. Florida beggarweed is of particular value because of its ability to grow on moderately acid soils. Its lime requirement is low; few other legumes are as well adapted to the soils of the southeastern United States as this crop.

INOCULATION is unnecessary. The organism that inoculates Florida beggarweed seems to be present in most, if not all, southern soils.

Best time for seeding is late spring. Scarified seed should be used for quick stands.

Harvesting for forage must be undertaken when the plants are in early bloom or when the first seed pods form; i.e., about July in Florida. Hay is hard to cure and spoils easily. Forage yields amount to 1 to 2 tons per acre.

Florida beggarweed can be used in rotation with CORN, giving a full season to the beggarweed, or it can be volunteered in the corn after last cultivation.

The plants are immune to root knot and no serious damage from diseases or insects has been reported.

Reference: M.13.

FLORIDA BUSH = *Bush velvetbean.* *See* DEERING VELVETBEAN.

FLORIDA NAPIERGRASS is a strain of NAPIERGRASS.

FLORIDA VELVETBEAN. *See* DEERING VELVETBEAN (variety).

FLOUR CORN. *See* CORN.

FLOWER GLAND. *See* NECTARY.

FLOWERING GLUME = LEMMA. —*See also* GRASSES.

FLOWERS OF SULFUR, *sulfur flowers,* or *sublimed sulfur,* is used as a FUNGICIDE for SEED TREATMENT.—*See also* SULFUR.

FLUORINE—the very reactive chemical element *F*—is a gas but it is so reactive that it does not occur *free* in nature; its solid compounds are contained in minerals which, when fed to animals, may cause FLUORINE POISONING.—*See also* MINERAL FEEDS.

FLUORINE POISONING is caused by FLUORINE, a cumulative poison. It is dangerous to feed to livestock rations containing ROCK PHOSPHATE because this mineral usually contains 2 to 4 percent fluorine. Other minerals as well as water, soil, and plants in some areas of this country—e.g., in Arkansas, California, South Carolina, and Texas—contain high enough fluorine content to cause trouble with livestock by mottling teeth and interfering with normal calcification.

Mineral mixtures fed directly to livestock must not exceed 0.30 percent F for cattle, 0.35 percent for sheep, and 0.45 percent for swine. The fluorine level in dry feed for all species of animals must not exceed 0.003 percent.

Industrial contamination is becoming

more common; fumes containing fluorine or fluorides often settle on plants, etc.

FLUSHING EWES. *See* SHEEP RATIONS.

FLY. *See* FLIES.

FLYNN and *Flynn 37* are SIX-ROWED BARLEY varieties.

FODDER is any dry feed for livestock; the term is applied more specifically to such feedstuffs as CORN, SORGHUMS, and coarse GRASSES harvested whole and cured in an erect position.

Pulled fodder consists of leaves of corn or sorghum stripped by hand from the stalk and then cured.

Topped fodder refers to the tops of corn stalks cut off above the ears and then cured.—*See also* SHREDDING.

"FODDER" = BUNDLE FEED.

FODDER CORN = *corn fodder. See* CORN.

FOENICULUM. The dried ripe fruit of *F. vulgare* is known as FENNEL.

FOLGER'S SORGO, or *Folger's Early,* is one of the forage SORGHUMS.

FOLIAGE DISEASES = LEAF DISEASES.

FOLIATE means: leaved.

FOLIC ACID is a term which has been changed to *pteroylglutamic acid.* It is one of the B-COMPLEX VITAMINS and occurs in leafy plant material and grasses, in yeast, liver, and kidney. It is important to animal life.

A shortage in chick diets leads to *macrocytic anemia,* poor growth, and poor feathering. A related compound, known as CITROVORUM FACTOR, has similar activity.

Pure folic acid forms yellowish-orange crystals that are only slightly soluble in water.—*See also* VITAMINS; ANTIBIOTICS.

FOOD AND DRUG ADMINISTRATION = F.D.A.

FOOT ROT of cattle and sheep may occur at any time of the year, but is more prevalent when livestock is on PASTURE during wet seasons. The symptoms are usually soreness of the feet, lameness, swelling, redness, heat, and a definite indication of pain. After the disease has progressed for a few days, necrosis (sloughing of the tissues) and a distinctive foul odor will be noticed.

References: S.28; S.10.

See also GRAZING.

FOOT ROTS, *foot-and-root rots,* and ROOT ROTS are terms applied to a variety of FUNGUS DISEASES which are usually found to be most severe on dwarfed, undernourished plants or on plants receiving an excess of NITROGEN fertilizer. Among the more important foot rots are ASCOCHYTA FOOT ROT, CULM ROT, and LEAF AND POD SPOT.

Reference: M.37.

See also FUNGUS; ROTS.

FORAGE, in a broad sense, is the vegetable matter that is fed to animals, but the term is usually applied to the leaves, flowers, stems, and twigs. Forage and ROUGHAGE are high in fiber and contain relatively small amounts of net ENERGY per unit volume.

Green forage is fresh forage.

Fermented forage = SILAGE.

FORAGE BLOWER. *See* SILOS.

FORAGE CROPS and PASTURES supply the most important feeding stuffs for all species of farm animals, except swine and poultry. HAY is among the most valuable FORAGE crops.—*See also* FORAGE; SILAGE CROPS; STRAW MEAL; RANGE PLANTS; PASTURE PLANTS.

FORAGE ELEVATORS. *See* SILOS.

FORAGE POISONING is a loosely used term to indicate poisoning of animals due to their eating spoiled (moldy) cornstalks, pastures, silage, and other FORAGE. The affected animals may show a variety of symptoms—from staggering gait to delirium and death.—*See also* POISONOUS PLANTS; PRUSSIC ACID POISONING.

FORAGE RANGE.

See RANGE PLANTS; RANGE MANAGEMENT.

FORAGE SORGHUMS. *See* SORGHUMS.

FORAGE SPECIES.

See RANGE PLANTS; PASTURE PLANTS.

FORBS are nongrass-like herbs; in the range stockman's sense, they are WEEDS which are more harmful than beneficial. Forbs are LUPINES, dandeloins, BASSIA, and many others.—*See also* RANGE PLANTS; SAGEBRUSHES.

FORKEDEER. *See* RED OAT (variety).

FORMALDEHYDE GAS is a pungent, very irritating, colorless gas which is occasionally used as a FUMIGANT. The gas is soluble in water; this solution is known as FORMALDEHYDE SOLUTION.

FORMALDEHYDE SOLUTION, or *formalin*, is a colorless liquid, the vapors of which are very irritating. The solution is used for SEED TREATMENT because it is very effective in preventing seed-borne diseases, but it has no effect on those caused by soil-borne FUNGI. It frequently injures the seed. It is therefore not favored, unless used on SMUT-infested seed. Formaldehyde solution may be used as follows for SORGHUM seed:

Mix 1 part of commercial formaldehyde solution (containing 37 percent FORMALDEHYDE GAS by weight) with 240 parts of water in a tub. The seed, first thoroughly cleaned, is placed in a loosely woven burlap bag, half filled and tied at the top. Immerse the sack of seed in the formaldehyde solution for half an hour, lift it out, and let it drain a few minutes; then spread the seed in a thin layer on a clean floor or canvas in a well-aired place to dry. Stir it occasionally to hasten drying and plant on the same day—as soon as it is dry enough to feed through the planter. Treated seed, however, should not be planted in dry soil.

Caution: Formaldehyde solution is poisonous. Keep it out of eyes and do not breathe the fumes.

Reference: L.1.

See also PERICONIA ROOT ROT; GRASS SMUTS.

FORMALIN = FORMALDEHYDE SOLUTION.

FORTUNA RICE. *See* RICE (variety).

FORTYFOLD = *Goldcoin.*
See COMMON WHEAT.

FORWARD WHEAT.
See COMMON WHEAT (variety).

FOUR-ROWED BARLEY.
See SIX-ROWED BARLEY.

FOUR-WINGED POISONVETCH.
See POISONVETCHES.

FOURWING SALTBUSH (*Atriplex canescens*), or *chamiza*, is a freely branching shrub attaining a height up to 10 ft., though it is usually lower. It prefers deep, sandy soil.

Fourwing saltbush is one of the most valuable forage shrubs in the Southwest and Intermountain regions. Its importance is due to its abundance, accessibility, size, evergreen habit, high palatability, and nutritive value. Moreover, it exhibits hardiness to cold and a remarkable ability to withstand drought because of its tremendous root development (sometimes penetrating to a depth of 20 ft.). The leaves, stems, flowers, and fruits are cropped by all classes of range livestock, except horses, which graze the species only in winter when other forage is sparse.

Reference: U.6.

See also RANGE PLANTS.

FOWL BLUEGRASS (*Poa palustris*), also called *fowl meadow grass*, occurs in meadows and moist open grounds in Alaska, Canada, and to the south in Virginia, Missouri, New Mexico, and California.

This GRASS yields up to 2½ tons of hay per acre; the hay is liked by all farm animals.

FOXTAIL is a term applied to different genera of plants; some foxtail GRASSES of the genus *Alopecurus* are WEEDS. Of importance as forage plants are MEADOW FOXTAIL, REED FOXTAIL, and MILLET FOXTAIL. Foxtail species which are succulent late in summer are often attacked by CHINCH BUGS.—*See also* ALFALFA; COWPEA; FOXTAIL BARLEY.

FOXTAIL BARLEY (*Hordeum jubatum*), also called *squirreltail grass*, is a perennial WEED from 8 to 10 in. high. It grows in tufts or bunches and is widely distributed, occurring from Alaska to New Jersey, Texas, and California. This weed is very common, especially along roadsides and other waste places as well as in grain and hay fields.

While young, foxtail barley is palatable to livestock; after the bearded heads form, the plants become troublesome—their SPIKELETS, with the stiff awns, easily become inbedded in the mouth tissues, nostrils, and eyes of livestock and game animals.

Control: Once established, foxtail barley is difficult to eradicate. It is a prolific seeder. Seeding plowable meadows or pastures after thorough cultivation to a grass which will quickly form a dense stand, is effective in reducing the amount of foxtail barley. On the range, where cultivation is seldom practical, conservative grazing which will facilitate the estab-

lishment of the native, palatable, perennial grasses, is the most feasible method of reducing this weed.

Reference: U.6.

See also BARLEYS; WILD BARLEYS.

Foxtail barley. Plant and flower heads (spikes). (U.6.)

FOXTAIL BROME (*Bromus rubens*), or *foxtail chess*, is one of the BROME GRASSES; it occurs on dry hills and in waste or cultivated ground in the western part of the United States and in Massachusetts. Foxtail brome is considered a poor forage grass.—*See also* RANGE PLANTS.

FOXTAIL MILLET (*Setaria italica*)—not to be confused with MEADOW FOXTAIL—has erect or ascending stems. It grows 2½ to 5 ft. high and bears broad, flat leaves. The seeds are borne in a rather dense, cylindrical spike.

Foxtail millet is grown throughout the Great Plains, as far south as northern Texas, east through Missouri, southern Iowa, and northern Arkansas, and across Tennessee, Kentucky, southern Illinois, and Indiana. It can be grown in almost any area that has warm weather during the growing season and enough rain for any other crop. In fact, it has a lower rain requirement than most other crops but is seriously damaged by severe drought.

Foxtail millet is used as hay, pasture, and green fodder; the seed is used for bird feed. It is useful as a catch crop to supply supplemental feed when pastures fail or the hay crop is short.

Foxtail millet. (H.1.)

Nitrogen and phosphate particularly have given increased yields, but as a general rule, fertilizer should be applied to other crops in the rotation rather than to the foxtail millet.

The seed deteriorates rapidly; seed more than two years old usually has low germination. Therefore, only fresh seed should be used.

A good seedbed should be prepared by plowing, harrowing, and cultipacking or otherwise firming the seedbed. The seed is sown from shortly after corn-planting time to the middle of summer. A mixture of foxtail millet and SOYBEANS or COWPEAS may be broadcast by hand or drilled separately.

Foxtail-millet *hay* is fed to horses and cattle. The feeding value is greatest from the time of the bloom until the seed reaches the milk stage. Hay yields are from 1 to 3 tons. The hay is less palatable and does harm to horses if it is fed as the sole roughage, but makes fairly good hay for cattle and sheep and good roughage for growing stock.

Foxtail millet is often used as a cash crop in a regular rotation and as a catch crop following SMALL GRAIN, or other late-spring- or early-summer-maturing crops.

Varieties: A number of varieties are recognized; the ones most generally grown are *common* and *German foxtail millet;* other varieties are the *Hungarian*, *Siberian*, and *Kursk foxtail millets.*

Reference: H.1.

See also BACTERIAL SPOT; GRASSES.

FRANKLINIELLA. *F. Fusca*
= TOBACCO THRIPS.

FRAPS FEEDING STANDARDS are expressed in terms of dry matter, digestible crude protein, and productive value (in THERMS of net energy). Because Fraps considers not only the true proteins but all nitrogenous substances in feeds, his standards are preferred by some to the ARMSBY FEEDING STANDARDS, particularly by poultry men who use them to calculate the energy of their rations.

NOTE: Many of Fraps' values were determined on feedstuffs that are not representative of products with the same name used today; e.g., most soybean meal contains much less fat (and therefore energy) and more protein than Fraps' values indicate. His values were also determined on slow-growing birds that may have had to use more feed for maintenance and less for production than present-day broilers.

FREED and *Dwarf Freed* are grain SORGHUMS.

FREMONT SORGO is one of the forage SORGHUMS.

FRENCH GRAY PEA.
See FIELD PEA (variety).

FRENCHWEED = PENNYCRESS.

FRIABLE means: easily crumbled or broken to powder.

FRINGED SAGEBRUSH (*Artemisia frigida*), also known as *fringed wormwood, estafiata,* and *pasture sagebrush,* is a half-shrub with a low, perennial, woody base. Its leaves are finely dissected and the flowers have a strong, camphor-like odor. This sagebrush species extends from Mexico, through the western United States and Canada, into Alaska; it prefers dry, coarse, or shallow loam soils. The plant basks in the glowing sunshine of southwestern summers and also withstands the frigid vigors of the Arctic.

Fringed sagebrush varies considerably in forage value in different places; it is highest in the Southwest, but is considered practically worthless, except during late fall and winter, on the cattle ranges of the northern plains and prairies.

Reference: U.6.

See also RANGE PLANTS.

FRINGED WORMWOOD
= FRINGED SAGEBRUSH.

FROG-EYE is caused by the FUNGUS *Cercospora sojina*, also known as *C. daizu.* This leaf spot disease appears on SOYBEANS rather late in the season. Although it affects other parts of the plant, the conspicuous phase of the disease is the "eye-spot" composed of a gray-to-tan central area, usually bordered by a narrow, darker margin. The leaves, when badly infected, fall prematurely. The disease also affects the stems and pods and is carried on the seed.

Diseased leaves and stems serve to carry

the fungus over the winter and lead to new infections in the spring.

Control: When the disease appears in a field, soybeans should not be planted on the land the following year.

Reference: C.9.

FROZEN SILAGE. *See* SILAGE.

FRUCTOSE = LEVULOSE.

FRUIT is the ripened PISTIL of a seed plant; a pea pod, a grain of wheat, a huckleberry, and a rose haw are all, botonically speaking, FRUITS.

FRUITING BODY is a complex FUNGUS structure that contains or bears spores and disseminates them.—*See also* NONPARASITIC SORGHUM-LEAF DISCOLORATIONS.

FRUITS, such as apples, peaches, plums, pears, and other surplus fruits, may be used to replace a part of the regular rations fed to livestock. The fruits contain SUGARS as main nutrients, but they are very low in protein.—*See also* FRUIT.

FRUIT SUGAR = LEVULOSE.—*See also* FRUITS.

FT. COLLINS SUDANGRASS. *See* SUDANGRASS (variety).

FUCACEAE are a seaweed family. —*See also* KELP.

FULCASTER, also known under many other names, is a soft winter wheat variety of COMMON WHEAT.

FULGHUM. *See* RED OAT (variety).

FULGRAIN. *See* RED OAT (variety).

FULHIO. *See* COMMON WHEAT (variety).

FULTEX. *See* RED OAT (variety).

FULTZ. *See* COMMON WHEAT (variety).

FULWIN. *See* RED OAT (variety).

FUMIGANTS are liquid or solid substances that form vapors which destroy insects, micro-organisms, etc. They are often used in soils or in closed structures. Widely used fumigants are CARBON DISULFIDE, METHYL BROMIDE, FORMALDEHYDE GAS, CARBON TETRACHLORIDE, and DOWFUME W-40.—*See also* SOIL FUMIGATION; RED HARVESTER ANT; WESTERN HARVESTER ANT.

FUMIGATION is a method of disinfection or disinfestation using FUMIGANTS as DISINFECTANTS or DISINFESTANTS.—*See also* SOIL FUMIGATION.

FUNGI. *See* FUNGUS.

FUNGICIDAL means: of, or pertaining to, FUNGICIDES; e.g., fungicidal dusts.

FUNGICIDES are chemical substances which kill FUNGI. They may be applied to plants or seeds as spray or dust; e.g., for SEED TREATMENT.

ARASAN, BORDEAUX MIXTURE, CERESAN, CERESAN M, COPPER CARBONATE, COPPER SUBSULFATE, DICHLORONAPHTHOQUINONE, DITANE, FORMALDEHYDE SOLUTION, PANOGEN, PARIS GREEN, PARZATE, PHYGON, SPERGON, SULFUR, and TERSAN, are widely used fungicides.—*See also* FUNGUS.

FUNGI IMPERFECTI, or *imperfect fungi,* are a major FUNGUS group for which no sexual production of SPORES is known.

FUNGUS (plural: *fungi*), a very primitive plant, is a micro-organism. The fungi, lacking CHLOROPHYLL, live on living or decaying plant or animal matter.

The body of a fungus consists of delicate threads, or *hyphae,* many of which form branched systems called *mycelia.* Many fungi multiply by forming SPORES at the ends of, within, or on specialized hyphae.

Classification of fungi is based on the manner in which the spores are produced and the appearance of the FRUITING BODIES from which the spores are disseminated. The sexual activity of some fungi consists in the fusion of male and female cells; others produce sexual spores; and one group, consisting of the FUNGI IMPERFECTI, is characterized by the nonsexual type of spore formation. Some fungi produce both sexual and nonsexual spores. A fungus in its *perfect,* or *sexual* stage, sometimes has a name different from the one in its *imperfect,* or *unsexual* stage; e.g., GLOMERELLA (perfect stage) and COLLETOTRICHUM (imperfect stage), or MYCOSPHAERELLA (perfect) and CERCOSPORA (imperfect).

NOTE: The Botanical Congress of 1905 set up certain rules in regard to botanical nomenclature; one of them states that a plant could have only one proper Latin binominal, and that in the case of fungi, possessing two or more morphological forms, the name applying to the *perfect* stage should have preference. However, this rule is not always observed because

of long association of a disease with the name of the imperfect stage; e.g., *Cercospora* leaf spot instead of *Mycosphaerella* leaf spot of peanut.

Higher fungi are the *Saccharomyces* spp., commonly known as YEASTS. MOLDS are fungi, found on damp or decaying matter.

Among the more important fungus species, causing FUNGUS DISEASES, are the following: *Alternaria* spp.; *Aristastoma oeconomicum; Ascochyta* spp.; *Aspergillus* spp.; *Beauveria globuliferia; Botrytis cinera; Candida* spp.; *Cephalosporium gregatum; Ceratophorum setosum; Cercospora* spp.; *Cercosporina kikuchii; Claviseps* spp.; *Colletotrichum* spp.; *Curvularia lunata*; *Cymadothea trifolii; Diaporthe phaseolorum; Diplodia theobromae; Empusa sphaerosperma; Entyloma oryzae; Erysiphe polygoni; Fusarium* spp.; *Gleocercospora sorghi; Glomerella cingulata; Helicoceras oryzae; Helmintosporium* spp.; *Kabatiella* spp.; *Leptosphaeria* spp.; *Macrophomina phaseoli;* MOLDS; *Mycosphaerella* spp.; *Neovosia horrida; Ophiobolus* spp.; *Pellicularia filamentosa; Penicillium* spp.; *Periconia circinata; Peronospora* spp.; *Phialea temulenta; Phoma trifolii; Phyllosticta glumarum; Phytophthora drechsleri; Piricularia oryzae; Pleospora herbarum; Pseudopeziza* spp.; *Pseudoplea trifolii; Puccinia* spp.; *Pythium* spp.; *Ramulispora sorghi; Rhizoctonia* spp.; *Rhizopus* spp.; *Rhynchosporium* spp.; RUSTS; *Saccharomyces* spp.; *Sclerotinia* spp.; *Sclerotium* spp.; *Scolecotrichum graminis; Septoria* spp.; SMUTS; *Sphacelotheca* spp.; *Stemphylium sarinaeforme; Tilletia* spp.; *Torulopsis* spp.; *Urocystis* spp.; *Uromyces* spp.; *Urophlyctis alfalfae;* and *Ustilago* spp.—*See also* CLOVER LEAF WEEVIL; CHINCH BUG; BLACK POD.

FUNGUS DISEASES, caused by a great variety of FUNGI, include these plant diseases: ALTERNARIA LEAF SPOT; ANGULAR LEAF SPOT; ANTHRACNOSES; ASCOCHYTA BLIGHT COMPLEX; ASCOCHYTA BLIGHT OF COTTON, ASCOCHYTA BLIGHT OF PEA, ASCOCHYTA FOOT ROT, and ASCOCHYTA STEM CANKER; BARLEY STRIPE; BLACK KERNEL; BLACK LOOSE SMUT; BLACKPATCH; BLACK SHEATH ROT; BLACK STEM OF CLOVER and BLACK STEM OF OATS; BLAST OF RICE; BORDERED SHEATH SPOT; BOTRYTIS STEM CANKER; BROWN-BORDERED LEAF SPOT; BROWN PATCH; BROWN SPOT OF LUPINE, BROWN SPOT OF RICE, and BROWN SPOT OF SOYBEAN; BROWN STEM ROT; CHARCOAL ROT; CLOVER RUST; COLLETOTRICHUM STALK ROT; COMMON BUNT; COMMON LEAF SPOT; CONCEALED DAMAGE IN SEED; CORN SMUT; COVERED SMUT OF BARLEY and COVERED SMUT OF OATS; COWPEA WILT; CROTALARIA ANTHRACNOSE; CROWN ROTS, CROWN RUST, and CROWN WART; CULM ROT; DAMPING-OFF; DOWNY MILDEWS, e.g., DOWNY MILDEW OF ALFALFA and DOWNY MILDEW OF SOYBEAN; DWARF BUNT; ERGOT; FALSE ANTHRACNOSE OF VETCH; FLAG SMUT OF WHEAT; FOOT ROTS; FROG-EYE; FUNGUS LEAF DISEASES; FUSARIUM ROOT ROT, FUSARIUM STALK ROT, FUSARIUM WILT OF ALFALFA, and FUSARIUM WILT OF FIELD PEA; GRASS SMUTS; GRAY LEAF SPOT; GRAY MOLD; HEAD DISEASES; HELMINTHOSPORIUM LEAF SPOT; KERNEL SMUT OF RICE and other KERNEL SMUTS; LARGE BROWN PATCH; LEAF AND POD SPOT; LEAF BLIGHT; LEAF BLOTCH; LEAF DISEASES; LEAF RUSTS; LEAF SMUT OF RICE; LEAF SPOT OF PEANUT and other LEAF SPOTS; LESPEDEZA ANTHRACNOSE; LOOSE SMUTS OF BARLEY and LOOSE SMUT OF WHEAT; LUPINE ANTHRACNOSE; MILDEWS; NORTHERN ANTHRACNOSE; NORTHERN CORN LEAF BLIGHT; OAT LEAF SPOT; PEA ANTHRACNOSE; PEPPER SPOT; PERICONIA ROOT ROT; PLEOSPORA LEAF SPOT; POD AND STEM BLIGHT; POWDERY MILDEW; PSEUDOPEZIZA LEAF SPOT; PURPLE SEED STAIN; PYTHIUM ROOT ROT; REDDISH-BROWN SHEATH ROT; RED LEAF SPOT; RHIZOCTONIA STALK ROT; ROOT AND STEM ROT, ROOT ROT OF SAFFLOWER, and other ROOT ROTS and ROTS; "ROTTEN NECK"; ROUGH SPOT; RUSTS, e.g., SAFFLOWER RUST; SCALD; SCLEROTINIA STEM ROT; SEEDLING BLIGHT; SEED ROT; SEPTORIA BLIGHT OF WHEAT; SHAKES; SMUTS; SOIL ROT; SOOTY BLOTCH; SOOTY STRIPE; SORGHUM RUST; SOUTHERN ANTHRACNOSE, SOUTHERN BLIGHT, and SOUTHERN CORN LEAF BLIGHT; SPOTS; STALK DISEASES, such as STALK ROTS; STEM CANKER OF CROTALARIA and other STEM CANKERS; STEMPHYLIUM LEAF SPOT; STEM ROT OF RICE; STEM RUST OF OATS and other STEM RUSTS; STEM SMUTS; STRIPE RUST and STRIPE SMUTS; SUGARCANE STALK

ROT; SUMMER BLACKSTEM; TAKE-ALL; TARGET SPOT; VETCH ANTHRACNOSE; VICTORIA BLIGHT; VIOLET ROOT ROT; WEAK NECK; WHEAT SCAB and WHEAT STEM RUST; YELLOW LEAF SPOT; YELLOWS; and ZONATE LEAF SPOT.—*See also* POTATO LEAFHOPPER; VELVETBEAN CATERPILLAR.

FUNGUS LEAF DISEASES are distinguished from BACTERIAL LEAF DISEASES by roughened leaf spots which are due to the presence of fungal FRUITING BODIES.—*See also* FUNGUS DISEASES.

FUSARIUM. The FUNGI *F. avenaceum*, *F. culmorum*, *F. graminearum*, and other *Fusarium* spp. cause WHEAT SCAB. Various species,—e.g., *F. oxysporum*, *F. solani*, *F. moniliforme*, and *F. roseum*—are associated with FUSARIUM ROOT ROT. *F. oxysporum*, *F. medicaginis*, and other *Fusarium* spp. cause FUSARIUM WILT OF ALFALFA; *F. oxysporum* f. *cheiphilum* causes COWPEA WILT; *F. orthoceras* var. *pisi* causes FUSARIUM WILT OF FIELD PEA.

Fusarium spp. are among the causes of CONCEALED DAMAGE IN SEED and of SEED ROT; *F. culmorum* and *F. moniliforme* cause SEEDLING BLIGHT; and the last-named species also causes FUSARIUM STALK ROT.—*See also* CHARCOAL ROT; ERGOT; CLOVER ROOT CURCULIOS; CLOVER ROOT-BORER; BAHIAGRAS.

FUSARIUM BLIGHT

= FUSARIUM WILT OF ALFALFA.

FUSARIUM HEAD BLIGHT

= WHEAT SCAB.

FUSARIUM ROOT ROT plays a major role in CLOVER failures. Several *Fusarium* spp. are associated with this bad disease; these include *F. oxysporum*, *F. solani*, *F. moniliforme* and *F. roseum*. These FUNGI enter the host plants through wounds in the crown and the tap root and are responsible for a severe thinning of plants during the second year. These fungi also kill some seedling plants during the first year.

Infected plants have several symptoms: The top growth may be stunted or wilted and the leaflets of large plants often show yellow or red discoloration of the margins; and at least a part of the vascular system of the tap root is dark in color. This disease is generally associated with injuries to the root system caused by the CLOVER ROOT CURCULIOS or by the CLOVER-ROOT BORER.

Fusarium root rot also attacks other plants, e.g., LUPINES and FIELD PEAS.

Control of this disease depends on the control of insects that feed on the root system of the plant.

References: E.5; W.8.

FUSARIUM STALK ROT, caused by the FUNGUS *Fusarium moniliforme*, occurs in the northern part of Texas. This STALK ROT produces symptoms almost the same as those of CHARCOAL ROT. Instead, however, of small black SCLEROTIA which are visible to the naked eye, this fungus produces within the dried rotted stalks of SORGHUMS a powdery mass of white spores that can be seen individually only with the aid of a microscope. The fungus invades the sorghum plant through openings made by insects or mechanical injuries. It grows rapidly after it once gets into the stalk and soon causes it to break over at the base.

Control: Some varieties seem less susceptible than others to this fungus, but no definite statements on varietal reaction can be made at present.

Reference: L.1.

FUSARIUM WILT OF ALFALFA, or *fusarium blight*, is a FUNGUS DISEASE caused by *Fusarium* spp., especially *F. oxysporum* f. *medicaginis*. It may be easily confused with BACTERIAL WILT of alfalfa. In fusarium wilt, which occurs from northeastern Mississippi as far north as Virginia and in the southern part of California, the root is more deeply discolored than in bacterial wilt, but wilting and death are not preceded by dwarfism or discoloration of the foliage.

Reference: J.2.

FUSARIUM WILT OF FIELD PEA, caused by the FUNGUS *Fusarium orthoceras* var. *pisi*, is characterized by a rapid wilting of the vines without a conspicuous rotting of the roots.

Control: Rotation of field peas with other crops is recommended.

Reference: M.24.

FUSED is a mineral or other inorganic material sintered and then cooled to form a compact mass; e.g., fused CALCIUM PHOSPHATE.

G

GADIDAE is a family of fish to which the *Gadus* spp. belong.—*See also* GADUS; VITAMINS.

GADUS. Cod liver oil is obtained from livers of species of the family Gadidae, especially of *Gadus morrhuae.*—*See also* VITAMINS.

GALACTAGOGUE is any substance which promotes the flow of milk; e.g., FENNEL.—*See also* FEED INGREDIENTS.

GALACTOSE is a water-soluble sugar derived from milk sugar (LACTOSE).—*See also* REDUCING SUGARS.

GALGALOS is a soft spring variety of COMMON WHEAT.

GALL = KNOT.—*See also* CROWN WART; ROOT KNOT NEMATODES; WHEAT JOINTWORM.

GALLETA (*Hilaria jamesii*), often called *curly grass* (or—erroneously—*curly mesquite*), grows in patches forming an open turf. It reproduces and increases largely by means of short rootstocks beneath the ground. Ordinarily the leaves are 2 to 5 in. long and they curl up when dry. The flower stalks are often 8 to 15 in. in height. In some years when precipitation is favorable, two crops of seed stalks and seed are produced.

Galleta, one of the most common GRASSES on the winter range, grows on the valley slopes, the best growth occurring with summer rains.

Galleta is one of the desirable forage species on the *winter range.* It is readily utilized by sheep and on properly grazed range about half of the herbage is eaten. It withstands heavy grazing because of the rootstocks.

Reference: H.41.

See also PASTURE PLANTS; RANGE PLANTS.

GAMBLE OAK (*Quercus gamebllii*) is one of the poisonous OAK species.—*See also* POISONOUS PLANTS.

GAMMA-TOCOPHEROL.

See VITAMIN E.

Galleta plant and single spike. (H.26.)

GARBAGE is animal and vegetable refuse; it is usually collected by contractors from kitchens or from cooking and feeding operations. Depending on its origin, garbage varies widely in its composition and feeding value; best quality garbage comes from restaurants. It must be fresh and free from injurious material. Most states now have laws that require boiling of garbage for thirty minutes for the prevention of *V.E.* (vesicular exanthema) *disease;*