STORAGE

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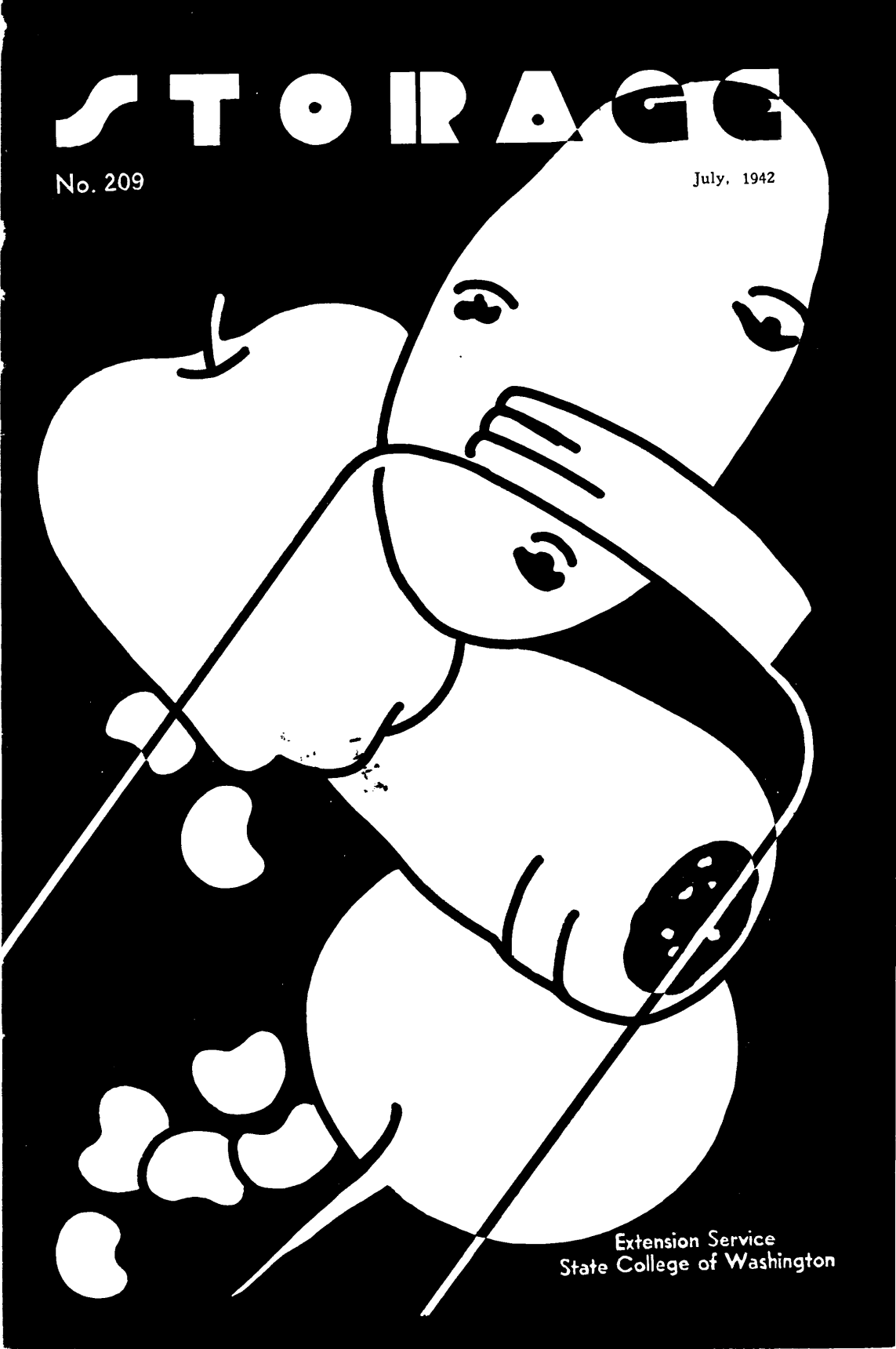

Extension Service
State College of Washington

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Home Fruit and Vegetable Storage

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Fruits and vegetables are at their best when fresh. Many of them may be stored to extend the period during which they are available in fresh form. Storing them also reduces the cost of the family food supply.

TEMPERATURE

Temperature is the most important single factor to be considered in storing fruits and vegetables, provided they have been harvested at the right stage of maturity and treated properly following harvest. Low temperature is reached by replacing warm inside air with cold outside air. For most fruits and vegetables the tempera-

Table 1. Recommended Storage Conditions and Approximate Maximum Storage Period For Fruits and Vegetables

Crop	Temperature (°F.)	Relative humidity, (per cent)	Maximum storage period
Asparagus	32	95 to 98	1 week
Beans, lima	32	90 to 95	2 to 3 weeks
Beans, snap	40	90 to 98	12 days
Beets	32 to 40	90 to 95	4 to 5 months
Broccoli, sprouting	32	95 to 98	10 days
Brussels sprouts	32	95 to 98	2 months
Cabbage	32 to 40	90 to 98	5 months
Carrots	32 to 40	90 to 95	6 months
Cauliflower	32	90 to 98	30 to 40 days
Celery	32	90 to 98	3 to 5 months
Cucumbers	32 to 40	95 to 98	4 to 5 weeks
Eggplants	32	90 to 95	3 to 4 weeks
Kale	32	95 to 98	1 month
Lettuce	32	95 to 98	3 to 4 weeks
Muskmelons, immature	50	80 to 90	2 weeks
Muskmelons, mature	32	80 to 90	1 month
Onion and onion sets	31 to 32	80 to 95	5 months
Parsnips	32	90 to 95	5 months
Peas, green	32	95 to 98	2 weeks
Peppers	32	95 to 98	40 days
Potatoes	35 to 40	85 to 90	5 to 6 months
Pumpkins	40	50 to 70	2 to 3 months
Rutabagas	32 to 40	90 to 95	3 to 4 months
Squash	40	50 to 70	5 months
Sweet corn	32	90 to 98	3 to 4 weeks
Sweet potatoes	55	50 to 70	4 months
Tomatoes, green	50 to 60	95 to 98	1 month
Tomatoes, ripe	40	95 to 98	10 days
Apples	32	80 to 90	3 to 6 months
Pears	32	80 to 90	3 to 6 months
Filberts	32 to 50	70 to 75	6 months
Walnuts	32 to 50	65 to 70	6 months

ture should be as low as can be reached in the home storage without freezing.

Fruits and vegetables in storage carry on life processes if suitable conditions are provided. These processes are more rapid at high temperatures than at low temperatures. Winter apples, for example, in good condition for storage keep eight months at 32° F. but only one month at 70° F. Low temperature, therefore, by slowing down life processes, extends the life of products in storage.

In regions where there is danger of freezing within the storage, a means of protection must be provided. To determine when protection is needed, hang a thermometer inside the storage where the temperature is likely to go too low. Keep all ventilators closed when there is danger of freezing. The door may be left ajar in basement storages; in out-of-door storages live coals or a small heater may be used. To keep the temperature down in the fall and spring, open the ventilators in the evening and close them in the morning.

HUMIDITY

Humidity is an important factor to be considered when storing fruits and vegetables. Without high humidity (damp atmosphere) some of them shrivel badly, although others keep best in a relatively dry atmosphere. The preferred humidity for the various products is given in Table 1.

The products commonly kept in the home storage may be divided into two groups; namely, those requiring high humidity and those requiring low humidity. To provide suitable humidity for each, it is suggested that the storage may be divided into two compartments, with the products requiring humidity above 70 per cent in one (referred to as the moist room) and those requiring 70 per cent or below in the other (called the dry room). Canned goods also may be placed in the dry room. Here the development of molds is less than in the moist room.

Humidity, adequate for high humidity products, is usually maintained automatically in pit storages, and in above-ground and basement storages with dirt floors. When concrete floors are used in above-ground and basement storages, means of increasing the humidity are necessary. A common practice is to add two or three inches of sand on which is placed a slatted, false floor. Sprinkling the floor with water occasionally, helps to keep the humidity up. Where these methods are inadequate, humidifiers of various types may be installed. Discarded burlap with water dripping from it

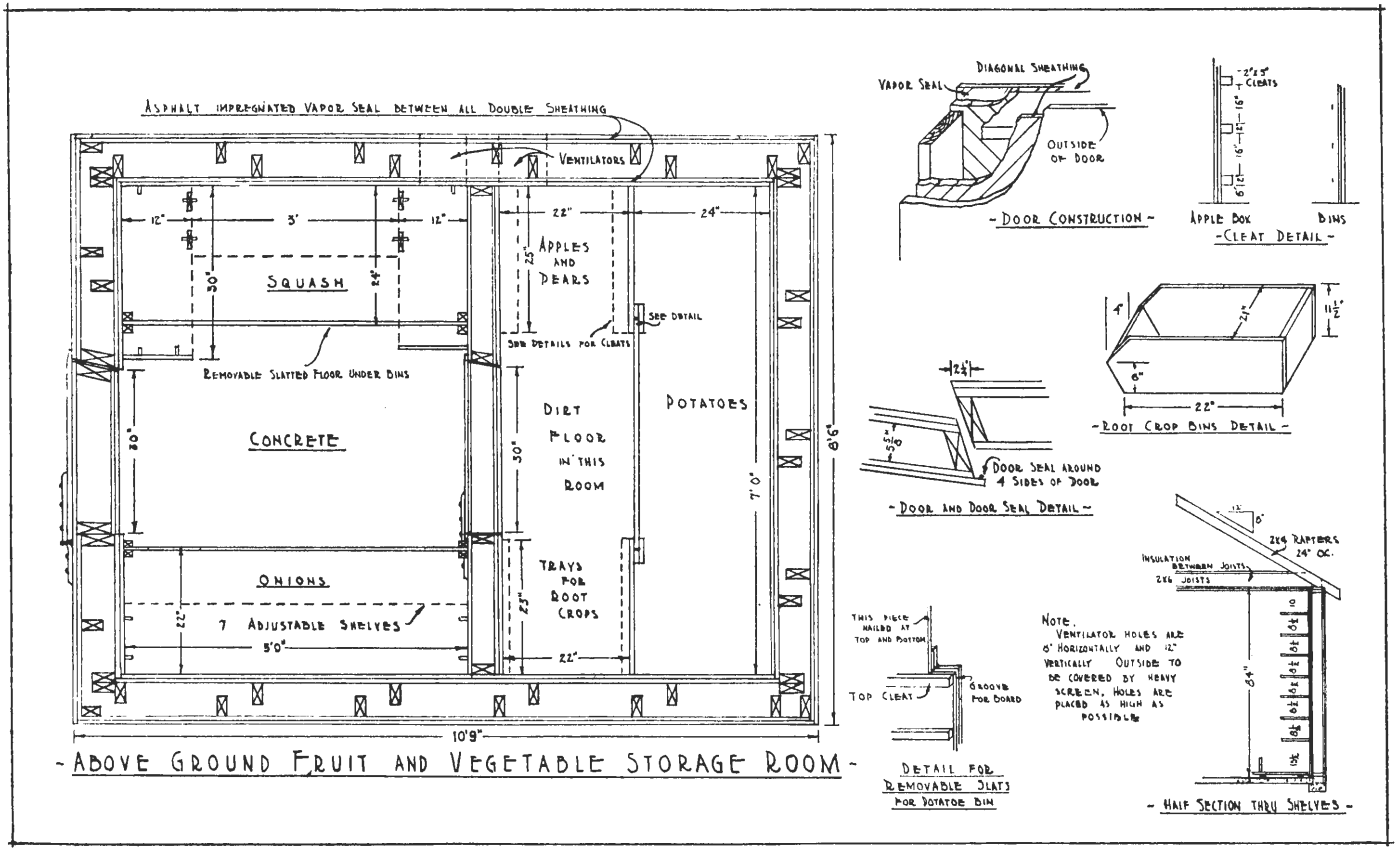
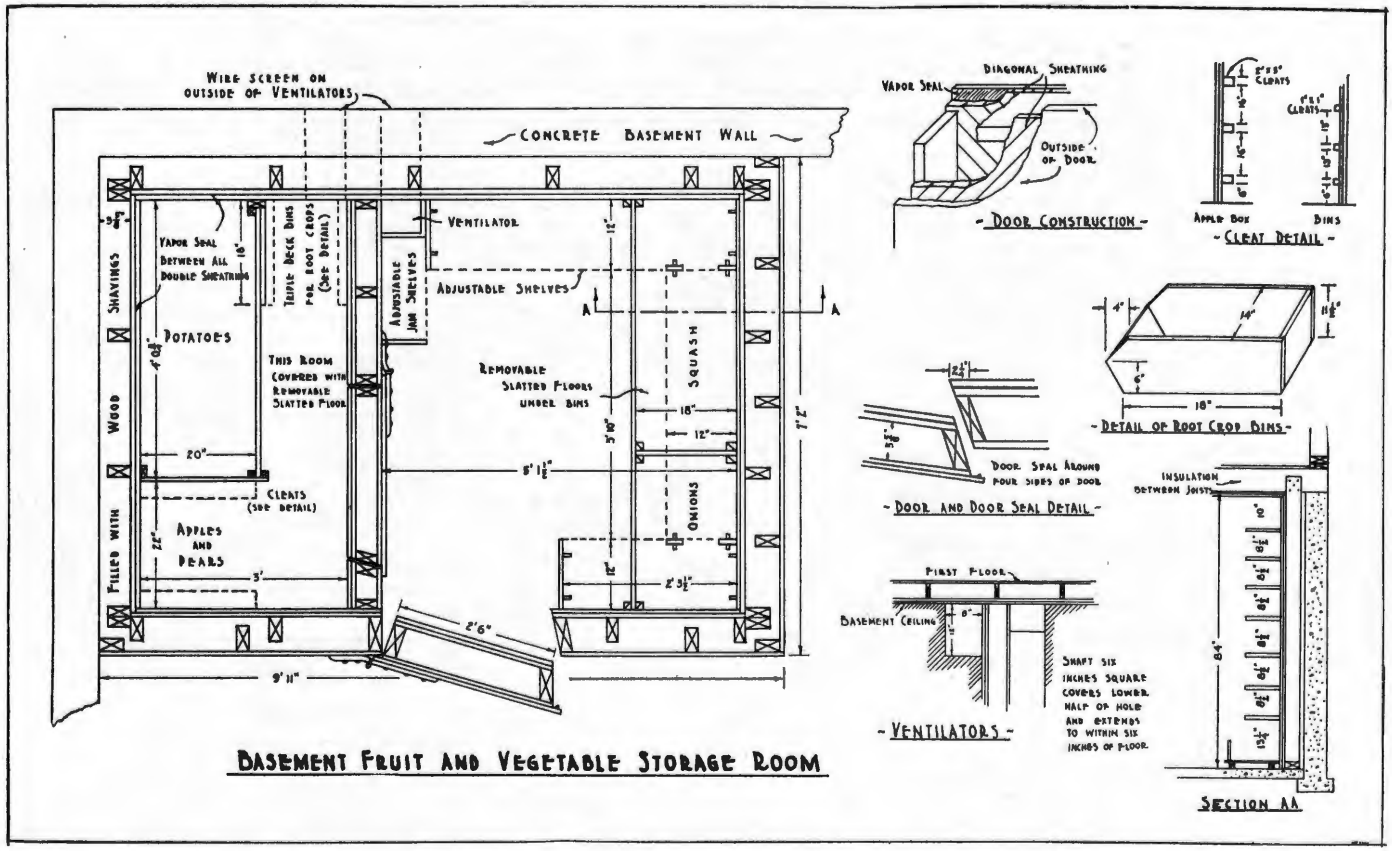


Fig. 1. Aboveground fruit and vegetable storage, separate from the house. Note moist room for high humidity crops and dry room for low humidity crops. Shelves in dry room for canned goods are removable; those in one section are adjustable. Bin partitions are removable to aid in keeping the storage clean.



BASEMENT FRUIT AND VEGETABLE STORAGE ROOM

Fig. 2. Basement fruit and vegetable storage with a humid and a dry room. Bins for carrots, beets, parsnips and similar root crops are in the form of drawers, one above another. Shelf cleats for apple boxes are built in. Shelf arrangement in dry room is the same as for the above ground storage, shown in Figure 1, except that a section of shelves for jam is added.

may be used, or air may be drawn through a moist layer of excelsior or burlap by use of a fan.

VENTILATION

Ventilation is a means of regulating temperature and humidity. It may also eliminate odors that might otherwise be taken up by certain crops. Warm air being lighter than cold air provides a natural means of ventilation. Cold air must be allowed to come in and displace warm air. Ventilators with shutters similar to those in heat registers are satisfactory. Dampers of various kinds are used also.

The size of the ventilator varies with the capacity of the storage. The equivalent of one square foot of ventilating surface per 1000 cubic feet of space within the storage is adequate.

The location of the ventilator is influenced by several factors. One placed just below the ceiling, although somewhat slower than one here and another at the base, provides complete exchange of air. Inasmuch as a rapid change of air is not usually necessary in small storages, it appears that placing the ventilators, as many as needed, just below the ceiling is the best plan for basement and above-ground storages (Figs. 1 and 2).

In small pit storages, ventilators are not essential except during the first part of the storage period. When they are included, they vary in type from a continuation of the first layer of straw, exending up through the roof at the peak, to a box shaft perforated with holes in its area within the storage. Several small posts extending from the bottom of the pit to six inches above the peak are sometimes used. As soon as cold weather sets in, the ventilators must be closed. A simple type that can be removed and replaced with material used in covering the products offers advantages in this respect.

The temperature of fruits and vegetables immediately following harvest usually is higher than that at which they should be stored. This heat contained by the products themselves should be eliminated either before or after the products are placed into storage. Ventilators in the storage permitting cold air to come in and warm air to go out, usually take care of the situation. In small pit storages the heat is permitted to escape by withholding part of the covering during the first part of the storage period.

INSULATION

Constantly fluctuating conditions prevent satisfactory storage. Adequate insulation does much toward minimizing temperature

and humidity changes. Suitable insulating material can usually be obtained at low costs. The insulating value of numerous materials is given in Table 2. These should be used according to directions by the manufacturers.

The relative position of the insulating material and the siding of a wall influences the insulating value of the material. For example, a wall made by placing one inch insulating boards on either side of 2 x 4 studdings has an insulating value of five. Adding a third board in contact with one of the others increases the value to 6.5, but placing it in the middle of the sealed air space raises it to 7.5.

Table 2 — Insulating Values of Materials

Material	"Internal resistivity" based on sample 1 foot square, 1 inch thick.	
Air space, no radiation or convection (ideal condition, not found in ordinary construction)	5.70	excellent
Flexible (grass, hair, wood and similar fiber), weighing from 2 to 13 lb. per cu. ft.	3.70	good
Fluffy rock, slag or other mineral fiber, weighing about 12 lb. per cu. ft.	3.33	good
Nonstructural (cork board without artificial binder, or "low-density" fiber boards) weighing about 10 lb. per cu. ft.	3.33	good
Cork particles, 3/16 inch in diameter, weighing about 10.7 lb. per cu. ft.	3.22	good
Semi-rigid (grass, flax, and similar fiber), weighing about 13 lb. per cu. ft.	3.12	good
Structural (bagasse, cornstalk, straw, wood, and similar fiber), weighing from 15 to 19 lb. per cu. ft.	3.03	good
Sawdust, dry, various kinds, weighing about 12 lb. per cu ft.	2.44	fair
Shavings, dry from planer, weighing about 9 lb. per cu. ft.	2.44	fair
Dry fluffy gypsum, weighing about 24 lb. per cu. ft.	2.08	fair
Dry cellular gypsum, weighing about 18 lb. per cu. ft.	1.70	fair
Plaster, gypsum	.30	poor
Brick, common	.20	poor
Cinder concrete, weighing about 110 lb. per cu. ft	.19	poor
Concrete weighing about 150 lb. per cu. ft.	.084	poor
Concrete weighing about 150 lb. per cu. ft., 8 inches thick	.672	poor
Hollow tile, horizontal flues, 4 inches thick	1.00	poor
Hollow tile, horizontal flues, 6 inches thick	1.56	poor
Hollow tile, horizontal flues, 8 inches thick	1.67	poor
Hollow tile, horizontal flues, 10 inches thick	1.73	poor
Hollow tile, horizontal flues, 12 inches thick	2.50	poor
Concrete block, 8 inches thick	1.00	poor
Concrete block, 12 inches thick	1.25	poor

TYPES OF STORAGE

Most rural and many urban families in the state have a fruit and vegetable garden this year. If the products grown in these gardens are to be used to best advantage, a suitable place for stor-

ing them must be available. The type of storage to be constructed where one is not already available will depend upon such factors as (1) the quantity of products to be stored; (2) the amount to be spent in building it; (3) the permanence desired; (4) the necessary protection from winter temperatures, and (5) the depth of the soil above the water table.

The storage need not be expensive. A shallow trench or pit in the garden, for example, may be built at no cash outlay and with little labor. A modern basement or above-ground storage, on the other hand, may mean an appreciable expenditure. The cash cost of such a storage need not be high, however, inasmuch as the construction involves considerable labor, most of which the owner can do. Although the simple types are not as satisfactory as those which are more elaborate, they serve very well.

UNDERGROUND STORAGE

The earth, in contact with the storage room, influences conditions within. This influence may be an advantage or a disadvantage. In the fall when the soil temperature is higher than that within the storage, the soil tends to hold the temperature up. In the winter when the temperature of the surrounding soil is approximately 40° F., it is difficult to bring the inside temperature down to much below this point because of the soil. The surrounding soil, on the other hand, usually contains considerable moisture which aids in maintaining a high humidity within the storage.

PIT STORAGE

The pit is one of the simplest types. It consists of a leveled-off spot of ground or of a hole in the ground with dimensions varying according to the desired capacity. The site for the pit must be well drained. To locate such a spot in sections of heavy winter rains requires special effort. If a suitable site is not available, a high place in the corner of the garden may be built in a few minutes with a shovel (Fig. 3).

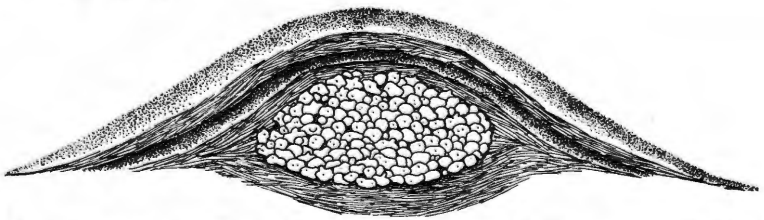


Fig. 3. Pit storage above ground level. Small pits, each holding a supply that can be taken out at one time, avoids the necessity of opening and closing a larger pit. The ventilator for the early storage period has been removed and the winter protection has been put on.

Several small pits instead of one large one may be used so that all the vegetables of a single pit may be removed at once. When this plan is followed, some of each of the vegetables are placed in each pit. This practice is most desirable in extremely cold areas where opening and closing the pit may cause injury to the products.

The Above Ground Pit

Vegetables may be stored on top of the ground. Level off a spot and cover it with three or four inches of straw. Pile approximately 150 pounds of vegetables or a month's supply on the straw, bringing the pile to a point. Cover the pile with three inches of straw and then with two inches of soil, leaving the soil off the tip of the pile. Fill an apple box or similar container with straw and invert it over the top of the pile. The straw serves as a ventilator and also keeps out rain and freezing temperature. When the soil crusts over or when cold weather arrives, remove the apple box and complete the two-inch layer of soil over the entire pile. Add a four inch layer of straw to the entire pile and finally five or six inches of soil or as much as needed to furnish winter protection.

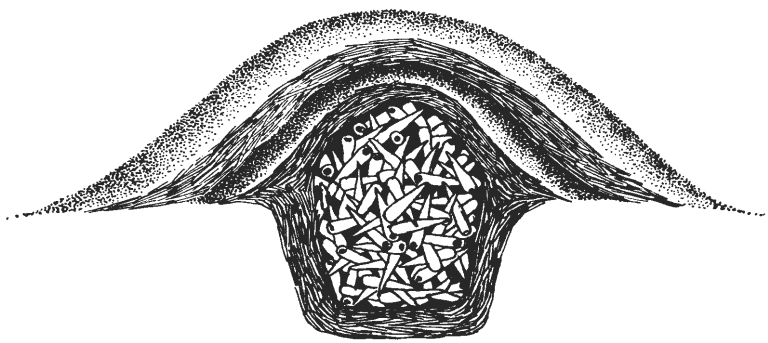


Fig. 4. Shallow pit storage with covering placed directly onto products. Not easy to open and close. Top may cave in as products are removed. Several different kinds of vegetables may be stored in the same pit. Arranging them so that some of each can be obtained through the same opening makes for convenience.

The Below Ground Pit

Line the pit with five or six inches of clean straw or similar material. Dry squash or tomato vines may be used. Bring the pile of products to a point and cover it with three or four inches of straw. Complete the covering as described under "the above-ground pit". The products are removed from the pit by making an opening through the covering near one end.

The roof structure of pit storages varies according to the size of the pit. When only two or three hundred pounds of products

are to be stored, the straw may be placed directly over the products as just described. When a large quantity is to be stored, a roof suport is needed (Fig. 5). A substantial, well-anchored ridgepole placed over the center of the pit, leaving a 10 to 12 inch space between the ridge-pole and the top of the pile forms the peak of the

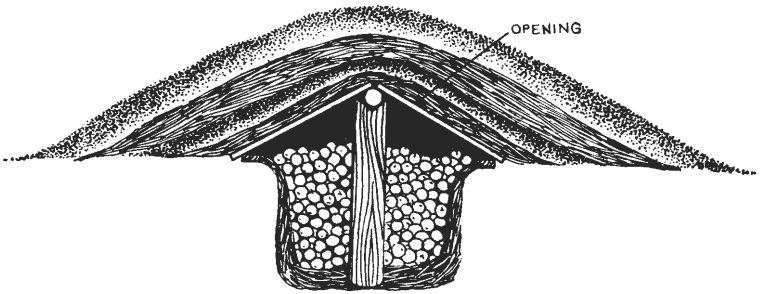


Fig. 5. Shallow pit storage with roof support. Same as Figure 4 with the addition of a roof support. The roof support keeps covering from caving in as products are removed.

roof. Place a light pole flattened on one side or a 2 x 4, on the side shoulders of the pit. A pitch of 20 to 30 degrees is desirable; if too steep, it is hard to keep the covering in place. Old boards, slab wood and such material may be used for the under-structure of the roof. It is well to nail these lightly to the ridge pole to keep them from slipping off and dropping down onto the products. Leave openings between some of these, through which the products can be removed (Fig. 5). Put on three inches of straw and complete the covering as described under "the above ground pit".

SIDE HILL STORAGE

The storage may be located on a hillside (Fig. 6). Here less digging is required. This type is rather common in rolling areas where large quantities of products are stored. The amount of excavation is a matter of choice. The greater the excavation the less banking is necessary in making the roof. The pit should be deep enough to permit a seven foot ceiling with other dimensions varying according to the capacity needed. The pit usually is extended into rather than parallel with the bank. Because the pit is usually covered with soil, heavy supporting posts, sills and joists are necessary.

The walls may be made of plank, concrete, or stone, one of the latter being most common for the front wall because of the greater strength. The top of the front wall should be slightly higher than the soil line of the slope at that point to keep soil from rolling down

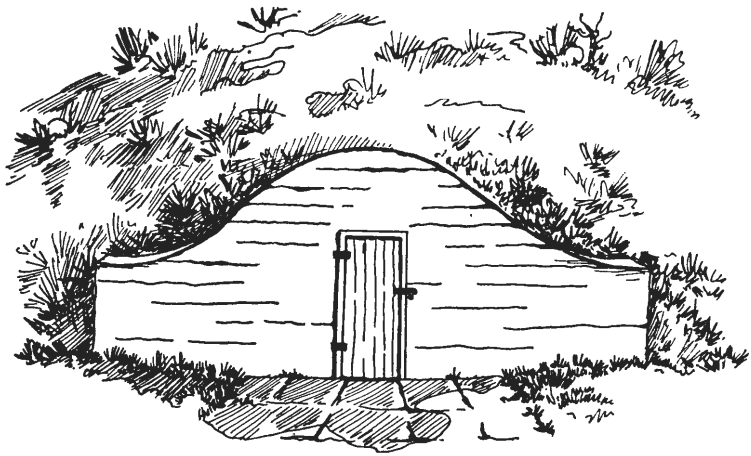


Fig. 6. Side hill storage. Common in areas where the land is rolling. The inside arrangement suggested in Figure 2 may be used.

onto the floor at the entrance. An insulating wall may be added on the inside, although this practice is not common except with the front wall.

After the sills and ceiling joists are put into place, a heavy wire netting to support the material to be put on later is stretched over the joists. A layer of straw two or three feet deep is then spread over the netting. Planking or a concrete floor may be used instead of the netting in which case the layer of straw may be omitted. The under-structure should be substantial enough to support a team or tractor used in applying the soil. The layer of soil is put on immediately, the depth ranging from one to several feet. The arrangement within may be the same as that for basement or above-ground storages as described on pages 13 to 17 and shown in Figures 1 and 2.

Twelve-inch tile extending through the roof and above the soil are often used as ventilators. In the absence of tile, a wooden shaft 16 to 18 inches square may be used. The number of ventilators should vary according to the size of the storage. If the storage is more than 12 feet long, one should be placed in the center and another at the rear. Intakes may be put at the base of the front wall, or the door may serve.

CELLAR OR CAVE

Fruits and vegetables are sometimes stored in caves or cellars dug solely for this purpose (Fig. 7). These are dug completely in the ground or to a depth of about four feet, leaving four feet above ground to be covered with soil. The size varies according to the

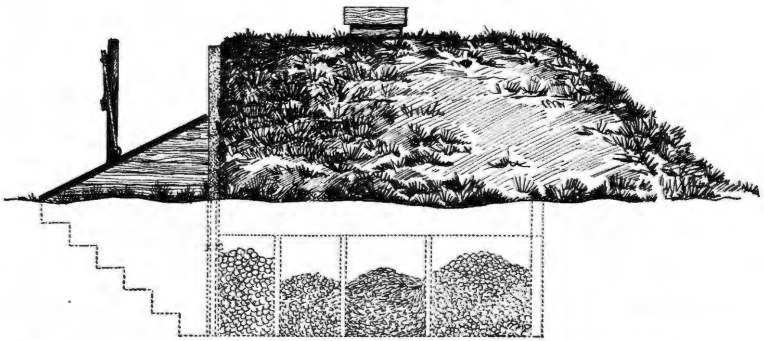


Fig. 7. Cellar or cave. Often used in areas of level land. The inside arrangement suggested in Figure 2 may be used.

capacity desired. A ventilator in the ceiling to avoid too much dampness is a desirable feature. The door usually serves an an intake for cold air.

This type of storage, having an entrance door, is more convenient than most other pit storages. Being away from the house and below ground, it is not as convenient as the basement type. The inside arrangement suggested for basement or above-ground storages may be used.

ABOVE-GROUND STORAGE

The above-ground type is used where under-ground types are not practical or desirable (Fig. 1). This type provides an easy entrance, which is not true of those underground; it also eliminates the inconvenience of an awkward opening as is used in small pits.

Because the storage is visited frequently by the housewife, it should be located near the kitchen when possible. It is well to consider the appearance of the landscape also when choosing the location.

The building, usually of wood construction, is well insulated and equipped for maintaining a low temperature and a high humidity in one part and a low humidity in the other. The dimensions vary according to the capacity desired, a common size being 8 x 12 feet with an 8-foot ceiling. Space should be provided for canned goods and the winter's supply of fresh fruits and vegetables. The plan suggested in Figure 1 is adequate for a family of five. If stock carrots and mangels are to be stored in it, the capacity must be increased.

It is well to build the storage large enough to hold the maximum amount of fruits and vegetables normally stored by the family

at any one time. In the case of families producing their own fruits and vegetables, capacity for all of the winter's supply is needed. Families who purchase them, part at a time, need capacity for the largest supply purchased at any one time. Purchasing a complete supply in the fall and storing it, may offer advantages in convenience and money saving, enough to justify enlarging the storage for this purpose.

The door is in one end, opening into the dry room. Placing the outside door here and using the first room for low humidity crops and canned goods buffers the temperature and humidity fluctuations of the second room, caused by opening and closing the outside door. Fluctuations of the second room are still further reduced by closing the outside door before entering the second room.

WALLS

Walls with 2 x 4 studdings are commonly used. Staggering the studdings provides a continuous layer of insulating material (Figs. 1 and 2).

The siding on the outside should be moisture proof to keep the insulating material dry if sawdust or shavings are used. That on the inside should be moisture proof in any event. Two layers of siding, shiplap on the inside and six-inch rustic or drop siding on the outside, with moisture proof paper between may be used. Low grade shingles laid six inches to the weather over moisture proof paper and shiplap, make a good wall at relatively low cost. The wall is filled with insulating material, several types of which are listed in Table 2.

CEILING

The moisture-proof construction described for the wall is also used for the ceiling. Insulating material is placed between the joists at rates specified by the manufacturers. Sawdust and shavings should be approximately five inches thick. A shiplap floor is laid over the joists to protect the insulating material and to make the attic useable.

FLOORS

It is easier to maintain high humidity on a dirt floor than on a concrete floor. A dirt floor, therefore, is preferable in the humid room but a concrete floor is more suitable for the dry room. Concreting the traffic area of this room is sometimes practiced for convenience and to aid in keeping the storage clean.

A slatted false floor is almost essential in the humid room in the absence of a dirt floor. The slatted floor consists of 3 to 4 inch

boards laid 1½ inches apart on 2 x 2 joists. It is made in sections which can be removed easily for cleaning. A two or three-inch layer of sand under the false floor aids in maintaining the desired humidity.

ARRANGEMENT WITHIN THE STORAGE

If the storage space is to be used efficiently, it must be well planned. Careful planning adds not only to the efficiency but also to convenience. Bins are planned according to quantities of the products to be stored. Approximately two cubic feet of space is required for 100 pounds of products such as potatoes and carrots. Removable partitions, which can be taken out and aired for cleaning are desirable.

Table 3. Shelf Capacity Required for Different Containers

	Approx. width of jars (inches)	Approx. length of shelf required for 100 jars (feet)		Approx. height of jars (inches)	Height of shelf space required (inches)
		2 rows*	3 rows**		
GLASS JARS:					
Half-gallon	4¾	20	14	9¼	11½
Quart	3⅞	17	11	7	8½
Pint					
Wide mouth	3⅞	17	11	4	5½
Narrow mouth	3¼	14	10	5½	7
Half-pint	3	13	9	3¾	5¼
JELLY GLASSES:					
Tall	2⅞	12	8	3¾	5¼
Squat	3¾	16	11	2¼	3¾
TIN CANS:					
No. 2½	4¼	18	12	4¾	6¼
No. 2	3½	15	10	4⅝	6
JUGS:					
Gallon	6½	28	19	12	13½
Half-gallon	5	21	14	10	11½
STONE JARS:					
3-gallon	10½	44	30	11	12½
2-gallon	9½	40	27	10	11½

$$* \frac{\text{Width of jars in inches}}{12} \times \frac{100}{2}$$

$$** \frac{\text{Width of jars in inches}}{12} \times \frac{100}{3}$$

Shelving is a major feature of the room in which canned goods are stored (Figs. 1 and 2). Shelves should be planned so that the jars are within easy reach. The highest shelf should not be over 72 inches from the floor nor the lowest one less than nine. Shelves wide enough to accomodate only two rather than three or more

rows of jars, are generally recommended because of the greater ease in placing jars onto and removing them from the narrow shelves. However, where space is limited, it may be necessary to include some wide shelves.

The shelving capacity should be determined by the total number of jars on the shelf at any one time. In addition to the space required for this number, some space should be left between jars to permit easy transfer to and from the shelves; allowing 20 to 25 per cent more space than needed for the total jars, takes care of this and also reduces the amount of shifting jars necessary when returning empties. The space shown in Figures 1 and 2 accomodates approximately 800 quart jars which provides ample space, assuming that the average family of five puts up approximately 600 quarts of canned goods.

The shelves should be removable so that they may be taken out for airing when the storage is being cleaned. Making part of them adjustable is desirable also. One section is adjustable in each of Figures 1 and 2. To make them adjustable, it is necessary to put in extra shelf rests or to make the rests adjustable. A simple method is to use dowel pins for rests and to bore extra holes so that to adjust the shelves, the dowels need only be removed and inserted in new holes as shown in Figures 1 and 2. To avoid confusion when adjusting the shelves from one size to another, half-inch dowels may be used for quarts or larger, and three-eight for smaller. The dowel pins may be allowed to protrude an inch to provide freedom in inserting and removing the shelves. Another method is to use shelf stripping.

The vertical space between shelves depends upon the sizes of the jars. Allowing an inch and a half above the jars makes for convenience in handling. The space necessary for the various containers is given in Table 3.

Quart jars are used more frequently than is any other size by the average family; pints are next. Assuming that the average family uses quarts and pints exclusively, a logical proportion of each for a family of five is approximately 500 quarts and 100 pints. Making all the shelves suitable for **quarts** and one section adjustable for **pints** and **two-quarts** takes care of the most likely variations from **quarts.**

The Basement Storage

A supply of fruits and vegetables in the basement is a convenience to the housewife. A suitable storage room, as shown in Fig-

ure 2, may be constructed if proper consideration is given to the storage requirements of the products to be stored. Good insulation is particularly necessary in order that the proper temperature and humidity may be maintained.

PAINTING THE STORAGE

Painting rules for the outside of other similar buildings are also applicable to the outdoor above ground storage insofar as preserving the wood is concerned. Finishing the inside not only makes it look better and last longer but also makes it easier to keep clean. Inasmuch as the inside is exposed to moisture, resulting from humidity within the storage and from washing, the finish should be waterproof and washable. Such a finish is particularly necessary for the shelves.

There are several wood preservatives that may be used. A simple inexpensive combination of materials consists of turpentine one part and boiled linseed oil two parts, applied hot. **Heat the linseed oil in a double boiler. Keep it away from an open flame. Destroy or spread out for airing all used rags.** After applying the turpentine and oil, permit it to dry about 30 minutes and then wipe off the excess material, rubbing with the grain. Boards so treated are not completely waterproof. Apply one or two coats of varnish for further water-proofing. This method preserves the natural appearance of the wood.

Another method of finishing the inside is to use ordinary house paint, applying one thin and one normal coat.

A third and more expensive method is to use an enamel. The enamel should be applied according to directions on the container.

PREPARATION OF PRODUCTS FOR STORAGE

The storage life of fruits and vegetables is influenced by their condition when placed into storage. Store only those which are sound and in good condition. Sort out injured specimens. Be sure they are in the proper stage of maturity for storing. Do not give valuable space to those that will soon lose quality and decay.

Cleaning the vegetables before placing them into storage aids in keeping the storage in a sanitary condition. If possible, dig root crops when the soil is fairly dry. Ordinarily, normal handling in getting them into the storage will clean them. Remove the tops of such crops as carrots about an inch from the crown. Wipe off

squash with a cloth if soil sticks to them. The loose husks of onions are sifted out fairly well by normal handling.

LEAVING VEGETABLES IN THE FIELD OVER WINTER

Parsnips, salsify, and horseradish may be left in the field and dug as they are used. Digging part of them in the fall after frosts have killed the tops and placing them into storage avoids the necessity of several diggings in the winter. In Eastern Washington where the ground sometimes freezes to a considerable depth this practice is particularly desirable. Where the soil does not freeze except on the surface, such root crops as carrots may be left in the field. When this practice is followed, they should be covered with three or four inches of soil to prevent freezing and thawing.

SPECIAL CONSIDERATIONS IN STORING MISCELLANEOUS CROPS

Dry Beans

As soon as the pods are mature, pull and allow the plants to dry. Shell the beans when dry enough, and place them in a tray to dry still further. When dry, place them in a container that can be closed tightly for weevil treatment. Pour carbon disulfide over them at the rate of one tablespoonful per two quarts, and close the lid tightly. **Because carbon disulfide is inflammable, it should be used cautiously.** Maintain a temperature of 60° F. or more during treatment. After treating for 48 hours, empty the beans in a suitable container out of doors for airing. Air them for 24 hours, and then place them in metal or glass containers that can be closed tightly. Store them at low humidity and low temperature.

Cabbage

Cabbage is commonly stored in pits and in humid store rooms above ground. Because of the undesirable odor, it usually is not stored in the basement. In aboveground storages, the heads are stacked on shelves after trimming to two or three layers of loose outer leaves. The stalk is cut off a couple inches from the base of the head. Each individual head may be wrapped in newspaper to protect it, although this is not necessary. In large pits or cellars it may be placed in bins or stacked on shelves. In small pits the stalks are pulled and packed, ordinarily one layer deep with the roots sticking up. Several layers may be stacked together bringing the pit to a peak. As soon as the pile is finished, it is covered with a thin

layer of soil. Additional soil is added as necessary for winter protection.

Carrots

Carrots are easy to store if allowed to become fairly mature. Most varieties are sufficiently mature when one and one-half to two inches in diameter. Contrary to common belief the eating quality of old carrots is equal to, if not superior to that of young carrots.

The sweetness of carrots is highest immediately following harvest, decreasing slightly during the first part of the storage period but becoming constant within a short time. Most of the loss in sweetness is restored after storage for five or six months.

Celery

Celery may be stored in a trench one to two feet wide and deep enough so that when the stalks are set upright in the trench the tops are below the surface of the ground. Remove the plants from the field, roots and all. Set them upright in the trench, packing them close together. Water the roots after packing. Bank the sides of the trench with soil, and cover the top with boards. When cold weather sets in, cover the boards with straw and soil, the amount depending upon the amount of protection needed.

Kohlrabi

Kohlrabi should be harvested before it becomes woody. The size varies from one to three inches in diameter, depending upon its rate of growth and the weather conditions during the growth period. The bulbous stems are stored in the same way that beets and carrots are stored.

Onions

Allow the tops to ripen and to become dry before pulling. The bulbs are ripe when the necks are dry. It may be necessary to break the tops down to get them to ripen soon enough.

After harvest, it is necessary to cure them. If grown in large quantities they may be windrowed in the garden. They also may be placed in slatted boxes or trays and stacked in the garden or in any dry airy place. They should not be piled more than three or four inches deep and should be given plenty of ventilation during the curing period. When cured, the necks and outer husks are dry. A period of several days to two weeks, depending upon the weather, is required. When curing is completed, the tops are removed in preparation for storage.

Onions have a normal rest period of two months following harvest, after which they must be protected from sprouting and root growth. Because high temperature induces sprouting and high humidity stimulates root growth, onions are stored at a relatively low temperature and low humidity. They may be placed in shallow bins or trays with slatted bottoms. In the absence of a storage room, any well-aired, dry, dark place may be used as long as the temperature is low but not freezing. Attics are sometimes used.

Parsnips

Parsnips ordinarily may be left in the ground over winter with safety. In Eastern Washington where the ground freezes, digging part of them immediately prior to freezing weather is recommended as a matter of convenience. In Western Washington, digging part of them in the fall offers some advantage also. If the tops of the crowns are exposed in the fall, it is well to hill up those which are to be left.

Parsnips tend to shrivel badly in dry air. They do not possess a protecting coat as do some root crops. To prevent shrivelling, the humidity is kept high. The general type of storage used for beets and carrots is also used for parsnips.

Contrary to popular opinion, parsnips do not require freezing to develop good eating quality. The sweetness in parsnips is due to the development of sugar, which takes place rather rapidly at temperatures varying from 34° F. to 40° F. Roots stored two weeks at 34° F. possess quality equal to that requiring two months to develop in the field where the soil freezes spasmodically during the winter.

Peppers

Peppers remain firm and smooth for several weeks at temperatures below 50° F. Be sure that they are free from surface moisture when placing them into storage. The plants, with fruits still attached, may be pulled and hung in storage, or the fruits may be removed from the plants and placed on a shelf.

Popcorn

The success with which popcorn may be popped is influenced by its moisture content. Dry it to the popping stage and place it in a glass or metal container that can be closed tightly. The container need not be sealed. Store in a slightly humid room such as that for squash and onions.

Corn too dry for popping may be improved by adding water at the rate of one tablespoonful per quart of shelled corn. Partially

fill a fruit jar with corn, add water, put on lid and shake thoroughly. Store as fresh corn.

Potatoes

Dig potatoes carefully to avoid injuries. Digging when the soil is dry aids in keeping the storage clean. During warm bright days, it is well to dig in the morning or evening to prevent injury from sunscald. The tubers should not be left in the sun for more than an hour after digging.

Hold the temperature at 60° F. and the humidity at 85 per cent with good air circulation for the first ten days of the storage period. This treatment aids in healing injured tubers and disposing of excess moisture. If the temperature is raised to 70° F. and the humidity is held at 85 per cent, the healing may be achieved in four or five days. After this treatment, place them in storage at 35° F. to 40° F. with a high humidity. They may be placed in bins 10 to 15 feet deep if necessary.

Potatoes taken directly from storage at 40° F. and used immediately for potato chips and french-fried potatoes, turn dark. The darkening may be prevented by placing the potatoes at 60° F. for a few days before processing them.

Pumpkins

The storage requirements for pumpkins are similar to those for squashes. The storage life of pumpkins generally does not exceed two to three months.

Squashes

If squashes are to be stored successfully, they must be mature. Skin breaks resulting from rough handling lead to decay. Good, mature, sound specimens can usually be stored successfully for several months.

They lose weight while in storage. The higher the temperature, the greater the loss. At temperatures ranging from 60° F. to 70° F. the loss in a period of five-months may amount to as much as 20 per cent or more.

Place them two or three layers deep on a shelf or in a bin with a slatted floor. Do not lay them on a floor which is inclined to be damp. A cool, freezeproof attic is sometimes used with fair success.

Sweet Corn

Attempting to hold sweet corn in storage exposes it to an appreciable loss. High quality is due chiefly to high sugar content. A loss of sugar and a consequent lowering of quality starts almost

immediately following harvest. At 85° F. it loses 50 per cent of the sugar within 24 hours after harvest. The loss is four times as great at 50°F. as at 32° F. and continues to increase as temperature increases.

Tomatoes

Part of the tomato crop sometimes fails to mature by the time of the first killing frost. The immature fruits are of two classes: (1) those starting to color, and (2) those turning from dark green to a very light green or almost white (green mature). By placing these in storage for ripening, the tomato season may be extended.

The most suitable temperature varies from 50° to 70° F. The higher the temperature, the more rapid the ripening. Fruits starting to color may be held 10 days at 50° F.; green, mature fruits may be held for one to six weeks at this temperature. The rate of ripening may be governed to the extent that the temperature can be controlled within these limits.

Place the fruits on a tray or shelf one or two layers deep. Using only one layer permits rapid examination daily, to select those which are ready for consumption.

Herbs

Sweet annual marjoram, mints, rose geranium, rosemary, parsley, chives, bush basil, pot marigold, and other herbs may be potted for winter and grown as house plants. Plant them in large pots in good soil containing plenty of organic matter. Because the foliage is the desired product, these plants should be kept in good vigor.

The leaves of such herbs as sage are commonly dried for winter use. Keep the plants in good vigor. Harvest the crops just before the plants start blooming. The stems may be cut close to the ground, tied in bundles, and hung in a dry dust-proof place to cure. Curing should be rapid.

The leaves may also be stripped from the freshly-cut stems and placed in trays to dry. The thoroughly dried leaves may then be crushed and put into wide-mouthed jars. These are closed tightly and stored in a dry place.

The seed is the desired product of several herbs. Among these are angelica, anise, celery, sweet cicely, coriander, cumin, dill, fennel, lovage, poppy and sesame. Harvest the seed just before it starts to shatter. Cut the stalks and place them on a paper to dry. When dry, thresh and clean the seed. Allow the cleaned seed to dry still further, and store it in a closed jar in a dry place.

Apples

Apples to be stored should be picked when very firm. They are usually ready to pick before they begin to drop. The color ordinarily is well developed. The green undercolor usually turns to a lemon yellow when they are ready for storage which is considerably before they are edible. Sort the fruit carefully to keep decay from starting. One decayed fruit in a box may lead to considerable spoilage.

Place them into storage immediately following harvest. Apples keep well at 32° F. with humidity of approximately 80 per cent. The temperature may go to 30° F. without injury, but it should not go much below this point. Apples suitable for storage may be held for eight months at 32° or for one month at 70°. This fact emphasizes the importance of keeping the temperature down.

Pears

Pick pears as soon as the leaf-green color has turned to a light green. When in this stage, they are not yet edible. Sort them carefully. Place them in storage as suggested for apples.

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