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Department of Horticulture

# Canning Fruits and Vegetables on the Farm


BY

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# Canning Fruits and Vegetables on the Farm

## INTRODUCTION

Government experts estimate that over 50 per cent of the natural products of the average orchard and garden is actually lost for food products to American homes, for want of some simple method of taking care of the surplus. In Idaho, increasing production of fruits and vegetables tends to make this percentage of loss even greater. Steps should be taken at once to prevent it.

The Fruit Grower and Farmer, in a recent editoral says, "Making a little profit out of every product is a rule that big business is applying and which little business is beginning to observe. It is a rule that is going to turn farming into profit." This great conservation movement is one of the most important problems before the American people. The Federation of Women's Clubs of Illinois is behind this movement and has adopted for its slogan: "Set the State a-Canning." Every man, woman, and child in Idaho has an opportunity now, to join in this great canning movement and help make it a success. The slogan for Idaho should be: "Let Nothing go to Waste." The aim of this bulletin is to demonstrate to the farmers of Idaho how they can increase the earning capacity of their farms and orchards through the cannery.

## NEED OF EXPERIMENTAL WORK

The canning industry in the State of Idaho is in its infancy. Only a small proportion of the products not marketed in the fresh state are utilized by the local canneries. The larger part of the canned fruits and vegetables consumed by the people of the state is imported from other states. The imports in 1913 were as follows: One hundred and eighty-five tons of dried apples, 75 of dried prunes, 150 of dried peaches, 100 of other dried fruits and 950 of canned fruits and vegetables. During the same year 175 tons of dried apples, 50 of dried prunes, 75 of other dried fruits, 25 of canned berries, 100 of canned peaches, 25 of canned rhubarb and 50 of beans, were shipped out. The total imports were 96 tons greater than the total exports.

Under the existing conditions it can readily be seen that there is urgent need of canning outfits of every description. No doubt many of the fruit and vegetable growers of the state would install small plants upon their farms if they were in possession of the detailed information necessary to operate the same. The importance of this work may be shown by the fact that the Government, in co-operation with a number of experiment stations in the eastern and southern states, where the truck industry is highly developed, has organized

canning clubs for the boys and girls. By interesting the children in this way the adult community has taken the matter up, with the result that a number of small canneries have been installed on the farms. There is no reason why their use can not be now extended with profit and satisfaction to the fruit- and vegetable-growers of Idaho.

Heretofore we have been giving our attention to the production of extra fancy fruit and have not had the time or the inclination for these smaller details of the industry. Nor has there been a necessity for it. The situation is fast changing, however, for owing to limited markets and increasing supply, the profitable disposition of fruits and vegetables in the fresh state is a matter of no little concern to the growers. The writer believes that the time is not far distant when the handling of the by-products of the farm will be of more importance than any other problem.

Experience and accurate information concerning the minor details of the work are the first requisites to success in the canning, as well as any other, industry. Local conditions vary, and one must have a thorough knowledge of all phases of the business before he can put out a first-class product. To obtain accurate information concerning the home canning of fruits and vegetables, the Idaho Experiment Station has conducted an experiment for the past three years.

## FIELD FOR THE INDUSTRY

There is a splendid field for the development of small canneries. After operating successfully one of the home plants, we wish to recommend it very highly as a safe and profitable investment to all orchardists, farmers, and vegetable growers who wish to operate one on a commercial basis. Any city or town in Idaho, not large enough to support a large commercial cannery could well afford to install one of these smaller factory outfits, and assist in this great conservation movement, so prominent before the people of Idaho today.

To those who do not wish to engage in the business on a commercial scale, I would urge the installation of small outfits or portable canneries. These plants cost from $15.00 to $50.00. The portable canneries encourage more and better canning at home. With the aid of one of these plants, all the canned fruits and vegetables needed for winter use can be put up. The direct outcome is a material saving in the grocery bill and a large step in the right direction toward the reduction of the high cost of living.

The benefits derived from a fruit and vegetable diet, and the substitution of peas and beans for meat to a large extent during the winter months, should not be underestimated. Prof. Watt, Director of the Pennsylvania State Experiment Station says, "It has always been admitted that a vegetable diet is more wholesome than one composed largely of meat. If peas and beans were used to a greater extent in the diet of the winter months, the cost of living would be materially reduced. The average housewife pays for her incomplete knowledge of the possibilities of vegetable cookery with heavy butcher bills."

In a steam tight boiler, where from 38 to 40 degrees more heat

can be secured than can be obtained from boiling water in an open vessel, all the corn, peas, beans, tomatoes, fruits, etc., could be successfully canned with very little cost to the operator.

## PLAN OF WORK

The experiment just completed has been confined entirely to the preservation of fruits and vegetables by canning. It is the purpose of the Horticultural Department to follow this with other experiments along the line of the utilization of by-products through preserving and jelly plants, and also by the evaporator. Reports will be published as progress is made.

It is hoped that the information obtained may be of use to any farmer who contemplates engaging in this work. We will endeavor to show the advisability of doing this work on the farms, together with the exact cost and methods employed in all of the details. The plan of investigation was as follows:

1. The operation of a canning outfit having a capacity of from 3000 to 5000 cans daily, fully equipped.

2. The canning of fruits. To work out formulas for the handling of such fruits as are grown in the various sections of the state.

3. The canning of vegetables. To determine the best methods of canning peas, beans, corn, tomatoes and other vegetables which lend themselves to this purpose and are satisfactorily grown in the state.

4. Gathering field data. To determine whether home canning will pay on the average farm. Data are being gathered to show the yield of the various crops.

The results embodied in this report represent three years of practical investigation along the lines outlined above. The process is very simple and one of ordinary intelligence can very easily comprehend it. The only requirement to its successful operation is the complete sterilization of the products. This is accomplished by heat.

## EQUIPMENT

The types of canning outfits sold upon the market are of three distinct kinds: (a) hot water with open boiler; (b) hot water with steam combination, having a close fitting cover; (c) steam-pressure outfit. The latter was the type of canner installed at the University of Idaho and used in the preparation of the material in this bulletin. The plant was secured of the Northwestern Steel and Iron Works, Eau Claire, Wisconsin.

The outfit installed consists of two steam-tight retorts, 27 inches deep and 25 inches in diameter and each will hold at one cooking, 144 No. 2 cans; 90 No. 2½ cans, and 21 No. 10 cans. They are made of heavy boiler plate and thoroughly riveted to withstand the pressure necessary to process the different kinds of fruits and vegetables. The close-fitting cover is made of cast iron, having a grove packed with asbestos rubber, to prevent the steam from escaping. Galvanized iron crates, having openings in the bottom and sides, to allow free access and circulation of air, come with each retort. If woven wire

crates are preferred they may be used instead of the heavier galvanized sheet-iron ones.

The three horse vertical steam boiler is equipped with tubular flues, steam gauge, safety valve, water gauges, etc. Enough pipe to connect the boiler to the retorts or process kettles is also furnished. The iron cranes consist of drum and ratchet, handle, pulley, hooks for crates, and top-and-bottom swivel castings. The wood necessary to construct the crane can very easily be found somewhere on the farm.

The soldering apparatus is also included and is a very important tool in the canning business. There are two parts: one a circular steel. made to fit the circumference of the can cap; and the other a pointed rod used to steady the steel in the operation of capping. The rod serves to hold the cap down while the melted solder is setting. When heating the iron the rod is slipped out.

The fire pot or blast furnace is so constructed that two steels and two coppers may be heated at one time. The two tipping coppers are also furnished and are used to seal the small vent in the caps.

## ACCESSORIES

The parts of the canning outfit already discussed are those included in the original cost price, and constitute what may be termed the major items of equipment. There are a number of other accessories which are just as essential as the items furnished that must be secured before the plant is properly equipped for work.

To complete the outfit installed at the University, the following articles were secured; one grading table, two peeling tables, one packing table, one capping table, one soldering table, one scalding vat, two cooling vats, two sets of capping steels, can tongs, hoisting rope, solder, syrup hydrometer, paste brush, flux brush, fruit and vegetable funnel, fruit and tomato knives, pitting spoons, cherry stoner, apple parer, syrup can, white aprons, and caps for help, clock, scales, besides pans, pails, tub, etc. for receiving fruits and vegetables.

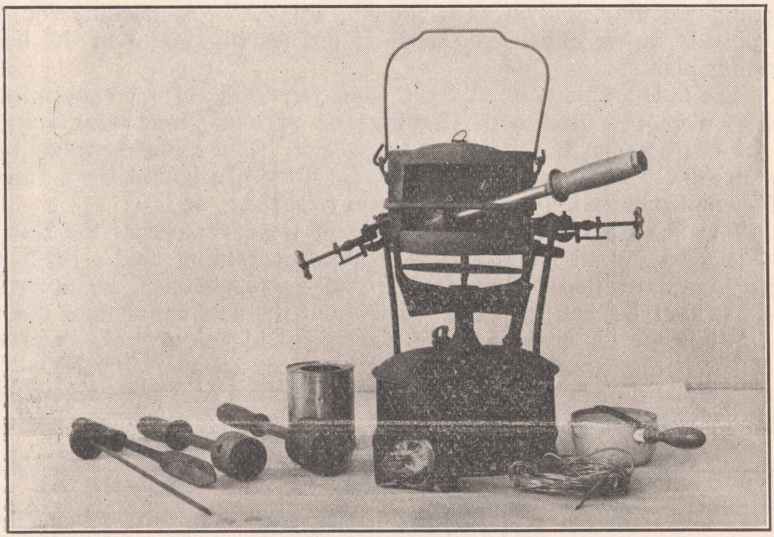
One handy with tools can very easily make the necessary tables for the cannery. The cooling and scalding vats can be secured from almost any manufacturing firm, at reasonable prices, or can be made by the local tinsmith. To keep the capper busy most of the time, it will be necessary to secure an extra set of capping steels.

The quantity and kind of fruits and vegetables to be canned will determine largely the character of outfit to install. The above equipment has proved very efficient in handling all products mentioned in this bulletin. Very little apparatus is needed for the smaller outfits that have a capacity of a few dozen cans per day.

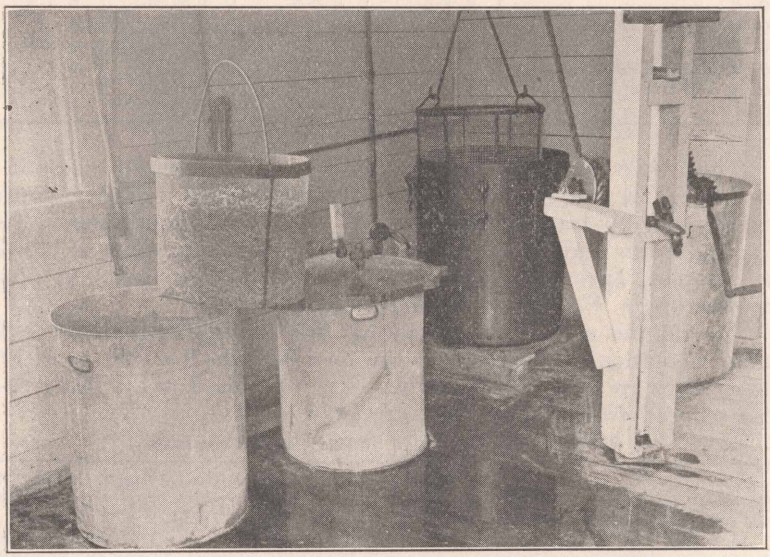
Canning outfits of various kinds may be purchased from the following firms:

Northwestern Steel and Iron Works, Eau Claire, Wisconsin.
Henninger & Ayes Manufacturing Co., Portland, Oregon.
Sprague Canning Machinery Co., Chicago, Illinois.
Modern Canning Co., Chattanooga, Tennessee.
F. S. Stahl, Quincy, Illinois.
Monarch Manufacturing Co., Chattanooga, Tennessee.

The Wilson Canning Co., Cochran, Georgia.
Dixie Hardware & Manufacturing Co., Elkin, North Carolina.
The Ranney Canner Co., Chattanooga, Tennessee.



**Soldering Outfit**



**View Showing Retorts, Scalding Vats, Etc.**

**CANS**

The tin can is almost universally used as a container for all fruits and vegetables. It is used in commercial as well as in home

canneries. The types of cans placed upon the market are of two general kinds. The "Sanitary" cans, in which no solder is used except on the side seam, and the hole and cap or soldered cans. The "Sanitary" or open-top can is used only in factories having access to a capping machine, known as a "double seamer." A machine for this purpose is rather expensive, hence is not usually found in the home canning plants.

The hole-and-cap, or soldered cans, were used in our experiments. These were procured with openings of various dimensions suitable to the character of the article to be packed. The solder-hemmed caps are decidedly better than the plain, for they are bound by a rim of solder and require only the heated iron to seal.

The "Enamel lined" can is a recent improvement in the tin can and is used for all fruits and vegetables containing acid. Since the introduction of these cans, fruits such as raspberries, loganberries, and blackberries, can be preserved without the acid eating into the tin.

While the dimensions of the Sanitary and hole-and-cap cans will vary some, the capacities of the different sizes are the same. The following table showing the dimensions of standard cans, was taken from Bulletin No. 172 of the Connecticut Agricultural Experiment Station:

**TABLE NO. I**—*Dimensions of Standard Cans

| Size of Can | Sanitary | | Hole and Cap | |
|---|---|---|---|---|
| | Height In. | Diameter In. | Height In. | Diameter In. |
| No. 1 | 4 | 2 5-8 | 4 | 2 11-16 |
| No. 2 | 4 1-2 | 3 3-8 | 4 9-16 | 3 3-8 |
| No. 2 1-2 | 4 11-16 | 4 | 4 3-4 | 4 |
| No. 3 | 4 7-8 | 4 1-4 | 4 7-8 | 4 3-16 |
| No. 3, 5 in. Jersey | 5 | 4 1-4 | 5 | 4 1-4 |
| No. 3, 5 1-2 in. Jersey | 5 1-2 | 4 1-4 | 5 1-2 | 4 1-4 |
| No. 10 | 7 | 6 1-8 | 6 7-8 | 6 1-4 |

* All Outside Measurements.

The above table shows that there are five standard sizes of tin cans in general usage. The size of package required for various products is fixed by trade customs. To meet these requirements, corn, peas, and beans should be packed in No. 2 cans; tomatoes in No. 2½ cans; apples, apricots, blackberries, cherries, pears, peaches, plums, strawberries in No. 2½ cans and No. 10 cans.

To aid the canner in estimating this item of expense, the following quotations are given on the cost of cans for the year 1915. These prices are F. O. B. Portland. The cans used in this experiment were secured from The American Can Co.

**TABLE NO. II**—Cost of Cans per Thousand

| How Shipment is made | Size of Can | Size of Opening | Hole and Cap Cans | | Sanitary Open Top | | Weight of Cans per M Crated |
|---|---|---|---|---|---|---|---|
| | | | Plain Tin | Inside Enamel | Plain Tin | Inside Enamel | |
| Car Lot Crated | No. 2 | 2 1-16 in. | $22.75 | $26.25 | $18.71 | $22.21 | 267 lbs. |
| Car Lot Crated | No. 2½ | 2 1-16 in. | 26.35 | 30.35 | 22.25 | 26.25 | 353 lbs. |
| Car Lot Crated | No. 10 | 2 1-16 in. | 55.00 | 65.00 | 54.25 | 64.25 | 1000 lbs. |
| L. C. L. Crated | No. 2 | 2 1-16 in. | 27.25 | 30.75 | 19.21 | 22.71 | 267 lbs. |
| L. C. L. Crated | No. 2½ | 2 1-16 in. | 31.50 | 35.50 | 22.75 | 26.75 | 353 lbs. |
| L. C. L. Crated | No. 10 | 2 1-16 in. | 66.00 | 76.00 | 55.65 | 65.65 | 1000 lbs. |

The following firms also handle tin cans and glass jars:
National Can Co., Baltimore, Maryland.
Continental Can Co., Chicago, Illinois.
United States Can Co., Cincinnati, Ohio.
Consumers Can Co., Baltimore, Maryland.
Sanitary Can Co., Indianapolis, Indiana.
Victor Jar Co., Detroit, Michigan.
Hazel-Atlas Glass Co., Seattle, Washington.

## LABELS

Neat labels, attractive to the eye, well arranged on the cans, add very materially to the stock of canned goods. The name of the article, the grade, where and by whom packed, should be stamped on the label. The labels have a great deal to do in building up a fancy trade in the markets, hence the importance of selecting those that truly represent the goods. As there are laws regarding labels, it would be advisable to write to the Pure Food Commission at Boise, for information concerning their use in the state.

When placing the labels on the cans, the cap end should be down. A good paste can be made of starch or flour. The paste should be placed on one end and not on the whole label. Well printed labels, can be bought from label manufacturers and lithographers in any of the larger cities, for about $2.25 per thousand. The following firms are very reliable and handle labels of various kinds:

Schmidt Lithograph Co., Portland, Oregon.
United States Printing Co., Seattle, Washington.
American Label Manufacturing Co., Baltimore, Maryland.
Simpson & Doeller Co., Baltimore, Maryland.
E. F. Kirwan & Co., Baltimore, Maryland.

## CASES

Canned goods are usually packed in cases for distant shipment. A case holds 24 No. 2 cans; 24 No. 2½ cans; or 12 No. 10 cans. These cases may be obtained from almost any box factory, or from the manufacturers of cans in "shook" form. Cases are made according to the following inside measurements:

No. 2 Cans—14 in. x 10½ in. x 9¼ in.
No. 2½ Cans—16⅜ in. x 12¼ in. x 9⅝ in.
No. 10 Cans—19 in. x 12¾ in. x 14 in.

It is customary, when packing the cans in the cases to put them in with the soldered ends up. This is to prevent injury to the lower cans if there should be a leak.

## LABOR

The amount of help needed to operate a canning plant successfully will depend almost entirely upon the character of the outfit installed. If one of the smaller portable outfits is used, no extra help is needed. The various members of the family can put up what fruits and vegetables are needed for winter use.

In the larger plants, having a capacity of from 1000 to 10,000 cans daily, extra help will need to be employed. As the range of

operations will be wider in such a plant, each person should have a regular job. There is plenty of work, such as preparing fruits and vegetables for the can, soldering, filling cans, etc. The capacity of any plant will depend almost entirely upon the speed of the employees as well as the number employed. The help should be so arranged that there will be no one idle when the plant is busy.

There should be as much system in running a canning factory as in any other business. In operating the University cannery, our method of procedure was as follows: One man to solder and tip the cans and care for the boiler; another to load and unload the crates, to take away the cans and attend to the blanching and scalding; a woman to fill the cans and prepare them for the capper; and enough girls to prepare the fruits and vegetables for the cans, the number depending entirely upon the kind of products canned.

Owing to the limited amount of fruits and vegetables grown upon the college grounds, the plant installed by the University was never operated to its full capacity. We merely employed enough help to utilize our products. The following table is prepared upon the basis of one person filling cans and preparing them for the capper and is approximately correct.

By referring to the table, one can readily see that the output of the cannery could be greatly increased by increasing the labor, as the retorts are not kept busy the entire day. For the length of time required to process the different fruits and vegetables, see pages 16 to 22.

**TABLE NO. III**—Daily Output of Cannery

| Kind of Product | No. Persons employed | Kind of work performed | No. Cans per hr. | No. Cans per day | No. lbs. raw material per can | No. lbs. raw material per day | Size of Cans |
|---|---|---|---|---|---|---|---|
| **Peas** | 1<br>6<br>1 | Filling Cans<br>Shelling<br>Soldering & Processing | 37 | 370 | 2 | 740 | 2 |
| Total | 8 | | 37 | 370 | 2 | 740 | 2 |
| **Tomatoes** | 1<br>3<br>1 | Filling Cans<br>Peeling<br>Soldering & Processing | 33 | 330 | 2 1-4 | 742 | 2 1-2 |
| Total | 5 | | 33 | 330 | 2 1-4 | 742 | 2 1-2 |
| **Beans** | 1<br>3<br>1 | Filling Cans<br>Snipping<br>Soldering & Processing | 40 | 400 | 2-3 | 266 | 2 |
| Total | 5 | | 40 | 400 | 2-3 | 266 | 2 |
| **Cherries** | 1<br>3<br>1 | Filling Cans<br>Stemming<br>Soldering & Processing | 20 | 200 | 4 1-2 | 900 | 10 |
| Total | 5 | | 20 | 200 | 4 1-2 | 900 | 10 |
| **Peaches** | 1<br>2<br>1 | Filling Cans<br>Peeling<br>Soldering & Processing | 32 | 320 | 1 3-4 | 560 | 2 1-2 |
| Total | 4 | | 32 | 320 | 1 3-4 | 560 | 2 1-2 |

In many of the commercial plants, facilities for preparing various products for the cans are installed. As a general thing, these machines are not found in the smaller plants, hence the work in the preparing room, such as snipping beans, hulling peas, preparing fruits, etc., is done by women and girls. The amount of material that can be prepared during the day by one person is as follows:

**TABLE IV**—Preparing Material

| No. Persons | Kind of Product | Lbs. per hr. | Lbs. per Day |
|---|---|---|---|
| One | Beans | 8 | 80 |
| " | Corn | 22 | 220 |
| " | Peas | 12 | 120 |
| " | Tomatoes | 33 | 330 |
| " | Apricots | 22 | 220 |
| " | Cherries | 30 | 300 |
| " | Pie Cherries | 10 | 100 |
| " | Peaches | 34 | 340 |
| " | Raspberries | 6 crates | 60 crates |
| " | Strawberries | 1 crate | 10 crates |

**Capper at Work**

## CROPS FOR CANNING

Many of the varieties of fruits and vegetables grown upon the farms of Idaho will be found suitable for canning purposes. There are, however, certain varieties better adapted for this work than others. This being the case, we should try to meet these requirements. Commercial canners have found, when handling the strawberry, that ber-

ries firm and red throughout are excellent for canning. Those that are soft and that fall to pieces after being put up, are not desirable to grow for this trade. The popular varieties of beans, grown for this purpose, are those possessing very few strings, such as the New Stringless, and others.

To have a stability of supply so that the small commercial plant can run during as long a period as possible will also necessitate the growing of crops that come on very early in the season, as well as those coming on late in the summer. Any community that can furnish a constant supply of dependable products thruout the summer, will have no difficulty in making a canning plant pay good dividends. The rapid growth of the canning industry in the eastern states has been due largely to this stability of supply, coupled with efficient management, and a thorough knowledge of the various details involved in processing.

In the following tables, a few of the most suitable varieties of fruits and vegetables are recorded as well as the length of season and the average yield per acre.

**TABLE V**—Varieties of Fruits for Canning

| Kind of Fruit | Varieties to Use | Length of Season | Yield per Acre |
|---|---|---|---|
| Apricots | Moorpark<br>Royal<br>Blenheim | July 15 to Aug. 15 | 10 tons |
| Apples | Tart varieties are best | Sept. 1 to Dec. 15 | 10 to 14 tons |
| Cherries | Royal Ann<br>Bing<br>Morello<br>Olivet | July 1 to Aug. 20 | 4 tons |
| Peaches | Elberta<br>Muir<br>Phillip Cling<br>Orange Cling | July 20 to Sept. 10 | 12 tons |
| Pears | Bartlett<br>Flemish Beauty<br>Howell | Aug. 20 to Nov. 1 | 12 to 16 tons |
| Plums | Bradshaw<br>Wickson<br>Peach<br>Green Gage | Aug. 15 to Sept. 20 | 10 to 12 tons |
| Dewberries | Lucretia | July 15 to Sept. 15 | 200<br>24-pint crates |
| Loganberries | | July 15 to Aug. 15 | 250<br>24-pint crates |
| Raspberries | Cuthbert | July 10 to Aug. 15 | 200<br>24-pint crates |
| Strawberries | Clark's Seedling<br>Wm. Belt<br>Parson's Beauty | June 10 to July 15 | 150 to 300<br>24-pint crates |

TABLE NO. VI—Vegetables for Canning

| Kind of Vegetable | Varieties to Use | Length of Season | Yield per Acre |
|---|---|---|---|
| Asparagus | Palmetto<br>Connover's Colossal | May 15 to July 1 | 2 to 4 tons |
| Corn | New First Early<br>Early Minnesota<br>Country Gentlem'n | Aug. 10 to Sept. 20 | 3 to 4 tons |
| Beans | New Stringless Refugee | July 15 to Sept. 15 | 2 to 3 tons |
| Peas | Alaska<br>Dwarf Telephone<br>New First Early | June 10 to July 20 | 1 1-2 to 3 tons |
| Rhubarb | Victoria<br>Giant Linnaeus | June 15 to July 30 | 3 to 4 tons |
| Tomatoes | Earliana<br>New Stone<br>Livingston's New Coreless | Aug. 15 to Oct. 1 | 7 to 10 tons |
| Cauliflower | Early Snowball<br>Danish Giant<br>Dwarf Erfurt | From June on | 2 to 5 tons |

The yield of the various crops will vary according to climatic conditions, general care, condition of soil, etc. In Table No. 3 we have indicated the number of persons necessary to turn out a definite amount of finished products per day. To keep eight people busy daily, when canning peas, would require the product from one-eighth of an acre. Tomatoes, yielding at the rate of seven tons per acre, would take the product of one-eighteenth of an acre, to keep five persons employed daily. Twenty-five boxes of peaches are needed to put out 320 No. 2½ cans of the finished product. The average weight of a box of peaches is twenty pounds.

## STEPS INVOLVED IN HANDLING PRODUCTS

All products should be delivered to the cannery in first-class condition, hence the necessity for careful handling. Bruises may be avoided by delivering small fruits and vegetables in shallow crates and baskets. Upon arrival at the cannery, the first step is grading or sorting for quality. All defective, decayed specimens should be discarded as well as small, wrinkled, and unripe specimens. The fruits and vegetables not ripe enough to make a good finished product should be set aside to ripen.

## WASHING AND CLEANING

After the products have been sorted they should be carefully washed and cleaned. For instance, tomatoes must be scalded to loosen the skins, peeled, and cored; strawberries washed, stemmed, and hulled; peas shelled and blanched; apples, pears, and peaches must be washed, peeled, and cut into pieces of the proper size.

## BLANCHING

Most vegetables, before being placed in the cans, are blanched. This process is accomplished by placing them in wire baskets and

boiling for from one to five minutes. The object is to set the color of green vegetables, to eliminate certain objectionable acids, to remove the bitter taste that usually accompanies fresh vegetables, and to wash away any slimy substances formed by bacteria.

### SCALDING

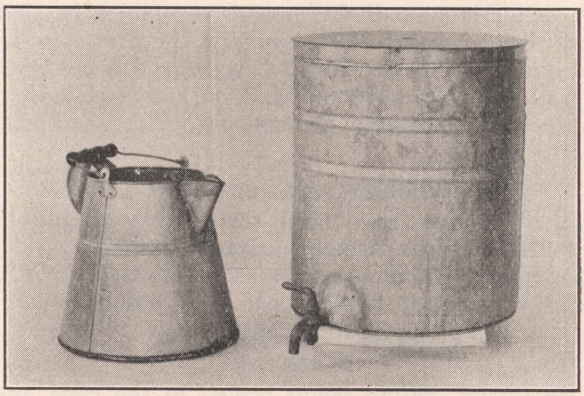
Some of the fruits and vegetables are scalded by immersing in boiling water for a short time to loosen the skins.

### FILLING THE CANS

As considerable dust accumulates on the cans in transit and storage, it is best to wash them in hot water, just prior to filling. They are now ready to be filled with the various products. In placing the fruits and vegetables in the cans, every precaution should be taken so as not to injure the appearance of the finished product. Fill the cans to within one-half inch of the top and cover the solids with liquid. One should always try to place a uniform quantity of material in each can. This can be accomplished without very much difficulty by weighing or measuring the products. The uninitiated will probably have as much trouble in overfilling as underfilling. If the cans are filled too full, considerable difficulty will be experienced in soldering the lids on.

### CAPPING

By capping is meant the soldering of the cap on to the can. After the can has been filled, the top is cleaned of all fruit juices and the cap placed over the opening. The flux is now applied to the cap with a small brush and the solder is melted, with one of the hot "capping steels." If the iron is hot, two or three turns around is sufficient to melt the solder smoothly. The rod which runs through the center of the steel is long enough to allow the steel to be raised from the cap without releasing the pressure. The steel should be raised slowly for if raised too quickly, the solder will not set.



**Syrup Receptacles**

## EXHAUSTING

In most of the commercial canneries, all articles that are packed cold and not covered with a hot syrup or brine are exhausted. Exhausting consists of heating the contents of the can before tipping, to 160 degrees F. for from one to three minutes. Many of our products were not exhausted because we covered them with a hot liquid. Tomatoes are packed cold and do not require exhausting.

## TIPPING

By tipping is meant the sealing of the vent hole in the cap. After applying soldering flux, the tipping steel is held near the vent and touched lightly with a stick of solder. But very little solder is required to perform this work. If too much is used there is danger of getting pieces of the solder in the fruit.

## PROCESSING

The sealed cans are now ready to be processed or sterilized. Processing is nothing more nor less than cooking or sterilizing the products in hermetically sealed cans. The cans should be placed in the crates and lowered into the retorts and sterilized for the required length of time as recommended elsewhere in this report.

## COOLING

As soon as the products have been sufficiently processed, the crates should be removed from the retorts and dropped immediately into a tank of cold water. This checks the cooking process and prevents over-cooking of fruits and vegetables. If this precaution is not taken, the color, flavor, and appearance of the finished products will be injured. The cans should now be tested for leaks. If any are defective, bubbles will be seen rising to the surface. These should be removed and resoldered.

## FLUX

Flux is quite a valuable asset to the cannery. A good supply of this fluid should be found upon the soldering table. Soldering flux is used to clean the soldering irons and for wiping all surfaces to be soldered. Solder will not adhere to the tin unless flux is used. It can be bought from the factory or made by dissolving zinc in commercial hydrochloric acid. The acid is placed in a wooden dish or earthern-ware jar and zinc added until the acid is saturated. It should be diluted with one to two parts of water before using. A brush for applying the flux to the cans can be made by placing horse hair between a piece of bent tin.

## TINNING THE IRONS

It may be necessary to tin the irons several times during the canning season. Anyone can very easily do this by heating the irons, then filing them until they are bright. The irons are now dipped in a zinc solution, then rubbed in a salammoniac to which solder has been added. In a short time the irons will be completely covered with a thin coat of solder. If the irons are not properly tinned, it will be almost impossible to do a smooth job of soldering.

## METHODS OF CANNING

The methods followed by different processors in canning fruits and vegetables vary somewhat. In operating a small cannery one has the choice of any one of three systems. These methods as described in a recent bulletin of the Texas Department of Agriculture, are as follows:

1st. "Fill cans with fruit or vegetables and syrup, brine or water, as desired, then cap, tip, and process without exhausting. This method is largely used by small canning factories but not by large ones. The flavor of goods canned in this way is retained to a greater extent than in any other, but the risk of having spoiled goods is greater."

2d. "Fill cans as above, then cap, but not tip, and then exhaust before tipping; tip and process. There is less risk than in the first method. Tipping is more difficult and less flavor is retained."

3d. "Fill cans as before stated. Exhaust and then cap, tip, and process. There is not so much of the flavor retained as in the other methods but there is less risk. Most large factories use this method."

In our experiments, we followed the first method almost entirely with good results. We found that the materials kept splendidly if they were subjected to sufficient heat and pressure for the requisite length of time. On the other hand, if our processor did not follow directions exactly and varied the time one-half minute, the loss was noticeable. In operating a steam-pressure outfit, I would suggest that the pressure be kept up as recommended, and the recording of the time not begin until the thermometer registers the degree of heat recommended for the handling of the various products.

The following table shows the comparative gauge and steam pressure and will serve as a guide when processing:

| Gauge Pressure Pounds per square inch. | Degrees of Temp. Fahr. |
|---|---|
| 1 | 216 |
| 3 | 222 |
| 5 | 228 |
| 7 | 233 |
| 8 | 235 |
| 10 | 240 |
| 12 | 244 |
| 15 | 250 |

## CANNING OF FRUITS

Ordinarily it is a very easy matter to can fruits, for they require less cooking for complete sterilization than do vegetables. The ultimate success, however, depends almost entirely upon careful and conscientious work and attention to details. The proper filling and sealing of the cans, proper sterilization during the process of cooking, and cleanliness, are essential requisites leading to success in the canning business.

The proper selection of fruit for the cans should receive due consideration. The idea that inferior, low grade fruits are suitable for canning, is wrong. Only clean, sound, high-grade products should

be used. Fruits of medium size, firm and capable of retaining their color and flavor when canned, are desired.

The general practice, when packing fruits, is to fill the cans to within one-half inch of the top, then add the necessary syrup. During the process of filling, the fruit should not be crushed. The enamel can is best for most fruits as it aids in preserving the color, flavor and quality of the finished products. One must avoid filling the cans too full, for the heat from the soldering irons will discolor some of the fruit and a ring of burnt sugar will form on the under side of the lid.

To make a good syrup, use granulated sugar and pure water. After bringing to a boil, all impurities should be skimmed off as they rise to the surface. The syrup is said to be heavy when the proportion of sugar is large. A light syrup is one in which the water predominates. There are three ways of determining the proportion of sugar in a syrup: (a) by the use of a syrup gauge; (b) by measurement; and (c) by weighing. To secure the percentage of sugar when the syrup has boiled one minute, the following table may be used:

1 pint sugar to 1 gill water gives syrup of 40 degrees density.
1 pint sugar to ½ pint water gives syrup of 32 degrees denstiy.
1 pint sugar to 3 gills water gives syrup of 28 degrees density.
1 pint sugar to 1 pint water gives syrup of 24 degrees density.
1 pint sugar to 1½ pints water gives syrup of 17 degrees density.
1 pint sugar to 2 pints water gives syrup of 14 degrees density.

If the canner expects to place his products in competition with others in the open market, it would be advantageous to find out the trade requirements before canning. In many cases, the trade wants water-packed products and does not care to pay for the syrup added. In a local or private trade, a rich syrup is preferable.

As our products were sold to private concerns, a 24-degree density syrup was demanded. The amount of sugar that was required, per bushel of material, to make a 24-degree density syrup was as follows:

Apricots, 10 pounds.
Sweet Cherries, 12 pounds.
Dewberries, 14 pounds.
Loganberries, 12 pounds.
Peaches, 7 pounds.
Plums, 7 pounds.
Pie Cherries, 5 pounds.
Raspberries, 10 pounds.
Strawberries, 14 pounds.

The ripeness of the fruit, as well as the solidity of the pack will effect largely the amount of syrup required.

## APPLES

A great many of our apples may be utilized by canning, as the demand for apples in gallon cans has greatly increased during the past few years. Those best for canning are the tart, late fall, and early winter sorts.

To Prepare—Peel, cut out all decayed parts, core, and cut in halves or quarters. To keep the apples from discoloring, drop immediately into cold water. Now fill the cans, cover with boiling water or hot syrup and cap, solder, tip, and process:

No. 2½ Cans, 4 minutes at 240 degrees F.
No. 10 Cans, 10 minutes at 240 degrees F.

### APRICOTS

When the apricots are delivered at the cannery, sort over for even ripeness, size and quality. Wash, cut in halves, and remove pits. Do not peel. Now pack in cans to within ½ in. of the top and cover with syrup of the desired density. Cap, solder, tip, and process:

No. 2½ Cans, 4 minutes at 240 degrees F.
No. 10 Cans, 10 minutes at 240 degrees F.

### CHERRIES (Sweet)

Select ripe, but not over-ripe fruit. Stem and pick out all leaves and decayed specimens. Wash, place in cans and fill with a hot syrup. Cap, solder, tip, and process:

No. 2½ Cans, 5 minutes at 220 degrees F.
No. 10 Cans, 10 minutes at 220 degrees F.

### CHERRIES (Sour)

Stem and clean, remove pits and process:
No. 2 Cans, 2 minutes at 240 degrees F.

### DEWBERRIES

It is best to deliver all small fruits to the cannery in pint boxes. Only berries of good size and firmness should be used. Stem, pick out all trash and inferior berries, wash and place in cans. Fill with hot syrup. Cap, solder, tip, and process:

No. 2 Cans, 3 minutes at 240 degrees F.
No. 10 Cans, 8 minutes at 240 degrees F.

### LOGANBERRIES

Wash, stem, and put in cans. Fill with hot syrup. Cap, solder, tip, and process:

No. 2 Cans, 3 minutes at 240 degrees F.

### PEACHES

Peaches should be graded very carefully and only those that are just beginning to soften used. When there is only a small quantity of peaches to prepare, peeling may be done with a knife. In the larger factories, lye is used to loosen the skins. Scald the peaches for one minute in boiling water and rub off the skin. To prevent the fruit turning brown, handle rapidly. Now halve, pit, and pack in cans, and fill with a hot syrup. Do not fill the cans too full because it will be difficult to solder the caps on. Cap, solder, tip, and process:

No. 2½ Cans, 4 minutes at 240 degrees F.
No. 10 Cans, 10 minutes at 240 degrees F.

### PEARS

In order to secure a first class product, the pears should be fully matured. If they are not ready when delivered, set aside until they ripen. All inferior and over-ripe specimens should be discarded. Peel, cut in halves, remove cores, and stems. Blanch one minute in boiling water and pack solidly in cans. Fill with hot syrup, cap, solder, tip, and process:

No. 2½ Cans, 12 minutes at 240 degrees F.

### PLUMS

Plums are very easily canned. Select fruits of uniform size and ripeness. Can before they get too ripe. To assist in peeling, scald for one minute in boiling water, then plunge in cold water. Some packers do not remove the skins. The pits may be removed or allowed to remain according to the size and variety. Fill the cans and cover with hot syrup. Cap, solder, tip, and process:

No. 2½ Cans, 4 minutes at 240 degrees F.

### RASPBERRIES

Handle raspberries very carefully. Wash and clean thoroughly. When filling cans, shake several times to insure a good pack. Then cover with a hot syrup. Cap, solder, tip, and process:

No. 2 Cans, 3 minutes at 240 degrees F.
No. 10 Cans, 8 minutes at 240 degrees F.

### STRAWBERRIES

Sort the berries, removing all soft and imperfect specimens. Wash to remove sand, grit, and dirt. Hull and place in cans and fill with a hot syrup of the desired density. Cap, solder, tip, and process:

No. 2½ Cans, 4 minutes at 240 degrees F.
No. 10 Cans, 10 minutes at 240 degrees F.

### CANNING OF VEGETABLES

Vegetables, being classed among the staple articles, are the most important packs of the industry. They are, however, more difficult to handle than fruits and require, in many instances, special machinery for commercial canning. In packing vegetables for the trade, the most important thing to consider is quality. The cans should be filled with vegetables of uniform size and ripeness and covered with a brine or salt solution.

Brines of varying percentages may be made by adding salt to water as follows:

1 lb. salt to 12½ gal. water gives a 1 per cent solution.
1½ lb. salt to 12½ gal. water gives a 1½ per cent solution.
2 lb. salt to 12½ gal. water gives a 2 per cent solution.
3 lb. salt to 12½ gal. water gives a 3 per cent solution.

### CAULIFLOWER

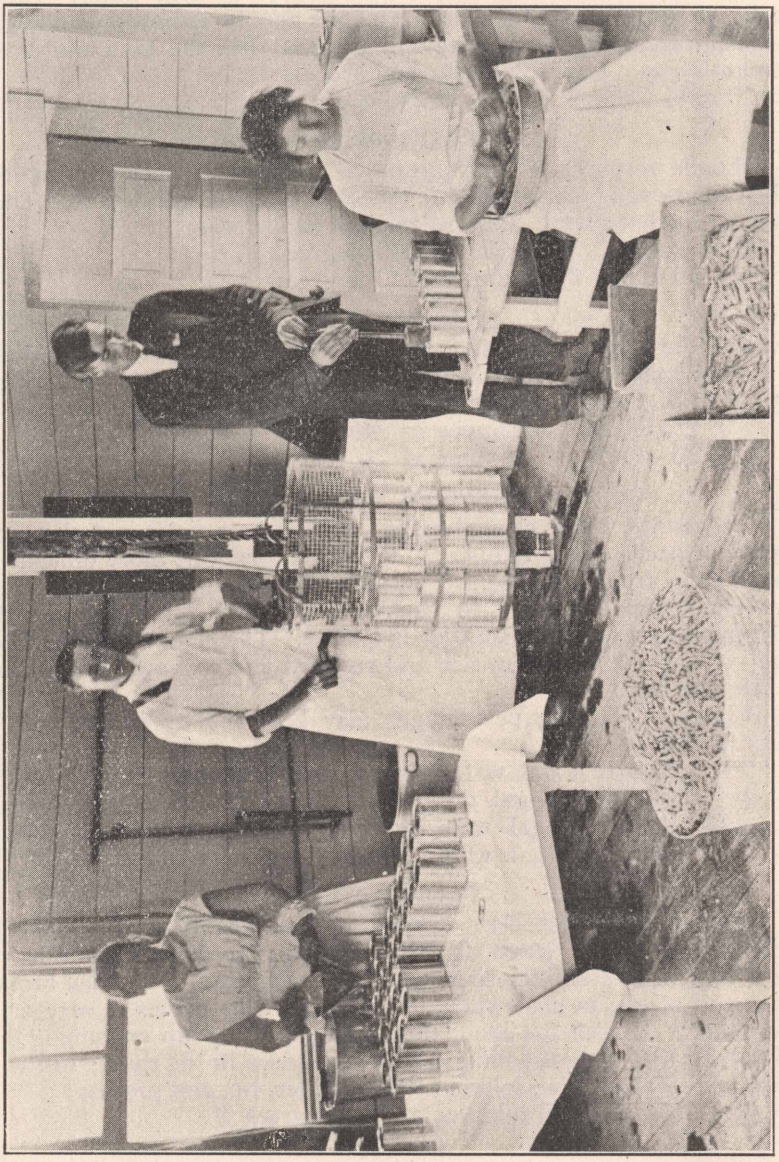
To secure a first class canned product, cauliflower should be picked at the proper stage of ripeness. To prepare, the outer leaves are first picked off and the stalk cut close to the head. It is then broken apart and placed in cold water for awhile. This makes it very crisp and tender. Blanch for about three minutes in a bath containing 1½ lbs. salt to 12½ gal. of boiling water, then place in the cans. Fill with a 1½ per cent hot brine solution. Cap, solder, tip, and process:

No. 2½ Cans, 15 minutes at 240 degrees F.

### CORN

In our experiments, corn was the most difficult vegetable to can successfully. The reason for this is largely the fact that corn ferments very quickly, hence but very little time should elapse between the time it is pulled and the time it is placed in the retort.

The corn is ready to be canned when the milk is thick and will not leave the kernel. As soon as delivered, husk and remove silk. Trim and cut out all worm-eaten places and discolored spots, then



Interior View of Canning Plant

scrape from the cob. Fill the cans and cover with a syrup brine made as follows: 30 gal. water, 15 lbs. sugar, 3½ lbs. salt; cap, tip, and process No. 2 cans by either of the following methods:

1st Method—After the cans are filled, and have been properly sealed, place them in the retort and process twenty minutes at 240 degrees F. under a 10-lb. pressure. Remove the cans from the retort and allow them to cool for from five to ten minutes, then prick a small hole in the cover of each can with a small sharp instrument. A damp, cold cloth is placed over the cans which cools them slightly and prevents the steam from escaping. After sufficiently cooled, the vent is resoldered and the No. 2 cans are replaced in the retort and processed 60 minutes at 240 degrees F.

2d Method—By this method the cans are securely sealed, placed in the retort and processed for 60 minutes at 240 degrees F. under a 15-lb. pressure. No exhausting is necessary. Remove from the retort, cool in cold water and set aside for 24 hours. If, at the end of this period, the cans are still bulging, one of two things is true—the cans are too full, or the spores have not been completely killed. If the live spores are causing the trouble, replace in the retort and process the second time for 30 minutes to one hour.

In both of these methods the cans should be immediately cooled after the process. This will prevent the corn from turning brown.

## PEAS

In order to put up a pack of excellent quality, the peas should be picked when young and tender. The quality of peas varies greatly with different seasons, also during the canning period. This necessitates close inspection at all times. There must be no delay after picking, as they gather moisture easily and become sour. For handling on a large scale, vining and hulling machines are necessary.

For the home cannery, the following method has proved successful. Immerse in boiling water for five minutes, then rub over a wire mesh, large enough for the peas to fall through into a tub or pail. The peas can be graded by using wire mesh of different sizes. There are six sizes or grades used in commercial factories. For the home cannery, three grades are sufficient: 1st, Standard—Consisting of peas fairly uniform with only a small portion hard; 2d, Extra Standard—Uniform and of good appearance, liquor clear, and 3d, Fancy—Excellent flavor, small, uniform, and very tender, liquor clear.

Blanching is accomplished by immersing the peas in boiling water for from one to four minutes, according to the size. They are immediately immersed in cold water to harden them and set the green color. Fill the cans solid to within one-half in. of the top and cover with a plain brine made by dissolving 1 qt. of salt in 50 gal. of water. A sweet brine is sometimes used if the peas are a trifle old or lacking in sugar and is prepared by using 1½ lbs. salt and 2 lbs. of sugar to 10 gal. of water. Cap, tip, and process No. 2 cans, 15 minutes at 240 degrees F.

## STRINGLESS BEANS

If the beans are picked when young and tender, an article will be secured that will excel in color and quality the commercial product. They should be brought to the cannery as soon after picking as possible for if allowed to sweat, they become tough and lose their crisp,

tender nature. Allowing them to stand in cold water for awhile will restore part of their crispness.

Commercial canners divide the string beans into five grades, but for the home canner only two grades are necessary. The different grades are based upon the length of the pods. After grading, wash, break into two to three pieces, and blanch for from two to four minutes. Pack in cans and cover with a hot brine made of 1½ lbs. salt to 12½ gal. of water. Cap, tip, and process No. 2 cans 20 minutes at 240 degrees F.

### TOMATOES

The best canning tomato is one that is picked ripe and fully colored. The inferior, wrinkled specimens should never be used. Better results will be secured if the tomatoes are canned the day they are picked. Place the tomatoes in a wire basket and scald in boiling water for from one to two minutes or for a sufficient period to loosen the skin. To make a firmer pack, they are rinsed in cold water. Peel, remove the core, and pack solidly in cans. They are covered with the juice caused by peeling. Cap, tip, and process No. 2½ cans, 15 minutes at 240 degrees F.

### QUALITY OF CANNED PRODUCTS

Too much emphasis cannot be laid upon this factor of quality. In the successful operation of a plant of this kind, it is necessary that the quality of the finished product be of the highest grade and character. This is absolutely essential in establishing and maintaining a reputation for goods of a superior quality and is really the foundation for success in the operation of a home cannery. The maintenance of this standard of excellence will be of the greatest aid in selling the product.

That the product of a home cannery can be made much better than the average commercial cannery is readily conceded. Miss Permeal French, dean of women of the University, who has been using commercial as well as home canned goods for a number of years, has the following to say in regard to the products of the University Cannery: "In my experience of seven years purchasing of canned fruits and vegetables, I have never found more palatable nor satisfactory products than those prepared and canned by the University Cannery."

### COST OF CANNING

Before engaging in a business of this kind, the beginner likes to know approximately what it is going to cost to pack the various products. With a view of determining this point, we have kept an accurate account of all overhead charges during the past three years on the cost of production.

In computing the cost, all items such as preparing fruits and vegetables for the cans, filling, syruping, soldering, labeling, sugar, salt, solder, can, case, label, fuel, gasoline, etc., were included. Such items as wear and tear on machinery, taxes, insurance, depreciation on canning building, were not included in arriving at the initial cost of production. With most of the smaller farm outfits, there is no need of considering those factors.

The cost per case for canning different products is shown in the following table:

TABLE NO. VII—Cannery Cost

| Kind of Product | Cost per Case | | |
|---|---|---|---|
| | No. 2 Cans | No 2 1-2 Cans | No. 10 Cans |
| Apricots | | $2.21 | $2.69 |
| Cherries (Sweet) | | 1.85 | 2.30 |
| Cherries (Sour) | $1.95 | | |
| Peaches | | 1.86 | |
| Plums | | 2.28 | 2.30 |
| Dewberries | 1.61 | | |
| Loganberries | 1.66 | | |
| Raspberries | 1.64 | | |
| Strawberries | | 2.33 | |
| Beans | 1.57 | 1.96 | |
| Cauliflower | | 1.73 | |
| Corn | 1.91 | | |
| Peas | 1.89 | | |
| Tomatoes | | 1.73 | |

A case holds 24 No. 2 Cans; 24 No. 2½ Cans; 12 No. 10 Cans.

In making the above estimates, the following prices were paid for cans, cases, labor, etc.:

Cans, F. O. B. Portland,
No. 2 plain, $29.75 per M.
No. 2 enamel, $33.25 per M.
No. 2½ plain, $34.00 per M.
No. 2½ enamel, $38.00 per M.
No. 10 enamel, $78.00 per M.

Cases, $8.00, $10.00, and $18.00 per hundred in shooks, F. O. B. Spokane.

Employees received 15c and 20c per hour.

Labels, approximately $2.25 per thousand.

The cost of production will vary, year to year. The cost of cans was the largest single item to consider in our experiments. There is no question but that the above cost can be materially reduced, if the cans, sugar, labels, etc., are bought in larger quantities. (See Table 2). Running the plant to its fullest capacity over a long period, and keeping the employees constantly busy will also reduce the initial cost of production.

## PROFITS

The profits in canning will depend entirely upon the cost of production, the yield, efficient management, and the selling price. A good profit can be made if the cannery is properly managed. When the products are shipped some distance and sold through the commission merchant, the profits would be less. To show the possible profits from an acre of tomatoes and beans, the following data is given:

### TOMATOES

Average yield per acre, 7 tons or 259 cases.

| | | | |
|---|---|---|---|
| Cost of canning per case | $ .6120 | Wholesale price | $2.20 |
| Cost of cans per case | .9216 | Cost of canning | 1.73 |
| Cost of case and labels | .1978 | | |
| | | Profit per case | .47 |
| Total | $1.7314 | Profit per acre | $121.73 |

### BEANS

Average yield per acre, 2400 lbs. or 138 cases.

| | | | |
|---|---|---|---|
| Cost of canning per case | $ .6336 | Wholesale price | $2.40 |
| Cost of cans per case | .7920 | Cost of canning | 1.57 |
| Cost of case and labels | .1478 | | |
| | | Profit per case | .83 |
| Total | $1.5734 | Profit per acre | $114.54 |

The following table will also aid the farmer in figuring his profits on his own average yield:

**NUMBER OF CANS TO A BUSHEL**

| Article. | Article. |
|---|---|
| Apples, 35 No. 2½ Cans; 9 No. 10 Cans. | Dewberries, 50 No. 2 Cans. |
| Apricots, 36 No. 2½ Cans; 9 No. 10 Cans. | Loganberries, 20 No. 2 Cans. |
| Cherries (Sweet) 36 No. 2½ Cans; 9 No. 10 Cans. | Raspberries, 48 No. 2 Cans; 10 No. 10 Cans. |
| Cherries (Sour) 34 No. 2 Cans. | Strawberries, 38 No. 2½ Cans. |
| Peaches, 30 No. 2½ Cans; 9 No. 10 Cans. | Beans, 44 No. 2 Cans; 37 No. 2½ Cans. |
| Plums, 30 No. 2½ Cans. | Corn, 45 No. 2 Cans. |
| | Peas, 15 No. 2 Cans. |
| | Tomatoes, 25 No. 2½ Cans. |

**NUMBER OF CANS TO CRATE**

| | |
|---|---|
| Raspberries, 16 No. 2 Cans; 4 No. 10 Cans. | Dewberries, 21 No. 2 Cans; 4 No. 10 Cans. |
| Strawberries, 13 No. 2½ Cans. | Loganberries, 20 No. 2 Cans. |

There is quite a variation in the estimates on the number of cans per bushel on some products, but this difference is due to the size of the fruits or vegetables packed and in filling the cans.

## MARKETING

The ultimate success in the canning business will depend upon placing the canned products in a market where they will be appreciated. To make them appreciated will necessitate bringing them up to a high standard and maintaining that standard. As stated previously, home canned products are superior in quality to many of the commercial brands, hence for the good of the industry, I wish to discourage the placing upon the market anything but a first class article.

The beginner in the business must learn that successful marketing for awhile at least will largely be an individual matter and a personal search must be made for customers. Under existing conditions, there are the following methods of marketing open to Idaho canners:

1st. Selling to Commission men in the larger cities.

2d. Selling to retail merchants in the cities.

3d. Direct sale to consumer in larger cities.

4th. Selling by samples to retail grocers in the smaller towns and villages.

5th. Wonderful possibilities in the local markets.

6th. Selling direct to summer resorts, mining and logging camps.

That there are unlimited markets for canned fruits and vegetables here in the Pacific Northwest is readily conceded by the By-Products Committee. In one of their recent reports we find the following statement:

"Through the co-operation of our own railroads, wholesalers, retailers, and buying-at-home leagues, by the stimulation of lumber camp trade, and with our present home and Alaskan needs, surely we can increase our consumption materially in our own home territory."


## ACKNOWLEDGMENTS

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