FOOD PRESERVATION QUARTERLY

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Editor :
W. A. EMPEY

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Published by
THE DIVISION OF FOOD PRESERVATION AND TRANSPORT
COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, HOMEBUSH, NEW SOUTH WALES, AUSTRALIA

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EDITORIAL NOTE

The FOOD PRESERVATION QUARTERLY was first published in the year 1941 with the aim of bringing before food processors information likely to assist them in their work.

This was indicated in the Editorial of the first issue, from which the following is extracted :

> " The scope of the publication will include articles in semi-technical language dealing with specific points in handling,processing and storage of foodstuffs, explanations of advances in technique from outside sources, and reviews of progress in specific fields. In addition there will be accounts of the nature and scope of the work in progress in the laboratories of the Division of Food Preservation, together with explanations of results of investigations already published."

Publication of the QUARTERLY proceeded along these lines for the ensuing nine years except that results of investigations by this Division were sometimes briefly presented before their appearance elsewhere as complete publications.

It should be emphasized that the QUARTERLY is in the main a journal of review, and is not to be regarded as a medium for the publication of original research investigations or for presentation of articles of a highly technical nature. The former appear as Bulletins of the C.S.I.R.O., and in the several journals published by the Organization.

The Export of Frozen Poultry

PART II. PREPARATION AND FREEZING

By
W. A. EMPEY

The over all quality of dressed poultry at the time of marketing will depend on several factors including the quality of the live birds and the methods used in slaughtering, storing and marketing the product. An article dealing with the grading, packing and marketing of frozen poultry for the British market appeared in the December, 1949, issue of the QUARTERLY. There is evidence that world production of poultry is increasing so rapidly that it will not be long before there will be keen competition from other countries supplying this market. It therefore behoves Australian processors and packers to adopt the most up-to-date and efficient methods of handling and preparing poultry for export. A few shipments of poor quality Australian poultry could quickly spoil the market for all Australian poultry.

The information contained in this article is intended primarily for the export trade, but it could be applied also to the processing and marketing of poultry within Australia.

Feeding Prior to Slaughter

Special feeding of poultry prior to slaughter, while not practised in Australia, is a common feature of processing plants in U.S.A., where subsidiary feeding stations are often conveniently placed alongside the processing floor. The purpose of operating a feeding station is to improve the edible quality and flavour of the poultry and to increase its weight. Most of the poultry may be kept in the feeding station from three to 14 days, during which time it is made to consume as much feed as possible. The feed eaten by poultry during its growth has some influence on the eating quality of the flesh, but the feed eaten during the last few days before slaughter is of special importance in affecting the flavour of the flesh and colour of the fat. This method of feeding and confinement in the feeding batteries also influences the tenderness and juiciness of the meat. To obtain the best results it is necessary to maintain air temperatures within the range of 65° to 70° F. It is sometimes necessary to increase the humidity of the air, particularly on hot dry days, and at all times it is essential to provide adequate draught-free ventilation.

A full description of the equipment used and the operation of a feeding station for poultry will be found in *Marketing Poultry Products*, by Benjamin, Pierce and Termohlen (1948).

Pending the development, in Australia, of these special methods of feeding prior to slaughter it may be possible for processors to secure larger quantities of high-grade poultry by paying premiums to the producers.

Slaughtering and Dressing

The value of dressed poultry depends largely upon the methods and skill exercised in killing, bleeding and scalding and the completeness and neatness of the removal of the feathers. Poultry of prime quality should show no external sign of blood in the superficial blood vessels. All feathers, including pin feathers, should be removed and the skin should be free from bruises, tears, cuts and roughened areas.

Killing

For commercial killing the bird is hung by both feet with its wings level with the elbows of the killer. A heavy cord may be used for suspending the bird, but in commercial packing plants wire shackles are generally used for this purpose. The most efficient shackles are constructed so that the thighs of the birds are held apart, thus facilitating feather removal. Bench killing and picking, which is sometimes practised, confines the blood and keeps the bird under better control than when suspended by a cord or shackle, but if canvas-topped benches are used there is a danger of the skin of the hips being rubbed so that they become brownish as the air dries them.

There are several methods of killing and bleeding poultry. One of these is by cutting the jugular vein inside the throat; another is by cutting the vein from the outside by slashing the throat behind the mandibles; and yet another is by inserting a knife at the side of the neck, leaving a small hole on either side. Slaughter by electrocution has been practised in one cannery in U.S.A. If skilfully and correctly done, each of these methods results in satisfactory bleeding. The older methods of cutting off the head or wringing the neck are not used commercially.

If it is intended to dry-pick the birds for feather removal, the operation of braining, performed immediately after the bleeding cut is made, serves to loosen the feathers, but this is not necessary if the birds are to be soft-scalded for feather removal. Braining, which is in effect the destruction of the nerve tissues of the *medulla oblongata*, which connects the brain with the spinal column, is done by means of a knife either through a slit in the roof of the mouth into the rear of the skull or from the outside by inserting a knife beneath the eye and through the opening formed for the passage of the optic nerve. Poor bleeding adversely affects keeping quality and may be responsible for the development of undesirable flavours and poor appearance of the carcase. Improperly bled birds show traces of blood in the capillaries on the breast and in the veins in the neck, shoulders and ends of wings. Blood spots may also be apparent in the feather follicles and over the hips and thighs. Evidence of poor bleeding will be shown in discoloration of the bones and skin of poultry held for any length of time in frozen storage.

To enable turkeys to be killed on the conveyor line cone-shaped buckets open at top and bottom are sometimes used to hold the turkeys securely from just before bleeding is commenced until the completion of bleeding into the troughs. For small sized turkeys a smaller cone is provided to fit inside the larger one.

Picking

Four methods have been adopted commercially for the removal of feathers, namely dry-picking, hard-scalding, soft-scalding and wax-picking.

Dry-picking by hand is still largely practised in Europe, but the majority of commercial plants in U.S.A. have discarded this method.

Hard-scalding, involving immersion of the birds in hot water (ranging from 180° to 190° F.) just long enough to permit easy pulling of the feathers, was in vogue for a time; but is rapidly disappearing as a commercial practice due to the difficulty of avoiding damage to the outer protective skin with consequent discoloration.

Soft-scalding, more commonly termed semi-scalding or slack scalding, was developed as the result of the discovery that when fowls were immersed for about 30 seconds in water at a temperature of 128° to 130° F. the feathers loosened to permit easy removal, while the birds retained their appearance as well as those which were dry-picked. Later investigations indicated that by using lower temperatures, 122° to 128° F. with longer immersion time, up to 90 seconds, there was less damage to the skin during subsequent mechanical picking, and the drawn toughened skin which occurs under hard-scalding at higher temperatures was avoided. A scalded appearance and breaking of the thin protective outer layer of skin is possible even at 135° F. Processors have found that boilers, with their lighter feathering and more tender skin, require shorter immersion times than older birds.

As the result of soft-scalding the fat beneath the skin of the poultry softens and spreads, thus improving the appearance of the dressed bird. Loosening of the feathers persists for a greater length of time than with the dry-picking method, so that the feathers are more easily removed without scarring the skin. It has been estimated that because of these two factors the proportion of top-grade birds in a pack may readily be increased by 10 per cent. Other advantages are that the cost of picking is reduced due to less time being required per bird, and the cleanliness and comfort of the workers is increased due to the work being easier and to the elimination of loose dust, feathers and lice.

Over-scalding by the use of too high temperature or by too long an immersion in the scalding tanks must be strictly avoided to prevent thickening of the skin and darkening of its colour. Evidence of over-scalding is usually more prevalent on the legs and wings, although it is common also on the breast. Because the feathers on the back lie closer to the body, this area is less likely to be over-scalded.

It has been stated that hand-picking is the only satisfactory alternative to scientific scalding, which involves accurate temperature and time control. The necessity for such measures of control has given a stimulus to the introduction of machinery for the dressing of poultry. In a modern plant equipped with up-to-date machinery the birds, hung on shackles which are attached to an endless chain conveyor running along an overhead track, are killed, and allowed to bleed for about one minute before entering the scalding tank, through which they pass in from 30 seconds to 1½ minutes.

The scalding tank usually takes the form of a narrow metal vat filled with water, the temperature of which is thermostatically controlled within the range of 122° to 128° F. It is equipped with an overflow, and under the best conditions fresh water is continually added to replace that carried out by the birds and also to overflow and keep the water clean. A strong circulation of water is maintained in the tank by a pump, so that the feathers of the bird are ruffled and the water allowed to reach the skin on all portions of the bird.

A spray type of scalder now on the market in U.S.A. has spray nozzles, set at different angles, placed on both sides of the overhead line. During their passage through spray chambers the birds are completely drenched with water at the desired temperature.

Due to variations in age and condition of the birds, the temperature of the water in the scalding tank requires to be varied to suit the prevailing conditions. An accurate thermometer should be available for frequently checking the water temperature. The appearance and condition of the birds should be frequently inspected as a means of determining whether proper water temperatures are being maintained.

Mechanical Picking

After emerging from the scalder the birds are moved through one or more automatic picking machines which rough-pick the birds mechanically. In many plants, after the first or second automatic picker, one or more persons pull the quill or wing-tip and tail feathers.

Next along the line more feathers are removed by operators who press the birds against the revolving drum of one or more mechanical buffers. Sometimes three finishing units, for neck, wing and legs respectively, are employed. These units have a variation in the angle of the revolving drums and placement of the rubber stripper bars. Special shackles are needed, and the birds are reversed between the wing and leg finisher so as to hang by the neck. Some operators say that, with this equipment, wax-picking is not necessary for producing high quality dressed poultry and that less labour is required.

Pinning

The pin feathers are removed with the aid of dull, short-bladed knives. It is customary for the pinners to walk with the line and handle two or three birds each trip.

Cropping and Cleaning Vents

Withholding feed, but not water, from the birds for at least twelve hours before dressing minimizes the necessity for cropping. To ensure that no feed is left in the crop the birds next pass through the cropping station, where one or more operatives strip the feed from the crop by a massaging motion from the crop down the neck, forcing the feed out of the mouth ; alternatively a small incision is made in the skin into the back of the crop and the feed forced out by pressure of the hands. Unless the crop is emptied, fermentation, which sets in very soon after the bird is killed, may taint the meat of the breast and cause the skin over the crop to darken.

When it is desired to remove the crop, the bird is hung with its back towards the operator, who makes a vertical incision in the skin between the wing and the neck, being careful not to cut into the crop. The fingers are carefully run through the opening to loosen the connecting tissues completely around the crop, which is then pulled slowly through the opening and cut off close to the body. After removal of the crop the incision should be carefully sewn up.

Vents are pressed or squeezed to force out any fæcal matter from the lower intestines.

Wax-Picking

The method of wax-picking for removal of residual feathers is sometimes used, generally in conjunction with soft-scalding. Most of the free water on the surface of the roughed bird is removed by modern automatic and buffer picking machines, thus eliminating the need for the long bulky drying tunnels used in the early days of wax-picking. Some operators use a short tunnel or partially enclosed area with fans blowing cooled air on the birds before they are immersed in the hot wax. In other plants immersion of the birds in wax takes place immediately after completion of picking.

The best results are obtained by using two successive immersions in wax at two different temperatures, the first at about 160° F. for three seconds or less and the second at 128-136° F., which is close to the solidification point of paraffin wax. The first immersion produces a firmly attached prime coat and the second coat results in the formation of a thick firm coat which is more easily stripped from the birds than a thin coat. The two dipping tanks are spaced far enough apart to permit ample time for cooling the birds between the two coatings and following the second wax dip the birds are promptly passed through cold water (sprays or tank) to harden the wax coatings.

Modern types of overhead conveyor lines dip so that the birds, suspended by both head and feet, are submerged in the melted wax.

When sufficiently cooled, the wax coating is broken and removed, together with most of the remaining feathers and pins. Usually this operation is performed by hand, but there are automatic picking machines capable of removing a large proportion of the wax.

According to Heitz (1946) the following advantages are claimed for the wax method of picking poultry :

(1) Removal of feathers is usually more thorough than with most hand picking.

(2) The skin is less liable to damage which may occur when pin feathers are removed by pinning knives.

(3) The poultry surfaces show better bloom and are much cleaner, since most of the dirt is removed with the wax.

(4) Labour costs are reduced.

The wax-feather mass is conveyed to a reclaiming tank, where it may be heated to about 250° F. for removal of the moisture prior to separation of the feathers in a perforated centrifugal extractor. By another method most of the feathers are removed from the wax in a heated centrifugal wringer, and the wax is then transferred to a reclaiming tank, where it is heated sufficiently to melt completely, so that the remaining feathers can be removed by skimming. When the heat is shut off the water separates to the bottom of the tank and it may be drained away with most of the impurities.

The loss of unreclaimable wax is approximately one pound per 100 birds.

Singeing

Singers used to remove the hairs from the birds generally have gas flames which momentarily envelop the birds so that hair is removed from all parts of the body without burning the skin. Singeing may be done either before or after cropping.

Washing

Spray washers in which water jets at various angles are directed against the birds are used to clean and at the same time to partially cool them. An improved type of washing unit has long rubber fingers which provide a massaging action as the birds pass through the cold water sprays. After washing, the birds are taken from the conveyor line and hung on cooling racks or immersed in cooling vats.

Defects in Killing and Picking

The most noticeable killing and picking defects are: incomplete feather removal, torn and abraded skins and poor bleeding. Darkness of the crops, due to the birds having swallowed blood during processing, is more frequently found in soft-scalded than in dry-picked birds. It is generally confined to birds which are bled through the mouth or to those which are cut too deeply when outside incisions are made.

Blood discoloration of the fat in the groin is a further defect attributed either to allowing insufficient time for bleeding before soft-scalding, or the hanging of the bird by one leg during scalding, with consequent rupture of the blood vessel in the hip, allowing blood to ooze into the adjacent fat.

Precooling

When required for subsequent frozen storage, it is advisable to reduce the internal temperature of the birds to about 34° F. as soon as possible after killing. It is possible to pack warm poultry directly into boxes and freeze quickly in circulating air at relatively low temperature, but this method has not been generally adopted on account of the low temperatures which are required to avoid the danger of bacterial spoilage in birds at the interior of boxes during cooling.

Where precooling is carried out, the time required for the final cooling in air may be reduced by initially reducing the flesh temperatures with the aid of cold water either applied in the form of sprays or by direct immersion. In experimental work in Canada, Cook (1939*a*) found that immersion of birds in water at 0° C. (32° F.) for two hours prior to hanging in air at 0° C. reduced the time for cooling to about 60 per cent. of that required in air alone. He found no evidence to indicate that temporary immersion in water during precooling had either a detrimental or beneficial effect on the retention of bloom during subsequent storage in the frozen state.

Cooling vats usually receive water and crushed ice while they are being filled with poultry. Compressed air, if available, may be effectively used for agitating the water at several points on the bottom of the vats, thus appreciably increasing the rate of cooling.

The cooling time required in air to reduce the deep flesh temperature to about 34° F. depends on the air temperature, rate of air movement, the size and weight of the birds and the density of stacking. Cook (1939) devised the following formula for calculating the time required for reducing the deep flesh temperature of poultry precooling in air:

$$T = -5{\cdot}0 + 6{\cdot}23 \log (t_p - t_m) + 1{\cdot}16W.$$

t_p = initial flesh temperature in °F.
t_m = temperature of air in 0° F.
W = weight of birds in pounds.

Some calculations based on this formula are given in the following table.

Weight of Bird (lb.).	Time in Hours to Reach Internal Flesh Temperature of 34° F. with Commencing Flesh Temperature (°F.) of			
	90	80	70	60
2	9	8	7	6½
4	11	10	9	8½
6	13	12½	12	11½

Internal flesh temperatures should be measured with a thermometer inserted through the vents into the centre of the birds, and packing should not begin until such temperatures have been reduced to 34° F. in the heaviest birds.

Shrinkage during cooling varies with humidity, rate of air movement, and size of the bird, and may range between ¼ and 1 per cent. Immersion in water for two hours prior to hanging in air may cause a slight overall increase in the weight of the birds.

Evisceration

Evisceration or drawing of poultry which is to be exported in the frozen state is not practised in Australia, but it is generally recognized that the removal of viscera has the advantages of avoiding the possibility of transmission of visceral taint to the flesh, in addition to permitting more sanitary handling in the final stages and avoiding the necessity for thawing the product some time prior to its consumption.

In U.S.A. some operators eviscerate warm poultry direct from the dressing line, and they assert that there are savings in labour and cooling space and that the quality is improved. It is, however, difficult to perform this operation cleanly on warm birds, and there is also an unpleasant odour which may be objectionable to the employees. The most common practice, therefore, is to eviscerate or draw the poultry following a preliminary cooling in ice-cold water or after thorough pre-cooling in air.

Freezing

Cook (1939*b*) demonstrated that, where poultry can be handled promptly and properly with respect to precooling, freezing and storage, no advantage is to be gained by using rapid rates of freezing so far as a direct improvement in the quality of the product is concerned. He states, however, that quick freezing may improve plant practice and in addition to reducing costs of operation may contribute to the final quality of the product by reducing or avoiding delays. In so-called sharp freezers Cook reported that 12-bird boxes may require 15 to 60 hours to freeze, depending on temperature, air movement, method of piling, insulating qualities of container, net weight of box, etc. Freezing times to reduce flesh temperatures in 12-bird boxes from 32° to 25° F. quoted by Cook are as follows :

Air Temperature ° F.	Time in Hours to Reduce Flesh Temperatures from 32° to 25° F.
22·2	275
9·0	66
—3·5	49·5
—18·9	31
—35	19·6

During freezing, boxes should be stacked loosely or separated by dunnage to allow movement of the circulating air over the boxes. When freezing is complete the boxes may be closely stacked.

During storage in the frozen condition poultry is subject to the following changes which reduce the quality of the product: loss of bloom or appearance, desiccation or "freezer burn", development of rancidity in the fat, and loss of aroma and palatability. All of these defects develop more slowly as the temperature of frozen storage is lowered; in addition retention of bloom and freedom from freezer burn are favoured by high relative humidities in the atmosphere in contact with the product.

Overseas investigators have found storage temperatures in the vicinity of 0° F. to be satisfactory for retention of aroma and flavour for periods up to twelve months, but showed that serious loss of bloom and development of freezer burn could occur unless precautions were taken to minimize these changes. Freezer burn, due to surface drying, will develop at a rate which depends on several factors including temperature, humidity and rate of movement of the air surrounding the product. The latter is of least importance since rate of air movement is usually small due to the inclusion of the birds in boxes which are lined with paper and which are closely stacked after freezing.

Cook (1939) demonstrated that relative humidities greater than 98% (relative to ice) in the storage atmosphere are required to reduce freezer burn to small proportions over a one-year storage period of poultry held at —13·5° C. (7·5° F.). The following data (p. 10) taken from Cook's table indicate the effects of both temperature and relative humidity on the incidence of freezer burn in poultry.

Cook reported also that relative humidities of the atmosphere in frozen storage rooms were often below 85%. He found that, in boxed poultry, the relative humidity within the box reached 100% during freezing and then fell off gradually during storage; some improvement was effected by the use of unsealed liners of waxed paper and moisture-vapour-proof Cellophane, but the relative humidity in the interior was too low for storage periods exceeding six months. The safe storage period for each method of lining was estimated by adding eight weeks to the period required for the humidity inside the liner to reach 95%. Sealing of paper stocks used for lining wooden boxes was considered by Cook to be impracticable.

Air Temp. °F.	Relative (to Ice) Humidity. (%)	Time (Weeks) for Definite Surface Drying.
—7·5	70	13
	75	8–9
	80	10–11
	85	22
	90	37
	95	None in 83
+7·5	70	8
	75	9
	80	11
	85	9–10
	90	23
	95	3

The means whereby loss of water by evaporation from frozen boxed poultry can be reduced to a minimum are :

(1) Maintenance of low temperatures in the storage atmosphere, e.g. 0° F. or lower for storage periods of six months or longer.
(2) Efficient insulation of storage rooms to reduce heat losses to a minimum.
(3) Provision of a high ratio of area of refrigerated cooling surfaces to volume of the storage room so that the difference between the temperatures of the refrigerating medium and that of the room will be as small as possible.
(4) Maintenance of uniform temperatures in the storage atmosphere. Separate rooms should be used for freezing and for frozen storage.
(5) Close stacking of boxes.
(6) Use of moisture-vapour-proof liners for boxes and sealing of these liners if practicable.

Liners used for poultry boxes should completely cover the interior to avoid any possibility of contact between the flesh of the birds and the wood, which may draw moisture from the skin under such conditions. Individual wrapping of birds by the Cry-o-Vac process would provide additional protection against water loss from the product. Kaess (1949) lists the following materials as having sufficient resistance to water-vapour transfer to be used as wrappers and bags and laminates : Cellophane MSAT, lacquered glassine, special papers impregnated with wax-plastic mixtures, Pliofilm FF, Polythene, polyvinyl chloride film, some polyvinyl copolymers, polyvinylidene chloride films and copolymers, styrolisobutylene copolymer film, and laminated metal foils. The choice of the wrapping material may be to some extent limited by costs, but preference should be given to those which are capable of being sealed.

Where it is desired to substitute cartons instead of wooden boxes for holding poultry for any length of time in frozen storage, it is advisable to use cartons which can be effectively sealed. The ordinary telescopic type carton is not satisfactory in this respect, but Cook and White (1940) have described one in which corrugated cardboard, waxed inside and outside, is used and which can be effectively sealed with a moisture-vapour-proof adhesive tape.

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RECENT PUBLICATIONS

1. **Developments in Food Manufacture.** By J. R. Vickery. The food manufacturing industry in Germany during the period 1939-1945. British Intelligence Objectives Sub-Committee Overall Report No. 14 : 103-13 (1949).

This report has been written to acquaint Australian food technologists with fresh developments in the German food industries, and to compare the present technical status of Australian food processing industries with those of Germany. The report is available from the Commonwealth Division of Industrial Development at Canberra, Sydney and Melbourne ; also from His Majesty's Stationery Office, London.

2. **Australian Problems in the Preservation of Perishable Foods.** By J. F. Kefford and W. A. Empey. United Nations Scientific Conference on the Conservation and Utilization of Resources (1949).

A limited number of copies of this paper is available from C.S.I.R.O., Division of Food Preservation, Private Bag, Homebush Post Office, New South Wales.

The Cannery and Packing House at Hawkesbury Agricultural College

By
H. R. Richardson*

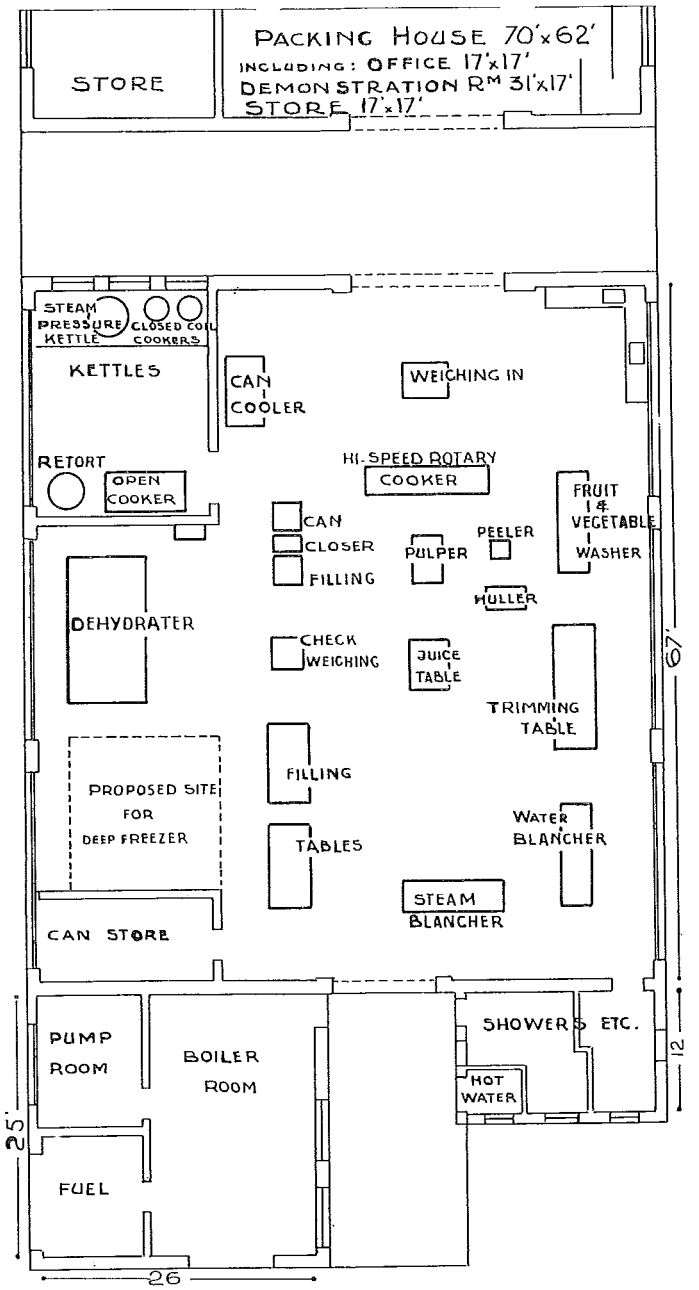
Recently Mr. W. J. Sheahan, Minister for Lands, on behalf of Mr. E. H. Graham, Minister for Agriculture, officially opened the new cannery and packing house at Hawkesbury Agricultural College, New South Wales, before a representative gathering of members of the industry, the Food Technology Association, C.S.I.R.O., and officers of the Department of Agriculture. After the opening, visitors were able to sample exhibits of canned products generously supplied by private firms.

Rapid developments in the canning of fruit and vegetables have emphasized the need for processors and operatives at all levels. Realizing this the New South Wales Department of Agriculture decided to proceed with the erection of a cannery and laboratories which would provide the required facilities. Adequate provision has also been made for research.

The design of the cannery and packing house and the machinery and equipment installed are the result of collaboration between members of the industry, machinery firms, research workers of the C.S.I.R.O. and departmental officers. It is on a semi-commercial scale specifically designed to train students in the processing and preservation of fruit and vegetables. The arrangements are such that a maximum of twelve students can be trained in any one year.

The building itself consists of a brick structure 180 ft. by 62 ft. with saw-tooth fibro roof to provide maximum possible lighting. The general processing line for canning and dehydration comprises : washer, peeler, huller, trimming table (with fluorescent lighting), water blancher, steam blancher, filling tables, weighing tables, vacuum can-closer, water cooker, pressure cooker (with pressure-temperature controller and recorder), kettles, reduction pots, can cooler and cabinet type dehydrater. The juice line consists of : juice churns, tanks and screens, pulper and high-speed rotary cooker. Practically the whole of this machinery is made of stainless steel, and specially designed. The steam raising plant provides adequately for the cannery and packing house needs and is automatically stoked and controlled, with copper steam and condensate lines throughout. Installations are such as to permit rearrangement or extension of equipment if so desired. Space has been provided for the installation of quick-freeze units at a later date.

* Deputy Principal, Hawkesbury Agricultural College.



PLAN OF CANNERY

◦HAWKESBURY AGRICULTURAL COLLEGE◦

Situated in an important fruit and vegetable production area, the College possesses facilities for training in crop production, which is considered essential for any course in fruit and vegetable processing and preservation. The cannery itself is located in the centre of the College orchard, which comprises 40 acres of mixed citrus, vine and pome fruits. Portion of this orchard is under spray irrigation, and this is being extended. Immediately adjacent is the vegetable garden, where 11 acres of vegetables are grown under irrigation. Students and research workers will also benefit from close association with the agronomy staff, which has already achieved notable successes in the breeding of improved vegetable varieties and in controlling Whiptail disease of cauliflowers by the use of molybdenum. Well-known French bean varieties bred at the College are Hawkesbury Wonder, Clarendon Wonder, Richmond Wonder and Windsor Long Pod, and in fruit, the well-known Richmond Red strawberry.

Modern laboratories and a highly trained and experienced staff provide adequate facilities for training in the basic sciences.

With these facilities in view the details of a diploma course in Food Technology (Fruit and Vegetables) were worked out by research workers of the C.S.I.R.O. and College officers. The course will be of two years duration and will deal with the following subjects :

Principles of Food Technology (Fruit and Vegetables)
Crop Production
Biochemistry
Engineering
Microbiology
Nutrition
Food Industry Economics
Applied Botany and Entomology
Business Principles and Book-keeping.

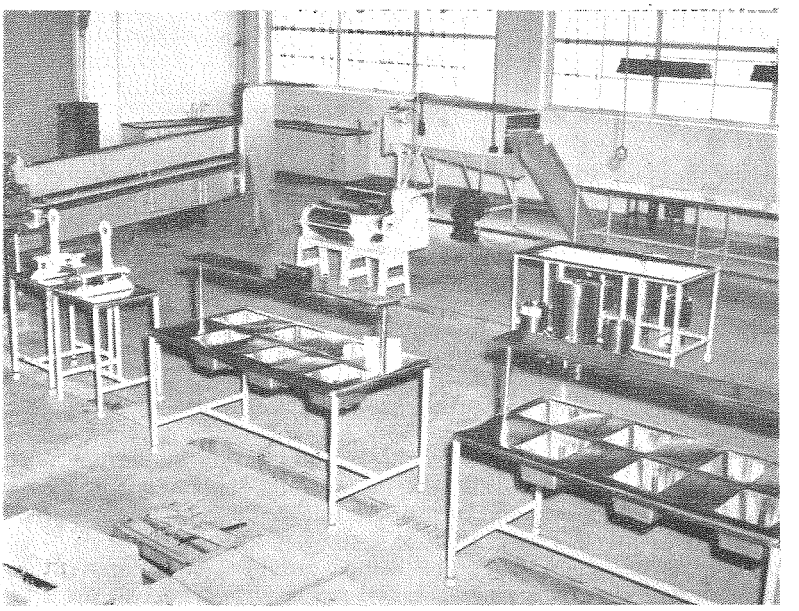
The necessary basic sciences will be dealt with in the first year.

Training will be given in the canning and dehydration of fruit and vegetables. It is intended to introduce quick-freezing as soon as the necessary equipment is obtained.

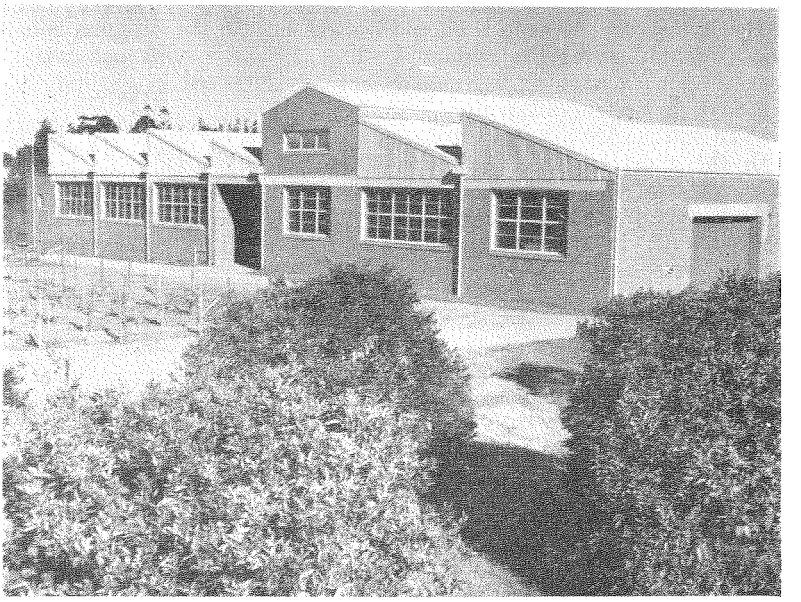
Visits will be made to city and country canneries.

The main object of the course is to train students for positions as managers, technologists, supervisors or foremen in canneries. The Food Technology course is not intended for cannery field officers. The Diploma in Horticulture, which was initiated in 1950, is designed expressly for that purpose, and in that course only sufficient food technology is taught to provide prospective orchardists and field officers with an appreciation of cannery requirements. The Diploma in Food Technology (Fruit and Vegetables), on the other hand, will only include sufficient training in crop production to provide future production and quality control officers in canneries with a background knowledge of production methods. It is not intended that graduates in horticulture should become factory officers, or that those in food technology should become field officers.

Certain criticisms of the proposed diploma course are worthy of consideration.



Interior of Cannery, Hawkesbury Agricultural College.



Exterior of Cannery and Packing House, Hawkesbury Agricultural College.

A warning has been issued that care should be taken not to train more students than can be absorbed by the industry. Experience with the dairying diploma course has proved the wisdom of this advice. The cannery has been designed to provide training for a maximum of twelve students in any one year. The number of students will be regulated to meet the needs of the industry.

Fears have been expressed that the duration of the course is too short. It should be remembered, however, that the course at Hawkesbury Agricultural College will be a full-time course. Arrangements have been made for students to spend three days a week on lectures or laboratory work and for the remaining two days per week to be spent in practical work in the cannery, orchard or vegetable garden. The time thus made available, 1536 hours for lectures and laboratory work alone in the two years course, compares favourably with other courses of a similar nature. Experience with other recognized diploma courses at this institution has proved the feasibility of this course of action.

Opinions have been expressed that firms would not be prepared to finance employees through a course such as this without a guarantee that employees, when fully trained, would return to the original firm. Without attempting to minimize this risk, it should be pointed out that it is possible for a firm or group of firms to initiate a suitable apprenticeship award. Recently a Dairy Produce and By-products (State) Apprenticeship Award was approved. This award provides for an apprenticeship period of five years covering an initial period of one to two years in the factory of the employer, two years' training at the Hawkesbury Agricultural College, and the remainder of the period with the original employer. During the five-year period of the indentures the employer is required to pay certain award rates of pay as well as any college fees incurred.

The course at Hawkesbury Agricultural College caters for the needs of country and interstate canners, and of individuals not already engaged in the industry. As such it should not clash with the diploma course in Food Technology at the Sydney Technical College, which is essentially concerned with training individuals actively engaged in the industry in the Sydney metropolitan area.

To summarize : a modern cannery has been erected ; it is equipped with the most suitable equipment that can be provided; it is situated in a fruit and vegetable production area ; adequate laboratory facilities and an experienced staff are available ; a suitable curriculum has been worked out ; it is intended to assist the industry by the provision of trained personnel.

CANNING OF QUINCES—ADDENDUM

In the last issue of FOOD PRESERVATION QUARTERLY there appeared a note (Thompson, 1949) on the canning of quinces, based on information collected from literature. Since that note was prepared a number of inquiries have been received on the canning of quinces, and the Division of Food Preservation has made a short investigation. As a result of this work the following procedure is recommended :

1. *Peeling.*

Immersion in boiling lye (20 per cent. caustic soda) for three minutes peels quinces satisfactorily. Thorough rinsing is necessary following lye peeling.

2. *Cutting.*

Some hand trimming is required, and then the quinces are halved, cored and sliced.

3. *Blanching.*

Blanching in steam for five to ten minutes improves the texture of the final product and removes intercellular gases which may promote can corrosion.

4. *Filling and Syruping,*

A fill-in weight of 10 ounces is suggested for 16 ounce cans and hot 40 per cent. syrup is added.

5. *Exhausting.*

It is important to obtain an adequate vacuum in canned quinces to minimize can corrosion. Exhausting for 10 minutes, or closure with steam-flow or mechanical vacuum, is recommended.

6. *Processing.*

In order to cook the product to a distinct pink colour, which is regarded as a desirable quality, it is customary to process quinces according to a schedule considerably in excess of the requirement for stability against spoilage. A process of 30 minutes at 220° F., followed by air cooling, is recommended.

The product appeared to be more highly coloured in plain cans than in lacquered cans, but in plain cans it is particularly necessary to maintain high vacuum in order to ensure a reasonable shelf life.

Reference

THOMPSON, P. (1949).—Food Pres. Quart. 9 : 74.