94th Congress
2d Session

COMMITTEE PRINT

1977 U.S. AGRICULTURAL OUTLOOK

Papers Presented at the National Agricultural Outlook Conference Sponsored by the U.S. Department of Agriculture—Held in Washington, D.C., November 15–18, 1976

PREPARED FOR THE

COMMITTEE ON AGRICULTURE AND FORESTRY
UNITED STATES SENATE

DECEMBER 10, 1976

Printed for the use of the Committee on Agriculture and Forestry

U.S. GOVERNMENT PRINTING OFFICE
78-885 O WASHINGTON : 1976

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402 - Price $3.85

HOME GARDENING AND PRESERVATION OF FRUITS AND VEGETABLES

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Home Gardening and Incidence of Freezing and Canning*

One of the main functions of the Consumer Economics and Demand Analysis Program Area (CEDA) is to continually assess consumers' motives, attitudes, knowledge, needs and behavior toward food and fiber and related goods and services. As a means of obtaining up-to-date information about the changing consumer concerns and behavior as they affect food purchases, USDA has developed a new continuing survey in which consumers will be interviewed periodically about a number of issues.[1]

The first phase of this survey was conducted during the spring of 1976 and included questioning about home gardening and preservation of fruits and vegetables. Home gardening has been presumed to be one of the favorite hobbies of Americans. Beyond that very little information is available in terms of motives, incidence rate, products grown, utilization of fruits and vegetables grown in home gardens and changes over time.

Personal interviews were conducted in over 1,400 households with the main food shopper, or, if none, with the person who had the major responsibility for food preparation. These households represent a cross-section of private households throughout the United States, excluding Alaska and Hawaii. Results from the study are projectable within certain statistical limits to all households within the coterminous United States.

There has been a slight but steady growth in the number of households with fruit and vegetable home gardens over the past few years. Findings indicated that 43 percent of the households surveyed planted a garden in 1974. This projects to around 30 million households in the 48 States surveyed; 46 percent in 1976 (approximately 33 million households); and 48 percent (approximately 34 million households) either had already planted or intended to plant one in 1976. This suggests that the interest in home fruit and vegetable gardening generated in the United States 3 or 4 years ago amid fast-rising food prices may be established and is not necessarily transitory.

REASONS FOR THE 1975 GARDEN

Most of the study covered behavior in 1975. Although respondents were not of necessity the gardeners, three reasons predominated

*By Evelyn F. Kaitz.

[1] National study of consumers' food-related behavior, attitudes, and motives.

among the variety of motivating reasons given by the respondents that reported a household fruit and vegetable garden in 1975. A preference for the taste of fresh fruits and vegetables was the most frequently mentioned reason (by about 50 percent), followed by the desire to save money and cut down on the food budget (by 40 percent), and as a hobby (by about one-third of the garden household respondents). In general, there were no significant differences in demographic characteristics in those households that had the garden because of a preference for the taste of fresh fruits and vegetables. Households in rural areas and those with five or more members were more likely than households in metropolitan areas or households with fewer members to have had a garden in 1975 to save money or cut down on the food budget. In contrast, households in rural communities were less likely to have a home garden as a hobby. However, about half the respondents with gardens in single-member households had the garden as a hobby compared to about 30 percent of the households with a larger number of members.

The reasons given by the respondents for the household fruit and vegetable garden in 1975 were what one might expect when the per capita income is considered. As per capita income decreased from $7,000 or more to less than $2,000, it was more likely that there was a household garden to save money and cut down on the food budget. In contrast, as the per capita income increased from less than $2,000 to $7,000 or more, it was more likely that the household garden was a hobby.

LOCATION OF THE 1975 GARDENS

Around 85 percent of the 1975 gardens were located in the household yard. We did not determine the exact location of the home gardens that were located elsewhere. But, there was practically no payment reported for the use of these garden locations. In the second phase of the study, we are planning to investigate who provided the land for the away-from-home fruit or vegetable gardens.

FRUITS AND VEGETABLES GROWN IN THE 1975 HOME GARDENS

As shown in table 3, the tomato was the most popular vegetable grown in the 1975 home gardens—about 95 percent of our garden households grew them. This is not surprising, as in a study of Consumer Satisfaction with Food Products and Marketing Services conducted during the spring of 1974 by ERS, tomatoes got the highest dissatisfaction rating of the 31 individual products in the survey. Consumers criticized price, ripeness, taste, and appearance. The next most frequently grown vegetables were beans (limas, green, wax, pole, etc.), grown in about 70 percent of the home gardens; cucumbers, peppers, radishes, and green onions (scallions) were grown in about 60 percent of the gardens. Lettuce, onions, corn, and carrots were grown in about 50 percent of these home gardens.

There were not many fruits grown in the 1975 home gardens. Strawberries and apples were the most popular—mentioned by about 20 percent. Melons, peaches, and pears were the only other fruits grown

in more than 10 percent of the home gardens. Strawberries were more popular in the West than in the other regions.

COMPARATIVE GARDEN SIZES

In those households that had a garden in both 1974 and 1975, about 65 percent of the respondents answered that the garden was the same size in 1975 as it was in 1974. About 25 percent of the households that had a garden both of these years had a larger garden in 1975 for reasons such as: Wanted to plant more (reported by about 50 percent of these respondents), had more ground available (by about 20 percent), and saves money (by about 15 percent).

About 70 percent of the households that had a garden in 1975 already had or planned to have one the same size in 1976. About 15 percent had or expected to have larger and about 10 percent smaller gardens this year.

ACTIVITY

Let us now look at table 1 and the activities in the different types of households—those that had gardens in 1974, 1975, and 1976; those that had gardens 2 out of 3 years; those that had a garden only in 1 year; and those that did not have or plan to have a garden. In discussion any of the comparisons that involve the 1976 home garden from our sample, I am including those households in which the respondent said someone in the household planned to have a home garden in 1976. Bear in mind, however, that because of the interviewing time period and climatic differences in the areas surveyed, only about 20 percent of the household gardens had already been planted this year.

About one-third of our sample households had a garden in 1974, 1975, and 1976. They represent about 75 percent of our households with gardens in 1975 and are probably the hard core or persistent kinds of fruit and vegetable gardening households. About 40 percent of our households did not have a fruit or vegetable garden in these 3 years—the determined, nongardening types. There was very little activity in the other households. Very small percentages of our households were either new gardeners or those no longer gardening.

DEMOGRAPHIC DIFFERENCES IN THOSE HOUSEHOLDS THAT DID OR DID NOT HAVE A GARDEN ALL 3 YEARS

As you can see in table 2, there were differences in the demographic characteristics of households that had a fruit and vegetable garden in 1974, 1975, and 1976 (the continuous garden households) and the characteristics of households that did not have a fruit and vegetable garden these 3 years (continuous nongarden households).

Our findings imply that gardening is more prevalent in those households that have a sense of permanency. For example, 87 percent of our garden households were living in houses that they owned. In addition, more respondents from the garden households than those from the nongarden households said they had lived in the same dwelling since January 1975.

Comparing the family income of the garden households to that of the nongarden households, there were about the same percentage of households with or without gardens in those households with total family income between $5,000 and $14,999 and $25,000 and over. However, more of the nongarden households had a family income of less than $5,000 than did the garden households; whereas, more of the garden households had a family income of between $15,000 and $24,999 than did the nongarden households.

More of the garden households had three or more members than did the nongarden households.

RELATIONSHIP OF GARDENING TO BUDGET CONSCIOUSNESS

Early in the interview, before the food shoppers were questioned about the household gardening activity, we asked them whether or not they always, almost always, sometimes, seldom, or never have to keep within a food budget. In those households where the respondents said they always or almost always have to keep within a food budget, a large proportion did not have a garden in 1975. This could be for any number of reasons, for example, these households could be in apartments. We plan to do some additional analysis to explain what appears to be an unusual situation.

Referring again to the reasons given by respondents for having the 1975 home garden, 40 percent said it was to save money and cut down on food expenditures. Speaking about this group only, we found that about two-thirds of them also said they always or almost always have to keep within a food budget.

RELATIONSHIP OF GARDENING TO HEALTH PROBLEMS

We were interested in whether there was any correlation between home gardening and eating more fresh fruits and vegetables because of a health problem. We found the demographic characteristics in households reporting that someone was eating more fruits and vegetables because of health problems were about the same in households that were growing their own as they were in those that did not have gardens.

In those households where fresh fruits or vegetables are eaten more by anyone in the household because of health problems they want to prevent, about 60 percent had a fruit and vegetable garden in 1975.

FREEZING

We established whether anyone in our sample households had frozen any fruits or vegetables in 1975, even if they were not from the household garden, which ones were frozen, and which ones came from their household garden. In 46 percent of our households, someone froze fruits or vegetables in 1975.

As would be expected, the largest proportion of households that froze fruits and/or vegetables whether or not these came from the household garden or the households even had a garden, were in the rural communities. The largest proportion of households that did not

freeze any fruits or vegetables were in the larger metropolitan areas, the Northeast region, and the one-member households. The largest proportions of households that froze were from the continuous garden household group (about 75 percent), whereas the least likely to freeze fruits and vegetables were from the household group that had not had a garden in any of the 3 years being considered.

Although freezing was not one of the three most popular reasons for having a garden in 1975, the respondents in around 10 percent of the garden households indicated that there was a garden to provide food for freezing.

About 69 percent of our 1975 garden households also froze fruits and vegetables from their home gardens. Shown in table 3, the order of popularity was very different for freezing the homegrown vegetables than it was for growing them. Beans were frozen in about half of the households; corn in about 40 percent; peppers, peas, and tomatoes in almost 30 percent. Strawberries and apples were again the most popular fruits, but in only 16 and 11 percent of the households, respectively.

RELATIONSHIP OF GARDENING TO FREEZING AND OWNERSHIP OF FREEZERS

About 60 percent of our total households had a refrigerator/freezer combination. Among this group, only 46 percent said someone in their household froze fruits and vegetables in 1975. However, about 30 percent of our total households had a separate freezer. Our findings indicated that about 75 percent of the respondents from these households said someone in their household froze fruits and vegetables. We can only imply a correlation from these preliminary findings between ownership of a separate freezer and freezing fresh fruits and vegetables from the household garden. However, the relationship seems plausible because the largest proportion of households (about 75 percent) that froze fruits and vegetables in 1975 were from the 34 percent of total households that were continuous gardeners.

HOME CANNING

We investigated home canning or preserving as another way to utilize the homegrown fruits and vegetables. Thirty-four percent of the households canned or preserved fruits or vegetables in 1975 whether or not these came from their home gardens or they even had a household garden. And, around 30 percent of our respondents said someone in their households canned or preserved fruits or vegetables in 1975 from the household garden. One of the reasons for the household garden (given by about 14 percent of our garden household respondents) was to provide food for canning. Our continuous garden households were more likely to can or preserve fruits and vegetables than were the other households.

As can be seen in table 3, the two most popular vegetables grown in the 1975 home gardens were also the two most popular vegetables from the household garden for canning—tomatoes in 65 percent of the households and beans in 42 percent. Cucumbers and beets were

canned in about 30 percent of the households. Of the homegrown fruits, apples were the most frequently canned fruit (15 percent); strawberries, pears, and peaches were canned in about 10 percent of the households that canned homegrown fruits in 1975.

DIFFICULTY IN GETTING THINGS NEEDED FOR CANNING OR PRESERVING

In approximately two-thirds of the households that canned or preserved fruits and vegetables in 1975 there was some difficulty in obtaining lids, jars, and other things needed for canning. Getting lids was a problem for almost all that experienced difficulty. The respondents in 40 percent of the households that said there was difficulty indicated that less fruits and vegetables were canned or preserved in 1975. About 25 percent said some fruits and vegetables that would have been canned were frozen. Is this a temporary effect or will more canners switch to freezing? Is there a need to develop different types of fruits and vegetables for eating fresh, for freezing, or canning?

THE FUTURE OF HOME GARDENING

Economy motives figured importantly when interest in home gardening of fruits and vegetables was generated 4 or 5 years ago amid fast-rising prices. There is some question as to whether or not this interest has peaked and is likely to decline.

The incentives for gardening, canning, and freezing are diminishing for those simply trying to save money as employment opportunities and incomes improve along with increasing stability in food prices. For the majority of gardening households, preference for their own produce and recreational enjoyment might tend to perpetuate gardening even in better economic times. As long as such households remain loyal to these motives, there is little likelihood of a major decline in home gardening activity.

Table 1.—Household gardening activity, 1974–76

Activity	*Percent*
Had a household garden in 1974, 1975, and either already have one or plan to have one in 1976	34
Had a household garden in 1974, 1975, and do not plan to have one in 1976	5
Had a household garden in 1974, did not have one in 1975, and do not plan to have one in 1976	3
Had a household garden in 1974, did not have one in 1975, and either already have one or plan to have one in 1976	2
Did not have a household garden in 1974, 1975, and do not plan to have one in 1976	42
Did not have a household garden in 1974, 1975, and either already have or plan to have one in 1976	7
Did not have a household garden in 1974, did have one in 1975, and either already have or plan to have one in 1976	5
Did not have a household garden in 1974, had one in 1975, and do not plan to have one in 1976	2

SOURCE.—National study of consumers' food-related behavior, attitudes and motives, conducted by USDA, spring 1976.

TABLE 2.—DEMOGRAPHIC CHARACTERISTICS OF HOUSEHOLDS HAVING A FRUIT OR VEGETABLE GARDEN IN 1974, 1975, AND HAVING OR PLANNING TO HAVE ONE IN 1976; AND OF HOUSEHOLDS NOT HAVING A FRUIT OR VEGETABLE GARDEN IN 1974, 1975, AND NOT PLANNING TO HAVE ONE IN 1976

[Amounts in percent]

Characteristics	Garden households	Nongarden households
Region:		
Northeast	22	25
North-central	34	24
South	28	33
West	16	18
Type dwelling:		
Own house	87	49
Rent house	6	15
Other (own/rent apartment, mobile home, etc.)	6	36
Occupancy period:		
Lived in same dwelling since January 1975	91	84
Did not live in same dwelling since January 1975	8	14
Family income:		
Less than $5,000	12	19
$5,000 to $9,999	19	22
$10,000 to $14,999	20	20
$15,000 to $24,999	24	14
$25,000 and over	11	8
Income change:		
More in 1975 than 1974	36	32
Less in 1975 than 1974	17	14
Same in 1975 and 1974	43	48
Household size:		
1 member	7	23
2 members	32	31
3 or 4 members	38	31
5 or more members	23	15
Households with at least 1 person in each age group:		
Under 6	23	23
6 to 11	29	18
12 to 17	28	18
18 to 24	25	28
25 to 34	30	27
35 to 44	27	20
45 to 54	26	23
55 to 64	27	19
65 or more	22	23

Source: National study of consumers' food-related behavior, attitudes, and motives conducted by USDA, spring 1976.

TABLE 3.—PERCENT OF HOUSEHOLDS WITH GARDENS GROWING, FREEZING, AND CANNING OR PRESERVING SELECTED FRUITS AND VEGETABLES FROM THEIR HOME GARDENS IN 1975

Fruits and vegetables	Grown	Frozen	Canned or preserved
Tomatoes	95	26	65
Beans (lima, wax, etc.)	71	54	42
Cucumbers	62	4	29
Peppers	61	28	10
Radishes	59	0	0
Green onions (scallions)	58	2	1
Lettuce	56	1	0
Onions	52	3	4
Carrots	50	15	8
Corn	50	41	15
Squash	45	21	8
Beets	40	7	29
Peas	40	27	7
Turnips	26	7	1
Strawberries	22	16	9
Apples	20	11	15
Melons	13	3	1
Peaches	13	7	10
Pears	10	3	10

Source: National study of consumers' food-related behavior, attitudes and motives, conducted by USDA, spring 1976.

Table 4.—Respondent characteristics (respondent is not of necessity the gardener)

Characteristic	*Percent*
Sex:	
Female	89
Male	11
Employment:	
Currently employed	40
Employed any time in 1975	50
Chief wage earner in household:	
Respondent is current chief wage earner	24
Respondent and someone else were chief wage earners in 1975	4
Respondent was chief wage earner in 1975	25
Respondent and someone else were chief wage earners in 1975	4
Education:	
None through eighth grade	15
Less than a high school graduate	16
High school graduate	38
Less than a college graduate (includes all vocational training beyond high school)	18
College graduate or more	12
Age:	
Under 25	13
25–34	24
35–49	26
50–64	23
65 and over	14

SOURCE.—National study of consumers' food-related behavior, attitudes and motives, conducted by USDA, spring 1976.

HOME CANNING*

Many people are canning food at home today. Moreover, because of economic uncertainty and unemployment levels, the number of home canners is likely to increase. Although the Department has for many years maintained publications offering research-based instructions to help the home canner, reports received in recent years through the extension service or directly from the consumer indicate that many of them are experiencing problems. These range from difficulty in obtaining proper canning supplies to spoilage of home canned foods. This spoilage not only results in economic loss, but may constitute a hazard to health or life if the food is consumed. To obtain a clear picture of the home canning situation a survey was undertaken.

At the conclusion of the personal interview for the Economic Research Service National Study of Consumers' Food-Related Behavior Attitudes and Motives, in those households where the respondents indicated that someone in the household had canned or preserved fruits or vegetables in 1975, the home canners were asked to self-administer and complete a supplemental questionnaire about the canning they did in 1975.

In order to obtain a large enough and significant sample of home canners, a personal screening interview was conducted in additional households in the same sampling locations used in the personal interview national probability sample. In those households where someone had canned or preserved fruits or vegetables in 1975, the canner was asked to self-administer and complete a supplemental questionnaire about the canning they did in 1975. The final number of self-administered questionnaires completed was 900.

*By Carole A. Davis.

Major areas of information obtained from the survey include demographic characteristics of the home canner, sources of canning instructions used, kinds and amounts of fruits and vegetables canned, methods and procedures used, extent of spoilage encountered, food safety awareness and practices followed in canning, and future plans for home canning. The results will help us to more effectively aid the consumer and will be useful in identifying research needs.

RESULTS

Results from the national survey on home canning indicate that one out of three households canned fruits and vegetables at home in 1975. These foods were canned by one out of five households in large metropolitan areas as compared to one out of two households in rural areas. A smaller percentage of those in the Northeastern as compared to those in the North Central, Southern, and Western areas of the country canned these items.

DEMOGRAPHIC CHARACTERISTICS OF HOME CANNERS

The profile of the home canner that emerged from the survey indicates that:

The usual home canner is between 25 and 64 years of age (2 out of 10 were 25–34 years; 3 out of 10 were 35 to 49 years; and 2 to 3 out of 10 were 50–64 years). Only 1 out of 10 was younger and 1 out of 7 was older;

Two out of five home canners were high school graduates with about one out of four having some college or vocational training;

A little more than half of the home canners were not employed. Of those working about half held part-time jobs;

Proportionately more of those canners without children and who were employed were employed full time;

Canners under 50 years of age generally came from households with three or more members, while those 50 years and older lived in one or two member households;

About 6 out of 10 canners came from households with a total income between $5,000 and $20,000;

Those with household incomes above $12,500 were more likely to be between 25 and 49 years of age;

Almost three-fourths of canners had at least 2 years canning experience; and

Of those who canned both in 1974 and 1975, about 10 percent had some food spoil in both of these years while 15 percent had spoilage in just one of those years.

Some of the major findings about respondent characteristics are shown in table 1.

SOURCES OF CANNING INSTRUCTIONS

Home canners obtained instructions from many sources—some more reliable than others. Friends or relatives were the source of instructions for almost two-thirds of the canners, while two out of five used cookbooks. USDA publications, extension service publications, personal recipes, canning equipment manufacturer's cookbooks, and mag-

azines or newspapers were each used by 1 out of 10 canners. Some of the instructions appearing in cookbooks, magazines, and extension publications, however, could have originated from USDA research. Even some of the directions obtained from friends or relatives could have come originally from USDA material.

A greater percentage of canners with some college education than those with less education used USDA and extension service publications. More of those under 35 years of age than older, more with children than without, and proportionately more who were employed full time than not employed, obtained instructions from friends or relatives. More canners under 50 years of age than older, more of those who had more than a high school education than those with less education, more households with five or more members than one member, and more households with annual incomes above $12,500 than those with incomes below $5,000 used cookbooks as a source of instruction. Proportionately, more of those having spoilage both in 1974 and 1975 than those not having spoilage used cookbooks.

KINDS AND AMOUNTS OF FRUITS AND VEGETABLES CANNED

Tomatoes were the most popular food item canned. Of those households canning fruits and vegetables, three out of four canned tomatoes. Other vegetables, pickles, and fruit were each canned by one out of two households. Tomato sauce and vegetable mixtures were each canned by about one out of five households, and about two out of five preserved jams and jellies.

The total volume of fruits and vegetables, excluding jams and jellies, canned by households was determined by using a quart as the common denominator of measurement. The number of different sized jars of food canned in 1975 by each household was converted to quarts and totaled. About 10 percent of households canned a total volume equivalent to less than 12 quarts, 40 percent canned 12 to 49 quarts, and 25 percent canned between 50 and 99 quarts. One-fifth of the households canned between 100 and 249 quarts, but only about one out of 16 canned more than 250 quarts.

In general, there was no relationship between the total volume of fruits and vegetables canned and employment status or income level. Relative to household size and volume canned, as expected, more households with two or more members than those with one member tended to can a total volume of 75 or more quarts.

HOME CANNING EQUIPMENT USED

Containers.—Most canners (94 percent) used jars designed especially for canning when canning vegetables and fruits other than jams or jellies. However, one-third used other jars, such as peanut butter, coffee, and salad dressing; therefore, some canners used both home canning jars and nonstandard jars. Less than 1 percent of canners used tin cans.

The USDA recommends the use of jars designed especially for home canning so that jars will be properly heat tempered, resistant to mechanical shock, of the right size for the established processing time and temperature, and the proper size to fit standard home canning closures.

More canners with at least 2 years of canning experience than with 1 year used jars not designed for home canning. A greater percentage of those having spoilage in 1974 and 1975 than those not having spoilage in these 2 years used nonstandard jars for home canning. Proportionately more households with five or more members than those with one or two members used nonstandard jars. Income level did not seem to affect the use of one kind of jar over another, as about the same percentages of households regardless of income used standard home canning jars.

The most popular sizes of home canning jars used were the quart and the pint, by 85 and 65 percent of the canners, respectively. Only about 1 out of 10 used half-pint jars and relatively small percentages used the 2-quart and 1½-pint jars. USDA publications primarily contain processing recommendations for foods canned in quart and pint jars. However, processing recommendations are included for a few products in half-pint jars.

Lids.—About 90 percent of canners of all ages used new flat metal lids with metal bands for canning fruits and vegetables, other than jams or jellies.

Porcelain-lined zinc caps and reused flat metal lids with metal bands were each used by 1 out of 10 canners. Directions are included in our publications for the use of zinc caps as well as two-piece lids with flat metal discs and bands. However, we do not recommend reusing flat metal lids because once an indentation has been made in the sealing compound by the jar rim, the lid may not seal properly the second time.

Although paraffin should only be used for jellies, 13 percent of canners used paraffin for sealing fruits and vegetable products.

There was a trend for more of those under 50 years of age than older to reuse flat metal discs. Canners over 65 years of age were more likely to use zinc caps than were the younger ones.

HOME CANNING METHODS USED

Slightly more than two-thirds of home canners used the open-kettle method for canning fruits and vegetables, including jams and jellies, and more than half, or 60 percent, used the boiling-water-bath method. The pressure canner was used by 3 out of 10 canners and 1 out of 10 used the pressure saucepan (holds only pints). Only about 2 percent of canners used the oven method.

As age of canners decreased they were more likely to use the boiling-water-bath method of canning. This method was used by more of those who had completed high school or some college than those with less education, by more households with three or more members than those with fewer members, and by more households with children than with no children.

As the level of education decreased from college to less than high school training and as the age of canners increased they were more likely to use the open-kettle method of canning. New canners were less likely to use this method.

The Department recommends the boiling-water-bath method for processing fruits, tomatos, pickles, and jams, and the use of a pressure canner or pressure saucepan for all vegetables, except for to-

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matoes. Processing times and temperatures have not been established by USDA for tomato sauce and vegetable mixtures.

Open-kettle canning is not recommended. With this method food is cooked in an ordinary kettle, then packed into hot jars and sealed. The food is not processed after packing in the jars. Open-kettle canning is not a safe practice because temperatures obtained are not high enough to destroy all the spoilage organisms that may be in low-acid foods, such as vegetables other than tomatoes. Spoilage bacteria may also enter the food when it is transferred from kettle to jar, making it undesirable to can other foods, such as fruits, pickles, and tomatoes by this method.

Oven canning is not safe because jars may explode, causing personal injury or damage to the oven. Also, temperatures obtained in the food in jars during oven processing do not get high enough to insure destruction of spoilage bacteria in low-acid foods, such as vegetables. Times specified for boiling-water-bath processing of foods are not applicable to oven processing since the rate of heat penetration would be different in the oven.

Table 2 shows the method of processing utilized by the home canners for each product they canned. Since more than one response was possible, percentages given will not total 100. About half of those canning fruits, tomatoes, and pickles, and more than one-third of those canning tomato sauce used the boiling-water-bath method; however, more than half of those canning pickles used the unrecommended, open-kettle method, as did almost one-half of those canning fruits and tomato sauce and one-third of those canning tomatoes. Pressure methods—either the pressure canner or pressure saucepan (holds only pints)—were used by one-fifth of those canning fruits and tomato sauce, and one-fourth of those canning tomatoes.

More than half of those canning vegetables other than tomatoes and almost half of those canning vegetable mixtures used pressure methods of canning, while about one-third of those canning vegetable mixtures and other vegetables used the boiling-water-bath method, which is inadequate for these products. The open-kettle method, which is not recommended was used by one-fourth of those canning vegetable mixtures and about one-sixth of those canning vegetables.

More than three-fourths of those canning jams and jellies used the open-kettle procedure. The boiling-water-bath was used by about one-tenth of those canning jams and jellies. About 5 percent of those canning jams and jellies used pressure methods.

The oven method, which is not recommended, was used by very few households—only 1 percent of those canning fruits and less than 1 percent of those canning vegetables, jams, or jellies.

HOME CANNING PROCEDURES USED

Type of pack and filling containers.—Fruits and vegetables may be packed raw into jars or they may be preheated and packed hot. About half of the canners used the raw pack, in which unheated food is placed into jars. More of those with at least 2 years of canning experience than with 1 year used the raw pack. A greater percentage of those under 65 years of age than older tended to use this pack.

Raw peas, corn, or lima beans must be packed loosely into jars because, unlike other raw vegetables, they will expand during processing. If they are packed tightly there is danger of underprocessing. Only 15 percent of canners used the raw pack for peas, corn, or lima beans, and of this number 1 out of 10 correctly packed them loosely. About one-half packed the vegetables fairly loosely, while about one-third packed them tightly. A greater percentage of those under 35 years of age than older incorrectly packed vegetables tightly.

Raw fruits and vegetables, other than raw peas, corn, or lima beans, can be packed into jars tightly because they will cook down or shrink during processing. About half of the canners packed raw vegetables tightly. Fewer canners 65 years and older packed these vegetables correctly than those under 65.

Three-fourths of canners used the hot-pack method in which fruits and vegetables are heated, then packed into hot jars. To avoid underprocessing, jars should be packed fairly loosely, as the food will not cook down during processing. Half of the canners packed jars fairly loosely, while more than one-third incorrectly packed them tightly.

After raw or heated fruits or vegetables are packed into jars, the food in the jar should be covered with boiling hot liquid. About half of the canners who used the raw pack method used boiling liquid to cover food. Three out of 10 incorrectly used cold liquid or liquid that was not boiling. As the age of canners increased and as the level of education decreased they were less likely to cover raw vegetables with boiling liquid. More than half of those using the hot-pack method covered heated vegetables with boiling liquid rather than with liquid that was not boiling.

Checking seals.—Almost all canners, or 95 percent, checked jars the day after canning to see if the jars were sealed. There were no differences among demographic characteristics of canners relative to checking jar seals.

About half of those who checked seals found jars that did not seal properly. A greater percentage of those under 50 years of age than those older had containers that did not seal. Among canners that found unsealed jars, 6 out of 10 used the food immediately, about one-third discarded the food, and one-fourth recanned the food—starting as if it were fresh. About 6 percent froze the food from unsealed jars. Any of these responses could be suitable, depending on the number of jars that did not seal. For example, if a dozen or so jars were found to be unsealed, the food would either need to be recanned, frozen, or discarded because it would be difficult to use that amount of food immediately.

A greater percentage of canners 65 years and older than of those younger discarded unsealed food, as did more canners in one or two member households than in households with five or more members. Canners who were not high school graduates rather than those with higher education tended to discard the food.

A greater percentage of those under 65 years of age than of those who were older used unsealed jars of food immediately, as did more of those with at least 2 years canning experience than with less experience, more of those with children than with no children, more households with three or more members than those with one or two members, and

more of those who had completed high school or some college than those with less education.

As the educational level of canners increased there was a tendency for canners to recan unsealed jars of food as if it were fresh.

Preparation of canned food for serving.—The Department recommends that home canned vegetables be boiled for at least 10 minutes before serving. One out of two canners prepared canned vegetables in this way. However, one-third of the canners only brought canned vegetables to a boil before serving, and one-fifth served canned vegetables without any heating. Of those who served canned vegetables without heating there were no differences among age groups, educational levels, or among those with or without canning experience.

Length of storage of home canned foods.—For optimum quality home canned foods should be used within 1 year. However, properly processed foods may remain safe to eat if stored longer than a year if the seal is not broken and other spoilage signs are absent. Nearly two-thirds of home canners stored home canned food, including jams and jellies, for 6 months to 1 year, about one-third stored food more than a year, and about 6 percent kept foods for less than 6 months.

As the age of canners increased, they were more likely to store home canned food for more than 1 year; however, as the educational level increased, they were less apt to store canned food for more than 1 year. Proportionately, more households with 1 member than those with 3 or more members, proportionately more with incomes less than $5,000 than those with incomes above $12,500, and more households with no children than those with children stored canned food for more than 1 year. A greater percentage of canners with some college education than those with less than high school training stored food 6 months to 1 year.

RECOGNITION OF SPOILAGE SIGNS IN CANNED FOODS

Most home canners are aware of some of the signs of spoilage in canned foods, including jams and jellies. Ninety percent recognized a bulging lid as a sign; leakage, mold, and off-odor were each recognized by about three-fourths of canners as signs. About two-thirds thought off-color would be a sign, while about half thought spurting liquid would be a spoilage sign. Almost one-third of canners thought floating fruit or vegetable in the jar would be an indication of spoilage. Unlike the other signs, which are an indication of spoilage, floating fruit or vegetable is not a spoilage sign. Fruit or vegetables may float because the pack is too loose, some air remains in the tissues of the product after heating and processing, or in the case of fruits, the sirup is too heavy.

Similar percentages of canners of all ages recognized spoilage signs of canned foods, except more of those under 35 years of age than between 50 and 64 years recognized mold as a sign, and more of those above 50 years than under 35 years thought spurting liquid was a spoilage sign. As the educational level of the canners increased, they were most likely to recognize spoilage signs.

The presence of botulinum toxin in canned foods is not always indicated by a visible sign; thus food may be spoiled when spoilage signs are not evident. Two out of five home canners thought that canned foods could be spoiled without spoilage signs and approximately the same number incorrectly thought that if foods were spoiled

there would always be some sign of spoilage. As the age of the canners increased they tended to incorrectly think that there would always be some sign of spoilage. But as the educational level of the canner increased they were more apt to believe that canned foods could be spoiled without any sign.

SPOILAGE EXPERIENCED BY HOME CANNERS

About one-fourth of canners had home canned fruits or vegetables that spoiled in 1975. The survey did not determine the actual causes of spoilage, but information given by respondents indicated that incorrect procedures had been used in many cases.

Table 3 compares the percentage of households experiencing spoilage with each type of food—fruits, tomatoes, tomato sauce, other vegetables, vegetable mixtures, pickles, jams, and jellies—to the percentage of households that canned the food.

Tomatoes were canned by three-fourths of the households, with one-fifth experiencing spoilage. Similar percentages of those reporting spoilage of tomatoes used the boiling-water-bath and the open-kettle methods.

Tomato sauce and vegetable mixtures were each canned by one-fifth of the households. Of those that canned tomato sauce, 3 percent had spoilage; about one-third of the 3 percent had used the boiling-water-bath and about one-third had used the open-kettle method. USDA does not have a processing time for this product; however, the open-kettle method is not recommended. Of those that canned vegetable mixtures, 7 percent experienced spoilage, and of these, similar percentages used the boiling-water-bath, open-kettle, and pressure-canner methods. Processing of vegetable mixtures would require the use of a pressure canner.

Canned fruits, other vegetables (not tomatoes), and pickles were each canned by about half of the households. Spoilage was observed by 7 percent of those canning fruits and 5 percent of those canning pickles. The open-kettle method, which is not recommended, was used by approximately half of those who had spoilage of fruits and pickles. Of those canning other vegetables 10 percent had spoilage. About half of those having spoilage used the boiling-water bath, a method which would result in an inadequate process for these low-acid foods.

Only a small number of households that preserved jams and jellies had spoilage of these products. For these products the open-kettle method was used.

About two-thirds of those having spoilage of home canned foods in 1975 had an idea as to the cause. About three-fourths thought food spoiled because the lids did not seal and one out of 10 though food was processed for two short a time. Other reasons, such as the wrong processing method, food having been packed too tightly into the jar, and that food having been overripe when processed were each given by 3 percent of canners as possible causes of spoilage.

Home canning jars were used by 94 percent of those canning fruits and vegetables other than jams and jellies, while only about one-third used other jars; therefore, it would be expected that a larger proportion of home canning jars could be involved in spoilage. Our findings showed that about 9 out of 10 of the 25 percent of canners having

spoilage used jars designed for home canning, and about one-fifth used other jars.

One would expect that those with higher income levels would be inclined to use only jars designed for home canning rather than other jars, but our findings showed that greater percentage of households with income of $20,000 or more than households with less income tended to use nonstandard jars for foods that spoiled.

Of the 25 percent of households having spoilage, more than three-fourths used new flat metal lids with metal bands, about one-tenth reused flat metal lids. Again, as with the home canning jars, a large proportion, or 90 percent of canners used new flat metal lids for canning fruits and vegetables, while only about 10 percent reused flat metal lids. Porcelain-lined zinc caps and glass lids with rubber rings and wire bails were each used by 5 percent of canners; about 3 percent of canners used paraffin to seal jars. It appeared that a greater percentage of those 35 to 49 years of age than of older or younger canners reporting spoilage tended to use paraffin or reused flat metal lids for sealing jars.

HOME CANNING PLANS

About 85 percent of those canning in 1975 also planned to can in 1976, about 8 percent were unsure as to whether they would can or not, and 5 percent did not plan to can in 1976. A greater percentage of households with two or more family members than those with one member planned to can in 1976. There were no significant differences in employment status, income level, or life cycle relative to 1976 home canning plans.

SUMMARY

One out of three households canned fruits and vegetables at home in 1975. Tomatoes were the most popular food item canned. Of those households canning fruits and vegetables, three out of four canned tomatoes. Other vegetables, pickles, and fruits were each canned by one out of two households. The survey indicated that many canners followed some procedures that are not recommended by USDA such as:

Using nonstandard jars rather than jars designed especially for home canning;

Reusing flat metal discs from the two-piece metal lid with band;

Using the open-kettle method for canning fruits and vegetables, other than jams and jellies;

Using the boiling-water bath for canning vegetables other than tomatoes;

Packing or filling jars too tightly;

Serving home canned vegetables with no further heating; and

Using paraffin to seal home canned fruits and vegetables, other than jams and jellies.

Approximately one-fourth of the households reported some spoilage in their home canned fruits and vegetables. Although the survey did not determine the actual cause of spoilage, three out of four canners thought spoilage was due to lids that failed to seal properly. Some spoilage undoubtedly resulted from use of improper methodology.

Home canners need to be cautioned to follow reliable instructions, such as those found in USDA home canning publications, to reduce the risk of spoilage that can result in economic loss from wasted food or in illness.

Table 1.—Respondent characteristics

Characteristic	*Percent* [1]
Employment:	
Currently employed	42
Full-time	54
Part-time	44
Not employed	56
Education:	
Grade school or less	17
High school or less	18
High school graduate	36
Vocational training	5
College or more	23
Age:	
Under 25	10
25–34	21
35–49	28
50–64	25
65 and over	15
Household size:	
1	9
2	31
3 or 4	38
5 or more	22
Income level:	
Under $5,000	14
$5,000 to $12,499	30
$12,500 to $19,999	27
$20,000 and over	11
Life cycle:	
Children	53
No children	47

[1] Percentages in individual categories do not of necessity total 100 as all respondents did not furnish all information.

TABLE 2.—PERCENTAGES OF HOUSEHOLDS CANNING SPECIFIED TYPES OF FRUIT AND VEGETABLE PRODUCTS BY PROCESSING METHOD, 1975

Method	Households [1]	Method	Households [1]
Boiling-water-bath, total	61.0	Vegetable mixtures	38.0
Fruits	53.0	Pickles	4.0
Tomatoes	52.0	Jams	2.0
Tomato Sauce	41.0	Jellies	3.0
Other vegetables [2]	40.0	Open-kettle, total	70.0
Vegetable mixtures [2]	34.0	Fruit [2]	45.0
Pickles	45.0	Tomatoes [2]	35.0
Jams	13.0	Tomato sauce [2]	43.0
Jellies	10.0	Other vegetables [2]	14.0
Pressure cooker (saucepan), total	10.0	Vegetable mixtures [2]	26.0
Fruits	4.0	Pickles [2]	57.0
Tomatoes	4.0	Jams	85.0
Tomato Sauce	4.0	Jellies	87.0
Other vegetables	10.0	Oven, total [2]	2.0
Vegetable mixtures	5.0	Fruits	1.0
Pickles	2.0	Tomatoes	.6
Jams	2.0	Tomato sauce	.5
Jellies	3.0	Other vegetables	.4
Pressure canner, total	31.0	Vegetable mixtures	.5
Fruits	16.0	Pickles	
Tomatoes	21.0	Jams	.8
Tomato sauce	18.0	Jellies	.6
Other vegetables	47.0		

[1] Components cannot be totaled because more than 1 response is possible.
[2] Results in inadequate processing.

TABLE 3.—PERCENTAGES OF HOUSEHOLDS CANNING FRUIT AND VEGETABLE PRODUCTS AND OF HOUSEHOLDS HAVING SPOILAGE OF THESE PRODUCTS, 1975

Product	Households	
	Canning	Spoilage
Fruits	50	7
Tomatoes	75	20
Tomato sauce	20	3
Other vegetables	50	10
Vegetable mixtures	20	7
Pickles	50	5
Jams	40	2
Jellies	40	1