

CARROT PREFERENCES AND CERTAIN
FOOD CONSUMPTION HABITS
OF 298 FAMILIES

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CARROT PREFERENCES AND CERTAIN
FOOD CONSUMPTION HABITS OF 298 FAMILIES

By
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Vern Alvin Vandemark

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CHAPTER I

INTRODUCTION

Purpose of study. The purpose of this study is to determine consumer preferences and practices as they apply to the purchase and use of carrots. It is hoped that a better understanding of these factors will aid in solving the problems faced in marketing Michigan stored carrots. Additional information regarding the consumption of some of the common foods was obtained for comparison with carrot consumption.

Source of data. The material used in this study regarding carrot preferences and use and other food consumption habits was obtained by personal interview of 298 family units in the Lansing-East Lansing area in February of 1948.

The sample was set up so as to obtain representation of the various income groups in this area. In order to obtain a representation at the various income levels the city was divided into three areas based upon rental ceilings in effect at that time, as given by the Area Rent Office in Lansing, Michigan. A quota was obtained from ten blocks in each of the three areas. The average rental used was that for an unfurnished, unheated five-room house. Records were obtained from 92 families in the low rental areas (average rental ceiling \$25.00), from 108 families in the medium

rental areas (average rental ceiling \$37.50), and from 98 families in the high rental areas (average rental ceiling \$65.00). The sample was intended to show the use and practices regarding carrots in each of the three economic areas.

The relationship of the number of records obtained in each area to the total population and to the income of each area was not determined. It was not considered feasible to sample the population in proportion to income as this would have required a greater number of interviews than was felt justified in this pilot study.

History. The carrot (Daucus carota), a native of Eastern Europe, has been cultivated for about 2,000 years. The familiar weed, wild carrot, is the original ancestor of the cultivated carrot. Liberty Hyde Bailey says that horticultural improvement of the vegetable probably originated in Holland.¹ The carrot was introduced in England during the reign of Queen Elizabeth (1558-1603) and was brought into this country and grown in Virginia in 1609. The crop is now grown in almost

¹ Liberty Hyde Bailey, The Standard Cyclopedia of Horticulture (New York: The Macmillan Company, 1947), I, 674.

every section of this country as well as throughout the world.

Production. Carrots are produced throughout most of this country, but California is by far the largest producer, followed by Arizona and Texas. California's most important production is in the winter, fall and spring seasons.

Michigan's commercial carrot production is principally of fall carrots, more than half of which move into processing channels. These processed carrots reach the consumer in the form of canned carrots, carrots and peas, mixed vegetables, and baby foods. There is a processing area in the Upper Peninsula near Norway, one near Traverse City, and others in the southern part of the Lower Peninsula. The principal areas for fresh market production are the Detroit area, especially Macomb County and near Imlay City; another is near Grand Rapids, and the third is in Bay County.

Accurate figures on carrot production for the fresh market in Michigan as well as for the entire United States are unavailable, as very little of the acreage grown by gardeners, who sell their produce locally, is included in the estimates of commercial acreage for processing and fresh market, as made by the Crop Reporting Service.

Carrots rank in value among the ten most important vegetables. The United States production has ranged in value from \$30,000,000 to \$50,000,000 in recent years while the value of the Michigan crop reported has been about \$1,000,000 annually.

Availability. Fresh carrots are available the year around as they are harvested somewhere each month. In addition, in some areas where the temperature is sufficiently cool, fall carrots which have been in storage are available during the fall and early winter months. Promising experiments aimed at lengthening this storage period are underway at present. Rail shipments of carrots, which, in the United States, have increased from 14,000 cars in 1936 to 27,000 cars in 1946, indicate the extent to which consumer education, better production methods, and improved transportation have increased the availability and consumption of carrots.

The principal production areas of winter carrots are California, Arizona, Texas, Louisiana, and Florida. Spring carrots come from California and Arizona. Summer carrots come from Ohio, New Jersey, New York, and Colorado. Fall carrots are produced in California, New York, Washington, Michigan, New Mexico, Illinois, Pennsylvania, Oregon, Utah, and Minnesota.

Production. There are three principal types of carrots--the short, thick stubby type like Chantenay and Oxheart, the cylindrical type like Nantes, and the long, tapering type like Emperor and Morse's Bunching. Red Cored Chantenay, difficult to bunch or package, is the usual variety grown in Michigan for processing. Nantes, Morse's Bunching, and Danver's Half Long are the leading varieties grown in Michigan for the fresh market. Emperor and Morse's Bunching are the leading varieties grown in the West and the Southwest for fresh shipment.

The grower should consider the soil, the climate, and the market when he selects the variety or varieties of carrots to grow. When selecting the variety to grow the grower should consider the carrot qualities desired which are related to the variety: the desired length, shape, and diameter of roots--length, strength, and abundance of tops--texture and color of the skin and flesh.

The early or new carrots are usually marketed in bunches, six to eight in a bunch, with the tops attached, though some are marketed with the tops clipped or removed. The early carrots are usually harvested before full maturity and have a brighter color and are milder in flavor than the late crop. Good quality in early carrots is indicated by a bright orange color, a firm

flesh, and a clean, smooth fresh appearance. Green, fresh appearing tops generally indicate freshness of the root, though sometimes the tops may have been damaged in handling and the roots may still be in good condition. Wilted, soft, flabby, or shriveled carrots are usually not as nutritious or as flavorful as fresh carrots. Those which are excessively pronged or rough or have growth cracks are wasteful to prepare. Excessive greening at the shoulder may indicate slow growth, which causes a lack of tenderness and a coarse-textured, stronger-flavored carrot.

When carrots are harvested they continue to live until their life processes are terminated by freezing, canning or cooking, dehydration, or natural death with accompanying shriveling and decay. When the carrot is harvested, its food supply from the soil is no longer available, and so it begins to digest itself, thus depleting stored food reserves and vitamins. Through respiration the stored starches and sugars in the carrot are broken down to provide digestible food for the plant. Oxygen is absorbed and water and carbon dioxide are given off; the plant cells are dehydrated in the process. Still greater loss of water occurs through the pores on the plant surface, the evaporating water cooling the plant. This loss is greatest at high

temperatures and low humidity. High humidity and refrigeration greatly decrease these losses and prolong the life of the plant.

Removing the tops at harvest greatly reduces respiration and transpiration and thus helps to retain the crisp, tender, garden-like quality of the carrots. Taking similar lots of carrots, with and without tops, and handling them under the same conditions, the carrots without tops remain in satisfactory condition longer. It is quite possible, however, that in actual marketing practice the carrots with tops receive superior care due to the necessity of retaining the fresh, green appearance of the tops.

Preparation. Carrots are prepared in numerous and varied ways both raw and cooked. Fresh-raw carrots are cut in strips and used as a relish or salad; they may be shredded or grated for a garnish, or used alone, or mixed with other vegetables, gelatin, fruit, or nuts to make a salad. Boiled or steamed carrots may be served plain, buttered, creamed, or in combination as carrots and peas. Carrots are often used with roasts or in stews. Baked carrots are served alone or with other vegetables; glazed carrots are usually served alone. Carrots are also used in combination in soups. Since carrots are appetizing and colorful, they are

often used to make other foods more attractive and palatable. The various types of recipes in which carrots may be used have by no means been exhausted.

Nutrients. "In comparison with twenty-eight other vegetables, carrots rank high in vitamin A per pound of roots. Food energy, protein, and iron are about average when compared with other important vegetables. Carrots are low in vitamin C, thiamine, riboflavin, and niacin."²

The table below, as compiled by the Bureau of Human Nutrition and Home Economics, gives the approximate amount of the several nutrients contained in 100 grams of the edible portion of carrots:³

Water	88.2	grams
Food energy	45	calories
Protein	1.2	grams
Fat	.3	grams
Carbohydrate	9.3	grams
Calcium	39	milligrams
Phosphorus	37	milligrams
Iron	.8	milligrams
Vitamin A value	12,000	international units
Vitamin B (thiamine)	.07	milligrams
Vitamin B ₂ (riboflavin)	.06	milligrams
Niacin	.5	milligrams
Vitamin C (ascorbic acid)	6	milligrams

² T.W. Whitaker and others, Carrot Production in the West and Southwest, U.S.D.A., Circular No. 750, 1946, p.1.

³ Bureau of Human Nutrition and Home Economics, Table of Food Composition in Terms of Eleven Nutrients, U.S.D.A., Misc. Publication No. 572, 1945, p. 12-13.

CHAPTER II

CONSUMER PREFERENCES IN BUYING CARROTS

Method. All the information included in this section was obtained by personal interview. Questions were asked consumers regarding their carrot preferences and the relative importance of certain characteristics of carrots in an attempt to determine what the consumer preferred and why.⁴ In the analysis of the replies regarding the relative importance of various factors those replies indicating "very important" were considered much more important "marketwise" than those replying "some importance," or "not very important".⁵

Non-respondents. In the following tables those individuals interviewed who gave no answer were omitted in the percentages in each category. The difference between the number shown and 298 (the number of families interviewed) represents non-respondents. It was thought that this would simplify the comparison of the actual replies.

CHARACTERISTICS OF IMPORTANCE TO CONSUMERS

⁴ A copy of the questionnaire used in the interviews is contained in Appendix A.

⁵ The method and computations to determine the relative importance of factors based upon consumer valuations are described in Appendix B.

Freshness. The consumer considered freshness to be the most important factor in the purchase of carrots. Of those replying ninety-two percent considered freshness to be "very important" (Table 1).

TABLE 1
IMPORTANCE OF FRESHNESS IN CARROTS

Importance	Replies	
	Number	Percentage
Very	268	92
Some	20	7
Not very	3	1
Total	291	100

The consumers indicated that freshness was important because they associated it with nutrient and vitamin content, tenderness, crispness, flavor, and economy (Table 2).

TABLE 2
WHY FRESHNESS IN CARROTS IMPORTANT

Factor	Replies	
	Number	Percentage
Health, more vitamins, more nutrition	72	25
Taste of flavor	55	19
Juicy	53	18
Crisp	23	8
Better value	28	9
Does not want withered carrots	25	8
Keep longer and less waste	17	6
Eat raw	15	5
Don't know	5	2
Total	293	100

The majority of the consumers determined freshness by handling the carrots or by looking at them; 47 percent relied upon appearance to determine freshness while 46 percent handled the carrots (Table 3).

TABLE 3
HOW FRESHNESS OF CARROTS TESTED BY CONSUMERS

Method of test	Replies	
	Number	Percentage
Feel firm	114	39
Appearance	75	26
Green tops	35	12
Color of carrot	26	9
Bending or snapping	19	7
Other	11	4
No method	10	3
Total	290	100

Shape and Size. Shape was considered the next most important factor in the purchase of carrots, though of much less importance than freshness; 37 percent considered this factor "very important" and 53 percent listed it as of "some importance (Table 4).

TABLE 4
IMPORTANCE OF SHAPE IN CARROTS

Importance	Replies	
	Number	Percentage
Very	104	37
Some	151	53
Not very	27	10
Total	282	100

A picture of the three basic shapes of carrots was shown the consumer.⁶ Short thick carrots were preferred by only 3 percent, long cylindrical carrots by 44 percent, and long tapering carrots by 53 percent (Table 5).

TABLE 5
SHAPE PREFERRED IN CARROTS

Shape	Replies	
	Number	Percentage
Long tapering	153	53
Long cylindrical with rounded end	125	44
Short and thick	9	3
Total	287	100

⁶ See Appendix A. The picture is in the questionnaire.

Long tapering carrots were the type most readily available in the market at the time of the survey.

Size was not considered of great importance (Table 6);

TABLE 6
IMPORTANCE OF SIZE IN CARROTS

Importance	Replies	
	Number	Percentage
Very	99	35
Some	133	47
Not very	50	18
Total	282	100

35 percent classed size as "very important" and 47 percent considered it as of "some importance". The carrots about six inches long ranked first in popularity, those about five inches long second (Table 7). The housewife selected these sizes from a scale carried by the enumerator.⁷

Color of skin. The consumers considered the color of the skin as the next most important factor in purchasing; 40 percent of those replying considered skin color "very important" and 35 percent considered it of "some importance" (Table 8).

⁷ See Appendix A. The scale is on the page with the carrot pictures in the questionnaire.

TABLE 7
LENGTH OF CARROT PREFERRED

Length in inches	Replies	
	Number	Percentage
Three	7	3
Four	23	10
Five	59	24
Six	112	46
Seven	35	14
Eight	7	3
Total	243	100

TABLE 8
IMPORTANCE OF COLOR OF SKIN IN CARROTS

Importance	Replies	
	Number	Percentage
Very	116	40
Some	103	35
Not very	73	25
Total	292	100

A medium to deep orange color was preferred by 68 percent; lighter shades of orange or yellow were preferred by 21 percent; 11 percent said they had no color preference (Table 9).

TABLE 9
SKIN COLOR PREFERRED

Color	Replies	
	Number	Percentage
Bright orange	75	26
Deep orange	65	23
Medium orange	54	19
Light orange	35	12
Bright yellow	24	9
No preference	31	11
Total	284	100

Skin color is a measure of the carotene content of the carrot. Carotene is the precursor of vitamin A. The light, pale-colored carrots are usually lacking in flavor and are low in carotene.

Defects. The consumers were quite well satisfied with the freedom from defects in the carrots purchased (Tables 10 and 11).

TABLE 10
IMPORTANCE OF DEFECTS -- CARROTS WITH TOPS

Importance	Replies	
	Number	Percentage
Very	90	32
Some	120	42
Not very	73	26
Total	283	100

TABLE 11
IMPORTANCE OF DEFECTS -- CARROTS WITHOUT TOPS

Importance	Replies	
	Number	Percentage
Very	65	41
Some	58	36
Not very	37	23
Total	160	100

Defects were considered more important in carrots without tops than in carrots with tops (Tables 12 and 13).

TABLE 12

DO CARROTS WITHOUT TOPS OFTEN HAVE DEFECTS

Defects	Replies	
	Number	Percentage
No	104	71
Yes	32	29
Sometimes	10	7
Total	146	100

TABLE 13

DO CARROTS WITH TOPS OFTEN HAVE DEFECTS

Defects	Replies	
	Number	Percentage
No	232	88
Yes	17	6
Sometimes	16	6
Total	265	100

Only 6 percent of the buyers of carrots with tops reported finding defects often; 29 percent of the buyers of carrots without tops reported finding defects often.

Cleanliness. Cleanliness was not considered an important factor affecting purchase (Table 14).

TABLE 14
IMPORTANCE OF CLEANLINESS IN CARROTS

Importance	Replies	
	Number	Percentage
Very	88	31
Some	144	50
Not very	54	19
Total	286	100

Carrots are usually washed when packed and consumers considered them sufficiently clean. (Table 15).

TABLE 15
ARE CARROTS OFTEN DIRTY

Carrots dirty	Replies	
	Number	Percentage
No	245	85
Yes	38	13
Sometimes	6	2
Total	289	100

Price. Carrots are one of the low-priced vegetables and consumers reported price to be unimportant.

Price was the only factor for which the number of consumers reporting "not very important" was greater than those reporting "very important". (Table 16).

TABLE 16
IMPORTANCE OF PRICE

Importance	Replies	
	Number	Percentage
Very	74	26
Some	111	39
Not very	102	35
Total	287	100

CHAPTER III

CONSUMER PREFERENCES IN EATING CARROTS

Taste or Flavor. Taste or flavor ranked as the most important eating quality. If eating qualities and buying qualities are considered together, taste or flavor ranks in importance after freshness as a preference factor (Table 17).

TABLE 17
IMPORTANCE OF TASTE OR FLAVOR IN CARROTS

Importance	Replies	
	Number	Percentage
Very	221	78
Some	54	19
Not very	9	3
Total	284	100

Freshness would no doubt have an influence upon taste or flavor because taste is related to freshness in most vegetables. A general descriptive term used by consumers to describe carrot taste or flavor was generally some variation of "sweet" (Table 18).

TABLE 18
DESCRIPTION OF TASTE OR FLAVOR

Description of taste	Replies	
	Number	Percentage
Sweet	185	71
mild sweet	18	7
"carrot taste"	29	11
other	30	11
Total	262	100

The sweet flavor comes from the sugar content of carrots. About 80 percent of the carbohydrate in carrots is in the form of sugar.⁸ Consumers were well satisfied with flavor; 94 percent reported that flavor was satisfactory. (Table 19).

⁸ Charlotte Chatfield and others, Proximate Composition of American Food Materials, Bureau of Home Economics, U.S.D.A., Circular No. 549, 1940, p 31.

TABLE 19
IS FLAVOR USUALLY SATISFACTORY IN CARROTS

Satisfactory	Replies	
	Number	Percentage
Yes	272	94
No	8	3
Sometimes	8	3
Total	288	100

Tenderness. Tenderness was the next most important factor after flavor. Of those replying 56 percent considered tenderness "very important" (Table 20); 98 percent reported that tenderness was "usually satisfactory" in the carrots purchased (Table 21).

TABLE 20
IMPORTANCE OF TENDERNESS IN CARROTS

Importance	Replies	
	Number	Percentage
Very	158	56
Some	109	39
Not very	13	5
Total	280	100

TABLE 21
IS TENDERNESS USUALLY SATISFACTORY IN CARROTS

Satisfactory	Replies	
	Number	Percentage
Yes	284	98
No	6	2
Total	290	100

Texture. Texture ranked less important as an eating quality than did taste or tenderness (Table 22). Texture was very satisfactory in the opinion of consumers; 95 percent reported texture as "usually satisfactory" (Table 23).

TABLE 22
IMPORTANCE OF TEXTURE IN CARROTS

Importance	Replies	
	Number	Percentage
Very	103	36
Some	149	53
Not very	31	11
Total	283	100

TABLE 23
IS TEXTURE USUALLY SATISFACTORY IN CARROTS

Satisfactory	Replies	
	Number	Percentage
Yes	267	95
No	15	5
Total	282	100

Cooking quality. Cooking quality--which includes the three previously mentioned factors, flavor, tenderness, and texture--was considered as less important than any one of the factors considered individually (Table 24).

TABLE 24
IMPORTANCE OF COOKING QUALITY IN CARROTS

Importance	Replies	
	Number	Percentage
Very	84	33
Some	124	48
Not very	48	19
Total	256	100

The relative importance of the cooking quality may result from the reports of those consumers who use most of the carrots purchased in a raw form. It may be that deficiencies in eating characteristics are less apparent in

cooked than in the raw carrots. Another possibility is that the consumer is so well satisfied with the cooking quality as found that it is not considered "very important". That the consumers were well satisfied was shown when 97 percent reported cooking quality as "usually satisfactory" (Table 25).

TABLE 25
IS COOKING QUALITY USUALLY SATISFACTORY

Satisfactory	Replies	
	Number	Percentage
Yes	216	97
No	7	3
Total	223	100

Factor considered most important in carrots. When asked to name the most important quality in carrots as applied to buying and eating, 53 percent of those replying first named freshness, crispness or firmness, or a combination of these. This emphasises the great importance attached to freshness by the consumer. Taste or flavor was named by 26 percent (Table 26).

TABLE 26
THE MOST IMPORTANT QUALITY FOUND IN CARROTS
AS LISTED BY CONSUMERS

Quality	Replies	
	Number	Percentage
Crisp, firm, fresh	150	53
Taste or flavor	73	26
Tenderness	31	11
Color	7	2
Other	24	8
Total	285	100

Factor most often lacking in carrots purchased.
When asked to name the qualities most often lacking in carrots purchased 48 percent replied "none" (Table 27).

TABLE 27
QUALITY MOST OFTEN LACKING IN CARROTS PURCHASED
BY CONSUMERS

Quality	Replies	
	Number	Percentage
None	125	48
Taste or flavor	57	22
Freshness, Crispness	30	12
Tenderness	22	8
Color	8	3
Other	18	7
Total	260	100

The next most popular reply was "taste or flavor", by 22 percent of the consumers reporting. Taste or flavor has previously been reported as "usually satisfactory" by 94 percent of the consumers (Table 19, page 23). This apparent discrepancy may be explained when one considers that tenderness was reported as "usually satisfactory" by 98 percent of those reporting, cooking quality was "usually satisfactory" to 97 percent, texture was "usually satisfactory" to 95 percent, and taste or flavor was "usually satisfactory" to 94 percent.

As indicated above, fewer consumers were "usually satisfied" with taste and flavor than with tenderness, cooking quality, and texture. When the consumers were asked what quality was "most often lacking" in the carrots purchased, some of those who had previously said that taste or flavor was "usually satisfactory" apparently felt that taste or flavor was the quality "most often lacking". Thus taste or flavor, though "usually satisfactory", was more often lacking in the carrots purchased than the other qualities.

CHAPTER IV

CONSUMER PRACTICES AND BELIEFS REGARDING CARROTS

Purchasing practices. A total of 69 percent of those reporting had carrots on hand at the time they were interviewed (Table 28).

TABLE 28
ARE CARROTS ON HAND NOW

On hand	Replies	
	Number	Percentage
Yes	199	69
No	90	31
Total	289	100

The usual frequency of purchasing carrots was given as once a week by 66 percent of those interviewed (Table 29).

TABLE 29
USUAL FREQUENCY OF PURCHASE OF CARROTS

Frequency of Purchase	Replies	
	Number	Percentage
Twice weekly	14	5
Once weekly	192	66
Twice monthly	57	19
Every three weeks or less frequently	20	7
Other	8	3
Total	291	100

Carrots were put on the shopping list by 79 percent of those replying (Table 30). The majority of those who did not put carrots on their shopping list said that an "attractive, fresh-appearing" display of carrots influenced their purchase.

TABLE 30
ARE CARROTS ON SHOPPING LIST

On shopping list	Replies	
	Number	Percentage
Yes	226	79
No	59	20
Sometimes	2	1
Total	287	100

Price was relatively unimportant in determining carrot purchases. When the consumers were asked if they decreased the quantity purchased when they considered the price high, 81 percent reported they purchased the same amount, while 19 percent reported they purchased less (Table 31).

TABLE 31
 RESPONSE IN BUYING HABITS WHEN,
 IN CONSUMERS' OPINION, CARROTS ARE HIGH PRICED

Response	Replies	
	Number	Percentage
Buy the same amount	236	81
Buy less	57	19
Total	293	100

Those who purchased less said they substituted other vegetables such as cabbage, beans, canned vegetables, spinach, and peas. Of those who reduced purchases when they considered prices high, 17 percent reported that nothing was substituted (Table 32).

TABLE 32

FOOD SUBSTITUTED BY CONSUMERS WHO BUY
LESS WHEN THEY CONSIDER CARROTS HIGH PRICED

Food substituted	Replies	
	Number	Percentage
Cabbage	13	23
Beans	6	11
Canned vegetable	6	11
Squash	4	7
Peas	4	7
Celery	3	5
Anything cheaper	7	12
No substitution	10	17
Other	4	7
Total	57	100

Carrots with and without tops. Of those replying, 84 percent usually selected carrots with tops (Table 33).

TABLE 33

TYPE OF CARROTS USUALLY PURCHASED BY CONSUMERS

Type of carrots	Replies	
	Number	Percentage
With tops	245	84
Without tops	42	15
Don't care	4	1
Total	291	100

The fact that satisfactory topped carrots were unavailable to many consumers at the time of the survey undoubtedly affected the above figures. Of those preferring carrots with tops 67 percent reported that "freshness" was the most important reason for their preference (Table 34). Freshness far outweighed all other reasons combined.

Carrots without tops were preferred by 15 percent of the consumers. This group considered the factors of "cheapness" and "no tops to mess with" of equal importance as reasons for their choice. These two factors each accounted for 39 percent of the reasons or a total of 78 percent of the replies (Table 35).

TABLE 34

WHY CONSUMERS CHOOSE CARROTS WITH TOPS

Reason	Replies	
	Number	Percentage
Fresher	154	67
Only available with tops	20	9
Stay fresh longer	16	7
More tender	10	4
Use tops	8	3
Other reasons	22	10
Total	230	100

TABLE 35

WHY CONSUMERS CHOOSE CARROTS WITHOUT TOPS

Reason	Replies	
	Number	Percentage
Cheaper	17	39
No tops to mess with	17	39
Fresher	4	10
Other	5	12
Total	43	100

Methods of serving carrots. Carrots were reported served at 29 percent of the meals served (other than breakfast) by the 285 families reporting. The lunches at which cooked or raw carrots were served were equivalent to 21 percent of all lunches; carrot dishes at dinner were equivalent to 37 percent of all dinners (Table 36, col. 6). This means that the average family interviewed had carrots almost four meals per week. About two of these meals included cooked carrots and slightly over two meals included raw carrots.

Carrots were served at more meals raw than cooked. Raw carrots were served with 16 percent of the total meals (lunches and dinners) by the 285 families reporting (Table 36, col. 2) while cooked carrots were served with 13 percent of the meals (Table 36, col. 4). More carrots were served raw with dinners than with lunches. Raw carrots were included in 18 percent of the dinner and 13 percent of the lunch menus (Table 36, col. 2). Dinners accounted for 58 percent of the meals at which raw carrots were served (Table 37, col. 2).

Salads accounted for 41 percent of servings of carrots at dinners (Table 38, col. 4) and 35 percent of the lunches at which raw carrots were consumed (Table 38, col 3).

TABLE 36

PERCENTAGE WHICH EACH NUMBER OF SERVINGS
IS OF THE TOTAL MEALS (LUNCHESES, DINNERS, AND
BOTH MEALS) SERVED IN PREVIOUS WEEK.*

	Meals raw carrots served		Meals cooked carrots served		Meals raw or cooked carrots served	
Meal	Number	Percentage	Number	Percentage	Number	Percentage
	1	2	3	4	5	6
Lunch	262	13	160	8	422	21
Dinner	359	18	373	19	732	37
All lunches & dinners	621	16	533	13	1154	29

*285 families allowing seven lunches and dinners a week totals 1995 lunches and dinners or 3990 total meals per week.

TABLE 37
MEALS AT WHICH COOKED AND RAW
CARROTS SERVED PREVIOUS WEEK BY 285 FAMILIES

Meal	Raw carrots		Replies		Total carrots cooked and raw	
			Cooked carrots			
	Number	Percentage	Number	Percentage	Number	Percentage
	1	2	3	4	5	6
Lunch	262	42	160	30	422	37
Dinner	359	58	373	70	732	63
Total	621 ^a	100	533 ^b	100	1154 ^c	100

TABLE 38
METHODS OF SERVING RAW CARROTS AT
LUNCH AND DINNER PREVIOUS WEEK BY 285 FAMILIES

		R E P L I E S			
		Meals at which raw carrots served		Raw carrots for lunch served each way	Raw carrots for dinner served each way
		1	2	3	4
<u>Method</u>	<u>Meal</u>	Number	Percentage	Percentage	Percentage
Salads	Lunch	91	15	35	
	Dinner	147	23		41
Strips	Lunch	74	12	28	
	Dinner	120	19		33
Raw (misc)	Lunch	97	16	37	
	Dinner	92	15		26
	Between meals	15	3		
Total		621	100	100	100

Cooked carrots were used in 13 percent of all meals; 19 percent of the dinners and 8 percent of the lunches contained cooked carrots (Table 36, col. 4). The most popular method of serving cooked carrots was with roasts. Dinners containing carrots with roast accounted for 30 percent of all dinners containing cooked carrots (Table 39, col. 4). The next most popular method of serving cooked carrots was buttered carrots at dinner. This method of preparing them accounted for 23 percent of the dinners containing cooked carrots (Table 39, col. 4). Buttered carrots were served at 25 percent of the lunches containing cooked carrots (Table 39, col. 3). Approximately 70 percent of all cooked carrots were served at dinner (Table 37, col. 4).

Utilization and income. There was a direct relationship between income and whether or not the carrots were cooked. The low-income groups cooked a larger percentage of the carrots that they consumed than did the high income groups. (Table 40).

Consumer beliefs regarding carrots. When people were asked the reason why they served carrots, "health" was the most popular reply, given by 55 percent. The next most popular reason was "eating enjoyment" which was given by 40 percent (Table 41).

TABLE 39
METHODS OF SERVING COOKED CARROTS AT
LUNCH AND DINNER PREVIOUS WEEK BY 285 FAMILIES

R E P L I E S					
		Meals at which cooked carrots were served	Cooked carrots served each way		
		1	2	3	4
Method	Meal	Number	Percentage	Percentage Lunch	Percentage Dinner
<u>With roast</u>	Lunch	18	3	11	
	Dinner	114	21		30
<u>Butter- ed</u>	Lunch	41	8	25	
	Dinner	84	16		23
<u>Soup</u>	Lunch	28	5	18	
	Dinner	55	10		15
<u>Cream- ed</u>	Lunch	26	5	18	
	Dinner	41	8		11
<u>Stew</u>	Lunch	19	4	12	
	Dinner	46	9		12
<u>Other</u>	Lunch	26	5	16	
	Dinner	33	6		9
Total		533	100	100	100

TABLE 40
UTILIZATION OF CARROTS BY RENTAL AREAS

Percent of carrots cooked	R e n t a l A r e a		
	Low	Medium	High
	R e p l i e s		
	Number	Number	Number
0-33	23	32	42
34-65	28	35	31
66-100	37	36	21

TABLE 41
RESPONSE OF THE CONSUMER WHEN ASKED WHY CARROTS ARE SERVED

Why served	R e p l i e s	
	Number	Percentage
Health	159	55
Enjoy eating carrots	117	40
Cheap	12	4
Easy to serve	4	1
Total	292	100

There was considerable divergence in opinion when consumers were asked regarding the vitamin content of carrots. The presence of vitamin A was reported by 27 percent of the consumers who listed A alone and by 17 percent more who named A in combination with one or more other vitamins. Thus 44 percent of the total reported vitamin A content. Only 26 percent said they did not know what vitamins were in carrots while 5 percent replied that there were no vitamins in carrots (Table 42).

When asked regarding the special food values contained in carrots there were only 93 replies of which 6 reported carotene (vitamin A) which is one of the most important values contained in carrots. Minerals and iron accounted for 62 percent of the replies (Table 43). The consumers were asked for values other than special food content; 76 percent of the 100 consumers answering reported that carrots were good for the eyes. This indicates that many consumers know one of the very good reasons for eating carrots even though they did not know the specific factor responsible (Table 44).

Who likes carrots the most. The most common reply to the question, "Who in the family (if any) likes carrots the most and the least", was "no preference".

The relative order of preference given for

TABLE 42
VITAMINS FOUND IN CARROTS

Vitamin	R e p l i e s	
	Number	Percentage
A	71	27
C	33	13
A & C, or A & D	27	10
Other	15	6
A & B	13	5
A, B, C	6	2
D	7	3
A, B, & other (except C)	3	1
C & one or more other than A	6	2
None	14	5
Don't know	66	26
Total	261	100

TABLE 43

WHAT SPECIAL FOOD VALUES IN CARROTS

Food value	R e p l i e s	
	Number	Percentage
Minerals	40	43
Iron	13	19
Roughage	15	16
Carbohydrates	7	8
Carotene	6	6
Other	7	8
Total	93	100

TABLE 44

VALUES FOUND IN CARROTS OTHER THAN SPECIAL FOOD CONTENT

Value	R e p l i e s	
	Number	Percentage
Good for eyes	76	76
Good for teeth	7	7
Balanced diet	5	5
Other	12	12
Total	100	100

individual members of three or more person families where there were differences in preferences of one or more members suggested that mothers liked carrots the most, followed in order by daughters and sons. Fathers seemed to have the least preference for carrots (Table 45).

TABLE 45
WHAT MEMBER OF THE FAMILY
LIKES CARROTS THE MOST AND THE LEAST

Two people in family (65 families)			
Person	Most	R e p l i e s	
		Least	No difference
Mother	18	17	
Father	16	19	
All like or equal preference			30
Three or more people in family (207 families)			
Mother	50	26	
Daughter	29	25	
Son	27	34	
Father	31	43	
All like or equal preference			78

CHAPTER V

FOOD CONSUMPTION HABITS

Procedure. The consumption per family of carrots and several other foods in the week previous to the interview was recorded. The respondent was asked to estimate the family's weekly food bill and the approximate weekly income of the entire family.

This information available from those responding was tabulated on the basis of rental area, estimated weekly food bill per family, number in family, proportion of carrots cooked, carrots purchased with or without tops, nationality and race of respondent, the husband's occupation, the approximate weekly income of the entire family, and by family income groupings within the rental areas.

Limitations. There were some limitations in the determination of the food consumption habits. The size of the sample was such that some of the groups had too little representation to give results which could be considered significant. There were non-respondents. Fewer persons replied when asked to give the average weekly family food bill and the approximate total weekly family income than responded to the food consumption questions. Only 86 percent of those who reported food

consumption responded when asked to give an estimate of their total weekly family income. No information was recorded regarding occasional meals eaten out by the family. The accuracy of some of the returned questionnaires was questioned.

Food consumption: average of all respondents and by rental areas. The average size of the family of all of the respondents was 3.51 persons. Family size was approximately the same in each of the three rental areas.

The average weekly carrot consumption of the entire groups was .50 bunch per person. Each person also consumed an average of .17 head of cabbage, .34 bunch of celery, .55 head of lettuce, .36 pound of onions, 2.7 pounds of potatoes and 1.2 pounds of apples. No adjustment was made for size of head of lettuce or size of bunch of celery.

The average weekly food bill was \$6.10 per person. The average weekly income was approximately \$26.25 per person (Table 46). This information was for February 1948 when food prices were higher than at present and due to the season certain foods were unobtainable or relatively high-priced. These weekly consumption figures would not be valid if expanded to yearly estimates.

TABLE L6

WEEKLY FOOD CONSUMPTION, FOOD EXPENDITURE, AND INCOME PER PERSON AS RELATED TO RENTAL AREAS

Rental Area	Approx. no. of replies	Number in family	Weekly food consumption per person							Weekly food bill per person	Income per person
			Carrots (bunches)	Cabbage (heads)	Celery (bunches)	Lettuce (heads)	Onions lbs.	Potatoes lbs.	Apples lbs.		
Low	91	3.47	.51	.18	.23	.49	.38	2.9	1.1	\$5.50	\$18.40
Medium	107	3.51	.48	.16	.41	.51	.42	2.9	1.1	6.20	26.10
High	97	3.54	.51	.16	.35	.65	.29	2.3	1.2	6.20	34.00
Average of all respondents	295	3.51	.50	.17	.34	.55	.36	2.7	1.2	6.10	26.25

In the three rental areas there were no consistent relationships in the consumption per person of carrots, celery, onions, and potatoes. Lettuce and apple consumption increased slightly per person from the low to high area. The average weekly food bill per person in the low area was \$5.80 while the weekly bill in both the medium and high area was \$6.20 per person. At the same time the approximate income per person varied from \$18.00 in the low, \$26.80 in the medium, to \$34.00 in the high rental area.

Weekly family food bill and food consumption. There was a direct relationship between the weekly food bill and the number of persons per family (Table 47). As the food bill increased from about \$7.50 to \$45.40 per family per week, the size of family increased from about 1.3 to 5.9 persons and the weekly food expenditure per person increased from \$5.80 to \$7.70. The per person purchase of the various foods decreased as the size of the food bill increased; the largest decrease coming between the low and medium food expenditure groups.

Number in family and food consumption. The consumption per person of the foods listed other than potatoes and apples was less per person as the size of the family increased. Apple and potato consumption was approximately the same for the largest as for the smallest families.

TABLE 47

WEEKLY FOOD CONSUMPTION, FOOD EXPENDITURE, AND INCOME PER PERSON AS RELATED TO ESTIMATED WEEKLY FOOD EXPENDITURE PER FAMILY

Estimated weekly food bill per family	Approx. no. of replies	Number in family	Weekly food consumption per person						Weekly food expendi- ture per person	Income per person
			Carrots (bunches)	Cabbage (heads)	Celery (bunches)	Lettuce (heads)	Onions lbs.	Potatoes lbs.	Apples lbs.	
\$ 6 - \$ 9 av. \$ 7.50	10	1.30	.77	.04	.54	1.00	.64	2.2	2.0	\$ 5.80 \$ 36.30
10 - 19 av. 14.70	106	2.59	.60	.19	.33	.66	.34	2.7	1.1	5.70 30.00
20 - 28 av. 22.80	104	3.96	.46	.14	.38	.51	.38	2.8	1.1	5.80 23.30
30 - 38 av. 32.00	31	4.51	.44	.19	.31	.48	.35	3.1	1.1	6.70 20.20
40 - 60 av. 45.40	13	5.92	.37	.13	.25	.51	.32	2.1	.9	7.70 35.10

The food bill per person for the one person family was \$9.40 weekly while the per person expenditure for a six person family was only \$5.30 weekly (Table 48).

Proportion of carrots cooked and food consumption.

Where consumers were grouped in relation to the proportion of carrots cooked there was no consistent relationship other than size of family. Families serving mostly raw carrots averaged larger in size than did those families which cooked most of the carrots served. The group cooking 0-39 percent of the carrots served averaged 3.73 persons per family; the next group cooking 40-69 percent of the carrots served averaged 3.59 persons per family; and the group cooking 70-100 percent of the carrots served averaged 3.30 persons per family.

The group eating approximately two-thirds or more of their carrots raw had a weekly approximate income of \$29.10 per person. The group eating about the same proportions of raw and cooked carrots had an income of \$22.50 per person. The group cooking most of their carrots served had an income of \$27.10 per person (Table 49).

Slightly less carrots were consumed per person by those who ate most of the carrots raw. Their weekly

TABLE 46

WEEKLY FOOD CONSUMPTION, FOOD EXPENDITURE,

AND INCOME PER PERSON AS RELATED TO NUMBER OF PERSONS IN FAMILY

Number in family	Approx. no. of replies	Weekly food consumption per person							Food bill per person	Income per person
		Carrots (bunches)	Cabbage (heads)	Celery (bunches)	Lettuce (heads)	Onions (lbs.)	Potatoes (lbs.)	Apples (lbs.)		
One	13	.75	.32	.73	1.27	.84	2.2	1.30	\$9.40	\$41.50
Two	73	.72	.23	.48	.80	.44	2.8	1.46	7.20	45.50
Three	75	.58	.17	.39	.62	.37	2.8	1.10	6.60	28.50
Four	67	.43	.15	.24	.52	.30	2.8	1.17	5.90	23.50
Five	24	.41	.15	.31	.44	.29	2.5	.99	5.60	20.90
Six	21	.34	.15	.20	.44	.34	2.4	.97	5.30	16.10
Seven to nine (av. 7.6)	10	.40	.11	.10	.34	.29	2.0	1.31	4.60	19.14

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TABLE 49

WEEKLY FOOD CONSUMPTION, FOOD EXPENDITURE,
AND INCOME PER PERSON AS RELATED TO PROPORTION OF CARROTS COOKED

Percentage of carrots cooked	Approx. no. of families	Number in family	Weekly food consumption per person							weekly food bill per person	weekly income per person
			Carrots (ounces)	Cabbage (heads)	Celery (bunches)	Lettuce (heads)	Onions (lbs.)	Potatoes (lbs.)	Apples (lbs.)		
0 - 39	96	3.73	.45	.16	.35	.55	.35	2.7	1.0	\$2.10	\$22.10
40 - 69	99	3.59	.53	.17	.34	.60	.41	2.6	1.3	5.70	22.50
70 - 100	66	3.30	.54	.16	.36	.51	.33	2.3	1.2	6.30	27.10

consumption was about .45 bunch per person while those who cooked about half or more of the carrots eaten consumed about 20 percent more. There was little difference in the per capita consumption of the other foods when related to groups according to the percentage of carrots cooked.

Carrots purchased with and without tops and food consumption. When the consumers who purchased carrots with tops were compared with the consumers who purchased carrots without tops there were no consistent relationships. The group purchasing carrots without tops consumed slightly more carrots (.56 bunch as compared with .49 bunch). This group also used slightly more celery and apples and less potatoes. The consumption of cabbage, lettuce and onions was about the same in each group.

Each group spent about \$6.00 per person a week for food, though the purchasers of carrots with tops had a higher weekly approximate income per person. Their income was \$26.80 per person as compared with an average income per person of \$22.60 received by the purchasers of carrots without tops (Table 50).

Nationality and food consumption. When comparing nationality with food consumption only the American

TABLE 50

WEEKLY FOOD CONSUMPTION, FOOD EXPENDITURE,
AND INCOME PER PERSON AS RELATED TO TYPE OF CARROTS PURCHASED

Type of carrot purchased	Approx. no. of replicas	Number in family	Weekly food consumption per person					Weekly food bill per person	Weekly income per person
			Carrots (bunches)	Cabbage (bunches)	Lettuce (heads)	Onions (lbs.)	Potatoes (lbs.)		
With tops	913	3.49	.49	.17	.34	.56	.37	1.1	47.00
Without tops	412	3.60	.56	.15	.39	.55	.36	1.5	22.60

White and the Northern European groups were large enough to yield results which could be considered to be significantly different from the rest of the groups.

The Northern European group in general consumed slightly more food per person than did the American White. The average weekly consumption of carrots was about the same in each group, .43 and .51 pounds per person respectively. The Northern European group consumed slightly less lettuce than did the American White (.51 as compared with .56 head per person).

The families averaged slightly larger in the Northern European group, 3.91 persons as compared with 3.42 in the American White. The Northern European group also had a lower weekly income per person, \$21.80 as compared with \$28.10 in the American White group.

From the limited data available the American colored group appeared to use less carrots, celery, lettuce, and potatoes and to consume more onions and cabbage per person than the American White and Northern European groups (Table 51).

Occupation and food consumption. There was little difference in carrot consumption when related to occupation. The range in average carrot consumption per person was from .47 to .58 bunches per week. The weekly food bill per person ranged from \$5.70 to \$6.80 (Table 52).

TABLE 51

WEEKLY FOOD CONSUMPTION, FOOD EXPENDITURE,
AND INCOME PER PERSON AS RELATED TO RACE AND NATIONALITY OF CONSUMER

Nationality; Race	Approx. no. of replies	Number in family	Weekly food consumption per person							Weekly food bill per person	Weekly income per person
			Carrots (bunches)	Cabbage (heads)	Celery (bunches)	Lettuce (heads)	Onions (lbs.)	Potatoes (lbs.)	Apples (lbs.)		
American white	226	3.42	.51	.54	.34	.56	.35	2.7	1.1	\$6.10	\$28.10
Northern European	58	3.91	.48	.73	.38	.51	.38	2.9	1.3	5.60	14.30
American colored	6	3.16	.37	.83	.05	.37	.63	2.0	1.2	5.60	21.00
Other	5	3.20	.53	.50	.56	.75	.73	2.3	1.5	6.50	20.00

TABLE 52

WEEKLY FOOD CONSUMPTION, FOOD EXPENDITURE,
AND INCOME PER PERSON AS RELATED TO HUSBAND'S OCCUPATION

Husband's occupation	Approx. no. of regies	Number in family	Weekly food consumption per person					Weekly food bill per person	Weekly income per person
			Carrots (bunches)	Cabbage (heads)	Celery (bunches)	Letuce (heads)	Potatoes (lbs.)		
Office or clerical	41	3.34	.58	.15	.33	.54	.32	1.0	24.10
Salesman	45	3.41	.51	.16	.35	.59	.34	1.0	23.45
Skilled	32	3.00	.51	.21	.27	.56	.42	1.3	22.20
Other	41	2.21	.49	.23	.46	.66	.13	1.3	23.05
Semi-skilled	41	3.39	.48	.19	.31	.46	.37	1.0	17.15
Business or professional	29	3.75	.47	.12	.41	.61	.31	1.3	31.20

Family income and food consumption. There was little consistent relationship of consumption of carrots and the other foods and income, ranging from approximately \$15.00 person person per week to \$65.00 (Table 53). The weekly food bill per person increased from about \$6.20 to \$8.40 weekly. This higher food expenditure per person in the higher income families may be explained by the purchase of foods whose consumption varies directly with income and by the higher priced sources of purchase, additional services purchased and similar factors.

Areas of similar rental but varying income and food consumption. When consumers of similar rental areas but with varying incomes were compared, there were no consistent differences in the amounts of the various foods consumed by the various consumer groups (Table 54).

There were indications that the total food expenditure per person for these consumers might have been more nearly associated with location than income. In the low and medium rental areas there were almost no differences in food expenditure per person even though income per person varied as much as \$6.00 weekly in the low and \$26.00 weekly in the medium rental area. In the high rental area (East Lansing) food

TABLE 53
FAMILY FOOD CONSUMPTION, FOOD EXPENDITURE,
AND INCOME PER PERSON AS RELATED TO APPROXIMATE WEEKLY FAMILY INCOME

Approximate weekly income of entire family	Approx. no. of families	Number in family	Weekly food consumption per person					Weekly food bill per person	Weekly income per person
			Carrots (bunches)	Cabbage (heads)	Onions (bunches)	Lettuce (lbs.)	Potatoes (lbs.)		
Under \$35	12	2.17	.53	.26	.40	.61	.72	2.1	1.3
36 - 45	16	2.13	.46	.18	.46	.70	.40	3.1	1.1
46 - 55	35	3.40	.51	.13	.36	.47	.32	2.7	.8
56 - 65	46	3.73	.44	.17	.23	.50	.35	2.9	1.1
66 - 80	43	3.84	.46	.16	.26	.50	.35	2.7	1.2
81 - 95	23	3.65	.56	.20	.34	.56	.29	2.8	1.4
96 - 115	26	4.26	.45	.15	.30	.48	.27	2.7	1.4
116 - 135	9	3.32	.55	.14	.46	.53	.46	2.7	1.1
136 - 155	10	4.00	.57	.17	.38	.48	.36	2.8	.8
156 - 200	15	3.00	.71	.23	.46	.86	.57	2.7	1.2
201 - 300	12	4.17	.36	.15	.76	.58	.23	1.8	.8
301 or over	5	5.00	.42	.14	.30	.72	.16	1.7	.6

TABLE 54

DAILY FOOD CONSUMPTION, FOOD EXPENDITURE,
AND INCOME PER PERSON AS RELATED TO INCOME GROUPS WITHIN RURAL AREAS

Rental Area	Approx. no. of replies	Number in family	Daily food consumption per person							Daily food bill per person	Daily income per person
			Carrots (bunches)	Cabbage (heads)	Celery (bunches)	Lettsuce (heads)	Onions (lbs.)	Potatoes (lbs.)	Apples (lbs.)		
Low; \$25.00 per mo.	low 26	3.08	.56	.16	.38	.54	.39	2.9	.9	5.90	14.70
	medium 27	3.58	.42	.13	.20	.46	.34	2.3	.6	5.50	16.00
	high 28	4.11	.46	.20	.23	.46	.34	3.2	1.2	5.00	22.00
Medium; \$32.50 per mo.	low 21	2.40	.42	.13	.37	.58	.50	2.5	.3	6.30	17.70
	medium 40	3.93	.45	.15	.26	.46	.41	3.5	1.2	9.90	16.10
	high 35	3.70	.46	.19	.62	.54	.40	2.4	1.2	6.10	42.60
High; \$42.50 per mo.	low 22	3.10	.47	.15	.29	.17	.26	2.0	1.0	6.30	20.00
	medium 23	4.07	.49	.17	.21	.14	.24	2.2	1.5	7.10	17.00
	high 24	3.46	.49	.14	.25	.60	.24	2.3	.7	9.10	17.00

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expenditure per person was directly related to income. It seems likely that some factor other than income, possibly nutritional education, may have accounted for part of the difference in response. On the other hand, with a given level of income per person, say \$17.00, a greater proportion would appear to have been used for food in the low than in the high rental area. It is recognized here that in grouping by rental areas, one also groups by income, education, occupation, and other factors to some extent.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Summary. Consumer preferences and practices as they apply to the purchase and use of carrots were determined. It was thought that a knowledge of these factors might aid in solving some of the problems faced in marketing Michigan stored carrots.

The material used in the study was obtained by personal interview of 298 family units in the Lansing-East Lansing area in February of 1948.

The factor in carrots found to be considered the most important by consumers was freshness. The consumer, not only listed freshness as most important, but also gave freshness as the reason for many of the consumer responses and actions. The consumer gave taste or flavor as second in importance. Flavor was followed by texture and tenderness which were considered of equal importance. Size and color of skin were considered to be somewhat less important. These factors were followed by defects and cleanliness which were given little importance. Defects in carrots without tops were given more importance than defects in carrots with tops. Price was given the least consideration by the consumers and was considered unimportant.

A preference for carrots with tops was expressed by 84 percent of the consumers, two-thirds of whom gave freshness as the reason for their choice. The consumers were generally well satisfied with the carrots they purchased.

Carrots were more often served raw with meals than cooked. Raw carrots were served with 16 percent of the total meals (lunches and dinners) and cooked carrots were served with 13 percent of the meals. Dinners represented approximately 58 percent of the meals containing raw carrots and 70 percent of the meals containing cooked carrots. The average family interviewed had either cooked carrots or raw carrots on the menu about four times a week.

Carrots were reported on hand by 69 percent of those reporting. Carrots were purchased once a week by 66 percent of those responding and were put on the shopping list by 79 percent. Price was relatively unimportant in determining carrot purchases; 81 percent reported that they continued to purchase the same amount when they considered carrots high priced.

Many consumers had knowledge of the nutritional values of carrots. When asked why they served carrots 57 percent replied, "Health". Vitamin A was given by 44 percent when asked regarding vitamin content.

Carrots appear to be generally used by all groups. The average weekly consumption per person at the time of the survey was one-half bunch of carrots.

Conclusions. If Michigan carrot producers are to take an increasing share of the market with stored carrots, they must satisfy the consumers' demands. Some growers selling an attractively-packaged, uniform, high quality, topped carrot--after developing outlets through retail food stores--have created a steady demand for their carrots.

The grower needs the cooperation of the merchant to market high-quality stored carrots which will be considered "fresh" by the consumers.

The consumer needs to be educated that high-quality stored carrots may be obtained in the fall and early winter months. Promising experiments are underway at present toward lengthening the possible storage period.

Methods by which increasing quantities of Michigan stored carrots may move into consumption channels need to be studied.

APPENDIX A

MICHIGAN STATE COLLEGE
DEPARTMENT OF AGRICULTURAL ECONOMICS

Interviewer _____ Date _____ Street _____ Block _____

How many carrots have you bought during the past week? _____
bunches _____

How often do you usually buy carrots? _____ What store
usually? _____

When you have a choice, do you generally select the
carrots with tops _____ or without tops _____
Why? _____

Where do you keep them? Refrigerator _____ Icebox _____
Other _____

Do you have carrots on hand now? Yes _____ No _____

Do the carrots stay fresh after purchase? Yes _____ No _____
Other _____

In what ways do you use carrots?

		<u>Ways Cooked Last Week</u>	
		Number of times each meal (L-D or between)	
	Creamed	_____	_____
.....	Buttered	_____	_____
.	Stew	_____	_____
☒ % Cooked.	Candied	_____	_____
.	Soup	_____	_____
.	With roast	_____	_____
.	Other	_____	_____
.		_____	_____
.	Strips	_____	_____
.	Salads	_____	_____
☒ % Raw	Raw	_____	_____
.....	Whole	_____	_____

Have you ever purchased packaged frozen carrots? Yes _____
No _____

Have you ever purchased packaged fresh carrots? Yes _____
No _____ Type package _____

Remarks: _____

Did you buy canned carrots last month? _____ Cans;
Carrot juice? _____

Baby food with carrots? _____

Do you put carrots on your shopping list? Yes _____
No _____ Other _____

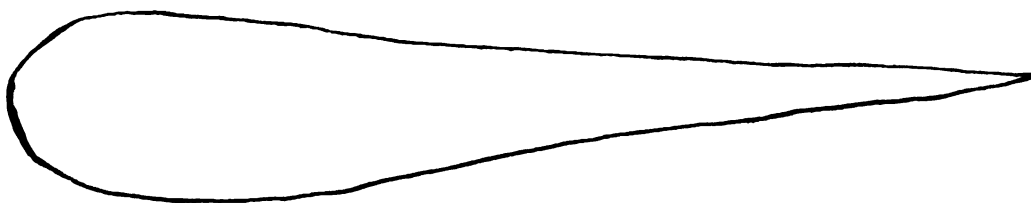
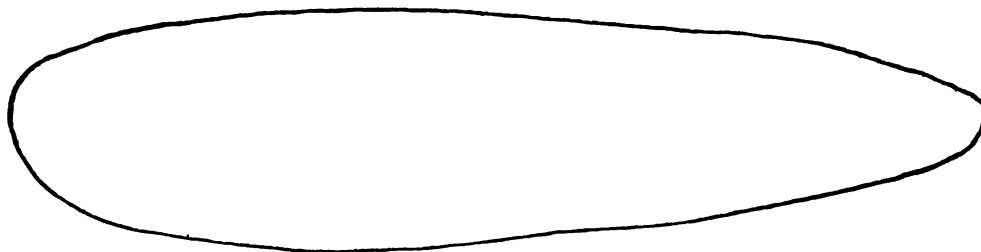
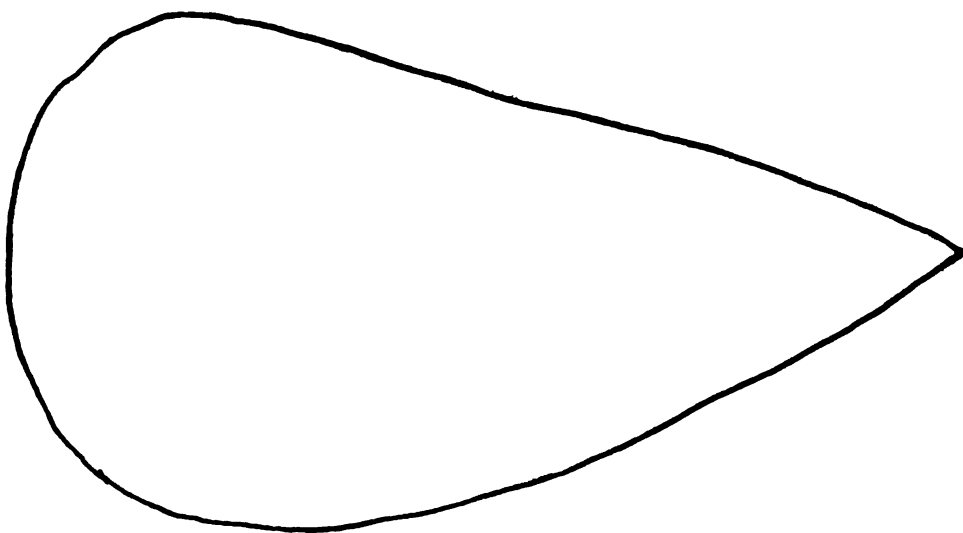
What influences you to buy them if they are not on the
list _____

When carrots are high-priced in your opinion, which do you
generally do? - - - -

Continue to buy the same amounts _____ Buy less _____
If buy less, do you substitute another vegetable?
Yes _____ No _____ Which one? _____

I have a list of qualities that carrots possess. I would
like to find out how important you think each of these
are and why.

<u>Importance</u>	<u>Buying Characteristics</u>
<u>Very-1; Some-2; Not very-3</u>	
____ Freshness	Why? _____ How test? _____
____ Color-skin	Describe _____
____ inside	Why? _____
____ Shape (scale)	Describe _____ Why prefer? _____
____ Size (scale)	Describe _____ Why? _____
____ Defects	Why? _____
____ (carrots with tops)	Do they often have defects? _____
____ Defects	Why? _____
____ (carrots with out tops)	Do they often have defects? _____
____ Cleanliness	Are carrots often dirty? _____
____ Price	Remarks _____



Eating Characteristics

___ Taste or	Describe _____
___ Flavor	Is flavor usually satisfactory? _____
___ Texture	Describe _____
___	Is this satisfactory? _____
___	Is this satisfactory? _____
___ Tenderness	

___ Cooking	Describe good quality _____
___ quality	Is this factor satisfactory? _____

List the most important quality: _____

What qualities are most often lacking in the carrots you buy? _____

In your opinion, what are the main reasons you serve carrots _____

We are interested in your opinion of the food and health value of carrots.

What vitamins are in carrots? _____

What special food values are in carrots? _____

What other values do you think they have? _____

Who in your family (if any) likes carrots?

Most: Father__Mother__Son__Daughter__Other__Age__

Least: Father__Mother__Son__Daughter__Other__Age__

In order to make statistical comparisons of carrots and other foods we would like some information on a few other foods. Approximately how much did you eat last week?

Potatoes___pk. Onions___lbs. or size (if No.)_
 Oranges___doz.____ Lettuce___heads___-size_____
 Celery___stalks-size____ Cabbage___heads -size_____
 Carrots___bunches____ Apples___lbs. or size (if No.)_

Please estimate your weekly food bill (including milk)
 for your household. \$_____

About your family: How many eat with the family?

Breakfast	Total	Under 6 yrs.
Lunch (Including box)	_____	_____
Dinner	_____	_____
	_____	_____

Husband's Occupation:_____

Race; Nationality:_____
 (homeland of father's or husband's parents)

Approximate weekly income in entire family:

Under \$35___; \$36-45___; \$46-55___; \$56-65___; \$66-80___;
 \$81-95___; \$96-115___; \$116-135___; \$136-155___; \$156-
 200___; \$201-300___; \$301 or over___.

APPENDIX B

METHOD USED TO DETERMINE RELATIVE IMPORTANCE
OF FACTORS BASED ON CONSUMER VALUATIONS.

The consumers rated each factor in one of three levels: (1. very important, 2. some importance, and 3. not very important). The relative importance of each of the various factors was determined by assigning numerical values to the replies. The replies were reported in percentages in the tables. Each percentage signifying "very important" was assigned a value of three; "some importance" was assigned a value of one, and "not very important" was assigned a value of negative one.

Let us assume an equal distribution of the three levels of importance to be 33%, 34% and 33% (total 100%). The percentage of each answer is then multiplied by the numerical value assigned above (3 for "very important", 1 for "some importance", and -1 for "not very important") with the result:

$$\begin{array}{r} 33 \times 3 = 99 \\ 34 \times 1 = \underline{34} \\ 133 \end{array}$$

$$33 \times -1 = \underline{-33} \\ 100$$

Thus an equal distribution of answers is given an importance value of 100. An importance value under 100 indicates that the consumer considers the factor relatively unimportant. As the consumers consider the factor more important the value rises above 100.

APPENDIX B
CONT'D

Importance Given Various Factors by Consumers									
Importance	Factor								
	Freshness			Taste			Tenderness		
	% Value			% Value			% Value		
Very	92	276		78	234		56	168	
Some	7	7		19	19		39	39	
		<u>283</u>			<u>253</u>			<u>207</u>	
Not Very	1	-1		3	-3		5	-5	
		<u>282</u>			<u>250</u>			<u>202</u>	
	Shape			Texture			Defects (with- out tops)		
Very	37	111		36	108		41	123	
Some	54	54		53	53		36	36	
		<u>165</u>			<u>161</u>			<u>159</u>	
Not Very	9	-9		11	-11		23	-23	
		<u>156</u>			<u>150</u>			<u>136</u>	
	Color of skin			Size			Cooking quality		
Very	40	120		35	105		33	99	
Some	35	35		47	47		48	48	
		<u>155</u>			<u>152</u>			<u>147</u>	
Not Very	25	-25		18	-18		19	-19	
		<u>130</u>			<u>134</u>			<u>128</u>	
	Cleanliness			Defects (with tops)			Price		
Very	31	93		32	96		26	78	
Some	50	50		42	42		39	39	
		<u>143</u>			<u>138</u>			<u>117</u>	
Not Very	19	-19		26	-26		36	-36	
		<u>124</u>			<u>112</u>			<u>81</u>	

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