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Choosing and Using Your Food Freezer

Michigan State University Extension Service

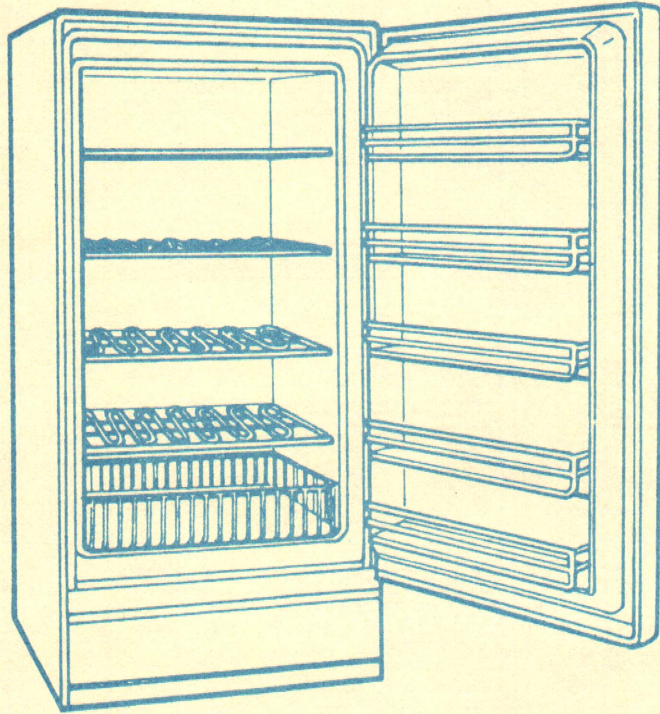
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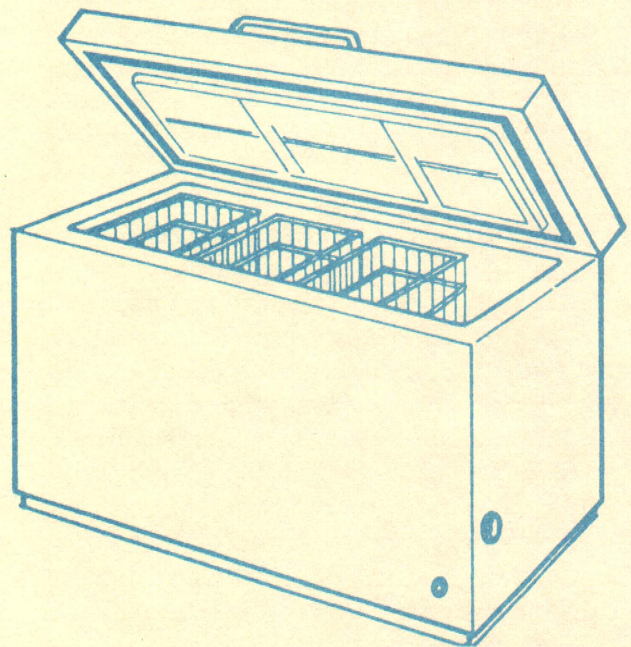
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Choosing and Using:

*your
food
freezer*



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This bulletin, with revisions by Anne Field, Extension Specialist in Family Ecology, Michigan State University, is reprinted from Leaflet 2492 of the same title, published in February 1978 by Cooperative Extension, Division of Agricultural Science, University of California. The author of Leaflet 2492 is Constance Burgess, home economist emeritus, University of California.

Choosing and Using:

your food freezer

Nearly every wired home in the United States has a refrigerator, but less than half of those homes have a separate food freezer. Many families use the combination refrigerator-freezers that provide space for a limited amount of food freezing.

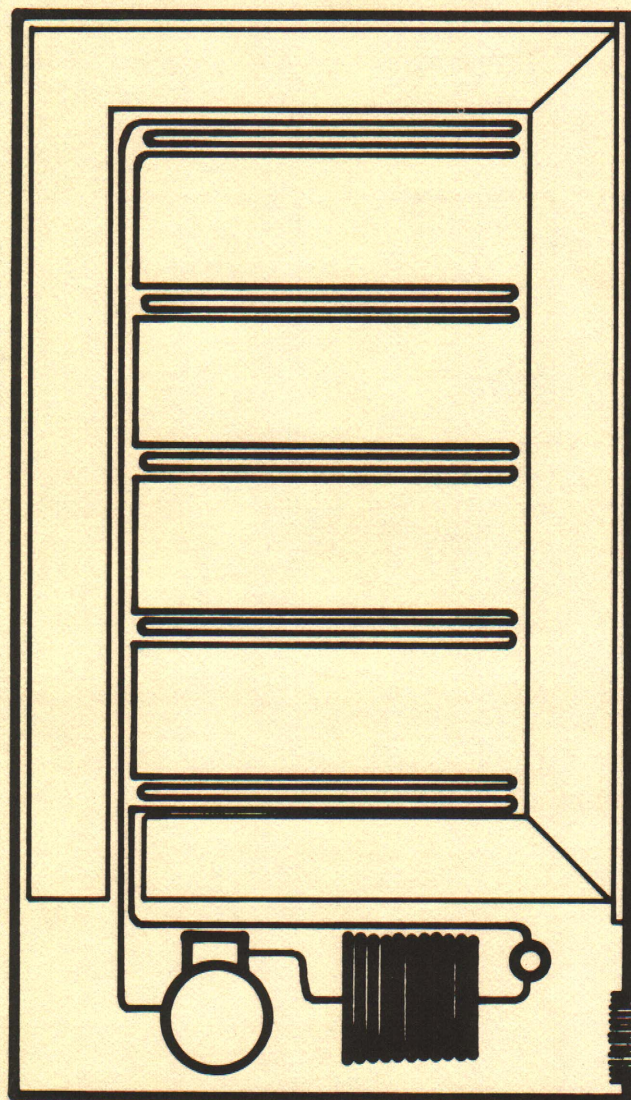
Families with freezers can take advantage of seasonal buys and off-season sales. Whether such families eat better and have more variety depends upon the food they freeze and their use of the freezer.

A separate food freezer is a convenience with advantages not offered by a refrigerator. If you're in the market for a freezer it will pay you to study the different models available.

HOW A FREEZER WORKS

A freezer works in much the same way as a refrigerator. Heat enters a freezer with warm food placed in it, through the door or lid when opened, or through leaks in the walls and around the door gasket. Like a refrigerator, the freezer removes heat from the compartment by means of liquid refrigerant, which travels through the evaporator coils and absorbs the heat. Later the heat is expelled as the refrigerant (now a gas) changes back into a liquid in the freezer condenser.

Placement of the evaporator (cooling) coils varies with different models. In chest freezers, coils often are in the walls, or some coils may be shaped into large plates that serve as space



UPRIGHT TYPE FREEZER (side view)—contact-freezing with cooling coils in each shelf, manual defrost.

dividers. Fastest freezing occurs as packages contact these walls. If there is a separate section for fast-freezing, it will have extra coils.

In upright models with contact freezing, the coils may be in the walls but are more likely to be mainly in the shelves at the top of the liner. For fast-freezing, more coils are directly under some shelves. Generally, the larger the evaporator surface, the more efficiently the freezer operates.

"No-frost" freezers usually have their evaporator coils outside the freezing compartment itself. Zero or subzero air is moved through the compartment by a fan or fans near the cooling coils.

Even though frozen solid, food can deteriorate. As temperatures rise, changes occur in color, texture, flavor, and nutritive value. The changes occur several times faster at 15°F than at 0° and several times faster at 25° than at 15°F.

It is important, then, to store frozen food at an adequately low temperature, but you will want to operate the freezer at a reasonable cost. Because the purpose of a freezer is not to store food indefinitely, an average temperature of 0°F is adequate. Keeping the temperature lower adds to the cost. Air temperature in a quick-freeze section, however, may go down as low as -30°F.

SELECTING A FREEZER

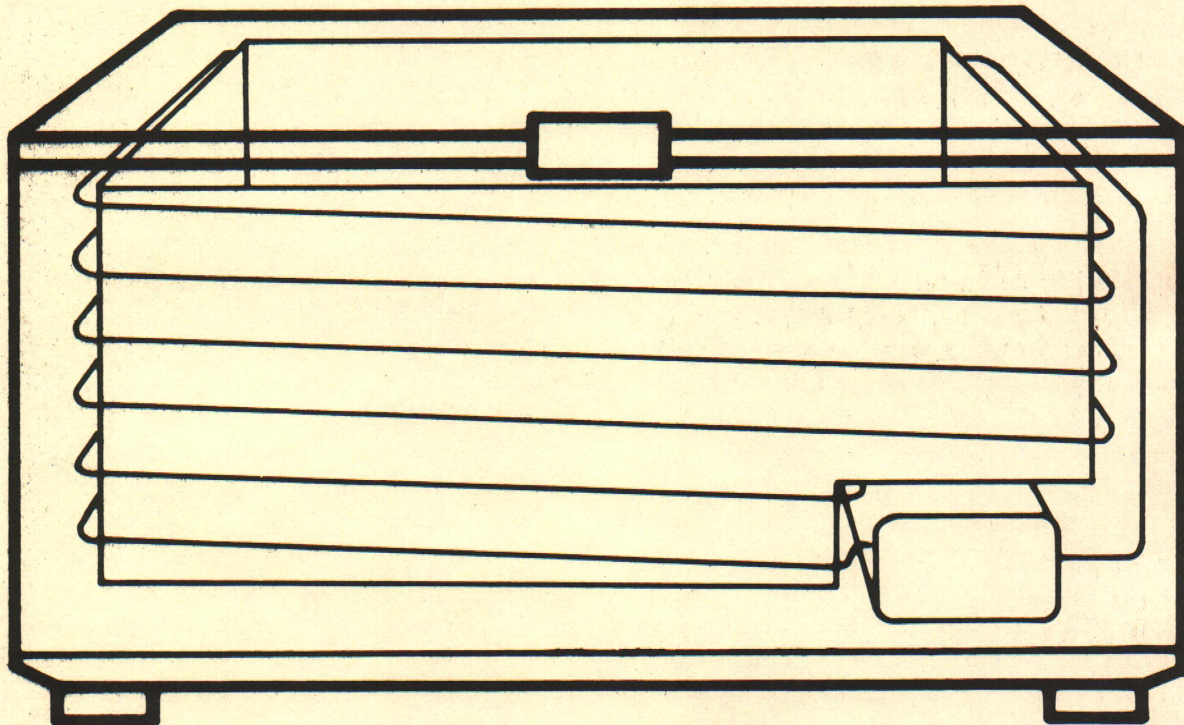
The style you choose will depend in part on where you plan to put the freezer. A convenient location is less important than it seems, because you open a freezer infrequently. If you period-

ically transfer frozen packages to your refrigerator freezing compartment, there may be several days between trips to your freezer.

Upright or chest?

Sales of uprights have surged ahead of chest models for some years for several reasons. You stoop less with an upright, and it's often easier to find packages placed on shelves or in drawers. An upright occupies only about half the floor space required by a chest model. Many people prefer the appearance of an upright, especially in the kitchen.

Chest models have been slightly more popular in recent sales for their special advantages. They cost less to buy and generally less to operate. Cold air is heavier than warm, and so, when the lid of a chest freezer is raised, little exchange of hot and cold air occurs. By contrast, when the door of an upright model is opened, warm air from the room rushes in, pushing out the heavier, cold air. This makes frost collect faster in uprights and adds to the operating cost. Cold temperatures are usually more even throughout a chest than in an upright though they are warmer at the top, which should be used for shorter-term storage foods.



CHEST TYPE FREEZER (front view)—manual defrost, cooling coils within walls and wrapped entirely around food compartment.

A chest model provides a good-sized counter top. Some chest models provide baskets for food packages, but these are usually heavy to lift when loaded. Probably more food can be frozen and stored in a chest-type freezer than in an upright, since little space is taken up by dividers. Too, it's easier to fit irregularly shaped packages and bulky items, such as a turkey, in a chest model so that little space is lost between them. Packages will be harder to find unless well organized, but they will not fall out and possibly injure the user as they could from the shelves of an upright if not arranged carefully.

Size and capacity

You can buy a separate food freezer as small as 6 cubic feet (referred to as a compact) or as large as 31 cubic feet. One cubic foot holds 35 pounds of frozen food, if the packages are regular in size, square cornered and stored in contact with each other. Irregularly shaped items, such as frozen juice cans, poultry or meat, require much more space.

A general figure of 6 cubic feet of freezer space per family member is often used. But if you plan to use the freezer mainly as a holding box and seldom for freezing peak loads, as little as 3 cubic feet per person may do. If you depend on a freezer for preserving much of your food supply, you may need as much as 10 cubic feet per person.

Frostless or regular defrosting?

All no-frost freezers on the market are uprights. The term frostless (or no-frost, frost-free, or whatever the manufacturer calls it) is a bit misleading. Actually, frost forms when the moisture vapor in the air passes into its crystal stage upon contact with the evaporator coil. This process is known as sublimation.

Because the evaporator coils or plates are outside the storage compartment, frost never forms on the packages or on the inside surfaces. Packages do not freeze to each other or to the shelves. Freezing is accomplished by forced circulation of zero or subzero air, which adds to operating costs and causes more drying of improperly wrapped food. Foods added may freeze a little faster because of the circulation of cold air throughout the freezer.

Frost that collects on the evaporator of a frostless freezer is removed regularly, usually by means of a clock device that shuts off the current once every 24 hours, such as 2 a.m. Since the defrosting period must be short to avoid thawing, most models introduce heat to melt the frost. One means is to use a heating element. Some models reverse the refrigeration cycle temporarily so that hot refrigerant passes through the evaporator coils.

Standard freezers (chest or upright) collect frost on shelves, wall linings, dividers or wherever the cooling coils are. Some of the frost may be scraped off; but once it turns to ice, other methods are needed to remove it. Manual defrosting is usually necessary only once a year, unless the freezer is opened frequently. Most frostless freezers will use a great deal more electricity to operate than comparable upright manual defrost freezers. Thus, they will cost more to operate for very little benefit or added convenience. Unlike refrigerators, manual defrosting of freezers is usually done only once, or at the most, twice a year, and an annual cleaning and re-inventorying of contents to use up older foods is desirable anyway. Frost-free freezers, therefore, do not offer the same convenience benefits as frost-free refrigerators.

Operating Costs

Costs of operating frost-free 15 to 16 cubic feet, upright freezers were as much as 45 to 85 kilowatt-hours (kwh) per month **more** than comparable sizes of upright manual-defrost freezers from the same manufacturers in 1977. At a utility rate of 5 cents per kwh, this would mean an additional operating cost of \$27 to \$39 a year for the frost-free models. (Chest models from the same manufacturers required 7 to 17 less kwh per month than the upright manual defrost models.)

Higher-efficiency models of freezers with improved design and insulation are being developed and marketed. For example, one manufacturer introduced a more efficient frost-free model using only a few kwh more per month than the manual defrost models described above, and a more efficient manual defrost upright using 30 kwh **less** per month than the

most efficient regular model described above. At a 5 cent per kwh rate, this would save \$18 a year, making up the difference in the higher initial price in a few years, and then being a real bargain the rest of its life as electricity prices rise.

Insulation

Adequate insulation is essential in freezer construction. The greater the difference in temperature between hot and cold objects, the more rapid the heat transfer. The force of vapor trying to get into the sealed shell of the freezer cabinet is equal to that of a 70-mile-per-hour wind.

Traditional insulating materials have been primarily fiberglass and mineral or rock wool. For 0° temperature inside, the insulation must be 3 to 6 inches thick. The extra thickness gives better protection and helps reduce operating costs, but means less storage space. Manufacturers have tried in many ways to reduce the problem of freezer "sweating," a natural result of warm, moist air contacting the cold freezer surface. Chests and many uprights run condenser tubes through which the hot refrigerant flows inside the outer freezer walls to warm them nearer room temperature (the reason outer walls feel warm when the freezer is running). Other uprights use a heated wire around the door opening for the same purpose and may provide an "economy" switch to turn off the wire when the room is not humid, thus saving electricity.

Foam plastics are also very good freezer insulators. Liquid polyurethane resin is poured into a mold, forming rigid sheets in permanent shapes. As the liquid is processed, it foams, entrapping dead air. The outside layer forms a tight skinlike membrane that resists the entrance of vapor. If freezer insulation gets wet, it loses its insulating properties and cannot keep heat out of the freezer.

Special features

As with any appliance, added features mean added cost. Some are highly desirable, others less so.

Hardware should be sturdy and rust-resistant to withstand the heavy demands and

the sweating normally found on freezers. Some models are available with locks.

A **freezer alarm** is desirable. Look for one that can be heard, not just a light that flashes on. The alarm should signal you before the warmest package in a partly loaded freezer reaches 15°F and also when the circuit is broken.

An **interior light**, available on some models, is a convenience for locating packages if room lighting isn't adequate.

Baskets and drawers are good but have drawbacks. You may have to give up as much as a cubic foot of storage space to accommodate them.

A **temperature control** that you can adjust for climate changes or amount of food being quick-frozen can help you keep desired temperatures inside the freezer without using excess energy.

LOCATION OF FREEZER

Putting your freezer close to your kitchen will be handy, but such a location will likely be warmer, which will make it run more and cost more to operate. A cool, dry room is better for economical operation and long freezer life, but be sure the room temperature stays above 40 F. (5 C.). Some people assume because the food is frozen, a location that drops below freezing in winter is good, but the freezer mechanism will not operate as efficiently below that temperature, and may fail to operate. If your freezer is located away from your kitchen, you can periodically remove foods to the freezer compartment of your refrigerator for several days' use.

Freezers full of frozen food are heavy. Upright freezers exert more load pressure per square inch than chest models. Be sure the floor is solid, and as level as possible. The freezer itself should be leveled when installed so that the door closes tightly. Uprights may be tilted slightly from the front so the door will close readily. Plug a freezer into its own circuit so there's no chance of an overload from another outlet on the same circuit that could shut it off. Use only a grounded outlet for safety.

Since cabinet walls get hot, leave room on both sides and back of the freezer for this heat to be given off in the air. Don't crowd the

freezer into a corner or back against a wall too closely.

USING YOUR FREEZER

Your satisfaction with a freezer will depend in part on how closely you follow the manufacturer's suggestions for use and care. Before you buy, compare various types and brands and study the manufacturers' booklets.

Freezing capacity

Put no more frozen food into a home freezer than will freeze within 24 hours. Usually this will be about 2 pounds of food to each cubic foot of capacity. Overloading slows down the rate of freezing, and foods that freeze too slowly may lose quality or spoil.

For quickest freezing, place packages of unfrozen food against freezing plates or coils and leave a little space between packages so air can circulate freely. Arrange them so that they do not touch any packages of frozen food stored in the freezer. If necessary, use a board or heavy cardboard, such as corrugated carton material, to act as insulation between the frozen and unfrozen packages to prevent them from coming in contact with each other.

Some manufacturers suggest preparing a freezer before a new load is frozen. To do this, set the temperature control at its coldest position several hours ahead of time; then the warmer food will not raise the temperature of the whole compartment much above normal. Wait 24 hours before returning the control to storage position.

Food quality

You'll never take better food out of a freezer than you put in. **Freeze only top quality food.** To keep the temperature inside packages from fluctuating, avoid opening the door often or leaving it open long. Proper airtight wrapping also helps to preserve high quality.

Packaging materials should be moisture-vapor-proof to keep food from drying out. Many of the packaging materials on the market for freezing foods are not moisture-vapor-proof but are sufficiently moisture-vapor-resistant to preserve the quality of the food. Glass, metal

and rigid plastic are examples of moisture-vapor-proof packaging materials. They are especially suitable for liquid packs. Plastic freezer bags, plastic films, laminated papers, heavy aluminum foil and waxed cartons made especially for freezing are moisture-vapor-resistant. **They are sufficiently moisture-vapor-resistant to be suitable for packaging foods for freezing.**

It's a good idea to have a system for keeping track of the food stored in your freezer. Otherwise, some of the more popular items will disappear quickly, and others may stay around too long. Recommended storage periods are given in publications on freezing foods available at the county Cooperative Extension Service office.

Package labels should show contents (including weight or quantity, if necessary) and date put into the freezer. A record that gives a running account of the freezer contents is also helpful. Keep the record and a pencil near the freezer. Following is an example of a freezer record sheet:

Item	Pkg. size	No. pkgs.	Date put in	Date to be used	Pkgs. used
Corn niblets	10 oz.	16	8/20/78	6/20/79	1111 111
Salmon steaks	2 lbs.	4	5/11/78	7/11/78	1

If conditions are right, refreezing can be done safely, according to the U.S. Department of Agriculture. You may safely refreeze foods that have thawed if they still contain ice crystals or if they are still cold—under 40°F.—and have been held at this temperature no longer than 1 or 2 days after thawing. Foods warmed to 40°F. or higher are not likely to be fit for freezing. If you are in doubt about refreezing thawed foods, contact your county Cooperative Extension Service office.

Refreezing reduces the quality of foods, particularly fruits, vegetables and prepared foods. Red meats are affected less than many other foods. Use refrozen foods as soon as possible.

CARE OF YOUR FREEZER

A thick layer of frost lowers freezer efficiency, increases operating costs and reduces the space available for food packages. Follow the manufacturer's recommended method of de-

frosting. Most suggest that this be done before frost is ½ inch thick on the freezer surfaces. Plan to defrost when the supply of frozen food is low. Store the frozen food that is left in insulated cooler chests, in cardboard boxes lined with thick sections of newspaper or in the refrigerator while the freezer is being defrosted and cleaned. When you scrape off frost between defrostings, use a plastic or wooden scraper—a sharp tool might puncture the coils.

In “frostless” models, water from the regular defrosting cycle collects in a small container and evaporates from it.

A freezer requires little cleaning, because it is not used in the same way as a refrigerator. However, after defrosting, it is wise to clean the interior. Wipe with a cloth or sponge thoroughly dampened in warm detergent water. Rinse with a cloth wrung out of clear water, then dry. The outside of a freezer, like that of a refrigerator, can be wiped periodically with a damp cloth and with one of the special white waxes for this purpose.

If the current goes off, don't open the freezer door or lid. If the freezer is full of frozen packages, the food will probably stay frozen for as long as 48 hours. In a half-full freezer, the food should stay frozen about 24 hours.

If a power failure caused the freezer to go off, there's a good chance the electricity will be restored within a safe time limit. If the difficulty

is with the freezer itself, your next move depends on how soon a service representative is available. It's good insurance to arrange with someone to let you buy 50 pounds of dry ice if you ever need it. This should keep the food in a 20-cubic-foot freezer at around 15°F for 3 to 4 days. Handle dry ice carefully; wear gloves, and place chunks of the dry ice on a board or cardboard, not directly on the food packages. Be sure there is good ventilation in the room, and work quickly while the freezer is open.

DOES IT PAY?

Most people consider a freezer an investment. Estimating the useful life of a freezer at approximately 20 years, depreciation can be computed on the basis of one twentieth of the purchase price each year. There is, of course a possibility of some trade-in allowance even after 15 years.

Operating costs depend on many factors, such as frequency and amount of freezing, number of times the door or lid is opened, room temperature and local utility rates. About one tenth of a kilowatt-hour (kwh) is required to freeze a pound of food and reduce its temperature to the recommended 0°F.

The table shows costs of freezing and storing food in one year under three different situa-

Cost of freezing and storing food in one year, as affected by frequency of turnover of contents*

	Capacity (360 lb food)	1½ × capacity (540 lb food)	2½ × capacity (900 lb food)
<i>Ownership costs</i>			
Net depreciation (based on 15-yr fully amortized loan, \$399, 20 yr @ 8%)†	\$ 30.56	\$ 30.56	\$ 30.56
Repairs (2% of purchase price)	6.00	6.00	6.00
Electricity for freezing food (@ 5 cents/kwh)	1.10	2.02	3.37
Electricity for maintaining 0°F (1644 kwh/hr, @ 5 cents/kwh)	82.20	82.20	82.20
Packaging (@ 5 cents/lb)	18.00	27.00	45.00
Total cost	\$138.66	\$147.78	\$167.13
Cost per pound of food	\$.38	\$.27	\$.19

*Freezer used as 12-cubic-foot model, 360-pound capacity.

†Adjust the depreciation allowance as to current interest rate.

tions. The cost of the food itself is not included. But the table gives the additional cost of freezing more food and the additional cost of packaging materials when there is more turnover of the freezer contents. Making good use of a freezer by frequent turnover of contents clearly helps defray other costs of owning the freezer.

It doesn't cost any more to operate a full freezer than a half-empty one. Whether it will pay you to have a freezer will depend on how you use it. For most families it is a convenience but not a saving.

Food freezer plans

We suggest that you investigate carefully before you enter any contract for a food freezer plan. The package deal that includes purchase of a freezer may be less to your advantage than buying a freezer separately. The food items included with the plan may or may not measure up to your usual purchases. In any event, be sure to read the contract carefully before you sign it, just as you do with any contract.

IT'S UP TO YOU

Buying a freezer is no simple matter, and you will probably not save any money by owning one. But it is a convenience, especially for those who work or who entertain frequently. It may also save on gasoline for shopping if you live far from a store. You might consider the trade-off between gasoline and electricity costs.

If you decide to buy, look for a reliable guarantee. Read it carefully so you'll know what it includes. Make sure there is a food spoilage warranty in case of a breakdown; these are usually good for 3 to 5 years. Look also for the **Underwriters Laboratory (UL) seal of approval**, indicating that electrical connections and refrigerating system are safe.

Buying for efficiency

The new more efficient freezers coming on the market now and in the next few years will cost more for new design, improved materials and more and better insulation. But if they cost much less to operate, they can pay for themselves in a very few years and save you money the rest of the time you own them. Freezers have a life expectancy up to 20 years, and most owners keep them a long time. A freezer that costs you \$50 more to buy and saves you \$30 a year in operating costs at a 5 cents per kwh rate is a real bargain. Don't be reluctant to pay a little more one year to save a lot in succeeding years!

Soon **Energy Efficiency Labels** should be appearing on freezers and other major appliances, giving specific information on how much energy each model would use under average operating conditions. These labels should help you compare models to find the more efficient ones.

Some excellent food freezers are on the market. Research has supplied necessary information about processing and using food. Proper use and care of the freezer will result in many satisfactions. From now on it's up to you.