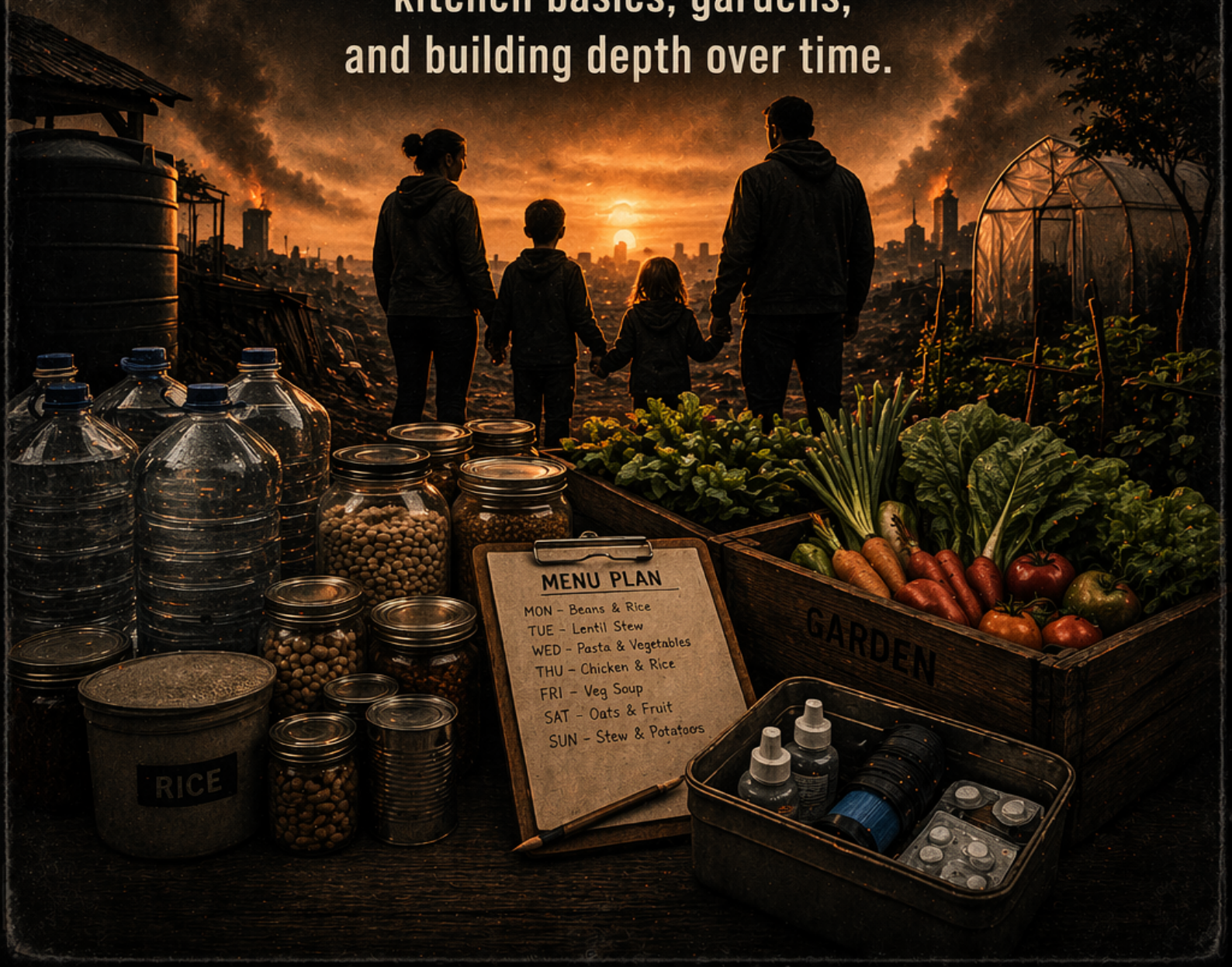
EMERGENCY PREPAREDNESS FOR SOUTH AFRICA

FOOD AND WATER

Storage, purification, menu planning,
kitchen basics, gardens,
and building depth over time.



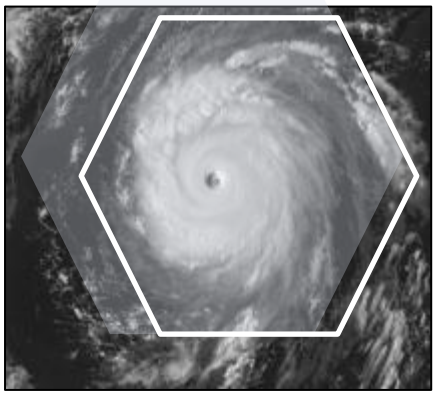
4 FOOD AND WATER

In 2005, in the USA, Hurricane Katrina left the city of New Orleans in ruins and the estimated damage amounted to more than 81 billion dollars. Hundreds of thousands of people had to evacuate the area and were at the mercy of the federal government and the Red Cross. Many people were stranded in homes, surrounded by water, without power or communication of any kind. Since any sign of civilization disappeared for weeks, the graceful old city fell victim to vandals and looters.

The government hastily set up temporary shelters in the superdome and the New Orleans convention centre for disaster victims. Thousands of others had to be squeezed in dwellings without adequate sanitation, food supplies and water.

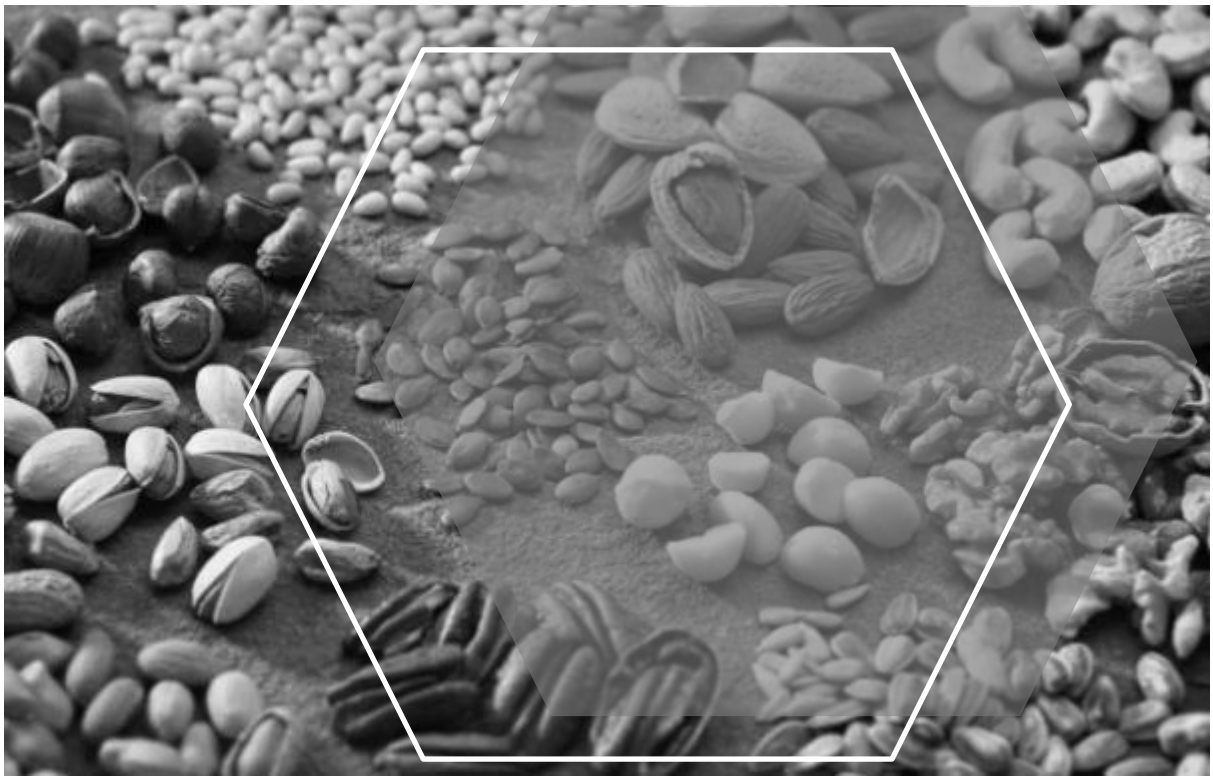
Nobody was prepared for a disaster of this proportion - neither the residents, volunteers, emergency crews, nor the US government. The government and the Red Cross came under fire for they did not respond quickly enough when the emergency warnings were received.

Due to the flooded, impassable roads and the total chaos that prevailed under which the rescue teams had to operate, the refugees who were housed in the superdome and New Orleans convention centre had to manage without supplies for four days. Those who chose to stay in their homes were without electricity, sewage or running water, and had to wait even longer for help to arrive.



The impact of Hurricane Katrina made all of us realize just how quickly a comfortable and civilized society can change to the status of a third world country, despite the support of the many people who made donations and did volunteer work to try to help the victims. For some of us, disasters like Katrina opened our eyes to the fact that we need to be more prepared.

4.1 FOOD



4.1.1 PLAN IN ADVANCE

During a disaster, it is possible that shops will end up running out of food after a few days. Fresh and perishable food that cannot be kept chilled can cause illnesses. It is therefore important that you allow for necessary food and water during your planning phase. A part of your financial budget should be allocated to for this purpose. By planning ahead of time and not buying it all at once, will drastically reduce the impact on your cash flow when you buy a few stock items each month. When a disaster strikes, it will most likely be too late to get to the supermarket in time - where you might have to fight your way through the stressed-out crowd to get the necessary supplies for your family.

4.1.2 PLAN ACCORDING TO YOUR BUDGET

Those of us who have already made a study of food supply will tell you that there are a variety of products available on the overseas market that is manufactured specially for survival and emergencies circumstances. The benefit of these foods (such as freeze-dried fruits and vegetables) is that they are very nutritious and retain their flavour. Unfortunately, they are very expensive and you might have to import it to South Africa.

Obtaining the necessary food supplies doesn't have to be an expensive endeavour. Gathering them gradually and steadily ahead of time will lessen the financial strain.

It is important to keep the following in mind when compiling your food supply:

- Do any of your family members have special dietary requirements?
- How long does your food supply need to last?
- How many people will you be providing for?
- How will you cook your food if there is no electricity?

SAFETY TIP

If you find yourself in a situation without electricity, it is important to use the food stored in the refrigerator and freezer first, before it spoils. Open your refrigerator / freezer as little as possible. The more often you open it, the harder it is for your fridge to regulate its temperature.

Before you go to the supermarket and spend your money, first have a look to see what food you may have already. Most of us, at least, will have a few things like canned fruit and vegetables and a few dry goods such as rice and pasta, in stock. Use a checklist as a framework and you might be pleasantly surprised to know that you are already more prepared than you originally anticipated.

When shopping for the remaining items, study the nutritional value on the back of the pack. If you do get into an emergency situation, it is important to eat foods rich in vitamins and proteins to maintain good health and optimum energy.

4.1.3 PLAN ACCORDING TO A MENU

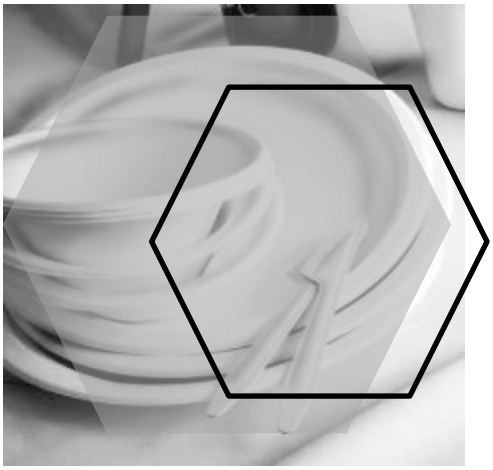
The best way to plan your food supply is to put your heads together and establish an "emergency menu". This will help you better plan the kind and amount of food you should get while shopping. The menu should preferably be based on food that you like. No one wants to experiment with food during a crisis situation. Some favourite quick meals are easy to prepare. There are inexpensive items that can be stored without refrigeration and require very little or no energy to cook.

4.1.4 FACTORS TO CONSIDER

4.1.4.1 LOSS OF ELECTRICITY

To further prepare your family, you should assume that you will be without electricity for a week, or even longer. It may happen that you won't have a stove or a freezer at your disposal. So, try to get stock that does not require extensive cooking, or need to be frozen. The easiest meals to prepare are foods to which you only need to add water, but there's limited choice for these kinds of meals. To have more options available, investing in a gas stove is a good idea. If your budget doesn't allow you to change your electric stove for a gas stove, it's highly recommended that you at least get a gas bottle with a burner. Further discussion on the topic can be found later in this Book: (See "LOSS OF ELECTRICITY")

4.1.4.2 KEEP DISHES TO A MINIMUM



It is important to keep preparations for meals as simple as possible. It is also important to restrict dishes to a minimum if your water supply is limited. Consider the following replacements:

- Styrofoam or paper plates
- Paper towels and napkins
- Plastic cutlery
- Plastic Cups
- Baby Wipes

4.1.5 GENERIC FOODITEMS

According to statistics provided by the United Nations, the minimum period you should plan for is two weeks. However, consider that it might take much longer than two weeks (perhaps up to two months) before sufficient stock may appear again on shops' shelves, and prices may then be significantly higher or even unaffordable. If you have at least two weeks of dry food and water in stock, you're more prepared than 95% of the population.

The following is a generic list of foods with their nutritional value and shelf life, and factors in the possibility that electricity might not be available. The quantities are determined by your family's needs and the meals you have planned. Even during a crisis situation, it is nice to be able to spoil your family, so there is nothing wrong with also stocking up on sweets and chocolates.

FOOD	CHARACTERISTICS	LIFE SPAN
DISTILLED OR BOTTLED WATER.	Although water is discussed at a later stage in this chapter, it is recommended to add it to your shopping list before you visit the shops to keep you from forgetting.	3 – 5 Years
CANNED LIQUIDS	It is important to remember to stock up on foods with high liquid content. ➢ Stewed tomatoes and vegetables, beef, or chicken stock can help give flavour to your food. ➢ It's also a good excuse to keep the necessary supplies of beer and wine. ➢	1 – 5 Years
MILK POWDER AND LONG-LIFE MILK	Long Life milk has a shelf life of between three to five years, if stored in a cool, dry place. Long Life milk that's already opened will last longer if stored at a cool temperature. Not all of us are very fond of powdered milk i.e. Cremora, but in an emergency, it will work for drinks like coffee. Powdered milk has a very long shelf life and in dry conditions can last up to 10 years or longer.	3 – 5 Years
EGGS AND POWDERED EGGS	Ordinary eggs usually have a shelf life of 3-5 weeks. To test whether the eggs are still edible, you can place the egg in a bowl of water. If it floats, it means that it has accumulated gas under the shell and therefore no longer safe to eat. If the egg sinks, it should still be fine. Powder eggs are usually without preservatives. Their shelf life is from 5 to 10 years, depending on whether they are stored in an airtight container in a cool, dry, place.	3 – 5 Weeks 5 – 10 Years

FOOD	CHARACTERISTICS	LIFE SPAN
TINNED MEAT AND FISH	For most South Africans, meat is an important part of our daily diet. Meat contains necessary proteins, minerals, vitamins, and fat, and these nutrients have a beneficial effect on your well-being. However, some portions of meat, such as saturated fats, can have negative consequences for those who suffer from high cholesterol, so it is important to consider all the pros and cons when including meat in your diet. Canned salmon, sardines, and tuna are rich in important Omega-3 oils. Vienna sausages and ham can also be held for a reasonable period in a refrigerator, but if a power failure occurs, you should eat them first.	Expiry date
CANNED FRUITS AND VEGETABLES	Did you know fruit contains two times as many calories as vegetables? Peaches, packed in light syrup, offers a great calorie boost to your survival diet. The fluids also provide a valuable source of hydration, so please do not throw away the 'juice' in the cans! There are other options too, such as pineapple and tangerines. Tangerines are very rich in vitamin C. There is a wide variety of canned vegetables available on the market. Canned vegetables are very convenient because everything is already peeled and they contain essential nutrients. Canned olives, asparagus, and artichoke hearts will help you to make an easy pasta meal.	Expiry date
COFFEE, TEA, HOT CHOCOLATE, AND CONCENTRATE	As far as your survival needs are concerned, coffee will improve your blood circulation and the caffeine will keep you awake. Coffee is rich in antioxidants, which fight inflammation, and is also good for the morale. Tea is not only a warm and pleasant drink, but also can be used medicinally. In addition, many kinds of tea have anti-cancer properties (polyphenol), reduce the risk of blood clotting, and can even lower cholesterol levels. There are thousands of herbal teas available and each can be used to strengthen you, helping the body to protect against infections and even healing some. One of the most common ways to calm your nerves is drinking a cup of mint and chamomile tea before going to bed. There are several types of soft drink products on the market, but the shelf life of drinks in powder form is the longest. Sports drinks are the most popular and contain adequate electrolytes which help if you feel dehydrated. Some companies like Brookes Sweet-O or Kool-Aid are making soft drinks with artificial sweetener and can be used by diabetics.	1 – 3 Years
CHICKEN AND BEEF STOCK AND VARIOUS VEGETABLE SOUPS	Beef and chicken stock will greatly improve the taste of food. A variety of vegetable soup can be used for the same purpose and used to thicken watery food. On a cold night, there are few things as good as a hot cup of soup and a slice of bread.	1 – 3 Years

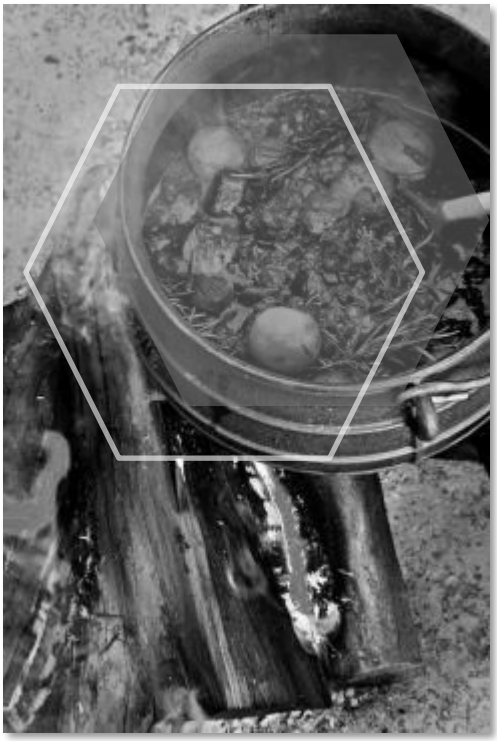
FOOD	CHARACTERISTICS	LIFE SPAN
OIL	Oil is essential for a healthy body. Avocado oil as well as olive oil protects against heart disease by keeping bad cholesterol levels in check. It contains more mono-unsaturated fatty acids than any other natural oil and is easily digested. Sunflower oil is mainly used for cooking because it has a higher boiling point before it begins to smoke.	Longer than 10 years
PROCESSED CEREALS	Have enough cereals such as All Bran, Pro Nutro, Oats, cereals and Rice Krispies or whatever your family enjoys. Oats are the healthiest because they're very low in saturated fat. It is also a good source of fibre, which is especially important during “survival”. To prepare oats, you need 4 cups of water for every cup of oats. A tip for preparing oats is to soak them overnight. This way, instead of taking 30 minutes, it will only take 9-12 minutes to prepare.	1 – 2 Years
OTHER STAPLES (WHEAT, CORN, AND RICE)	Staples are the foods that make up a dominant part of a standard diet. They are filling and will usually have a very long shelf life if stored in a cool, dry place. Apart from that, they are high in carbohydrates and include valuable proteins, minerals, and vitamins. Although brown rice is healthier, white rice has a longer shelf life because the process to make it white removes many impurities. Both rice and corn are rich in vitamins and minerals and they both contain antioxidants that are important to a healthy diet.	More than 10 years
PASTAS	Pasta is famous as the Italians' staple and is known for its versatility. Pasta is cooked in water and preparation takes about 10-12 minutes. Most pasta has a shelf life of more than 10 years since it contains no fat or moisture. It is important, though, to store them in a cool, dry place in airtight containers.	More than 10 years
COOKIES, BISCUITS, CRACKERS, AND RUSKS	The shelf life of these depends on a variety of factors (expiry date, preparation method, and how they are stored). Because of their relatively low cost and high calorie density, cookies are a popular dessert or snack. When stored in an airtight container in a cool, dry place, they will keep for four to six months.	4 – 6 months
RAISINS, DRIED FRUIT AND FRUIT ROLLS	Add more variety to your food by including dried peaches, apricots, apple rings, dates, mangoes, and pears, etc. Keep portions small, since dried fruit has the same number of calories before and after they dry and shrink. The nutritional value of a handful of raisins is equal to a full serving of fresh fruit. Most dried fruits are rich in protein, fibre, iron, and Vitamin C. Dried fruits are also rich in antioxidants which help keep you healthy.	More than 10 years

FOOD	CHARACTERISTICS	LIFE TIME
BEANS AND LEGUMES	A stock of beans can include all kinds of dried beans, roasted beans as well as canned and light beans. Beans provide necessary fibre and energy. A 450g serving of beans contains about 1,250 calories. Legumes such as peas, lentils, peanuts and soybeans provide sufficient protein to supplement your diet.	More than 10 years
NUTS & SEEDS	Nuts are an expensive item but they have great nutritional value as well as a long shelf life. Nuts contain high levels of monounsaturated and polyunsaturated fats to restrain cholesterol. Nuts offer a good alternative for animal products because of the great amounts of protein they contain and are especially popular among vegetarians. Minerals such as magnesium, zinc, plant iron, calcium, copper, selenium, phosphorus and potassium are found in nuts and peanuts. Although peanuts own many of the characteristics of nuts, it is actually a legume like peas or beans. Seeds are usually added in small amounts as a side ingredient. Even in small quantities, they have rich nutritional value and contain protein, healthy fats, fibre, minerals like magnesium, potassium, calcium, iron and zinc plant.	More than 10 years
HONEY	Even if you personally don't use honey, it is wise to keep a few bottles in stock. Honey's shelf life is eternal and in times of crisis will give aged oatmeal, cereal or even tea renewed taste. Since raw honey contains antibodies, it is a good medicine for a sore throat and can even be used to cover wounds.	More than 10 years
IODISED SALT	Throughout history, salt has always been a desired commodity and is a very important part of our diet. Besides it enhancing a food's flavour, salt was also used to preserve food and inhibit the growth of bacteria. Iodised salt is important for preventing thyroid problems and helping regulate the body's fluid balance.	More than 10 years
SUGAR	Although brown sugar is healthier, white sugar will last longer because it contains fewer impurities. It is important to pour sugar in airtight plastic containers to protect it from moisture and ants.	More than 10 years
DRIED SPICES & HERBS	Spices and herbs are usually dried seeds, fruits, roots or leaves that are used primarily for flavour, colour, or preservation of food. Sometimes a spice is also used to hide bad smells. Spices have antimicrobial and medicinal properties. This explains why spices are more commonly used in warmer climates where people are more exposed to infectious diseases. Spices are prominently used in meat, especially for membranes that are more susceptible to decay. Select the basic spices and condiments necessary for your recipes. Avoid spices like curry that cause a strong odour. Although they have great taste, they can attract "human predators."	More than 10 years

FOOD	CHARACTERISTICS	LIFE TIME
CONDIMENTS	Tomato sauce, Tabasco, soy sauce, Worcestershire sauce, mustard and mayonnaise are tasty condiments to add to things. Shelf life varies from product to product. Because condiments' shelf life is quickly shortened after it is opened, it is advisable to buy products in smaller packages.	1 – 3 Years
VITAMINS AND OTHER SUPPLEMENTS	It is important to try to keep your immune system and energy functioning optimally. While a multivitamin supplement is a necessity, additional supplements such as magnesium and calcium are also important to strengthen your frame.	1 – 3 Years
VINEGAR (white, red, balsamic as well as apple cider vinegar)	Vinegar is very versatile medium and can be used for cooking as well as for medical purposes. All you need for a tasty salad dressing or marinade is a little vinegar, a few drops of oil as well as a little salt and pepper. Vinegar can also be used to disinfect wounds. Apple cider vinegar serves as an appetite suppressant and also helps control blood sugar levels and food cravings. This will help to prevent you from overindulging. Apple cider vinegar can be used to detoxify and purify the liver, and that will help improve the blood circulation.	Longer than 10 years

4.1.6 KITCHEN EQUIPMENT

4.1.6.1 POTS AND PANS



Pots and pans are made of different metals, of which stainless steel and cast iron are the most desirable options.

CAST IRON - Pots made of cast iron are less hygienic than stainless steel pots and may need much scrubbing to get it clean. It is preferable to choose the types that have a laminated porcelain layer on the inside which aids in the cleaning of it, especially when it burned. Cast iron is the most suitable metal to use on an open fire or gas flame because it is hardier and retains heat the best. It is important to cover the pot in an oil layer after use to prevent it from rusting.

STAINLESS STEEL - The advantage of stainless steel is that it is very durable and won't easily rust or stain. For these reasons, it is easy to clean and requires less maintenance. Stainless steel pots are commonly available and affordable. When storing/carrying in a backpack, stainless steel pots are a better option than cast iron pots because of the weight.

CLAY OR EARTHEN POTS - Clay pots have been in use for thousands of years, storing food and water for long periods. Clay pots, however, are fragile and that makes it less suitable because it can break easily.

4.1.6.2 UTENSILS

It is advisable to rather use utensils that are made from stainless steel. Wood and plastic utensils is less hygienic than stainless steel. Plastic tools also have the risk of possibly melting if near an open flame or used in a hot pot. Wooden spoons are poor heat carriers and, for this reason, are popular where pots are concerned. Regardless of the material, it should always be washed very well with warm water and soap once it has been used, for obvious health reasons.

Basic Utensils

- Ladle
- Hole spoon
- Wooden spoon
- Teaspoons
- Beater
- Egg lifter
- Two-pronged fork

4.1.7 STORING YOUR FOOD SUPPLY

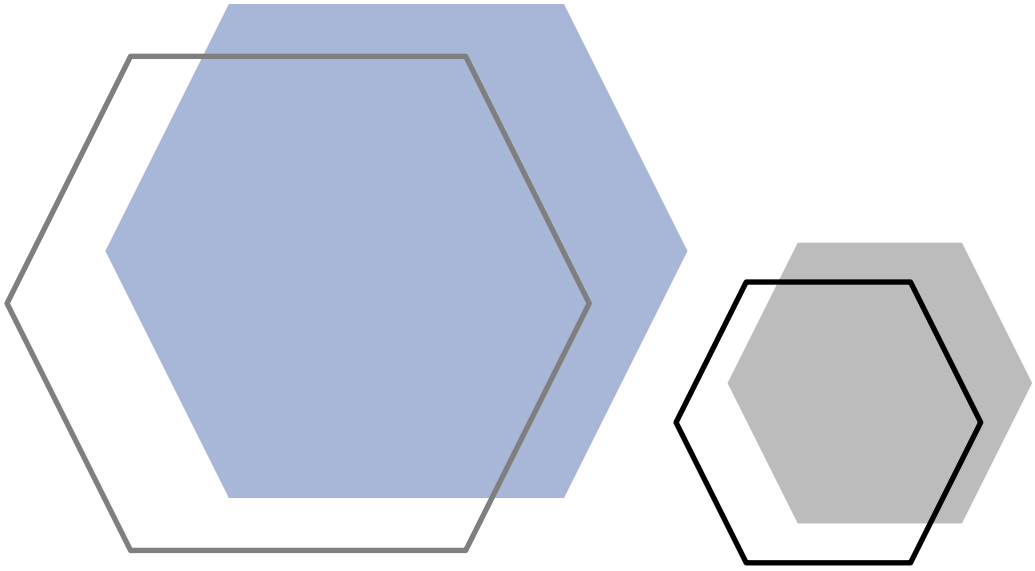
In a food storage location, there are four main causes of food spoilage that can destroy your hard work: (1) humidity, (2) air, (3) light and (4) temperature.

1) **HUMIDITY**- This is one of your biggest threats to your food storage. Humidity (or moisture) is bad for grain--mainly maize and wheat. Moisture causes cans to rust and is the main reason why you should not store food in your garage.

2) **AIR (OXYGEN)** - Bacteria need oxygen to survive in your storage of food. So, it's important to pack vacuum as much food as possible or to seal them in air-tight containers to try to keep oxygen out. Plastic is usually a deterrent for pests, but rats have strong teeth and have been known to chew through plastic. Since rats are more likely to go into your garage than into your home, store the plastic food containers preferably within enclosed room.

3) **LIGHT** – It will have a negative impact on the food and cause a deterioration of the nutritional value of food. This is the reason beer bottles are brown and wine bottles are green. It is therefore important to take your vacuum-packed stock and place them in dark plastic containers. The blue drums (see picture) can be easily found and is perfect for this purpose since they can easily be stacked on each other.

4) **TEMPERATURE** – The temperature is another factor that can affect the life of food. Heat causes the nutritional value and texture of food to deteriorate. A cool, moderate room temperature is the most ideal. In a non-insulated garage or attic, the temperature can drastically vary which thereby reduces the food's life and therefore is not appropriate for storage.



4.1.8 STORAGE OF ADDITIONAL STOCK

Regardless of the state of emergency in which you find yourself, it is always a good idea to store additional stock in an alternate location. There should always be additional inventory in an attic, basement, or even somewhere buried, to be retrieved at a later stage.

4.1.8.1 STORAGE IN A BASEMENT OR ATTIC

It is possible that your home might be broken into. So, it's possible that your stock may be stolen or damaged by vandalists or looters. It is recommended, therefore, that additional stock be hidden somewhere like an attic, basement or in a locked room. Factors such as bright light, air, heat, and humidity can affect the life span of your stock and it is important to take into account when deciding on a room.

You can hide the entrance by placing a cabinet, panel or even a painting in front of the opening. It is important to keep this space closed at all times and put the key away in a safe place. Just make sure your family also knows where the entrance is and where to find the key.

4.1.8.2 UNDERGROUND STORAGE

It has happened in the past that people had to hastily leave their homes because of a flood or fire. Because natural disasters can easily catch you by surprise, the chances are that you will leave your home without any photographs, documents and means of communication as well as the necessary emergency supplies.

Saving additional rations with family or friends is not always a good idea. If they do not have the same mind-set for making preparations, the chances are great that they will use your stock when they find themselves in an emergency situation and have not personally prepared for it.

4.1.8.2.1 MAKING APPROPRIATE CONTAINERS

Storing food and water underground, in watertight containers, has been done for centuries. Of all the different options that you can choose from, a plastic (PVC) sewage or irrigation pipe is the most appropriate. These blue pipes come in different sizes or thicknesses and are sealed on either side with a custom cover (end cap). These already-made containers are waterproof, airtight, and lightweight, making it an effective option for storing food, water, and electronics underground separate from each other.

These pipes can be expensive and usually come in six-meter lengths. The already-made one has a diameter of 168mm and a length of 1.5 meters. The length makes the containers more mobile and portable.

4.1.8.2.2 BURIAL OF CONTAINERS

- The minimum depth advised is one metre to ensure that it does not break if/when a heavy vehicle drives over it.
- Containers should preferably be buried without anyone seeing you. It is important that you bury the containers near a landmark so you can dig it up without hassle later. Remember to have your family informed of where you buried it.
- If tools such as a drill or hammer are not available to cut open the container, a sharp stone can be useful for this purpose.

4.1.9 IMPORTANT THINGS TO REMEMBER

4.1.9.1 PROVISION FOR PETS

For those who have pets, it is important not to forget about them during your planning phase. Remember to include such things as these:

- Adequate food for at least a month
- Extra water for your pets
- Necessary medication if needed

4.1.9.2 SPECIAL NEEDS

Some family members as babies, people with health problems and the elderly may have additional needs and therefore must be kept in mind during emergency situations.

- Provision for babies as additional milk formula, disposable nappies, disposable wipes, Vaseline, Panadol, syrup to name only a few.
- Protein and calcium supplement as well as well as the necessary calorie drinks
- Chronic medication
- An extra pair of glasses

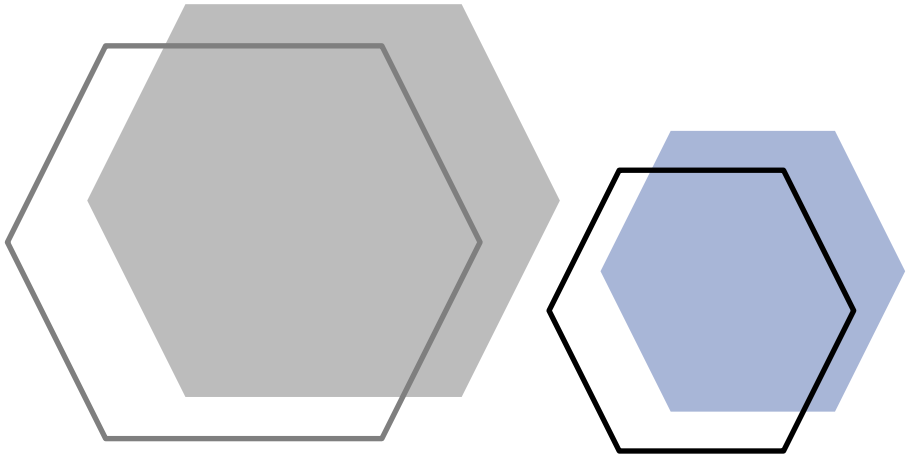
4.1.10 SUMMARY

1. Calculate the amount of food your family will need for types of emergencies that you're planning for.
2. Find a safe, dry area in the house to save your long-life food supplies. Those who lack of storage space should use creative methods to make enough space, such as extra shelf units up in their cupboards/closets in their extra bedrooms.
3. Try as much as possible to pack food content in zip-lock bags or vacuum-sealed packages before placing them in dark containers so they'll store for a longer period. Make sure that food lids are sealed correctly.

SHOPPING LIST

- Adequate food supply
- Dark plastic containers
- Vacuum sealing equipment
- Jiffy zip-lock bags
- Permanent marker
- Labels
- PVC pipe, caps and glue

4. The chances are that your bins will look the same. Mark each box clearly with a label and permanent marker and write the expiration dates on each crate.
5. If possible, rotate food products on a regular basis to prevent them reaching their expiry dates.
6. Those who have family members with special dietary needs, do further research on what type of food they may require.
7. Do not forget about your pets. Make sure you have sufficient provisions for them. Pets' food can also be stored in plastic containers to ensure it lasts as long as possible.



4.2 WATER

CAPE TOWN WATER CRISIS

Wikipedia, the free encyclopaedia

"The Cape Town water crisis in South Africa was a period of severe water shortage in the Western Cape region, most notably affecting the City of Cape Town. While dam water levels have been declining since 2015, the Cape Town water crisis peaked during mid-2017 to mid-2018 where water levels hovered between 15 to 30 per cent of total dam capacity. In late-2017, there were first mentions of plans for "Day Zero", a shorthand reference for the day when the water level of the major dams supplying the city fell below 13.5 per cent. "Day Zero" would herald the start of Level 7 water restrictions, where municipal water supplies would largely be switched off and residents would have to queue for their daily ration of water, making the City of Cape Town the first major city in the world to potentially run out of water.

The City of Cape Town implemented significant water restrictions in a bid to curb water usage, and succeeded in reducing its daily water usage by more than half to around 500 million Liters (130,000,000 US gal) per day in March 2018. The fall in water usage, combined with strong rains in June 2018, led dam levels to steadily increase, and for the city to continually postpone its estimate for "Day Zero". In September 2018, with dam levels close to 70 per cent, the city began easing water restrictions, indicating that the worst of the water crisis is over. "...And residents of Cape Town were limited to 50 litres of water per person per day, the public health professions expressed concern of communicable diseases spreading quickly by faecal-oral contamination due to a reduction in necessary handwashing. Health officials warn that water-borne diseases such as cholera, hepatitis A, and typhoid would probably become more common as people start storing their water in contaminated containers.

Inadequate sanitation is a major cause of disease, e.g. diarrhoea, which kills 2.2 million each year, with most deaths being among children younger than 5 years. With a population around 3.81 million and a population density of about 1,530 per square kilometre, diseases like cholera and others will rapidly spread without proper sanitation, especially in the poor neighbourhoods of Cape Town. Insects multiple in dirty water and then act as vectors for spreading community diseases."

The human body is about 60% water, and water is vital for people, animals, and plants to survive. The amount of water that the human body requires can vary according to age and gender. In general, an adult male requires about 3 litres per day, while an adult woman needs about 2.2 litres daily.

4.2.1 STORE ENOUGH WATER

The general rule is that you need about 5 litres of water per person per day. One half you drink, while the other half is used for hygiene. The amount of water required also depends on the circumstances in which you find yourself. If you find yourself in a warm climate, or someone is pregnant or nursing in your group, you will need to make provision for more water.

So, we assume that storage of 5 litres per day is acceptable measure. The big question is, how many days do you have to make provision for? The United Nations Health Department recommends that you should at least make provision for three days. Three days is only a starting point for we already know that the after effect of disasters may take even longer than that. After many hours of reading regarding the subject, the general consensus seems to be that you have to make provision for water for at least two weeks. This means that a single person must have 15 litres of available, so a family of four that means you will need 60 litres of water.

Whether you store more than the average two weeks – the minimum also depends on available storage space. Due to limited storage space, two weeks of stock for the ordinary man in the street may be sufficient.

4.2.2 STORAGE OF WATER

To store water for the long run, you must have sufficient sterile containers. The common practice is to use food-grade plastic bottles or glass bottles. Stainless steel is another option, but unfortunately, you will not be able to treat your stored water with chlorine as the chlorine will corrode stainless steel. In that case, just make sure you tightly seal your water to prevent any bacteria or impurities from contaminating your drinking water.

SAFETY TIP

Don't store water in containers previously used for milk or juice. Even if you try to clean these plastic containers thoroughly, sugars and proteins always stay behind and that's a perfect space for bacteria to grow.

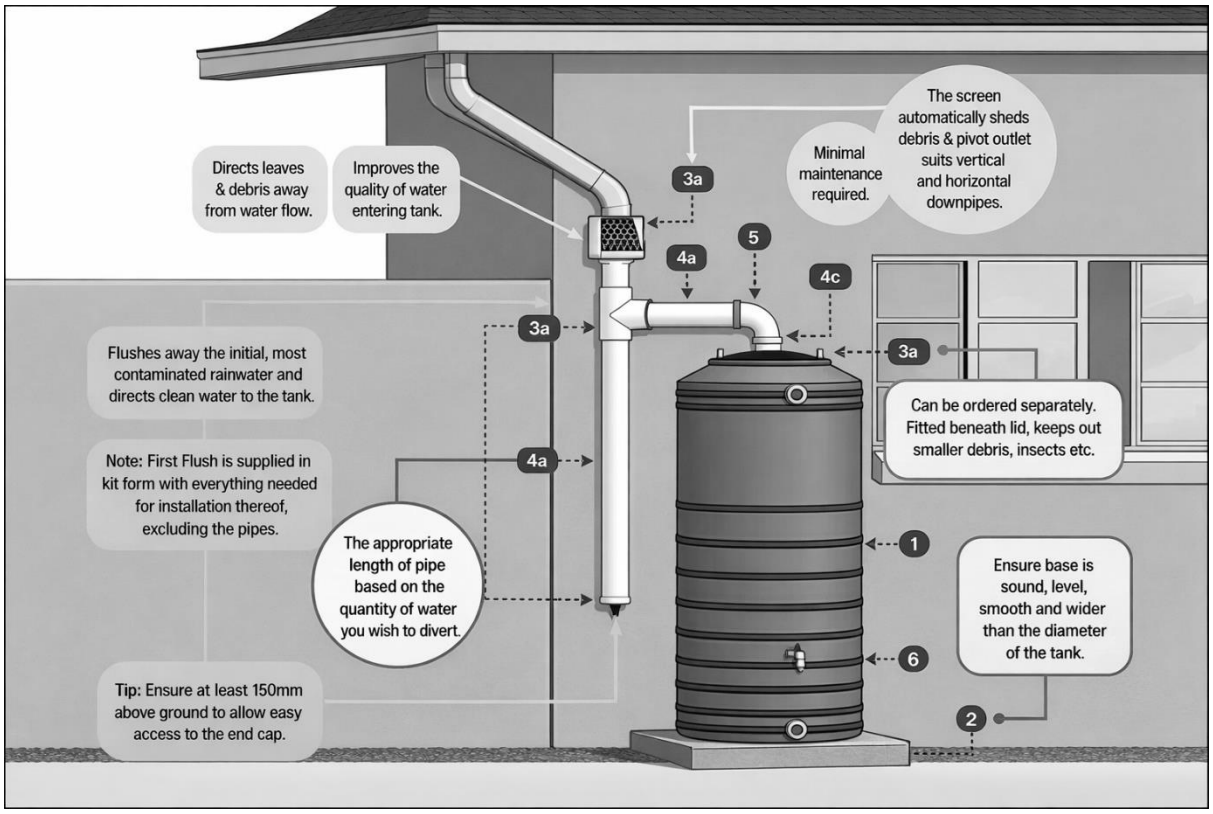
4.2.2.1 BOTTLED WATER AND CONTAINERS

PURCHASED WATER BOTTLES - The easiest (but slightly more expensive) way to reach your water storage quota is to simply buy prepacked bottled water. It's clean, well-sealed, and is available in sterile, plastic bottles. In addition, its bottled water is light and easy to handle when circumstances force you to evacuate. Purchased water is also a good option and takes up limited space as they can even be stored under your bed.

EMPTY SODA AND WATER BOTTLES - If you are a bit stingier, you can fill empty soda or water bottles at your tap with water. Be sure your bottles are cleaned thoroughly and is sterilized with boiling water before you fill them with water. Water containers should preferably not be transparent containers so as to avoid algae growth in the water. Where you have limited space, you can stack the kegs together on their sides. Just make sure the containers are properly closed to prevent leaks.

4.2.2.2 WATER TANKS

Expense and space are the two main factors when it comes to storing water over a long period of time. Large water tanks are expensive, but in the long run, you cannot put a price on something your life depends on. 'Slim line' tanks are usually more expensive than regular tanks but it's a good idea to buy one if you have limited space. Most tank manufacturers offer a variety of solutions for a variety of applications, including domestic, agricultural, and industrial. Municipalities often rely on electric pumps to pump water into reservoirs or storage tanks, from where it is distributed to household taps. If the City is not able to refill their storage tanks from the reservoirs, taps can run dry in less than two days. It is therefore important to store enough fresh water to carry your family through a crisis period.



4.2.2.3 THE COLLECTION OF RAINWATER

The collection of fresh rainwater is dependent on you having a collection tank. It requires the installation of a pre-filtration solution as well as appropriate gutters and pipes to carry rainwater to the tank. This way you are not dependent on regulated water sources.

It is extremely important to keep the water tank clean from leaves and other impurities that may come from your roof. There are three pre-filtering options that improve the quality of the water in your tank:

- A Tank Screen (mesh) that replaces the tank's current cover.
- A Leaf Eater
- A First Flush Diverter

4.2.2.4 MAINTENANCE OF YOUR WATER TANK

Although rainwater systems are relatively maintenance-free, there are certain things you must do regularly to extend your rainwater system's life, to reduce possible damage, and to ensure that you receive the maximum benefits.

1) **CLEAN ROOFS** - Roofs must be cleaned regularly to avoid the water collecting dirt. Dust, leaves, animal excrement, and dead insects accumulate on the roof during dry weather. It is therefore important to ensure that the roof is cleaned at the start of the rainy season, followed by a monthly check-up to keep it clean.
2) **REMOVE OVERHANGING BRANCHES** - Make sure that branches hanging over the roof are cut regularly.
3) Clean your gutters - Make sure the gutters are free of leaves. It's a good idea to install a sieve into the tank entrance.
4) **REGULATE YOUR PRE-FILTRATION OR LEAF CATCHER** – Regularly inspect the pre-filtering devices to ensure that they are free of leaves and allowing the rainwater to flow through.
5) **CHECK YOUR FLUSH DIVERTER** - If a flush diverter is installed, you should check and clean it monthly.
6) **KEEP YOUR TANK CLEAN**- Inspect the inside of your tank every 3 months to ensure that leaves haven't piled up at the bottom of the tank. A well-designed rain water system should not let leaves and other material end up in the tank.
7) **CHECK THE WATER QUALITY** - Remember that water that is collected from your roof will not always be clean. If you want to use rainwater for drinking purposes, consult an installer who has experience in installing water filtration systems. For irrigation, however, this water is ideal...

4.2.3 WATER TREATMENT

Water treatment is any process that improves the quality of water to make it more acceptable for a specific end use, for example to drink it, with flushing toilets, washing dishes and wash clothes including the safe return of water to the environment. The treatment of water to remove contamination or reduce their concentration so that the water is suitable for extended uses.

4.2.3.1 BLEACH (JIK)

Bleach has a strong odour and contains chlorine that kills harmful bacteria. Avoid scented bleach and bleach which contains dyes and other additives. Water with any impurities should preferably be filtered before bleach is added.

- **STEP 1:** Buy a bottle 'Jik' Jewel or any kind of bleach at your local store.
- **STEP 2:** Add a teaspoon of bleach to every 20 litres of water.
- **STEP 3:** Leave overnight, or for a minimum of 2 hours.
- **STEP 4:** Keep the water covered with a cloth or lid to keep insects and dirt keep out.

WARNING

CHLORINE AND BLEACHING AGENTS

Concentrated chlorine and bleach are highly toxic. Poisoning can occur when they are handled without proper protection, swallowed, or inhaled.

- If chlorine gas is inhaled, immediately leave the room and move outside where there is clean air.
- If chlorine has landed on your skin or clothing, immediately remove your clothes and wash your entire body with soap and water.
- For burning eyes or blurred vision, immediately remove any contact lenses and rinse your eyes thoroughly with clean water.
- If you possibly swallow chlorine or bleaching agent by accident, avoid any liquids and try to vomit it out.

After following these steps, you should immediately seek medical advice before taking any further action.

4.2.3.2 IODENE

This refers to general household iodine (or "tincture of iodine"). You may have iodine in your medicine cupboard or first aid kit. Add five drops of 2% tincture of iodine in each quarter of litre of water you disinfectant. If the water is cloudy or coloured, add 10 drops of iodine. Stir and allow the water to settle for at least 30 minutes before use.

4.2.3.3 CHLORINE

If you're not too keen on the idea of using bleach, then you can use chlorine solution instead. When chlorine is handled, it is advisable to wear rubber gloves and to work in well-ventilated room with a mask.

Add a heaped teaspoon of swimming pool chlorine (HTH) to two litres of water and stir until dissolved. The mixture will produce a chlorine solution of about 500 milligrams per litre of water. To disinfect water, add one part of this chlorine solution to 100 parts water. If the chlorine taste is too strong, pour the treated water back and forth from one container to another to lessen the strong smell and for some of the chlorine to evaporate. Let it stand for a few more hours before you use it.

4.2.3.4 WATER PURIFICATION TABLETS

You can disinfect water in smaller quantities with tablets containing chlorine, iodine, chlorine dioxide or other disinfectants. These tablets are available at most pharmacies and outdoor stores and can also be ordered online. Please follow the instructions on the product label as the dose of tablets may differ from variant to variant.

4.2.4 WATER FILTRATION SYSTEMS

There was a time when we were all drinking water directly from the tap. But because of harmful bacteria, high levels of chlorine, and a bad taste and smell, many people began to use only bottled water. It is expensive and once you realize that bottling companies have fewer regulations than those regulating tap water, you will certainly start looking at alternative solutions. The most cost-effective option is to buy a water filter.

4.2.4.1.1 FILTERATION JUGS

Most water-filter jugs are simple containers with built-in filters (which have to be replaced, depending on the frequency of use). Some of the jugs purify water by running it through activated charcoal while others rely on higher technology.

4.2.4.1.2 REVERSE OSMOSES FILTERS

To treat a larger volume of drinking water, the ideal solution is installing a reverse osmosis system. This is the best filtration system on the market to hook up to your municipal or rainwater system. A reverse osmosis system removes all the chemicals and trace elements from the water in order to improve the taste and smell. In the final stage of the osmosis process, the necessary minerals are put back in the water. Then you will get clean drinking water with all the necessary minerals, but without the presence of harmful substances.

4.2.5 GREY WATER

Water that has already been used in your household becomes what is called grey or black water. Grey water gets its name from its cloudy appearance. Many households divert grey water from showers, washing machines, and sinks into an underground storage tank and it's pumped out into your garden. Your vegetables and your lawn will love grey water - it even contains nutrients for the plants. When reusing dishwater, though, you must be careful because it contains a lot of grease which will accumulate and over time makes it harder for soil to absorb water.

SAFETY TIP

Grey water is never safe to drink. Contact with grey water should be avoided because it contains bacteria that may affect your health.

Limit the use of soap and detergents that have high phosphate content. Although plants need phosphates to grow, in the long run too much of it is not good for them. Most modern "green" washing powders and biodegradable soaps won't harm your garden. Keep bleach and biodegradable soaps won't harm your garden. Keep bleach and other harmful detergents out of your grey water as much as possible.

Grey water in a tank is anaerobic – i.e. it has a shortage of oxygen - and will begin to smell bad after a day. To avoid this, it should be used immediately (as with a basic grey water system), or you can add oxygen with an air pump (as with the advanced system). Another option is to add bacteria to your grey water that will neutralise the smell (for both systems). These bacteria are on sale at Maskam Water and other water purifying companies. Just pour it in with the water that runs into your grey water tank.

4.2.5.1 OTHER METHODS FOR COLLECTING GREY WATER

- Collect your shower water in a plastic basin; afterwards you can use that water to flush the toilet or water your garden. The same rule applies to bath water.
- Use a plastic basin in the sink when you wash the dishes. Cleaner dishwater, which does not contain much grease, can definitely be used in the garden.
- Cut the pipe connection from your bath and sink before it reaches the sewer system. Connect a pipe of at least 40 mm onto this and run it straight into the garden.
- A filter will prevent clogging in your irrigation system and sprinklers. Make sure it is cleaned regularly.

4.2.6 SUMMARY

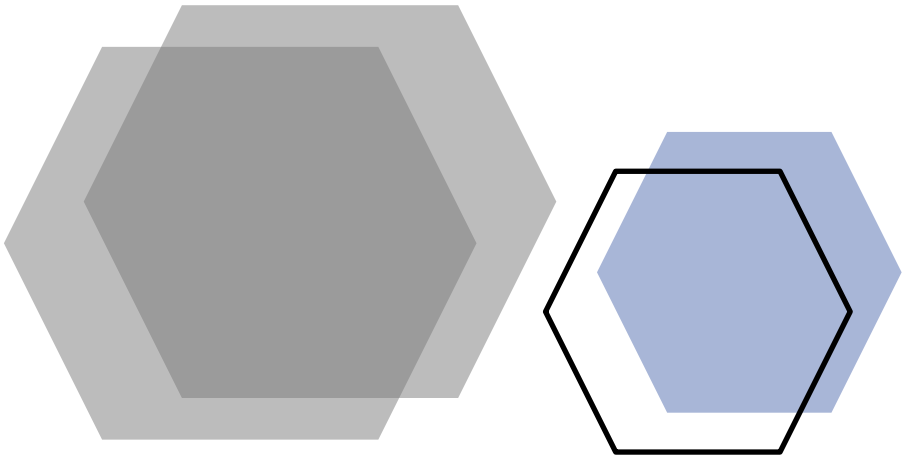
1. Determine how much fresh water you and your family will need. Besides drinking water, take into account what will be used to cook, to wash the dishes, and to flush the toilets.
2. Research the different filtration systems to determine what type is most suitable for you and your family.
3. Obtain more information on natural ways to filter water. YouTube has a lot of information on how to filter water for survival situations.
4. To avoid poisoning by chlorine and bleach, make sure you understand the ratio of chlorine/bleach to water.
5. Make sure you have enough medicine in stock to treat diarrhoea caused by contaminated water.

SHOPPING LIST

- 5 liters of water per person per day
- Opaque (blocks light completely) water containers or water tanks
- Filtration system that you can afford
- Water purification tablets (available at Cape Union Mart)
- Bleach
- Chlorine granules (available at most supermarkets or pool stores)
-

MEDICATION FOR CONTAMINATED WATER

- Anti-diarrhoea medicine
- Electrolyte and rehydration powders
- Vitamins to accelerate the recovery process.



4.3 VEGETABLE GARDENS

GETTING BY AFTER FOUR YEARS OF WAR IN UKRAINE

NRC|Published 16. Apr 2018

Anastasia Ursova lives in a small village with her husband Mikhail and their two young sons. But it was not always like that. One night in 2014, they took the last train to escape from heavy artillery attacks. Anastasia now 28, comes from Alchevsk, 50 kilometres outside of the Ukrainian city, Luhansk. The town has been controlled by Russian separatists for four years.

The war in Ukraine has lasted four years. Anastasia and her family are four out of 4.4 million men, women and children who are paying the price for it. Almost 40 per cent of the people living along the 'contact line' are affected by shelling every day, one of the most mine-contaminated stretches of land in the world. Last year, more than 230 people were either killed or injured by mines. Those and other dangers force civilians to flee from their homes.

Many Ukrainians grow vegetables in their gardens, but due to Ukraine's harsh winter conditions, the harvest is never enough to get by. Food insecurity has doubled since 2016, leaving 1.2 million people without enough to eat due to lack of funding. Ukraine is one of the world´s most underfunded emergencies, with only 35 per cent of the humanitarian appeal covered in 2017.

"We can't rely on humanitarian aid. For the four years of war, it's been four times only that we received assistance from international organisations: food packages and hygiene items. Sometimes we were refused, because we don't have certificates of internally displaced. It was in November when we received the food aid for the last time. And we were told there'll be no more."

Depending on how long a disaster lasts, the reality is that you usually only accumulated food for a limited time. So, one has to look at alternative methods such as planting your own vegetable garden in order to be self-sufficient.

It is a very satisfying to grow your own food. Small-scale farming can vary from one person to another, depending on the space you have available. A vegetable garden in your backyard, greenhouse, and patio or even on your apartment's windowsill can be a very rewarding activity.

In South Africa, the cultivation of herbs has become a fashionable activity. You can create a vegetable garden that meets the needs of a family of four in a space as large as your garage door. Climate does play a role. In

colder areas, fast-growing vegetables will perform better and usually have a quicker yield. In a warmer climate you can grow veggies in a container without too much worry and effort throughout the year.

4.3.1 PLANTING OF FRESH VEGETABLES

Some vegetable seeds can be sown directly in prepared vegetable beds, but others must first be sown in boxes or in a separate seedbed and made strong before they can go to the vegetable garden. The latter is usually also the kind that you can buy in ready-to-grow seedlings in nursery trays. Vegetables that you can sow directly are beans, beets, carrots, celery, peas, potato nuts (in winter rainfall regions), radishes and turnips.

4.3.1.1 PLANTING TIPS

- **SUMMER RAINFALL AREAS**: Plant summer crops in spring when the frost is over. Winter vegetables should be planted after the worst heat of summer and early autumn.
- **WINTER RAINFALL AREAS:** Because the growing season is so short, you should start as early as possible.
- **LARGE SEEDS:** Sow them about 30 cm apart, 1-3 cm deep (depending on the size of the seed).
- **FINE SEEDS:** Carrots, beet and turnips should generally be sown in foreheads of about 15 cm apart and 1 cm deep. Lightly water the seeds twice a day to keep the soil moist until they germinate. The plants will emerge dense at first and you should thin it out so that the final distance between two plants is about 5 cm for roots, 7 cm for beet and 5 cm for turnips.
- **DON'T SOW TOO MANY SEEDS AT A TIME** - It's much better to sow seeds with an interval of three to four weeks. This way the harvesting season will last longer and you won't be stuck with too many vegetables all ready to harvest at the same time.

4.3.2 VEGETABLE PLANTING GUIDE

On the consecutive page you will find a generic table shows the seasons for vegetables in the southern hemisphere. Note that seasons may vary between inland and coastal areas so you might have to adjust it a month or two accordingly. The table indicates whether crops grow in sun or shade as well as the time required for seedlings to reach full maturity.

Planting Guide																
South Africa - summer rainfall climate zones																
Plants	**Space plants**	**Harvest in**	**Exposure**		**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Amaranth	50cm apart	7 - 8 weeks	○										P	P		
Asparagus	20 - 40cm apart	2 - 3 years	○		Tr							P	P	P	P	P
Asparagus pea	20 - 25cm apart	8 - 11 weeks	○										P	P	P	P
Basil	20 - 25cm apart	10 - 12 weeks	○	◐	P	P	P	P					P	P	P	P
Beans - climbing	10 - 20cm apart	9 - 11 weeks	○	◐								P	P	P	P	P
Beans - dwarf	5 - 15cm apart	7 - 10 weeks	○	◐	P							P	P	P	P	P
Beetroot	20 - 23 cm apart	7 - 10 weeks	○	◐	P	P	P	P				P	P	P	P	P
Broccoli	35 - 50cm apart	10 - 16 weeks	○	◐	P										P	P
Brussel sprouts	45 - 60cm apart	14 - 28 weeks	◐	●	P	P	Tr									
Cabbage	50 - 75cm apart	11 - 15 weeks	○		P	P	P	Tr			P	P	P	P	P	P
Cape Gooseberry	50cm apart	14 - 16 weeks	○									ST	Tr	Tr		
Capsicum	100 - 150cm apart	10 - 12 weeks	○									P	P	P	Tr	
Carrot	25 - 30cm apart	12 - 18 weeks	○	◐	P	P	P	P				P	P	P	P	P
Cauliflower	60 - 100cm apart	15 - 22 weeks	○	◐	P	P	P								P	P
Celery	15 - 30cm apart	17 - 18 weeks	○			ST	Tr	Tr				ST	Tr	Tr	Tr	Tr
Chilli pepper	40 - 50cm apart	9 - 11 weeks	○									ST	Tr	Tr	Tr	
Chives	5cm apart	7 - 11 weeks	○		Tr	Tr	Tr	Tr	Tr			Tr	Tr	Tr	Tr	Tr
Coriander	Thin to 45cm	30 - 45 days	○		P	P							P	P	P	P
Cucumber	40 - 60cm apart	8 - 10 weeks	○										P	P	P	P
Dill	15cm apart	8 - 12 weeks	○	◐	Tr	Tr	Tr	Tr	Tr				ST	Tr	Tr	Tr
Eggplant	60 - 75cm apart	12 - 15 weeks	○									P	P	P	Tr	
Fennel	Thin to 30cm	14 - 15 weeks	○										P	P	P	
French tarragon	40 - 60cm apart	30 - 40 days	○	◐	Tr	Tr	Tr	Tr	Tr				ST	Tr	Tr	Tr
Garlic	10 - 12cm apart	17 - 25 weeks	○	◐		P	P	P								
Ginger	15cm apart	Approx. 25 weeks	○										P	P	P	
Globe artichokes	160 - 200cm apart	42 - 57 weeks	○		ST		Tr	Tr	Tr							
Leeks	10 - 15cm apart	15 - 18 weeks	○		P				Tr							
Lemon balm	25cm apart	8 - 10 weeks	○	◐								ST	Tr	Tr	Tr	Tr
Lettuce	20 - 30cm apart	8 - 12 weeks	○	◐	P			Tr				P		Tr	Tr	
Marrow	90 - 120cm apart	12 - 17 weeks	○										P	P	P	
Mint	30cm apart	8 - 12 weeks	◐	●	P	P	P	P	P	P	P				P	P
Spinach	45 - 60cm apart	8 - 10 weeks	○									P	P	P	P	Tr
Onion (red, white, brown)	5 - 10cm apart	25 - 34 weeks	○	◐		P	P	Tr								
Oregano	15cm apart	6 - 8 weeks	○	◐	Tr	Tr	Tr	Tr	Tr	Tr			ST	Tr	Tr	Tr
Parsley	20 - 30cm apart	9 - 19 weeks	○	◐	P	P	P	P	P	Tr			P	P	P	P
Parsnip	8 - 10cm apart	17 - 20 weeks			P	P	P	P			P	P	P			
Peas	5 - 8cm apart	9 - 11 weeks	○	◐			P			P	P	P	P			
Potato	30 - 40cm apart	15 - 20 weeks	○	◐	P	P				P	P	P	P	P		
Pumpkin	90 - 120cm apart	15 - 20 weeks	○										P	P	P	
Radish	3 - 5cm apart	5 - 7 weeks	○	◐	P	P	P	P				P	P	P	P	
Rhubarb	90cm apart	Approx. 1 year	◐									P	P			
Rosemary	100 - 150cm apart	Approx. 1 year	○		Tr	Tr							P	P	P	Tr
Sage	50cm apart	Approx. 18 mths	○		Tr	Tr						P	P	Tr	Tr	Tr
Shallot	15 - 20cm apart	12 - 15 weeks				Tr	Tr	Tr	Tr	Tr	Tr	Tr	Tr			
Silverbeet/swiss chard	15 - 30cm apart	7 - 12 weeks	○			P		Tr				P			Tr	
Snow/sugar peas	8 - 10cm apart	12 - 14 weeks	○				P			P	P	P	P			
Spinach	20 - 30cm apart	5 - 11 weeks	○	◐	P	P	P	P				P	P	P	P	P
Spring onions	Close together	8 - 12 weeks	○			P	P	P								
Squash	60 - 80cm apart	7 - 8 weeks	○										P	P	P	
Strawberry plants	30 - 100cm apart	11 weeks	○	◐								P	P	P	P	
Sunflower	20 - 30cm apart	10 - 11 weeks	○		P	P	Tr						P	P	P	P
Sweet corn	20 - 30cm apart	11 - 14 weeks	○										P	P	P	
Sweet marjoram	20cm apart	8 - 10 weeks	○	◐	Tr	Tr	Tr	Tr	Tr	Tr			ST	Tr	Tr	Tr
Sweet potato	40 - 60cm apart	15 - 17 weeks	○											P	P	P
Thyme	25 - 30cm apart	42 - 52 weeks	○				Tr	Tr	Tr				ST	Tr	Tr	Tr
Tomato	40 - 60cm apart	8 - 17 weeks	○		Tr	Tr	Tr					ST	Tr	Tr	Tr	Tr
Turnip	12 - 20cm apart	6 - 9 weeks	○	◐	P	P	P	P				P	P			
Watermelon	60 - 75cm apart	12 - 17 weeks	○										P	P	P	
Zucchini	50 - 90cm apart	6 - 9 weeks	○										P	P	P	

ST	Start undercover in seed trays, plant out in 4 - 6 weeks
Tr	Transplant seedlings
P	Plant in garden

4.3.3 DIFFERENT METHODS TO CULTIVATE VEGETABLES

4.3.3.1 CONVENTIONAL GARDEN

There are few things as enjoyable as harvesting your own vegetables directly from your garden. All you need is a small space in your backyard, a little patience and a bit of love.

4.3.3.1.1 SOIL

It is important to fertilize your soil in the winter months so you have the best and healthiest ground when it's time to plant. You could buy a test kit to test your soil. A good way to make you own compost is to use old leaves, vegetable peelings and grass cuttings and gather then on a compost heap. A compost container can be purchased to make your food waste ferment and later on you can throw the fermented food straight onto your land or on the compost heap.

4.3.3.1.2 HEIRLOOM SEEDS

Heirloom seeds are a necessity. The harvesting of your own heirloom seeds gives you the opportunity to gather and keep seed for the next season. This is the basis of food security. Store your unused seeds in a labelled, tightly closed glass bottle and keep in a cool, dark place.

4.3.3.1.3 PLANT ON A ROTATIONAL BASIS

Different plants have different requirement and it does affect the balance in the soil. Some plants such as brassicas (such as cabbage, cauliflower and radish) are heavy feeders that rapidly break down raw material, nitrogen and phosphorus. If you plant these in the same place year after year, the soil will lose nitrogen and phosphorus more quickly than other parts of your garden. By moving heavy feeders around you will be able to renew the soil where it grew last year and this will help to balance your soil. Planting on a rotational basis also helps keep your plants healthy and free of insects and other soil diseases.

4.3.3.1.4 DISADVANTAGES

Planting vegetables the traditional way does have its drawbacks. Traditional vegetable cultivation is more labour intensive because the ground constantly needs to be worked to combat weeds and the control thereof remains a never-ending task. Conventional gardening requires much more water than other cultivation methods and plants are more susceptible to insects and root diseases.

4.3.3.2 PERMACULTURE

Permaculture focuses on the sustainable use of land and food production in harmony with nature. Permaculture methods are based on three principles: (1) Reduce input, (2) reuse and (3) recover where possible. The idea is to plan your garden to be easily accessible, requires minimum labour and grows food without the use of any chemicals. Permaculture is designed to recycle and uses primarily natural compost and earthworms to ensure the necessary fertilizers.

It is important that you take into consideration the necessary environmental factors like sunny areas, the shelter and the direction of the prevailing wind, to determine what is most suitable for the particular weather conditions.

4.3.3.3 RAISED BEDS

Raised beds is a form of gardening in which fertile soil is placed in a framework. Frames are usually built from wood, rock or concrete blocks and the soil is usually enriched with compost. Compared to conventional methods, vegetables in raised beds can be planted much closer in rows. The spacing is such that when the vegetables are mature, their leaves just touch each other, creating a microclimate in which the growth of weeds are suppressed, thus preserving moisture.

Since the gardener is not stepping or walking on the raised beds, the soil is not compacted and plant roots can establish themselves very easily. The close plant spacing and the use of compost usually leads to higher production compared to conventional farming methods.

4.3.3.4 CONTAINER GARDENING

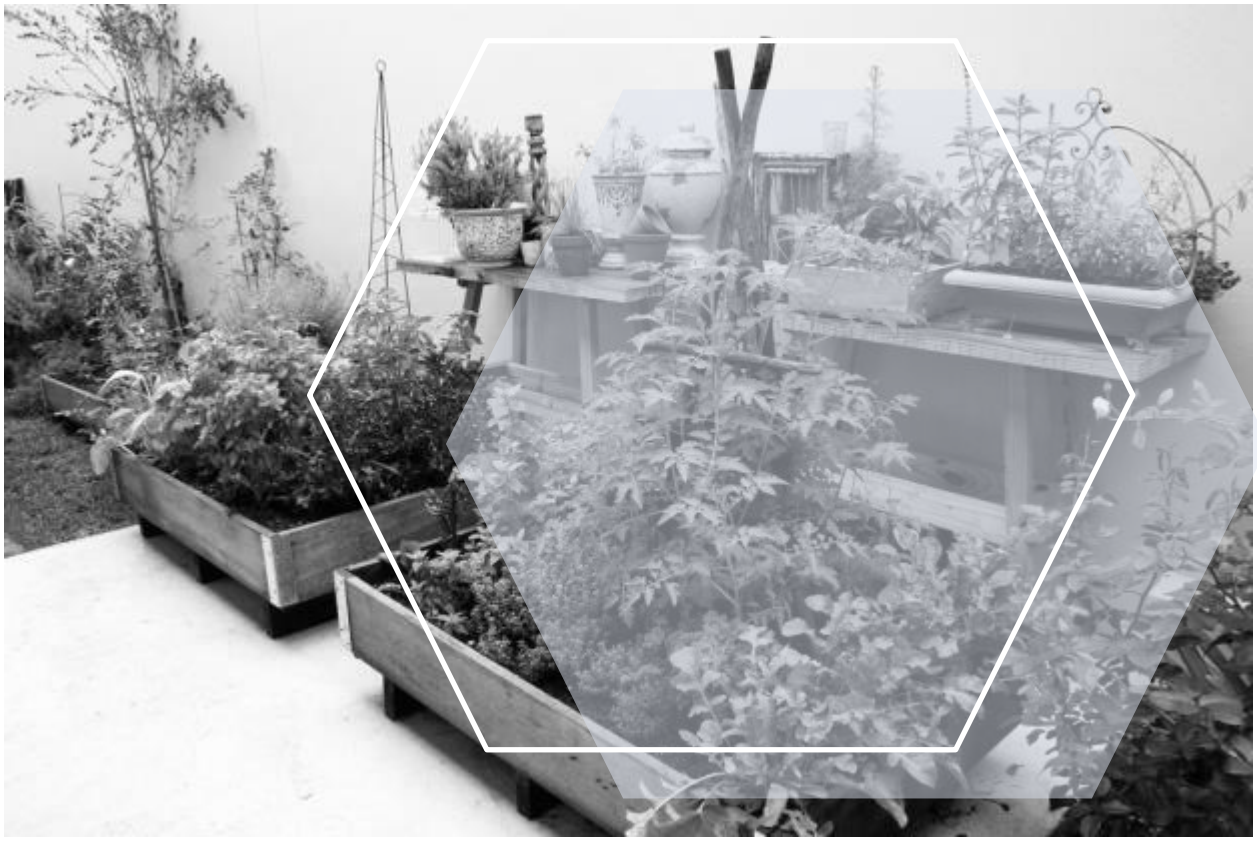
Due to the fact that most city dwellers have limited space to grow vegetables, the use of containers such as pots and trays is a popular option. It is also easier and more affordable than traditional gardening and offers the best option to utilise even the smallest space.

4.3.3.4.1 CONTAINERS

Almost any container can be converted for the purpose of planting vegetables. Some people become creative and use wooden crates, plastic wash baskets and cold drink bottles to plant herbs. Depending on the size, these containers can be placed in whatever space can be made available. This gives the advantage of being placed in or out of the sunlight or can be moved out of the wind. Vegetables need usually deeper pots (minimum 20cm deep) to ensure that sufficient vegetables growth.

4.3.3.4.2 SOIL

When it comes to the choice of soil for your containers, creating it in your backyard is not always the best thing to do. Raw garden soil can sometimes be too poor and its texture may be undesirable for the cultivation of vegetables. It could also contain unwanted impurities and pests that might hamper the growth of your plants. It is better to go to a nursery and buy the right potting mix.



4.3.3.4.3 WATER

Holes at the bottom of containers are crucial to ensure that sufficient drainage takes place. Vegetables in containers use less water than vegetables in a traditional garden. Depending on the type of plant, the amount of water that is needed differs from container to container. Compared to conventional vegetable gardens, the amount of water required can be more easily regulated.

4.3.3.4.4 SUNLIGHT

Sunlight is necessary for any plant to grow. Some vegetables require more sun than others and containers offer the advantage that it can be moved in or out of the shade. If you only have a patio or windowsill at your disposal shade crops are the most appropriate to plant.

4.3.3.4.5 FERTILISER

Different plants have different nutritional needs. So, it is advisable to do some internet research or ask counsel at a nursery as to what type and quantity of fertilizer your plants will need. If you want a more organic solution, you might be recommended instead to choose a potting mix that would be more appropriate for the type of vegetables you want to plant in the container.

4.3.3.5 HYDROPONICS

Hydroponics is part of hydroculture and is a sought-after method for cultivating plants without soil. Plants' roots are exposed to a nutrient or mineral solution that is absorbed by the plants. Vegetables that produce fruits are supported by an inert medium such as perlite or gravel. The nutrients used in hydroponic systems can come from a variety of sources. It may consist of by-products of fish waste, duck or chicken manure as well as purchased chemical fertilizers.

With hydroponics, the pH of water can be regulated to ensure that plants absorb the exact nutrients they need. Hydroponics is a closed system and the water as well as nutrients can be reused that has not been absorbed by the plants. The ability to cultivate vegetables within tunnels helps to better regulate the temperature and thereby extend the seasons and improve plant production. Systems can be designed to use vertical space in tunnels and increase plant density.

Hydroponic systems are easy to maintain. The continuous recycling of water in the system ensures that the roots of the plants are constantly watered. A PH and a nutrient measuring instrument also make it easy to measure the amount of fertilizer in the system for you to make adequate adjustments.

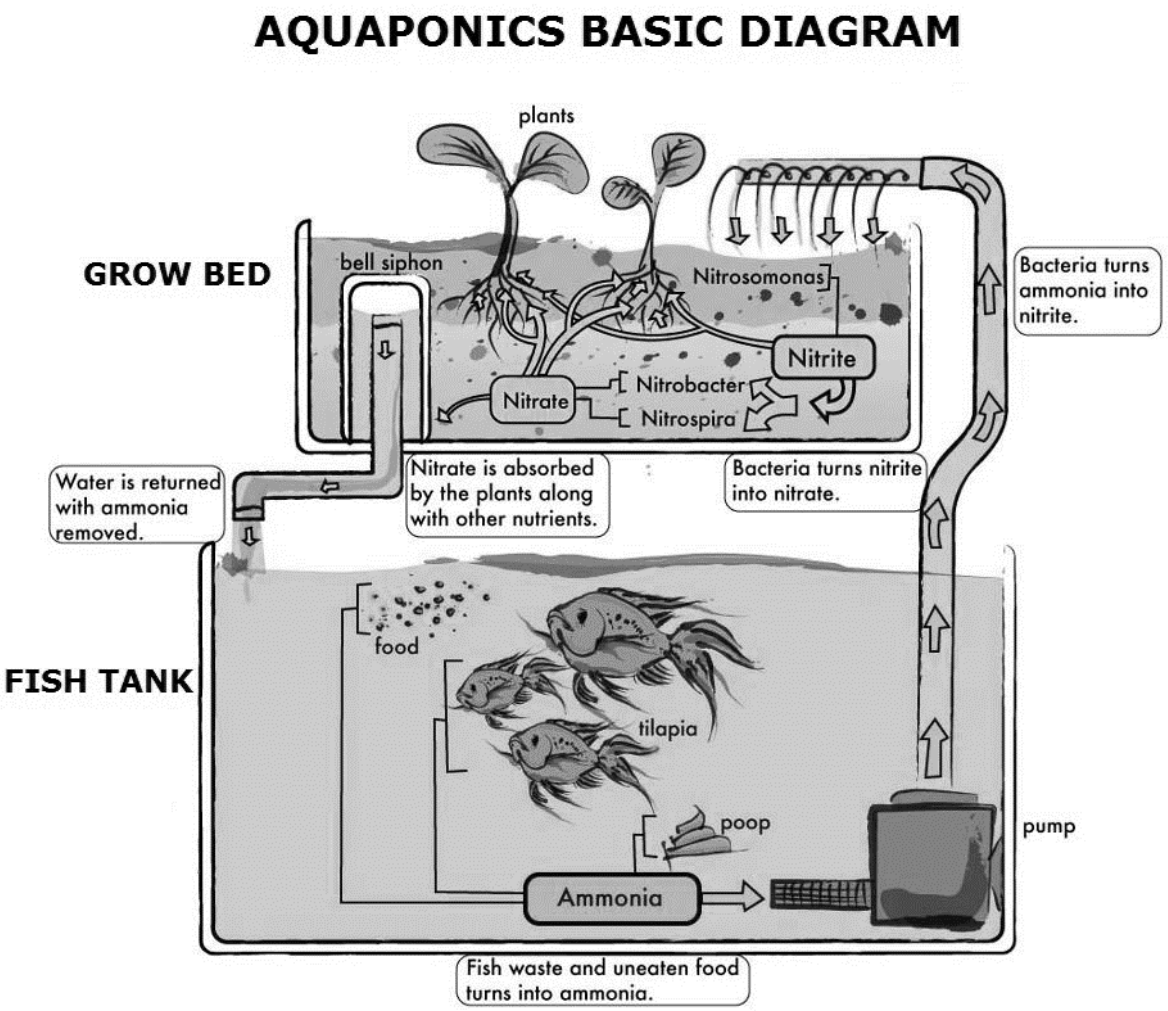
4.3.3.5.1 BENEFITS OF HIDROPONICS

When hydroponics is compared to traditional soil cultivation production, hydroponics has the following advantages:

- Water is used up to 90% more efficient.
- In a well-controlled hydroponic system, production can be up to three times in the same amount of space compare to conventional agriculture.
- It reduces the time between harvests and increases the nutritional value of the end product.
- Hydroponics' climate-controlled environment allows food production where weather and soil conditions are not favourable to traditional food production.
- No chemical weed or pest control products are required when operating a hydroponic system.

4.3.3.6 AQUAPONICS

Aquaponics combines hydroponics with aquaculture. Hydroponics is the science of growing plants without soil in nutrient-rich water. The nutrients are precisely tailored to meet the growth needs of the plants. Plants need nitrogen, phosphorus, potassium and a variety of other micro-elements to thrive. Normally in a hydroponic system, synthetically produced fertilizers are dissolved in water.



Aquaculture is the breeding and farming of aquatic organisms, such as fish, shellfish and aquatic plants, usually for human consumption. In aquaponics the fish, plants and beneficial bacteria are interdependent of each other to coexist. In an aquaponics system, the fish provide the necessary nutrients in the form of their "waste" or excretion. This waste contains nitrogen in the form of ammonia. Nitrifying bacteria living in the gravel of the grow beds or on walls of the fish tank switch the ammonia to nitrite. The nitrates are used by the plants. The plants thus act as a biofilter that cleans the water and the ammonia-free water circulates back to the fish tank.

In smaller backyard aquaponics systems, the grow bed sits on top of the fish tank. A fountain pump, pumps the water from the underlying fish tank to the grow bed and the cleaned water returns to the fish tank.

4.3.3.6.1 ADVANTAGES

1) Aquaponics is a model for sustainable food production because it integrates hydroponics and aquaculture, which means that it recycles and use all the waste materials.
2) Aquaponics is effective as it produces both high protein (fish) and vitamin and minerals (vegetables) foods in one system.
3) Aquaponics is a closed system because it uses recirculating water. For this reason, up to 90% less water is used in comparison to conventional agriculture.
4) Food products can be grown in even in dry areas where fresh water is not always freely available.

4.3.3.6.2 DISADVANTAGES

1) The initial outlay is expensive and large systems rely on electricity to power pumps.
2) From my own experience, there are limited alternatives when it comes to fish food. Good quality fish food is essential to keep your fish healthy. In South Africa, good quality commercial fish food is very scarce and expensive. To preserve the nutritional value of fish food, it should preferably be stored in airtight, dark plastic containers.
3) The variety of fish is limited when it comes to aquaponics. If water temperature increases the amount of dissolved oxygen decreases. Trout is dependent on oxygen-rich, cold water to survive while Tilapia stops eating if the water temperature drops below 20 ° C. Since the temperature can vary dramatically between winter and summer in certain areas, carp species are usually the hardiest (from 3 ° C - 21 ° C).
4) The nitrates that are generated by fish waste are not necessarily always enough for all plants. Vegetables that bear fruit such as tomatoes, pumpkin and eggplant require additional trace elements (phosphorus, potassium and potassium) to grow healthy, colourful fruits.
5) Although plants are cultivated in a tunnel, the plants are still vulnerable to pests and diseases. Environmentally friendly remedies and control methods should therefore be used to avoid the negative effects on the fish and the health of the various organisms.

4.3.4 SUMMARY

- Do additional research as to which vegetables will work best in your area.
- Preferably order Heirloom seeds.
- Decide which food growing method will work best. Take into account the space available to you as well as the weather conditions (sun and shadows)

SHOPPING LIST

- Heirloom Seeds
- Gardening tools
- Compost
- Trays for seedlings
- Hose pipe
- Watering Can