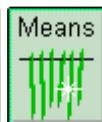


# Troubled Times



## Food

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Click on the icons above to go to your area of interest.



# Troubled Times



## TOPIC: Hydroponics

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Produce grown while suspended in recycled, [Nutrient](#) rich water in an indoor agriculture method that supplies [Large Quantities](#) of fresh, insect free [Produce](#) such as [Lettuce](#) year round. Some crops are [Continuous](#), but in all cases [Yields](#) are higher than soil based gardens. Where [Grass](#) for animals can be grown, this is not an [Efficient](#) production of food. [Hydroponic](#) agriculture is not difficult, [Simple Systems](#) such as an [Ebb & Flow](#) can be constructed, and growing [Your Own](#) can be done in the home or [Quonset Hut](#). A [Home-Made](#) nutrient solution can be produced from composting worm beds, and the pH balanced with [Wood Ash](#). [Volcanic Ash](#) will provide nutrients. [Indoor Pollination](#) and [Stressing](#) the plants may need an assist to increase the yield and/or produce seed. Hydroponics or [Aeroponics](#) is the garden of choice for the planned [Space Station](#). A Troubled Times [TEAM](#) is developing skills in hydroponics. Maintaining the right [pH Balance](#) of the water is important, and a [Growing Guide](#) can help. Complete assistance in [Setting Up](#) a hydroponic system, including education, training, [Supplies](#), and reference materials can be secured from several sources:

- [Cropping](#) and [E-Zine](#)
- [Global Hydroponics](#)
- [Light Manufacturing](#)
- [Simply Hydro](#)

# Troubled Times

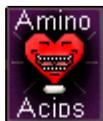


## TOPIC: **Honey and Bee Keeping**

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Honey is produced by bees as they go about their business, and fruits and vegetables require pollination for an optimum harvest. [Bee Keeping](#) is an established industry, and [Indoor](#) beekeeping is possible.

# Troubled Times

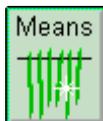


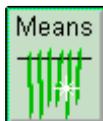
## TOPIC: Amino Acids

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Amino Acids are essential to life, and without them we cannot [Maintain Life](#). The known amino acids are categorized into those [Essential](#) for life, required as [Extra for Children](#) during their growth, [Non-Essential](#), and [Non-Protein](#) amino acids that are not involved in protein synthesis.

# Troubled Times



**TOPIC:**  **Means**

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[Vacuum Sealing](#), packing in [Nitrogen](#), or [Dehydrating](#) foods are options.

# Troubled Times



## Nutrient Solution

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For best results the pH should be kept between 5.5 and 6.5. Plant nutrients to be maintained in the hydroponic water are given as parts per million (ppm).

PPM	ELEMENT	
96	N	Nitrogen (as nitrate)
48	P	Phosphorous
264	K	Potassium
132	Ca	Calcium
48	Mg	Magnesium
412	SO	Sulfate
3.0	Fe	Iron
0.5	Mn	Manganese
0.08	Zn	Zinc
0.06	Cu	Copper
0.5	B	Boron
0.1	Mo	Molybdenum



# Troubled Times



## Large Quantities

Two companies in commercial hydroponics differ in their approach. American Hydroculture supposedly uses "new" hydroponics technics that Archer Daniels Midland does not. Take a look at the quoted yields of the two companies. Very disparate. American Hydroculture states:

We can grow vegetables in half the time of conventional farming on 1/200th of the land using 1/400th of the water - and at prices in line with produce from traditional farming. .. Future Farm announced today that it has begun construction on three new state-of-the-art greenhouses on its Palm City property. ... The growing facility will expand from its current 3,600 square feet .. allowing production monthly of 24,000 heads of bibb lettuce, 72,000 pounds of tomatoes and 45,000 pounds of peppers.



Archer Daniels Midland's are much more believable. In addition, Archer Daniels Midland is a \$5 billion dollar company doing this since 1981. Not committing to the latest technology is very unlike this company. In either case, the yields once you know what you're doing are very impressive! You can feed a lot of people!

Offered by [John](#).



# Troubled Times



## Produce

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Plants that are grown hydroponically at a nursery nearby: Arugula, Watercress, Sorrel, Swiss Chard, Spinach, Red Oak Leaf Lettuce, Green Oak Leaf Lettuce, Red lettuce, Bibb lettuce, Basil, Cilantro, Chervil, and Rosemary. The grower did tell me he was having trouble with the spinach bolting to seed too quickly, something to consider.

Offered by [Toni](#).

The spinach bolting to seed indicates either too much light or too much heat. It is very good to hear that the other vegetables and herbs are being successfully grown hydroponically.

Offered by [Ron](#).

His temperature is too high for the spinach. He should separate them if possible and keep them cooler (like at about 65 or 70 degrees).

Offered by [Roger](#).



# Troubled Times



## Lettuce

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Probably the easiest plant to grow in low light with moderate temperatures is lettuce. It does need a good dose of light to get going, but once 4 leaves are out, it can be moved near a window or at the far lengths of light's reach and grow profusely. Plant in rockwool and cut out a hole in Styrofoam. Place the Styrofoam in water and run one of those long green things that you find in aquariums for a few hours a day. You'll be giving it away you'll have so much.

Offered by [John](#).

Please review the [Nutritional Value](#) of lettuce. It could be used as a modest source of Vitamin C, but an adult would have to eat almost 6 cups to meet the USDA. In addition, lettuce is a natural diuretic which can flush the body of water soluble nutrients, this would be undesirable where potable water is scarce. Granted it could be useful for just helping to fill empty stomachs.

Offered by [Steve](#)



# Troubled Times



## Continuous

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Strawberry plants continually produce fruit, they never expire as long as they are fed properly and given light. I think they can also go into dormancy if you do not have ample solution on hand but do have some light. Strawberries, I think, would be an excellent treat when most of our sweet foods of the past are gone.

Offered by [Ted](#).



# Troubled Times



## Yields

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### Comparative Yields Per Acre

In Soil and Soiless

Crop	Soil	Soiless
Soya	600 lb	1,550 lb
Beans	5 tons	21 tons
Peas	1 ton	9 tons
Wheat	600 lb	4,100 lb
Rice	1,000 lb	5,000 lb
Oats	1,000 lb	2,500 lb
Beets	4 tons	12 tons
Potatoes	8 tons	70 tons
Cabbage	13,000 lb	18,000 lb
Lettuce	9,000 lb	21,000 lb
Tomatoes	5-10 tons	60-300 tons
Cucumbers	7,000 lb	28,000 lb

**Source:** *Hydroponic Food Production*, by Howard M. Resh, Ph.D.



# Troubled Times



## Grass

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How many of you are planning on raising grain fed animals for pack animals or for food? What are you going to feed them? Where are you going to grow it? Wheat is more than the wheat berries we consume. Another reason it is grown so widely in the midwest is straw can be made from it for feed!

Offered by [Roger](#).

Wheat can also be grown into wheatgrass easily and also sprouted for use alone as sprouts or baked into bread. It may be inefficient to grow the wheat to maturity because of ratio of edible/non-edible plant mass. Maybe growing wheat might have to wait until consistent sun returns for outdoor harvesting. I suppose this applies to other grains too.

Offered by [Craig](#).



# Troubled Times



## Efficient

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I have been experimenting for years to find the best plants to produce the most edible mass per square ft. of space above and below soil surface. Anyone with practical experience would understand that any plant grown hydroponically or in soil indoors or greenhouse needs to be a plant that has a bulk yield in fruit, seed, or totally edible vegetative material that far outweighs the mass of the plant to produce the edible parts. Wheat then would never be feasible because of the amount needed to be grown to be of use.

Offered by [Woodie](#).

We need to maximize edible growth per unit growing area for a given minimum growing time period. This might lead us to fast growing plants that are totally edible, roots and all. If they also did not take up much space (land area) as compared to the mass they produce we would have a winner. This is assuming light is a constant during our comparison. Edible weeds become a consideration. No hybrid problem and plenty of availability of seeds.

Offered by [Mike](#).

Just musing here, but it seems that the beet plant is a good candidate. It grows well in all soil types. It is completely edible (leaves as greens, and obviously the root too). It doesn't require a great deal of depth of soil (6 to 8 inches). It will get along okay in shady areas. And so on. But think about the culinary boredom that would arise from a diet of beets alone! Also, I don't think you could get all the nutrients required for life from one plant. Even supplementing a protein source such as earthworms would give rise to loss of appetite due to culinary boredom. We do need to find efficient plants, but we also need to consider growing less efficient plants on occasion for diversity in diet.

Offered by [Roger](#).



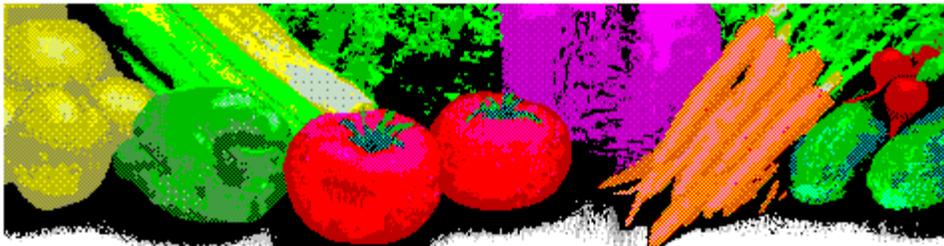
# Troubled Times



## Hydroponics Articles

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The possibility that plants could survive and grow without soil as the nutrient source was first described historically by Woodward in 1699. In the 1840's, a number of German botanists developed the basic nutrient formulas and growing techniques which are in use today. Most of what has been developed since then are refinements of and adaptations to these early discoveries. Hydroponics requires as little as 10% as much land as regular farming, and less than 10% as much water. If the hydroponic water is recirculated, water use is dramatically less. Hydroponic advocates claim that an area the size of a large back yard can supply 100 people with fresh vegetables during the year. Hydroponic produce is less affected by insects so does not carry traces of insecticide, and can be picked ripe just before eating so preservatives are not required. Produce such as broccoli, cabbage, celery, chard, cucumbers, eggplant, flowers, grapes, lettuce, melons, onions, peppers, pole beans, radishes, strawberries, and tomatoes have been grown hydroponically.



An article called **Feeding Astronauts - And Ourselves** on page 40 of the Jan/Feb '92 issue of *The Futurist* magazine describes the benefits to be derived from hydroponics. Excerpts of the article follow:

[Hydroponics is] an agricultural technique that uses nutrient-enriched water rather than soil as a growth medium. ... Growth chambers allow the producer to control the amount of light and carbon dioxide the plants receive, as well as the humidity and temperature of the air. Because there are no seasons inside a growth chamber, crops could grow year-round in any part of the world, eliminating transportation and storage costs. In addition, herbicides and insecticides are unnecessary because there are no weeds or insects to disturb the plants.

An article called **Hydroponic Produce** on page 8 of the July '91 issue of *Consumer Research* magazine describes hydroponic techniques and the variety of vegetables, fruits, and flowers that are being successfully grown hydroponically. Excerpts of the article follow:

Hydroponically-grown vegetables such as tomatoes, "burpless" cucumbers, and bibb lettuce have become commonplace offerings in the produce sections of many supermarkets. Many consumers favor these vegetables, which, being grown in water, are clean and have no soil clinging to them. Such produce has good flavor, having been allowed to ripen fully before it is picked. Because the roots of bibb lettuce are left intact on the plant within the plastic wrapper, the lettuce actually continues to grow and does not wilt readily. The controlled environment of hydroponics also eliminates the need for pesticides.

Modern hydroponics began in the 1860s. Plants were found to thrive, provided they received all the needed macro and micro nutrients from inorganic salts in solutions. Water economy is an attractive feature for arid areas because, in hydroponic systems, precious water can be recirculated. A large volume of hydroponic food can be grown rapidly in a small area. Reportedly, four heads of lettuce can be raised in the same amount of space required to grow one head of field lettuce. ... The technique has been suggested to raise a weekly crop of grass as cattle feed.

Hydroponic techniques vary. In water culture, the roots of the plants are held in a large waterproof tank. The plants are supported by mesh or string. In gravel cultures - a more costly system to install and maintain - a water-proof bench is filled with inert pea-sized gravel to support the roots. A solution containing all the essential nutrients required by the plant is pumped into the gravel from a holding tank. When the bench is full of the solution, the pump is turned off and the solution drains back to the holding tank. The solution is replenished periodically. A nutrient film technique is another system, which does not require as large a holding tank as that used in gravel culture. The plants grow in narrow, shallow troughs, and the roots of the plants are constantly bathed in a flowing solution of nutrients.

The lamps that are used emit three different wavelengths of light (red, far red, and blue) in a proper ratio to stimulate photosynthesis.



# Troubled Times



## Simple Systems

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Through my internship at my local farm i've learned quite a bit about hydroponics. I've recently taken that knowledge into my basement where I've designed and setup a few test systems. These are hydro systems which I feel might be more user-friendly.

### Cold Frame

This system can be built by a 6 year-old. It consists of a styrofoam board with plastic pots resting in it. the styrofoam floats on a reservoir of water so that the the roots of the plants dangle in the water. The water never needs to be changed, only nutrients added. (If you want, system can be circulated with a pump.)

Pros - inexpensive, simple construction (can be made during aftertime using wood as substitute for styrofoam), low maintenance, very forgiving, does not require a pump, requires very little water.

Cons - seeds need a medium to grow in (rockwool/oasis cubes/etc. - difficult after the pole shift).

Plants - anything that needs lots of water. lettuce and basil *thrive* in these systems. I'd imagine watercress would do well (high vitamins). I've got a bunch of seeds and I'm going to try everything I have in each system. I'll let you know what does well.

ToDo's - develop medium that will exist during the aftertime as a replacement for rockwool cubes, experiment floating styrofoam/wood on top of fish tanks.

### Ebb & Flow

Plants each have their own pot and are grown in a medium other than soil (usually perlite, vermiculite, and peat 1:1:1). Pots (with holes in the bottom) rest in a reservoir that is flooded 2-3 times/day. The medium retains enough water to keep the plants healthy. Flooding can be done by a pump on a timer, or a flood/drain bucket that's raised and lowered by hand. (Can also be done without pots and all plants in same medium.)

Pros - inexpensive, simple construction, little water, no pump needed.

Cons - if not using a timer skipping a few waterings can damage plants plants - just about anything.

ToDo's - develop medium that will exist during aftertime (possibly sand, however, sand might retain too much water and suffocate the plants, need something to mix with it for proper aeration).

Much work still needs to be done to get these solutions to the point where they can be completely constructed during the aftertime. We're eventually going to run out of rockwool, tubing, pvc pipe, etc.

Offered by [Gabe](#).



# Troubled Times



## Ebb & Flow

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There are many different kinds of hydroponic systems. Some are more complex (i.e. nutrient film technique), and some require an electric pump. But in my opinion, there are forms of hydroponics that are perfectly suited to an aftertime environment. For example, electricity is not needed if you are using a simple ebb and flow model. In that case, a bucket would be raised and lowered to flood and drain the tanks (respectively). Take a look at the [4th Picture](#) and on the [Simple Systems](#) page to get an idea of what I'm talking about. Hydroponics pro's as compared to soil based: better yields, faster growth, less chance of disease, and more plants in less square feet.

Offered by [Gabe](#).

Personally, I will be using soil based food production. It is suggested, and some of the evidence agrees, that hydroponics can out-produce conventional soil-based crops, however, there is the need of a carefully controlled nutrient solution and more electrical needs in the form of a pump to circulate that solution. The Troubled Times hydroponics lab has proven that alternate forms of nutrient solution can be used, but not everyone will be able to advance purchase their hydroponics equipment and then be able to maintain it after the shift. One can always fill a bucket with dirt and stick a potato in it and put it under some light.

Offered by [Roger](#).

Good points on hydroponics. Often what we think of for hydroponics involves elaborate plumbing, with pumps, pH meters etc. But as you pointed out they can be simple, like an ebb and flow method or even a wick system which simply requires one to keep a reservoir full. One other comment involving my experience is that the greens seem the easiest and fastest growing in hydroponics, fruiting plants (tomatoes, peppers) require a broader range of nutrients, but if you do it right you can have incredible yields.

Offered by [Stan](#).



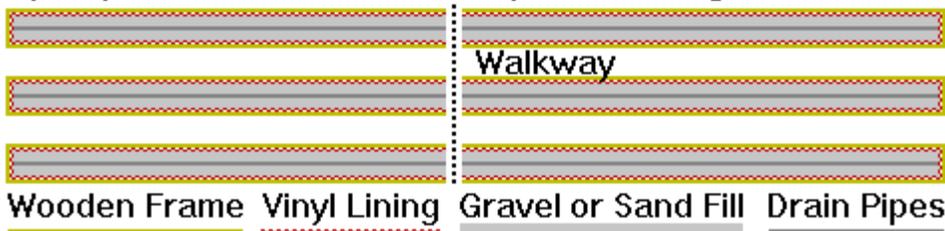
# Troubled Times



## Your Own Gardens

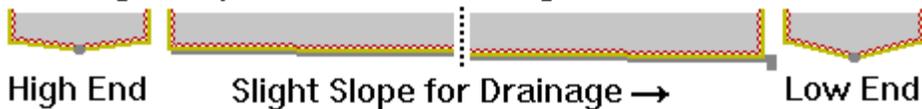
- Crops are grown in beds which are really shallow tanks or troughs that serve as a container for gravel or coarse sand. If there are several of these beds, they should be set up in a series at the same level and of a similar size.
- These beds should be about 3 feet wide and any convenient length, although 100 feet is common. The sides are about 8 inches high and with a V bottom so the center is 11 or 12 inches deep at the center.
- Beds intended to survive massive earthquake damage should be wooden frames lined with heavy vinyl sheeting. Pipes or other fittings should be plastic for increased flexibility and ease of repair after earthquake damage.

### Hydroponic Beds - 3' Wide and up to 100' Long

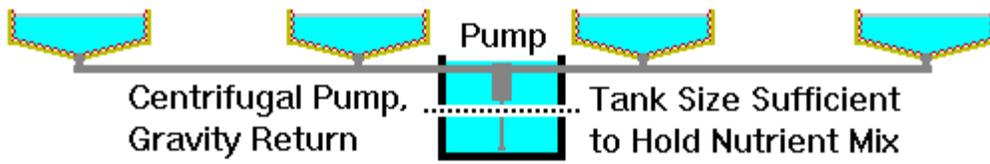


- This permits an arrangement whereby a half-tile or similar device through the center of the bed will feed or drain the solution rapidly from one end of the bed to the other. It is very important that the slope be precise, with no low areas from which solution will not drain.
- Drainage in the beds is not only pointed toward the V bottom of the bed, but also toward one end of the bed, so that the V at the drain end is 2" lower than at the high end of the bed. This is a slight slope in the bottom of the trough.

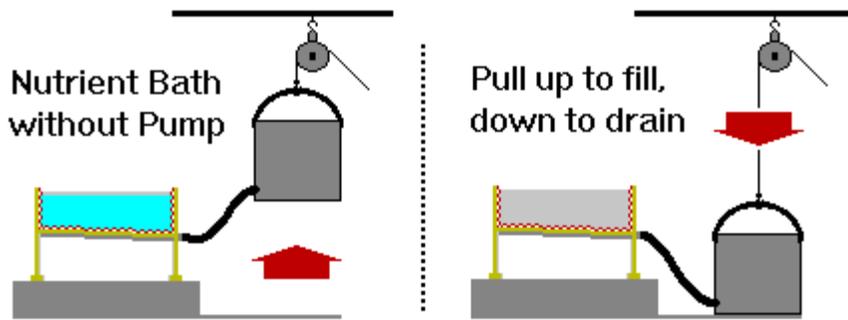
### Drainage Drop - 2" to bottom at High End, 4" at Low End



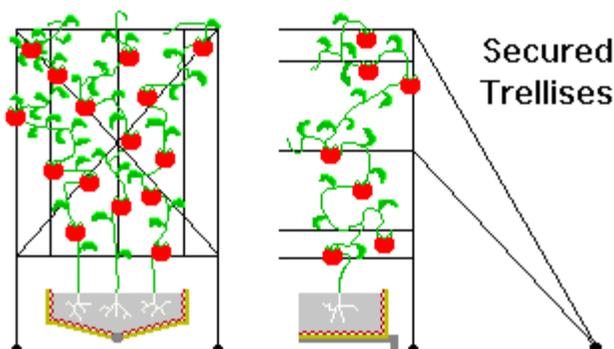
- There must be a pipe connection to the lowest point in the V at the drain end of the trough. The nutrient solution can then be pumped into the trough through that pipe and will drain out again when the pump has been shut off. The quantity of solution in the tank should be just sufficient to bring the water level up to within 1/2 to 1 inch of the top of the gravel or sand in the beds.
- The entire hydroponics system is relatively simple to operate and may be made at least semi- automatic. In cool weather, pumping solution should be done once a day, but in warm, dry, or windy weather, it may be necessary 2 or 3 times a day. Installation of a time clock allows the start and stop of the pump to be automatically.
- A centrifugal pump of sufficient capacity to fill beds in one-half hour is generally best for forcing the solution into the beds. With a centrifugal pump, the solution will flow by gravity through the pump back into the tank.



- For those without a pump, a simple pail and flexible hose system to give the hydroponic beds their daily nutrient bath works well.



- Gravel for the bed should be fairly uniform in texture, about 1/2 to 1/4 in diameter, and washed. If you use sand, it should be coarse and it also should be washed. Beds should be filled to within 1 inch of the top. The mix should be sterilized with heat or steam to prevent mildew and fungus problems.
- Use the best seed for seedlings, planted in disease-free soil or sand and six inches or more high before transplanting. Loosen the planting media around the roots so that there will be as little injury as possible to the roots during transplanting. Rinse the planting media off the roots with water before planting in the hydroponic beds.
- Supporting structures may be necessary to hold up the plants, as plants loaded with fruit, for example, are heavy. Do not attach supports to the ends of beds because the weight of the plants may warp the structure and cause leaks or draining problems. All supporting wires are suspended from overhead supports that are spaced at intervals alongside the troughs.



- Cooling of the hydroponic area can be achieved by ventilation, as transpiration of moisture off the leaf cools the plants just as perspiration cools the human body. Slats or windows that allow the air to circulate should be included in the arrangement.
- Plants produce oxygen during the day, under lighted conditions, and carbon dioxide during the night. Hydroponic areas attached to living areas thus can oxygenate and cleanse the air of carbon dioxide, but should be closed off during the night so that oxygen is not depleted from the sleeping areas.
- Pollination can be done either by bees or by hand, by manually shaking or tapping the flowers once a day, going

flower to flower so as to spread the pollen. Pollination helps increase fruit yield, and for some produce makes the difference between a high yield or no yield at all.

Authored by [Nancy](#).



# Troubled Times



## Quonset Hut

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Had an idea for hydroponics gardening. Submerge pony wall, approx. 3' tall, below grade. On top of same (widen footing at grade level) mount Quonset hut. Probably minimum of 16 foot wide to 20'. Quick construction, good barn raising mechanics for 3 or more to set up in a week. Good wind deflection, no maintenance. Wrap same with straw bales from ground level up and over top. Chicken wire over same wired to bales. Stucco or plaster over bale and chicken wire. This will give you about an R-60 value for summer or winter. Therefore cool in summer and easy to heat in winter, thereby reducing energy cost. I like the windmill idea for supplying water pump and lighting needs.

Offered by [Ron](#).



# Troubled Times



## Wood Ash

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Since finding Potash was suggested to be from ashes, rich in this nutrient, I was planning to get some ashes from a wood stove nearby and explore this. Just about the time the acid level was diving from 6.5 to 5.5, I arrived with filtered water from water soaked ashes, *very* alkaline. Lesson learned: earthworms, poop, and ashes are common ingredients that the common family can acquire. This balanced the pH beautifully, and I continued to add wood ash water periodically, testing pH to see when a pH of 7.0 or anyway at or above 6.5 was reached. At one point I added too *much* wood ash water, and the solution was highly alkaline, to my horror. So the ashes are a solution to high acid hydroponic water. Other than commercial strips or tabs, how would one determine that the pH was too acid or alkaline? I think the taste test might do it, acid or *not*, like vinegar or *not*, but since the solution is gained from manure in worm beds, one is likely to get the runs from this test.

Offered by [Nancy](#).

Best Management Practices for Wood Ash Used as an Agricultural Soil.

<http://hubcap.clemson.edu/~blpprt/bestwoodash.html>

Offered by [Gabe](#).

pH can be tested using red cabbage soaked paper;

<http://www.chemtutor.com/acid.htm>

We tried this and it works as advertised! Guess we have to put red cabbage on the list of plants to be growing. Next step is to find the degree of acid or alkaline condition (how far from pH 7 something is.)

Offered by [Michael](#).



# Troubled Times



## Volcanic Ash

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The source of a hydroponics solution will come from an overlooked source. The primary cause leading to the destruction of most vegetative life on Earth, volcanic ash, which will cloud the atmosphere preventing sunlight, will have another purpose. Have you ever noticed that the sides of volcanoes support lush vegetation? The ash is composed of Carbon, Nitrogen, Phosphorus, Hydrogen, Sulfur, Sodium, Iron and other trace elements found in hydroponics solutions on the market today. Rainwater will contain most chemicals needed to provide a nutrient solution, as it washes the air from the volcanic ash. The concentration of the nutrient solution does not have to be high since it can be discarded after one use, though that can be adjusted up by evaporation. The fact that rain will be constantly falling, provide an unlimited source during the first few years. Minerals containing those same elements in compound form can replace elements that may be missing in the rainwater every so often. These minerals can be sized to pea gravel size form and placed as part of the growing medium. Leaching of these chemicals naturally as rainwater pass over should be sufficient to replace shortages.

Offered by [Robert](#).

Atmospheric nitrogen can't be used by plants as a source of nitrogen (except for legumes which have a bacteria which can convert atmospheric nitrogen for the plant's use). Plants need most of their nitrogen in the nitrate form, although they can use some ammonia (too much is toxic). It is good to see someone recognizes volcanic ash as the wonderful fertilizer it is.

Offered by [Jennifer](#).



# Troubled Times



## Indoor Pollination

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Had a conversation with Nancy last week about tomatoes and she told me how her relatives used an electric toothbrush on their tomato blooms, to pollinate them. I have tried it and within days, 4 new tomatoes where blooms once were on the single plant bringing to five the number on this plant.

Offered by [John](#).

With my Tom Thumb tomatoes in my hydroponic garden. I shake 'em in the morning, shake 'em in the evening and they're proliferating out the wazoo. My lettuce has turned out well but even with plenty of light using a 400 watt sodium conversion bulb, I can't seem to get them to go to seed.

Offered by [Steve](#).

Get a box of Q-tips and prepare to use them. Outside, tomatoes are pollinated by insects or, occasionally, by the breeze. If inside, there are no insects or wind. Outside gardeners also experience this problem if they use sprinklers (which scare the bees away and also wash off pollen). Collect pollen from stamen and transfer carefully to calyces of other blooms via Q-tip, and do it every morning before your lights are scheduled to go on. Another useful thought: do your plants receive a breeze? The usual recommendation is to wall-mount a small electric fan that blows constantly on the tomatoes during the "on" part of the light cycle. It both helps to pollinate and evaporates away the moisture produced by carbon dioxide respiration, so it lowers ambient water moisture and encourages the plant to absorb more water by its roots. It also prevents many diseases that are fostered by high humidity.

Offered by [Jenny](#).

I have 6 tomato plants (Greenhouse variety) growing underneath regular fluorescent lights. I am in the process of dwarfing them to 18 inches and I have buds on all but one of the plants. The first plant to bloom did so about 10 days ago and as soon as the bloom opened up, I diddled the bloom (basically I wiggled it with a finger). I did this daily for about three days, then I noticed that the bloom was no longer opening up in the morning. Today I notice that that bloom is no longer a flower at all, instead it is a very small tomato! This plant also has two more blooms that are no longer opening up so in about 5 to 7 days I will have two more tomatoes on this plant. I just wanted to point out that you really don't need anything fancy to pollinate your tomatoes. A finger will work! Shaking will also work. Give the tomatoes a good shaking. Just grab hold of the cage or trellis or whatever and shake it once or twice. Do this every day.

Offered by [Roger](#).



# Troubled Times



## Stressed

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Several years ago I had a beautiful garden in Oklahoma. I had about 30 tomato plants that were watered by drip irrigation with fertilizer injected into the irrigation system. The tomato plants were *huge*, incredibly healthy and full of blossoms that wouldn't bare fruit, but eventually fell off. I tried everything. Finally I mentioned it to an old man working at a nursery. He said they were *too* healthy and happy. They didn't need to produce offspring and somehow knew it. He told me to take a stick and give them a good beating. Well, I was so frustrated with them by this time that I took an old fishing rod and proceeded to do just that. Within a week I noticed that the blossoms were no longer falling off until a nice little tomato was starting in their place. I produced almost 200 quarts of tomato sauce from that crop.

Offered by [Ron](#).

I have grown several types of tomatoes, and it seems I always get much better yield per plant when I have several rather than when I just have one.

Offered by [Martha](#).

Plants will literally kill themselves trying to out-produce their neighbors if they are a little crowded. Competition for resources and the need to reproduce. Of course this kind of competition isn't dependent on their neighbors being of the same species. Inter-planting with other varieties of plants produces the same general competition. Primarily, beating moves the plants, but one should take care not to damage the plants. Tomatoes are self-pollinating and like beans or peas, they need movement to dislodge the pollen. If your plants are too healthy (as represented by excessive foliage) you should really trim them up some. This sudden reduction in foliage will cause them to panic and bear fruit for self preservation.

Offered by [Roger](#).



# Troubled Times



## Aeroponics

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*[Aeroponics](#) International's patented Genesis Series II Growing Systems Aeroponic Technology provides plants with an enclosed air and water/nutrient ecosystem, that stimulates rapid plant growth, without soil or media.*



# Troubled Times



## Space Station

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*The New York Times*, May 19, 1998

### **Space Crops for Astronauts**

Hydroponically grown crops will be almost the entire source of ingredients for the foods astronauts will consume on remote space stations in decades to come. The list of crops, which must supply nearly all the astronauts' protein as well as vitamins, minerals, fiber and culinary variety, includes plants well-adapted to growing in nutrient-enriched water and short enough to fit in the troughs that will be available in space.

- Wheat
- Potatoes
- Sweet potatoes
- Soybeans
- Peanuts
- Common beans (kidney, lentils, etc.)
- Rice
- Chard
- Quinoa
- Lettuce
- Tomatoes
- Cucumbers
- Garden peas
- Green beans
- Mushrooms
- Carrots
- Kale
- Broccoli
- Spinach
- Beets
- Bell peppers
- Chili peppers
- Watercress
- Onions
- Scallions
- Garlic
- Strawberries
- Melons
- Green herbs



# Troubled Times



## pH Balance

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Damark has a **Chlorine and pH Electro-Tester** Item No. B-40070-426137 on sale for \$29.99 was \$39.99, typical price is about \$59.95. Call 1-800-729-9000 to order. Was in the just released Jul 97 catalog. Uses one AA battery. Is a white hand held meter with a two terminal probe for the water. Could be useful with hydroponics and gardening in general for pH measurements. For after PS I suspect it to be cheaper in the long run and to last longer and be more accurate than stockpiling pool test kits and or pH paper. One or more rechargeable AA batteries could be recharged from a 12V DC system with a simple limiting resistor.

I was able to find a simple pH meter with no batteries. Found it at a large Armstrong Garden Centers, Inc. Manufacture is **Rapitest** distributed by Luster Leaf Products, Inc. 2220 Techcourt, Woodstock, Il. 60098. Cost was \$19.99 before tax. Has one probe that is stuck into the wet soil that is made with two different types of metals insulated apart to make two separate electrodes. The acid or base of the soil makes a battery that moves a meter needle away from pH 7 (no flow or zero point) to Alkaline (positive flow) or Acid (negative flow). The pH scale runs from 3.5 to 9.

The instructions for use are a bit complicated and include shining or removing the oxide from the probe before each use. Under tips on testing it says - **Use the Meter Only in Soil. Do Not Place the Probe into Water.** Don't see any good reason for this statement, unless if you let it sit in water for a while, water may seep past the plastic seal between the two electrodes and possibly short to some extent the electrodes from the inside out, decreasing it's sensitivity.

Offered by [Mike](#).



# Troubled Times



## Growing Guide

Plant Type	Temp	Light	NPK Mix	Plants Per Sq. Ft.	pH	Growing Conditions	Vitamins Delivered
Artichoke	19-27 C	not directly under	1:02:02	1	6.5- 7.5	perlite 10 inches or deeper	high food value
Banana	27-29 C	fantastic light	12:01:16	0.5	5.5-6.5	perlite at least 16" deep w/ very high humidity	
Beans	15-18 C	needs good light	2:04:04	5	6	4 inches deep or deeper w/ plenty of moisture	protein, Vitamins A, B, C
Broccoli	13-18 C	needs good light	3:03:01	2	6-6.8	NFT - cut 5" from top and will continue to come	Vitamins A & C
Cabbage	13 C+	needs good light	3:03:01	2	6.5-7	2.5" deep or deeper (NFT works)	Vitamins A & C
Cauliflower	15-20 C	needs good light	3:03:01	1	6.5-7	2.5" deep or deeper (NFT works)	
Carrots	15-30 C	moderate light	1:03:03	2	6.3	30% vermiculite and 70% perlite - good drainage required	iron, Vitamins A, B1, B2, C
Corn	15-20 C	needs great light	10:03:05	3	6	6" deep or deeper w/ great drainage	carbohydrates and protein
Cucumber	24-30 C	good light	10:03:10	2	5.5	4 to 6" deep or deeper	little food value
Garlic	27 then 15 C	good light	15:03:16	3	6	4" deep or deeper - sand w/ high initial temp cooling off	illness prevention
Lettuce	12-20 C	moderate light	9:01:16	6	6-7	grow w/ rockwool sitting on styrofoam in water	little food value / roughage
Onion	15-27 C	good light	15:03:16	3	6-7	4 inches or deeper within aggregate or sand/ perlite/ vermiculite mix	not particularly high in energy or vitamins
Peas	15-18 C	good light	8:01:05	4	6-7	4" deep or deeper in aggregate or rockwool w/ good aeration	
Potatoe	60-70 F	fair light	7:01:09	3	5-6	12" deep or deeper 2/ good drainage - tubers not exposed to light	2.2% protein, .1% fat, 1% potassium
Pumpkin	20-27 C	good light	10:03:10	1	5.5-7.5	rockwool or perlite sow seed direct - need trellis big time	great Vitamin A, fair Vitamin C
Soybeans	15-18 C	good light	2:04:04	5	6	NFT culture	protein, iron, B Vitamins, calcium, zinc
Spinach	15-19 C	cool shaded	10:04:12	3	6-7	4" deep or deeper using rockwool or sane or perlite	excellent Vitamin A, C, Fair B, high fiber
Strawberry	15-18 C	good light	5:10:05	6	6	troughs filled with gravel/perlite or granulated rockwool 6 to 8" deep	Vitamin C
Tomatoe	21-24 C	great light	5:07:01	3	6-6.5	rockwool w/ trellis or something to hold them up	excellent Vitamin A and C
Wheat	60-70 F	good light	10:01:04	8	6	silt and clay loams outside; humus; significant moisture but not flooding	fiber 14%, protein (gluten) 12%, 2% fat, several minerals
Zucchini	24-30 C	good light	10:03:10	0.5	6	aggregate culture w/ constant supply of moisture	

Offered by [John](#).



# Troubled Times



## E-Zine

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The CropKing newsletter includes information on conferences, books, new products, classes, and more. Just subscribe to **CropKing** [Ezine Account](#).



# Troubled Times



## Indoor

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So far I've not been able to find some way in which bees could be utilized in the environment we envision. It seems we won't have many bees in the aftertime, not without the sun. From all the information I've been able to gather, bees are absolutely dependent on sunlight for all of their many cycles. They don't necessarily have to live outdoors, and there is a special bee variety developed in Israel for indoor strawberry pollination. But these bees live in the strawberry hothouse, which is covered with clear plastic which lets all the sunlight through. Whereas in the immediate post-shift environment, we're supposed to have very little sunlight (or am I wrong about that?) If any research is to be done with bees, it has to involve low-light settings, such as a complete hydroponic garden in a very large basement. My bee-man friend says he doesn't know any bees that can live like that. The big problem is creating 'low-light' bees.

Offered by [Sol](#).

One of the projects on my plate is to produce a database/Excel application to determine, based upon the number and types (gender/age) of people at a survival site, the number of calories required per day and thus the amount of hydroponics grown indoors, and from that the amount of artificial lighting - thus electricity generation capacity required. This pre-supposes a "high-tech" settlement capable of growing the required amount of hydroponic vegetation. From preliminary calculations it is clear that such a hydroponic setup will require a very large "shelter". The size of shelter required, and the continuously blooming vegetation appears to be quite adequate for a hive or two of bees. The only problem in this regard is that when working in the hydroponics "shelter", one would probably be required to wear the same sort of protective clothing used by bee keepers. So, my vision of a viable community hydroponic setup would certainly include one or more bee hives and thus the by-product of honey. By the way, the large shelter could easily be a group of interconnected smaller shelters. This wouldn't matter to the bees as long as they can get back to the hive.

Offered by [Ron](#).



# Troubled Times



## Maintain Life

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Amino acids are found in many different foods, for example: meat, milk, eggs, fish, plants, mushrooms, brewer's yeast, cashews, beer, chocolate, potatoes, cola drinks, peanuts, barley, cereals, peas, etc. Amino acids are just as important as vitamins and minerals are. According to *The Doctors' Vitamin and Mineral Encyclopedia* (1991), by Sheldon Saul Hendler, M.D., Ph.D., the following can be said about amino acids:

In principle, an amino acid is any compound that contains an amino group and an acidic function. When biologists talk about amino acids, they usually mean the twenty amino acids that are necessary for the synthesis of proteins. Proteins are large molecules that are *crucial* to life; they are involved in the formation of living structure and they catalyze the chemical reactions necessary for the maintenance of life.

In addition to participating in the synthesis of proteins, amino acids are involved in other important biologic processes such as the formation of the brain neurotransmitters.

The twenty amino acids involved in protein biosynthesis are divided into two broad groups- essential and non-essential. Healthy human adults require dietary intake of eight of these amino acids to maintain good health; phenylalanine, valine, threonine, tryptophan, isoleucine, methionine, lysine and leucine. The remaining twelve - the non-essential amino acids- can be made by the body from other substances. Healthy children require, in addition to the eight amino acids listed above, histidine and arginine. Situations exist in which non-essential amino acids become essential. For example, a physically traumatized adult requires arginine for optimal repair processes to occur.

The twelve non-essential amino acids are; alanine, asparagine, aspartic acid, cysteine, glutamic acid, glutamine, glycine, proline, serine and tyrosine.

Offered by [Michel](#).



# Troubled Times



## Essential

Below I have translated important information taken from *The Doctors Vitamin and Mineral Encyclopedia*, about essential amino acids which will be necessary to maintain life in the coming Aftertime.

<b>Essential Amino acids</b>			
<b>Amino acid</b>	<b>Effect(s)</b>		<b>Intake p/day</b>
	<b>positive</b>	<b>negative</b>	
<b>L-Phenylalanine</b>	<ul style="list-style-type: none"> <li>• provides pain relief (only DL-Phenylalanine does this which is available in health food stores too)</li> <li>• dispels depression</li> </ul>	<ul style="list-style-type: none"> <li>• elevates blood pressure (not to be used by people with high blood pressure!)</li> <li>• Dangerous in combination with anti-depressant drugs which contain monoamine oxidase inhibitors. Combination causes dangerously high blood pressure</li> <li>• may help nourish the growth of pigmented melanoma (form of skin cancer) when already present. It doesn't produce melanoma though when melanoma are not present!</li> <li>• persons with PKU (phenylketonuria, an inherited inability to metabolize L-</li> </ul>	<ul style="list-style-type: none"> <li>• Max. 1.5 grams</li> <li>• DL-ph. comes in 375 mg. doses</li> <li>• L-ph. comes usually in 500 mg. doses</li> <li>• as anti-depressant take with L-ph. 20-30 mg. of vitamin B6 on an empty stomach for maximum effect.</li> </ul>

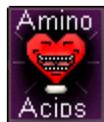
		<p>phenylalanine) should avoid phenylalanine supplements!</p>	
<p><b>L-Leucine</b>  <b>L-Isoleucine</b>  <b>L-Valine</b></p> <p>Note: Leucine, isoleucine and valine are the branched-chain amino acids</p>	<ul style="list-style-type: none"> <li>restores muscle mass in those who have liver disease, those who have undergone surgery and those who have suffered injury or other trauma.</li> <li>treats and in some cases reverses a form of liver damage called hepatic encephalopathy, a frequent feature of alcoholism (helps curb muscle wasting caused by this disease. Also it helps prevent a number of adverse neurologic effects of chronic liver disease through their actions on brain neurotransmitters)</li> </ul>	<ul style="list-style-type: none"> <li>no significant side effects</li> </ul>	<ul style="list-style-type: none"> <li>no specifics</li> </ul>
<p><b>L-Tryptophan</b></p>	<ul style="list-style-type: none"> <li>natural sleeping aid</li> <li>reduces and most times cures chronic insomnia</li> <li>reduces severity of anxiety attacks</li> <li>reduces significantly aggressive behavior</li> <li>controls partially and sometimes wholly the manic phase of the manic-</li> </ul>	<ul style="list-style-type: none"> <li>no significant side effects</li> </ul>	<ul style="list-style-type: none"> <li>as a natural sleeping aid take 1-2 gr. just before bedtime with carbohydrates</li> <li>against insomnia take 2 gr. of tryptophan thirty minutes before bedtime, for three days in a row. Then four days without etc. 'till it's over.</li> <li>as reliever of</li> </ul>

	<p>depressive disorder</p> <ul style="list-style-type: none"> <li>• reduces and can cure a number of depression types</li> <li>• relieves some chronic pains</li> <li>• appetite suppresser (in lean to mildly obese humans only)</li> <li>• reduces severity of hyperventilation attacks when combined with vitamin B6</li> </ul>		<p>chronic pain take 1-3 gr. with carbohydrate rich diet (this combination boosts levels of serotonin and diminishes pain)</p> <ul style="list-style-type: none"> <li>• as appetite suppresser take 2-3 gr.</li> <li>• as reducer of panic, anxiety and hyperventilation attacks take 2-3 gr. with vitamin B6</li> </ul>
<p><b>L-Lysine</b></p>	<ul style="list-style-type: none"> <li>• reduces recurrence rate of herpes outbreaks (it does not reduce duration or severity of herpes once underway)</li> <li>• regenerates and strengthens muscle (only in those who regularly do hard labor/exercise)</li> </ul>	<ul style="list-style-type: none"> <li>• no significant side effects</li> </ul>	<ul style="list-style-type: none"> <li>• in order to reduce recurrence rate of herpes outbreaks take up to 1.5 gr</li> <li>• to regenerate and strengthen muscles use (1200 mg) together with arginine(1200 mg). This combination promotes a significant release of GH (growth hormone) which in turn improves overall health and immunity when the physique is exercised regularly (whether it be through training or physical labor (long walks/working with heavy equipment))</li> </ul>

Offered by [Michel](#).



# Troubled Times



## Extra for Children

Below I have translated important information taken from *The Doctors Vitamin and Mineral Encyclopedia*, about those amino acids which will be required for children growing up in the coming Aftertime.

<b>Extra essential for children</b>			
<b>Amino acid</b>	<b>Effect(s)(for adults too)</b>		<b>Intake p/day</b>
	<b>positive</b>	<b>negative</b>	
<b>L-Histidine</b>	<ul style="list-style-type: none"> <li>• counteracts rheumatoid arthritis</li> <li>• boosts activity of suppressor T cells(rheumatoid arthritis is one of many autoimmune diseases in which suppressor T-cell activity is subnormal)</li> </ul>	<ul style="list-style-type: none"> <li>• no significant side effects</li> </ul>	<ul style="list-style-type: none"> <li>• against rheumatoid arthritis take 1-1.5 gr.</li> </ul>
<b>L-Arginine</b>  Note: is conditionally/essential for adults	<ul style="list-style-type: none"> <li>• boosts very significantly immunity!(promotes production of more and more active and effective lymphocytes which are crucial for immunity. And it stimulates the thymus gland and improves secretion of endocrine hormones ergo overall a greater resistance against infections!)</li> <li>• fights infection</li> <li>• is an enhanced wound-healer after injury and improves healing of burns!</li> <li>• has dramatic anti-tumor properties(regresses cancer, slows down it's growth and/or decreases it's</li> </ul>	<ul style="list-style-type: none"> <li>• children should not take supplementary arginine until their long-bone growth is complete(can cause, in large doses, skin and bone disorders)</li> <li>• causes nausea and diarrhea when taken at very high doses(these effects quickly recede when doses are lowered)</li> <li>• prolonged high doses</li> </ul>	<ul style="list-style-type: none"> <li>• max. 1 gr. for non-adults and those with some forms of kidney and liver failure</li> <li>• for burns, infection, injury and male fertility doses are unknown. It is better to be safe and take not more than 1.5 gr. Higher dosages better to be taken no longer than a couple of days</li> <li>• When a dramatically enhanced lymphocyte activity is desired within just 4 days(for example to fight a nasty infection/prevent infection when infection is spreading from one person to another) then take a</li> </ul>

incidence)  
• inhibitor of loss of muscle tissue after injury or surgery  
• has a detoxifying property(detoxifies some harmful substances(like ammonia) as a liver-detoxifying agent)  
• enhances male fertility(enough to result in pregnancies)

might pose some peril to those with some forms of kidney and liver failure(only to be used under knowledgeable supervision)

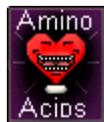
high doses(10-30 gr.) for a max. of one week!(better NOT for people with a liver disorder)

Take on an empty stomach. Do not take combined with other amino acids at the same time. Arginine can be combined though with lysine(see lysine) at the same time

Offered by [Michel](#).



# Troubled Times



## Non-Essential

Below I have translated important information taken from *The Doctors Vitamin and Mineral Encyclopedia*, about those amino acids which are non-essential but often beneficial.

<b>Non-essential amino acids</b>			
<b>Amino acid</b>	<b>Effect(s)</b>		<b>Intake p/day</b>
	<b>positive</b>	<b>negative</b>	
<b>L-Aspartic acid</b>	<ul style="list-style-type: none"> <li>• might help overcome the rigors of opiate withdrawal</li> <li>• fights fatigue</li> </ul>	<ul style="list-style-type: none"> <li>• no significant side effects</li> </ul>	<ul style="list-style-type: none"> <li>• max. 1.5 gr</li> </ul>
<b>L-Cysteine</b>	<ul style="list-style-type: none"> <li>• might increase 'survival' time (in that it extends lifespan, protects against degenerative diseases linked to aging- cysteine is an established anti-oxidant)</li> <li>• protects against certain toxins and pollutants (acetaldehyde, aldehydes, sigarrette smoke, carcinogens, etc.) when combined with vit. C and B1</li> </ul>	<ul style="list-style-type: none"> <li>• can cause kidney stones(see intake p/day)</li> <li>• can interfere with insulin, so not to be taken by diabetics!</li> <li>• those suffering from Chinese restaurant syndrome should not take cysteine (it can increase the toxicity of monosodium glutamate. Symptoms are: headache, burning sensations, sometimes dizziness and disorientation following the digestion of monosodium-glutamate-laced foods)</li> </ul>	<ul style="list-style-type: none"> <li>• take up to 1.5 gr. (or up to 2 gr. for a couple of days)</li> <li>• take with vit. C (two to three times the amount of cysteine) as a precaution against kidney-stone and bladder-stone formation</li> </ul>
<b>L-Tyrosine</b>	<ul style="list-style-type: none"> <li>• mental</li> </ul>	<ul style="list-style-type: none"> <li>• in some it may</li> </ul>	<ul style="list-style-type: none"> <li>• for PMS take</li> </ul>

energizer and stress reliever (more alert, more efficient, less anxious, fewer discomfort at ascending altitude, less muscle soreness, less headaches and more resistance to cold)

- effective anti-depressant
- may help relieve symptoms of PMS (premenstrual syndrome)
- addictive-drug detoxifier

elevate blood pressure, people with high blood pressure should not take tyrosine!

- elevates blood pressure dangerously when combined with anti-depressants containing monoamine oxidase inhibitors
- migraine sufferers might find this amino acid to increase the incidents of migraine headaches

500 mg. before each of the three meals. (try 1 gr. if 500 mg. is not effective)

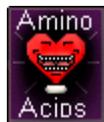
- to counteract stress(better take before stressful situations will be encountered) take 1.5 gr.
- for depression take 1.5 mg. up to 12 gr.(12 gr. for a week or two)

Do not combine with other amino acids. Take with a max. of 50 mg. of vit. B6. Take on an empty stomach!

Offered by [Michel](#).



# Troubled Times



## Non-Protein

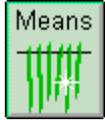
Below I have translated important information taken from *The Doctors Vitamin and Mineral Encyclopedia*, about those amino acids which are not involved in protein synthesis but are nonetheless beneficial.

<b>Non-essential amino acids, not involved in protein synthesis</b>			
<b>Amino acid (not involved in protein synthesis)</b>	<b>Effect(s)</b>		<b>Intake p/day</b>
	<b>positive</b>	<b>negative</b>	
<b>L-Ornithine</b>	<ul style="list-style-type: none"> <li>• detoxifies(see arginine)</li> <li>• stimulates GH release(enhances wound healing, arginine too)</li> <li>• enhances immunity</li> <li>• liver-regenerator</li> </ul>	<ul style="list-style-type: none"> <li>• no significant side effects</li> </ul>	<ul style="list-style-type: none"> <li>• take up to 1.5 gr.</li> </ul>

Offered by [Michel](#).



# Troubled Times



## Vacuum Sealing

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Instead of fumigating flour and grains (too much fuss), purchase a vacuum packer (about \$199.00-makes a great X-mas gift) and vacuum pack up flour and grains as you purchase them on sale. Toss them into one of those **Rough Neck** style 30+ gallon containers or a plastic garbage pail and before long you are preparing. The **Rough Neck** can also be used for hydroponics growing later on. When the containers are full, label and seal with duct tape.

We use it to pack food when we go camping. All food is prepared ahead of time and put in the bags. They can then be frozen if you want, or refrigerated if needed. We never have anything but our empty baggies to pack back out, no cans, no boxes, etc. The bags are reusable. I have also stored antique clothing and material in the bags, anything that you don't want getting soiled or wet. Old knives or metal items do not rust as there is no air in the bag.

A vacuum pack is similar to the seal-a-meal device. You have a roll consisting of pieces of two-sided plastic, 2 sizes, 8" wide or 11" wide. Roll out the amount you want, any length, cut off and seal one end on the heated clamp on the device. Place anything, (dry or liquid, towels, batteries, anything that will fit that you can imagine) into the bag, put the open end of the bag onto the device, clamp down and it sucks all the air out of the bag and seals it. It's so simple to use. I know you can get this from **Cabella's** at **1-800-237-4444** (you can get a catalog mailed to you at this number too) and I think **Sears** and **Wards** still carry it. It's called a "**FoodSaver**<sup>TM</sup> vacuum packing system".

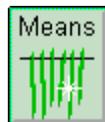
Offered by [Mary](#).

FoodSaver also has vacuum sealers and supplies. The last bags I bought at K-mart were **FoodSaver** bags and not **Seal-a-Meal** bags. I think they are better bags anyway.

Offered by [Clipper](#).



# Troubled Times



## Nitrogen

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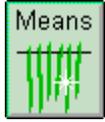
A **Mormon** website talked about wheat packed in nitrogen but the site didn't talk about how to get it. I know a person who is Mormon and works for the warehouse system they have based in Salt Lake. I asked him about it and he referred me to the local "cannery" as their called. I was also told that while some would say that wheat packed in nitrogen has an infinite shelf life, he wouldn't trust it more than 3 years.

The most important thing for me was that these "canneries" which are in most major cities, have bulk supplies at very reasonable prices for those who are stocking up regardless of faith. Therefore, you don't need to be Mormon to purchase from them. In addition, 80% of what they can, they grow, so you know where it came from. To get the location nearest you, look up the **Mormon's** under churches in your yellow pages and start calling.

Offered by [John](#).



# Troubled Times



## Dehydrating

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Here is some dehydrating links from the Noahs ark page.

<http://muextension.missouri.edu/xplor/hesguide/foodnut/gh1562.htm>

I have worked up a pattern for a solar screen type dehydrator that is completely enclose that can be hung on some kind of a hook out in the sun. If anyone wants a drawn pic and instructions, let me know. I saw these for sale for quite a lot on a web site and decided to make my own. To make your own costs under \$10.

Offered by [Cynthia](#).

Where do we get the sun from? Consider using waste heat from lights, refrigerator, and cooking.

Offered by [Mike](#).

Excellent point, Mike. This simple food dehydrator could be used before the pole shift to prepare food, and after in low light conditions using the residual light you mention.

Offered by [Brent](#).

