

We've been asked to share a bit with you about our experiences with raising animals for food and with building and using a modified walipini for year round vegetable production in an adverse climate.

But first, a bit about our goals.



**GOALS**

- 1) Reduce & eventually eliminate reliance on stores
- 2) Improve health
- 3) Share knowledge gained with others
- 4) Income source

- 1) Reduce and eventually eliminate reliance on stores for 4 reasons:
  - a) Food is expensive – it's a major part of our budget, which we want to reduce
  - b) Food in the store is stale, there is simply no way to buy anything in the store that compares in freshness with food produced on your own land and harvested within minutes before use
  - c) The food supply in the store is interruptible, for many reasons
  - d) Most food from the store has chemicals in it that we don't want in our diet
- 2) Improved health – this goes back to both the issues of freshness and chemicals. The

fresher the food is, the more nutrients it has

- 3) We want to be able to share the knowledge we have with others so they too can enjoy healthier foods and greater self reliance
- 4) We hope to eventually have some additional income from our activities

Now, a bit about my background

# BACKGROUND

My parents raised commercial beef cattle, chickens for eggs & occasional meat, and had a very large garden in southern Michigan. This gave me a pretty good foundation for my desires for food independence. The down side to this experience was that my allergies to the chickens were so bad that I could not help out with them in any way – but more on that later.

My parents raised commercial cattle, chickens for eggs & meat, and had a very large garden in the Midwest. I grew most of the food for a family of 6 on ¼ acre with a house in the middle of the Salt Lake valley for over 15 years. Now living at a much higher altitude with less water, more land, lots more cold, and a much shorter growing season!

As a mother, I grew most of the food for a family of 6 on just under ¼ acre with a house in the middle of it in the Salt Lake valley for over 15 years.

My husband and I are now living at a much higher altitude with significantly less water, more land, and lots more cold resulting in a much shorter growing season!

Our freeze-free period averages only 4-5 weeks while sub-zero (Fahrenheit) temperatures can hit in early September and continue through early June. This has resulted in a steep learning curve, pretty much starting from scratch when it comes to gardening.

Our first summer here the extent of my harvest was a bit of lettuce and a few strawberries. Additionally, I've learned quite a bit about keeping chickens in a way that doesn't particularly impact my allergies and asthma so we've had a steady supply of all of the eggs we need with usually having extras for sale.

We also have raised our own beef the last year and a half and are anticipating adding sheep within the next couple of months.

## REDUCE EXPENSES by RAISING:

- Protein
- Fresh Vegetables
- Fresh Fruit
- Grains & other starches

Our goal of reducing expenses for food has 4 general areas, protein, fruits, vegetables, and grains and other starches. We'll first discuss providing protein.

A few of our backyard meat kits in a grow-out cage



My first experience as an adult with providing protein for my family came with raising rabbits. Most municipalities will allow you to breed rabbits on your property so long as they do not create a nuisance by attracting flies. That means you do have to keep cages and the trays under the cages clean or they will breed flies.

# Rabbit Pros & Cons

- Quiet
- Good quality protein
- Moderately expensive per pound of meat
- Easy for children to help with care
- Fur/hide can be sold or used
- Manure is excellent fertilizer
- Cute, cuddly, easy to get emotionally attached
- Easily frightened to death
- Very sensitive to human illnesses
- Require safe chewing wood at all times
- Can attract/breed flies
- Extremely low fat

Rabbits are very quiet, however, when they are in mortal danger, they can scream.

Rabbits must ALWAYS have wood to chew on. They are lagomorphs, a group of animals in which the teeth are constantly growing. If they don't have something safe to chew on, their teeth can literally grow to the point that they pierce the roof of the mouth, causing brain infection and death.

They make excellent, high quality protein. I know

this may sound trite, but they really do have a very mild flavor that is nearly identical to chicken. One thing you do have to be careful of though is that they have so little fat that if they are your only protein source, you will need to make sure you have other sources of fat in your diet. Having basic food storage, and using it along with the rabbits, would be all of the addition you need.

Rabbits are very easy to care for. A typical day's care in the warmer months means making sure they have plenty of water at least twice a day and making sure they have food. Filling a feeder will usually keep them going for several days, however, just like humans, some of them can have a tendency to overeat. Observation will tell you if a particular rabbit is eating too much or not getting enough. Most of the rabbits I've had in the 20+ years I've raised them did just fine with a full feeder, but there have been a couple that would pork out and get seriously overweight. They got their food rationed every day rather than having a constantly full feeder.

Another thing to be careful of in hot weather is that rabbits can become overheated and get very sick or even die. I've used a couple of methods to keep them cool with pretty good success. One is to attach an old sheet above their cages and let it hang down in front of the cages, spraying it with a hose periodically to keep it damp so they have the effect of a swamp cooler. This only works in areas with low humidity! The second method is to use ice. Fill plastic soda bottles  $\frac{3}{4}$  full with water, then freeze solid. Put the frozen bottle in the cage with the rabbit. They can choose how close to lay to it to maintain the temperature they need. Along with the soda ice bottles, fill their water bottles about  $\frac{1}{2}$ - $\frac{3}{4}$  full of water and freeze. Just before taking them out, fill the rest of the way with tap water.

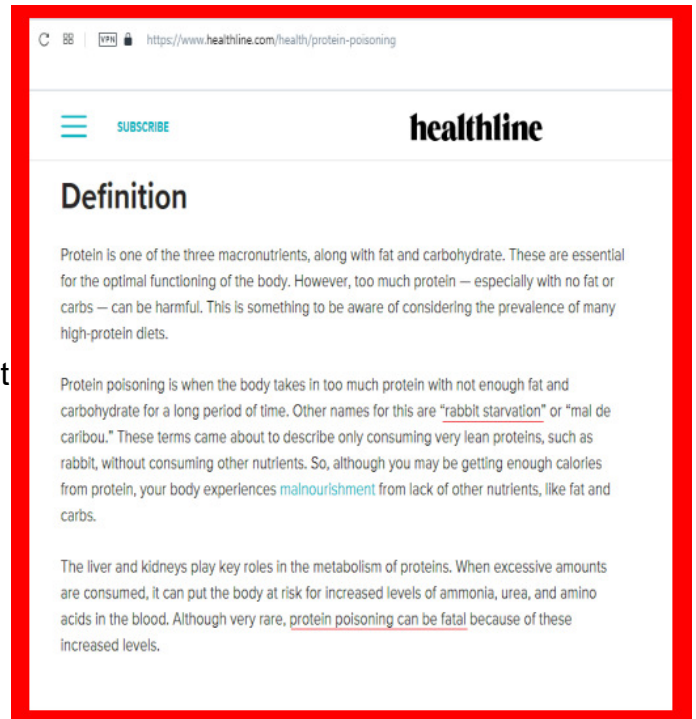
When temperatures are below freezing, care gets a bit more complicated. The metal tube they drink from will freeze long before the water in the bottle freezes. This means you have to actually make sure that liquid water is coming out. Depending on how cold it is, I may give them fresh warm water 3-4 times a day in the winter. Also in cold weather, I will often provide them with hay inside a box they can comfortably fit in for some additional shelter from harsh winds, precipitation and cold. If you do give them hay, you will need to watch their ears for the presence of mites and treat them quickly if you find any sign of them.

Occasional tasks, at least once a week, will need to include cleaning trays of manure, clipping nails and possibly teeth if they begin to overgrow. If you have long fair rabbits such as angoras, they will need to be brushed daily and they do not do well with hay in their cages.

I mentioned previously that rabbit meat is exceptionally low fat. The lack of fat can cause a condition known as "rabbit starvation" where you can literally starve to death with a belly full of food, after developing other serious health issues from the lack of fat and the lack of ability to absorb and transport fat soluble nutrients. This condition is very rare in modern society, but it can and does occur more frequently in difficult circumstances where food is hard to come by and very limited.

This slide is a screen shot of one of many legitimate resources where you can learn about rabbit starvation. I provide this slide because I've been laughed at too many times over the years when I've brought up the subject of rabbit starvation.

It's really very easy to prevent. Just make sure you are consuming other sources of fat and carbohydrates. I know those are considered to be bad in our society, but they really are essential. Just add some bread and butter, or some eggs, or stir-fried veggies using a bit of oil, or fry the rabbit, add cheese... You get the idea.



## Super Dude/Souper Dude



Now let's move on to the subject of chickens. This is a picture of one of our beautiful, but mean, Buff Brahma roosters. He earned the name of "Super Dude" because of his protectiveness of the hens, however, that protectiveness, i.e. aggressiveness, resulted in his being renamed "Souper Dude" when he found his way into the soup pot after drawing blood a number of times from the backs of my legs and others who would occasionally either help out or just want to see the chickens and coops.

Buff Brahma hens make very good mamas, and they are fair egg layers, but the roosters can be very aggressive. They are a breed that is one of the heavier "dual purpose" breeds, meaning they are good for both meat and eggs, at least according to the various hatcheries. My own experience is that they are only fair egg producers, but good meat producers.

There are 3 main classifications of chickens:

- 1 – Egg layers, i.e. production breeds
- 2 – Meat breeds
- 3 – Dual purpose breeds

For our homestead, I have gotten mostly dual purpose breeds, the only exceptions being Cornish X raised specifically for the freezer and Dark Cornish to be able to raise meat chicks without having to purchase them.

The advantage to the Cornish X is that they grow so much faster than any other breed! On the other hand, at this altitude, by 8 weeks they were starting to die because their hearts couldn't keep up, so I had to butcher them in one big batch rather than being able to drag it out over several weeks like I had planned. Even at 8 weeks though they were significantly larger than the Cornish game hens you can buy in the grocery store, and at about 2/3 the cost of the Cornish game hens in the store.

## Types of Chickens

Three main chicken classifications:

- 1) Egg layers, i.e. production class
- 2) Meat breeds
- 3) Dual purpose

Including buying chicks and feed, but not including the brooding equipment or coop, our cost for the Cornish X birds ended up at about \$3.25 each. Their feed is a bit more expensive than regular chick feed so the cost of raising fryers of other breeds, or the Dark Cornish, comes out to about 75 cents a pound.

I mentioned earlier that my allergies had kept from being able to help with chickens at all on my parents' farm. I would get severe asthma attacks from going in the coop for more than a minute or two. I attribute that to very poor air circulation since that coop was in one corner of the barn with a small, chicken-size door out to the covered run and a man door into the barn. There were no windows, and the door inside the barn was kept closed unless someone was walking through it.

The coops we have built have much better air circulation and the only time I have problems with asthma is when cleaning them. I do wear an N-95 particulate mask for that job, and have found that if I only do part of a coop a day, when it's not windy, I can keep the chickens healthy and me asthma free.

## One of Our Coops



You can sort of see from this picture that there are two closeable windows on each side which allows me to easily regulate the amount of air flow according to temperature and weather. There is also a small chicken-size door that allows the birds easy access in and out without freezing the coop in cold weather.

The floor is dirt covered with hay. I tried both straw and hay when I first started keeping chickens because there are quite a few proponents of each. My experience was that the straw didn't do as good a job of stopping odor build-up as the hay. I also had problems with it getting moldy around their waterers.

I've been asked how deep I keep the hay. I started out with the hay about 4" deep, but found that the chickens like to dig down through it to the dirt below so now I keep it simple by just removing about 1/4 of the floor "stuff" every 6 weeks, then throwing in a flake or two of fresh hay off of a bale every couple of weeks. That lets the chickens "rearrange the furniture" as I call it, to their hearts' content and I don't worry about trying to keep it at any certain depth.

I've also been asked a couple of questions about roosters, specifically, how many hens I keep per rooster and "what about aggressive roosters that take the feathers off of the hens and even leave them a bit bloody?".

The first question regarding how many hens per rooster is the easier question to handle. My chickens seem to be happiest when there are 8-10 hens per rooster. When there are only 4-5 hens per rooster, the hens soon get bare-back from the roosters mounting them too much and wearing out their feathers. However, there can be another couple of causes to feather loss.

A fairly common cause of feather loss, even when there are no roosters in the mix, can be mites. These are tiny insects that feed near the base of the feathers and cause intense itching. Dust bathing in the dirt or a prepared sandbox with some diatomaceous earth can help reduce this nuisance. If a hen has a really bad case of mites, her own scratching and picking at her feathers can cause bloody areas. If there is a significant mite infestation, you'll need to completely clean out the coop and

nest boxes, scrub with disinfectant while the chickens are kept away for a few hours, then dust the whole coop & nest boxes with either a miticide or diatomaceous earth, then put in new bedding and new nest box lining if you use it.

Another cause of feather loss that thankfully is pretty rare is cannibalism. So far, knock on my wooden head, I've only had one cannibalistic hen – not rooster. I tried several ways of keeping her apart from the flock for long periods of time but each time she was re-introduced to the flock, the cannibalism returned so she finally ended up in the soup pot.

Roosters can become aggressive, which generally means they are protective of the flock from outsiders – even the regular caregivers of the flock. These aggressive roosters will fly at anyone or anything they view as a threat and attack with their spurs, which can definitely draw blood and leave you with a nasty hole in your leg, or where ever they attack. Different breeds have different tendencies to aggressiveness. I have Black Australorps, Rhode Island Reds, Dominiquers, Easter Eggers, Buff Brahma, and Dark Cornish roosters. The Buff Brahma roosters are the only ones that have caused me any trouble with aggressiveness.

One final consideration if you are having issues with featherless or bloody chickens is that they may not have enough space. I've read books that claim you only need 4 square feet of space per hen. I suppose that if they are in individual cages, that may be the case, but from my experience, if they are not able to get outside every day, they really need more like 10 square feet per bird to avoid aggressiveness and potentially pecking of the weaker members of the flock to death. My coops provide 7-8 square feet per bird in addition to nest boxes and roosting bars. I've noticed that if we have several consecutive bad weather days when they can't really go outside, one or two of the hens will begin to show signs of stress and even areas where they've been pecked.

Another question regards nest boxes. I've used everything from 5-gallon buckets set into a frame made of 2x4's to keep them from rolling around and keeps eggs from rolling out (and had a broody hatch a clutch in one of them) to wooden boxes mounted to the wall and filled with hay or mats to these metal roll out nest boxes you see below. The roll out boxes have significantly reduced problems with



broken eggs and eggs being eaten by the hens. I frequently find 6-8 eggs in one compartment with no breakage. Both are still occasional problems, but not daily or even weekly. I maybe lose one egg to every 40 dozen collected, which is a huge improvement. The eggs also come out MUCH cleaner with the roll away nest boxes, at least most of the time. The bottom trays slide out easily for dumping poo or hosing clean if needed. Being metal and plastic, there is essentially no place for mites to hide and multiply, which is another plus, although I've not yet had any problems with mites, thankfully, and knocking again on my wonderful wooden head. I did find a picture someone posted of a homemade roll out nest box if anyone wants to try that, but it will hide mites and it looks like it would be harder to clean. Like it or not, the hens will poo in the nest boxes and you will have to clean it up so keep that in mind when you select or build your nest boxes.

# Chicken Pros & Cons

- Eggs are excellent quality low cost protein
- Cost of eggs may be less than, equal to, or a bit more than store depending on feed, season...
- Meat is excellent quality protein
- Cost of meat is about the same or slightly more than store if buy chicks & feed, less if raise from own eggs
- Not legal in all areas
- Can be noisy, especially roosters!
- Do not lay eggs year round
- Predators include cats, dogs, birds, snakes, skunks, foxes, coyotes...
- Cornish X are fast growing meat birds, but at this altitude, they have to be butchered earlier than I anticipated.

Chicken meat, as most people know, is excellent quality protein, having as nearly perfect a balance of essential amino acids as can be found in any meat. In fact, the only thing with a better amino acid profile is quinoa, but it's significantly more expensive per pound, and much harder to grow.

A lot of people think having your own chickens means "free" eggs. That can be the case, but usually it is far from accurate. First, there is the cost of chicks. Then the cost of all of the supplies you'll need to brood those chicks until they reach maturity and begin laying eggs,

usually around 16-20 weeks of age.

You'll need a coop, or other safe place for them to sleep, and to get out of bad weather.

If you allow them to free-range and forage for seeds and insects (and the occasional mouse for some breeds), they'll still do a better job of laying eggs if you at least provide them with some feed and scraps from your kitchen.

If you live in a place that gets snow during the winter, you'll need to feed them all, or nearly all of their required food through the winter, i.e. mixed grains of some kind. Foraging only really works in the snow-free months.

You also have to take into account molting and low light conditions in winter.

Molting is an annual process when the hens lose most of their feathers and then grow new ones. It usually doesn't start until they're around 2 years old, which is one of the reasons commercial operations get rid of their hens when they're 2 years old. This process takes pretty much all of the nutrition the hen can take in so they stop laying eggs while they are molting, roughly 3 months. Mine start molting in the fall, usually September or October.

The lower light levels in winter also significantly reduce egg production – unless you add electric lights to keep the light near 10 hours/day.

Personally, I think hens and their eggs are probably healthier if they are allowed to take a bit of a vacation during the low light months.

I still get some eggs every week during the winter low light and molt, but not nearly as many as once the hours of daylight begin to increase. For example, I have 60 hens. During the summer, I get 4-5 dozen eggs/day. During the winter, that drops to about 2 dozen/week. Now that winter solstice is past and molt is finished for most of the hens, production is increasing again and we're getting 12-18 eggs/day. Still not summer levels, but enough to be selling a few or giving to friends.

You'll also need to decide whether to turn your hens into stew or just put up with the lower, and ever decreasing, laying rates when they're 2-3 years old. As I mentioned earlier, commercial egg enterprises usually butcher their hens once they start to slow down. If you have a rooster, and get one or more breeds that go broody, you may be able to keep yourself supplied with young hens, otherwise, you'll need to figure in the replacement costs every couple of years to keep your egg numbers where you want them.

This is a screen shot of my spreadsheet calculations for how much the feed costs per dozen eggs if feeding commercial feed year round.

## Calculating Feed Cost/Doz Eggs

Bag cost of feed	Lb cost of feed	cost/hen /year	avg cost/dozen eggs @ 250/yr	avg cost/doz eggs @ 225/yr	avg cost/doz eggs @ 200/yr
\$11.75	\$0.24	\$19.74	\$0.95	\$1.05	\$1.18
\$12.00	\$0.24	\$20.16	\$0.97	\$1.08	\$1.21
\$12.25	\$0.25	\$20.58	\$0.99	\$1.10	\$1.23
\$12.50	\$0.25	\$21.00	\$1.01	\$1.12	\$1.26
\$12.75	\$0.26	\$21.42	\$1.03	\$1.14	\$1.29
\$13.00	\$0.26	\$21.84	\$1.05	\$1.16	\$1.31
\$13.25	\$0.27	\$22.26	\$1.07	\$1.19	\$1.34
\$13.50	\$0.27	\$22.68	\$1.09	\$1.21	\$1.36
\$13.75	\$0.28	\$23.10	\$1.11	\$1.23	\$1.39
\$14.00	\$0.28	\$23.52	\$1.13	\$1.25	\$1.41
\$14.25	\$0.29	\$23.94	\$1.15	\$1.28	\$1.44
\$14.50	\$0.29	\$24.36	\$1.17	\$1.30	\$1.46
\$14.75	\$0.30	\$24.78	\$1.19	\$1.32	\$1.49
\$15.00	\$0.30	\$25.20	\$1.21	\$1.34	\$1.51
\$15.25	\$0.31	\$25.62	\$1.23	\$1.37	\$1.54
\$15.50	\$0.31	\$26.04	\$1.25	\$1.39	\$1.56

Yes, you can often buy feed direct from a milling company and potentially save some money, but, if you do that, don't forget to figure in your costs for travel to and from the mill, containers for the feed, and your time to do that. You might also want to try mill feed for a couple of months and track production, and try commercial feed for a couple of months, tracking production, and see if the feed makes a difference. When I tried mill feed, production dropped by nearly 25%. The apparent cost difference was \$3 savings per 50 lbs, but by the time I added in my fuel cost to make the trip there and back (over 260 miles), to say nothing of my time, the savings dwindled to about 60 cents per pound. For me, that combined with nearly 5 hours to make the trip, and the drop in production, made it not worth the up front savings.

Yes, allowing the hens to forage reduces the cost of the feed, but remember, this is only the feed and does not include any of the other costs previously mentioned – chicks, brooder, heat lamps for brooder, electricity, and coop, much less fence to keep them safe from neighbor dogs, etc.

Feed currently costs me about \$14/50 lbs and an average hen will consume about 84 lbs of feed/year; less with free ranging in suitable weather.

## Chicken Pros & Cons (cont.)

- Eat lots of insects
- Some breeds catch & eat mice
- Large breeds can destroy gardens
- Need more space than rabbits
- Chicken feed attracts mice; mice attract snakes

If you allow your chickens to free-range, they will do an excellent job of reducing the population of crickets, grasshoppers, and flies. Two years ago, my neighbors were all complaining about the huge numbers of grasshoppers. I had very few. Most of the neighbors have now gotten a few chickens to help with their grasshopper challenge. You know, seeing is believing.

On the other hand, you do need to be careful about allowing them access to your garden areas. Small breeds, like the Bantam varieties, and small numbers of chickens can help a garden, but be very careful!

My mother always allowed her Bantams to free-range in the garden. They did good work keeping the bugs out and didn't do too much damage to the garden, but large breeds or large numbers of birds can quickly lay waste to a garden, both through eating the foliage and digging.

Chicken feed attracts mice. No way around it. Even if you keep the feed in metal cans and suspend the feeders above the floor, the chickens are just simply sloppy eaters and they will spread the feed around the floor of the coop.

Sadly, mice attract snakes. So, if you have chickens, you'll want to be on your guard for both mice and snakes.

Another thing to watch for if your flock free-ranges is aerial predators. These are mostly a problem during the day since chickens will generally very happily go into their coops when the sun begins to



dip low on the horizon.

My dogs and cat know better than to mess with my chickens. Neighborhood dogs are another matter entirely.

I haven't had any trouble thus far with coyote or fox predation, but others nearby have trouble with the foxes, even during the day. I think multiple fences help protect my flocks on that score. We have a perimeter fence around our property and each coop is inside a fenced paddock area that gets closed off at night, again keeping predators from being able to get close enough to really figure out where the chickens are roosting. At least, that's my theory at this point in time. The outdoor dogs probably help keep the coyotes away and the chickens aren't close enough to the perimeter fence in large enough numbers to attract the coyotes.

And lest you think I'm exaggerating when I say some breeds of chickens catch and eat mice, here is one of my Rhode Island Reds who just caught and killed a mouse that was under the back porch steps. I've also seen the Black Australorps catch mice and chipmunks, but haven't been able to get pictures of them further out in the yard.

Blue Ribbon Mouser on Our Back Patio



## Cattle – If you have space



Cattle take a lot of space and feed, but, if you have the inclination, miniature breeds might be a workable option. They require about 1/3 of the space/feed/water of full size cattle but still give you about half of the meat of a full size steer. They can be kept on roughly 1/4 acre of land per head.

However, I have learned the hard way that if you buy mini calves that are crossed with full size on one side, you may very well end up with a full size 2 yr old at butchering time! If you want the feed, space, and water reduction of a mini steer or cow, buy one that is full mini!

I do not have any female cattle for breeding or milk. Even the miniature breeds give far more milk than the two of can use, and they are a very significant time commitment, needing to be milked twice a day at the same time every day. I understand though that some people have been able to successfully go to once a day milking by keeping the cow and calf together for about 12 hours/day.

My reading tells me that miniature milking cattle of the Jersey and Holstein breeds generally produce 2-4 gallons of milk per day. That's probably perfect for most families with several children, but for an older couple with no desire to get into commercial cheese making or a dairy business, that's way more than we can use.

The question often comes up as to the sizing of the miniature cattle, so, here's a good reference:



As to weight, adult miniature cattle seem to range from about 400-800 lbs.

As with the chickens and eggs, whether or not steers or milk cows will save you money over buying meat or milk/cheese/butter in the store is highly dependent upon the cost of the calves, cost of the shelter and appropriate fencing (although they should be reusable for many years) and the cost of your feed, as well as the cost of butchering steers or the equipment you will use for milking/sterilization/etc for processing and storing milk.

Our overall cost for beef is running about \$4.50/lb. Steaks and roasts cost the same as hamburger and stew meat; that's big savings on steak, not so much on hamburger, but the quality and flavor is far better than what we were getting from the store. Our cattle are fed almost entirely on hay that I have to purchase since I don't have enough water to grow much pasture for them, which obviously pushes our cost per pound up – a lot!

I plan to add sheep to our protein mix in a couple of months, but don't currently have any. I bought a lamb ready to butcher from some neighbors in September. Including the butchering cost, that cost us a whopping \$3.34/lb.

The breed I plan to get is reported to be able to do very well on browse – that's the shrubby stuff like sagebrush which abounds in our area and doesn't require watering by me in order to grow. My hope is that this will drop my cost for the lamb meat to around \$2/lb, or maybe less. We shall see.

In the final analysis, **MY** costs for protein production have been roughly as follows, keeping in mind this does not include the cost of land, water, fences, buildings, cages, or other infrastructure, or transportation of animals.

This is the cost of purchasing the animals, feed, and butchering. I figure the cost of rabbits is zero since they are very easy to breed yourself once you get a pair.

Rabbits and chickens are pretty easy to butcher, and I think I'll be able to handle sheep in the future, but cattle – NO WAY! That requires a lot more equipment than I have or want to invest in, and a much stronger back than I have.

Eggs – about \$1.20/dozen

Rabbit – about \$1.50/lb with me butchering

Chicken/Cornish game hen – about \$2.17-\$3.00/lb with me butchering (Cornish X are ready faster so less feed expense than fryers)

Lamb – about \$3.34/lb with a commercial butcher

Beef – about \$4.50/lb with a commercial butcher

Keep in mind, these prices have been MY past experience and prices of starter animals as well as feed can fluctuate wildly.

Moving on from protein to fruit and vegetable production.

One of the first things you should do when beginning a garden, of any sort, is to check on your USDA Hardiness zone. This information can be found online at <https://planthardiness.ars.usda.gov/PHZMWeb/> where you can then search by state or zip code.

This map will tell you how cold to expect temperatures, but it doesn't convey the length of the growing season.

<https://planthardiness.ars.usda.gov/PHZMWeb/>

USDA Agricultural Research Service  
United States Department of Agriculture

Mapping by PRISM Climate Group - Oregon State University

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Find Your Plant Hardiness Zone  
Enter ZIP Code:  Find

View Your State Map  
For a static map of your state, click on the map below or

**USDA Plant Hardiness Zone Map**

The 2012 USDA Plant Hardiness Zone Map is the standard by which gardeners and growers can determine which plants are most likely to thrive at a location. The map is based on the average annual minimum winter temperature, divided into 10-degree F zones.

For the first time, the map is available as an interactive GIS-based map, for which a broadband Internet connection is recommended, and as static images for those with slower Internet access. Users may also simply type in a ZIP Code and find the hardiness zone for that area.

No posters of the USDA Plant Hardiness Zone Map have been printed. But state, regional, and national images of the map can be downloaded and printed in a variety of sizes and resolutions.

**USDA Plant Hardiness Zone Map**

Temp (F)	Zone	Temp (C)
-40 to -55	1a	-51.1 to -48.3
-35 to -50	1b	-48.3 to -45.6
-30 to -45	2a	-45.6 to -42.9
-25 to -40	2b	-42.9 to -40.2
-20 to -35	3a	-39.4 to -36.7
-15 to -30	3b	-36.7 to -34.0
-10 to -25	4a	-34.0 to -31.3
-5 to -20	4b	-31.3 to -28.6
0 to -15	5a	-28.6 to -25.9
5 to -10	5b	-25.9 to -23.2
10 to -5	6a	-23.2 to -20.6
15 to 0	6b	-20.6 to -17.9
20 to 5	7a	-17.9 to -15.2
25 to 10	7b	-15.2 to -12.5
30 to 15	8a	-12.5 to -9.8
35 to 20	8b	-9.8 to -7.1
40 to 25	9a	-7.1 to -4.4
45 to 30	9b	-4.4 to -1.7
50 to 35	10a	-1.7 to 1.0
55 to 40	10b	1.0 to 3.7
60 to 45	11a	3.7 to 6.4
65 to 50	11b	6.4 to 9.1
70 to 55	12a	9.1 to 11.8
75 to 60	12b	11.8 to 14.5
80 to 65	13a	14.5 to 17.2
85 to 70	13b	17.2 to 19.9

I've lived and gardened in an area, zone 5, that actually shows as being colder than where I currently am, but has a longer growing season and a lot more water available than I have here. Where I'm at now is also zone 5, but about 10 degrees warmer, and very water restrictive. At least, that's the figure for my zip code, but I'm at a higher elevation and with a lot more wind exposure than the main part of my zip code, and generally run about 7-10 degrees colder at night than the town down lower in the valley.

Wind dehydrates plants and can damage or destroy plastic tunnels, both of which can have a deleterious effect on your garden and trees.

Up here, we regularly (several days/week) have sustained winds in the 20-30 mph range and gusts of 35-40 mph, while sustained wind speeds of 40 mph or more seem to hit about once a month with gusts in the 50-60 mph range. The highest gust speed I've recorded in the two years I've been here was 66 mph. Sheet plastic on low tunnels just doesn't stand a chance under those conditions, so I've had to find alternatives. More on that later.

## Fruits



In the Salt Lake valley, zone 7, I was able to consistently get excellent crops of peaches, pears, plums, mulberries, grapes, and strawberries, as well as some cherries.

This area is proving to be significantly more challenging. For two years in a row (as long as we've had the opportunity) I've gotten only a handful of small strawberries, even with mulching over the winter and plenty of water. I've planted several varieties of cherries, apples, peaches, apricots, elderberries, mulberries, and plums, but so far, although

most of them are hanging on to life, they have significant freeze damage to large areas of trees and certainly are not thriving as I had hoped. Others, including all 4 of the grapes I planted, have succumbed to the numerous sub-zero winter nights and very short growing season. Yes, I do intend to try again on all of the ones that have frozen out.

We obviously have a long way to go in this area, but, we're working on it.

Grains have been a new area of endeavor for me, and a mixed bag.

Our first summer here, I planted winter wheat and winter rye. Both did well without irrigation and gave me an excellent harvest compared to the amount I had planted.

Last summer, was what I call "tuition". I planted two, much larger areas of winter wheat only to have all that I planted wash away in a torrential downpour the next day. We got almost 1.25" of rain in 17 minutes. Everything except the house

and sagebrush was under water. Sadly, I didn't realize that it washed all of my wheat seeds away, so I didn't re-plant. By the time I figured it out, it was too late to re-plant. I'll be trying again this spring and summer, although I suspect that our season isn't long enough for the spring wheat to grow, still, as warm as this winter is predicted to be, it might work so I'll be giving it a try.

Potatoes are something I grew successfully in my backyard in the Salt Lake valley, and indoors in buckets (in small quantity) in other areas I've lived.

Our first summer here, I planted two varieties of potatoes. They came up, but didn't get enough freeze-free time to bloom and give me more potatoes. Last summer, I again planted two varieties of potatoes as well as two varieties of sweet potatoes with the same success. Zero.

I also did a couple of buckets of potatoes, setting them outside in the day and bringing them in at night. When the modified walipini was finished, I moved the buckets into it and got a few potatoes.

## Grains & Other Starches



More are being started this week in buckets in the house and will be moved to the walipini in about a month.

## Vegetables



That brings me to vegetables, and one of the things I was specifically asked to share with you – my modified walipini.

In the Salt Lake valley, I grew a wide variety of vegetables: beans, corn, peas, tomatoes, eggplant, spinach, carrots, Swiss chard, sunflowers for seed, and more, quite successfully – even with the “help” of a daughter, who shall remain nameless, that would intentionally pull vegetable plants claiming she thought they were weeds so I would let her off the chore of working in the garden.

My first summer gardening here, I planted leaf lettuce, radishes, beans, peas, carrots, broccoli, Swiss chard, kale, and spinach in raised beds with low tunnels of plastic and a layer of agribon directly over the tiny seedlings to protect them from late frosts. I still lost everything, so re-planted – twice. No harvest. Not just a tiny harvest, but zero survivors after the first frost of fall. And these raised beds are in what I had hoped would be a warmer micro-climate on the south side of a light colored building.

That stunning lack of success led to a frantic push to design and build a modified walipini last winter and spring.

## What's a Walipini????

What's a walipini, you ask? Good question!

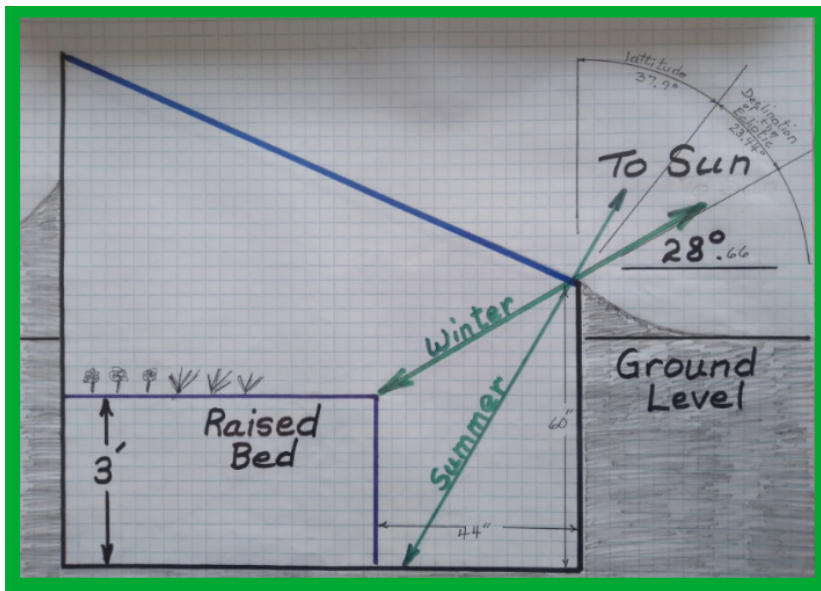
Walipini is an Aymara Indian word (from South America) meaning “place of warmth” because that is exactly what a walipini is, a place of warmth.

In many respects, it's very similar to an earth-sheltered greenhouse. The general exception is that most earth-sheltered greenhouses use a system of underground pipes with air forced through them by fans to help keep the greenhouse cooler in summer and warmer in winter by using the thermal constant of the earth.

The South American walipini simply uses the thermal constant of the earth to keep the greenhouse cooler in summer and warmer in winter without any added energy for elaborate air moving systems.

How much warmer? You ask. In a well constructed walipini, 30-40 degrees warmer at night is not uncommon. Hot summer days may be more of a challenge though, even though the earth helps keep them cooler in summer than a traditional greenhouse. Still, I had to use shade cloth inside mine last summer to keep from cooking my veggies as they were growing.

This is what our walipini looked like last spring when the basic construction was finished. There's still dirt work to be done, and a gutter system to be installed, but at least now you have an idea of what it looks like.



To build a walipini, you first need to know how deep your frost level goes. Your county building inspector should be able to give you that information. The floor of your walipini should be at least 2-3 feet below the frost line, or, you should be able to pile dirt around it to that height and width. This slide shows my husband's calculations regarding where the sun is located on the horizon for the winter solstice. Since that is the day with the very least sunlight, we wanted the maximum possible exposure for plants on that day.

You'll notice that I planned for raised beds inside my modified walipini. There are several reasons for that, although a traditional walipini has the growing area directly on the floor of the walipini.

My reasons for raised beds included:

- 1) a 3' high raised bed is far easier on my aging back, knees, and hips than the ground
- 2) it allows me to sit on a garden stool while working most of the bed area
- 3) It allows the floor to become a cold sink thereby hopefully helping to keep my plants a bit warmer
- 4) it provides good drainage
- 5) it allowed me to build the beds using hugelkulture techniques which provides
  - a. an excellent "worm farm" to keep the soil aerated and fertilized with one of nature's very best fertilizers
  - b. provides long-term nutrients for a garden
  - c. stores water down deep to reduce need for watering and draw plant roots deep into the soil (more about hugelkulture later for those who are unfamiliar with it)
- 6) it provides greater thermal mass inside the walipini to store heat and keep the temperature moderated
- 7) our soil is primarily sand and gravel, especially down that deep, so I needed to create my own garden soil anyway
- 8) raised beds, as you can see, allows me to have a smaller walipini than if I was trying to grow on the floor during the winter

However, building the raised beds also took a lot more time, energy, and materials.

Here are a few pictures of the construction process. Our finished building is 20'x9' with a 3'x5' vestibule to help maintain winter warmth, with 2 doors to keep cold air from blowing directly in and on the plants. Additionally, during the winter, I have an old sleeping bag hung across the door on the inside for some added insulation.

Some construction pictures:

## Framing the walls



## 2x6 Siding



## Ready to backfill 3 sides



Interior and exterior sealed, painted, and 6 mil black plastic stapled on the outside to protect wood from moisture in the soil, now ready to start backfilling dirt in the hole, the roof is corrugated clear plastic roofing panels like you might use on a patio cover. Glass would have been better from a thermal perspective, but it's more expensive and doesn't do as well with hail. In South America, they generally just use clear plastic from rolls with a layer above the rafters and a layer below but I didn't think that would stand up to the snow and wind as well as the corrugated plastic.

## Rock Walls for Dirt Retention

Rock walls built by vestibule door to hold back dirt. Most of the hole now back filled around the main structure but not the vestibule yet.



## Raised Bed Begun



## Hugelkulture Beginning

Beginning the Hugelkulture beds with wood. This would normally be logs or fallen trees, but those are in mighty scarce supply here, as in, there weren't any to be found, so I used scraps of untreated lumber from many previous projects





# Wood Chips



Wood chips now being added to fill in around the lumber scraps

# Soaking the Wood



Slide 30 – Soaking the wood well

# Manure/Hay/Straw Mix



Adding a layer of mixed chicken & steer manure plus old straw and old hay. It will compost, i.e. break down into nutrient rich soil in the beds

# Dirt, Peat, Worms

Slide 32 – The next, and top, layer is a mix of local dirt (mostly sand) from my land, peat moss, and vermiculite. Once I had that in place and well watered, I added both night crawlers for deep work and red worms for the near surface work – about 500 of each to each raised bed



# Transplants



Setting in the transplants Memorial Day weekend. Our last hard freeze (10 degrees) was June 30<sup>th</sup>, a little over a month later.

Slide 34 – 6 weeks and 2 killer frosts later, everything in the modified walipini is growing like crazy. The neighbors have now lost everything they planted, twice.

## 6 Weeks & 2 Killer Frosts Later



# 8 Weeks Squash Supported



8 weeks after planting, nearing the end of July. You can see that I had to put up shade cloth to keep the afternoon temperature below 95. This would have been helped if I had put a couple of windows high on the north side that could have been opened to let some of the heat escape, but, I didn't have enough money to add them. Maybe later. Meanwhile, you can see in this picture, maturing spaghetti squash are being supported by nylon stockings tied to either the cattle panel anchored to the north wall or the tomato cages placed around the transplants to support them and keep them in limited space early on.

What all did I grow last summer/fall?

Sadly, I did not weigh everything, and I had some leafy crop loss to larvae, but, I still harvested a lot of squash – butternut, spaghetti, and zucchini; enough tomatoes for us to eat and dehydrate plus share some with neighbors, green peppers, green beans, spinach, tatsoi, and quinoa in addition to about 15 lbs of bucket potatoes.

My hopes for a winter garden were dashed by too much water contributing to a bacterial wilt infection in the fall.

I will be planting next month to begin my spring garden.

All-in-all, I certainly had far more success with the modified walipini than without, and with no need for added heat.

Are we food independent yet? No, but we're working on it!