

## Mini-Agriculture

Kilifi, Kenya



## Rock Ranch Butte Valley CA



**Mini-Agriculture:  
Organic, No-Till, Permanent Beds**

**Garden**

**Mini-Farm**

**Mini-Ranch**

**Mini-Dairy**

**A proven food production system that is:**

❖ **ecologically sustainable**

- ❖ **environmentally responsible**
- ❖ **socially just**
- ❖ **humanely managed**
- ❖ **economically viable**
- ❖ **Biblically based.**

**The ideas presented in this booklet are very successful in one or more countries.**

**Permanent Beds:**

- I. Water System
- II. Single Dug
- III. Double Dug

- IV. Mulch System
- V. No-Till Garden/Mini-Farm/Ranch/Dairy
- VI. Tools

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### World Hunger

The UN estimates that 800,000,000 people go to bed hungry every night. It is estimated that 200,000 households experience hungry in the USA. It is not because the world's farmers do not produce enough food. There is more food produced each year than the population can consume. The reason people are hungry is because they do not have the money to purchase food and/or do not have the land on which to grow their own food. Most hunger and starvation, especially in Africa, is caused, not by natural disasters, but by politics and/or governments.

### World Population Growth

The world's family farmers can produce all the food the world's population requires, regardless of how high the number goes. They can do it with organic, no-till, permanent beds. This allows people to feed themselves on a local basis that provides total community food security.

### The Green Revolution

The Green Revolution is not ecologically sustainable, environmentally responsible, economically viable, socially just, humanely managed nor Biblically based. The Green Revolution makes farmers depend on, and economic slaves to, agribusiness, agrochemical and multinational corporations.

"The 'Green Revolution', which attempted to impose inappropriate crops and techniques in the Andes [and many other areas of the world-KH], has been a miserable failure. I. Garaycochea and J. Palao refer to the remains of twisted windmills, cracked irrigation canals and rusted out tractors littering the rural countryside in Bolivia as the 'archaeology of development.' It is ironic that the groups promoting the Green Revolution had to destroy ancient agriculture fields, to introduce inappropriate technology and capital-intensive farming. The prehispanic raised fields are classified on government maps 'for wildlife use only.' It is a good thing that those ancient farmers didn't have access to those maps!! C Erickson, University PA

Hybrid seeds will produce a high yield but only if the farmer uses high input rates of fertilizers and chemicals. The goal should not be the highest yield per acre but the highest profit per acre. Most of the time a lower yield [due to no external inputs] provides a higher profit. Use the open-pollinated varieties. It is fact that after several years using inorganic fertilizers, the amount applied must increase every year in order to maintain yields or they start decreasing. It reaches a point where the cost of the fertilizer exceeds the value of the crops.

### Chemical-Based Agriculture

Traditional agriculture is in a crisis worldwide. The World Trade Organization, USAID, government departments of agriculture [USDA has patents on GE seed and continues research so the extension services should recommend them so the USDA makes money?], congress and many government universities are pawns of these same corporations [for PAC money, funding and exports].

These companies told us that chemicals were safe to use but now we know that is not true. Firestone told us their tires were safe. Tobacco companies told us smoking does not cause cancer. They told us their GE crops would not spread to weeds [horseweed]. They told us it would not harm wildlife [butterflies]. Now they tell us that genetic engineering is safe; They tell us irradiated food is safe. Aventis told us StarLink corn would not get into our food supply. ADM fixes prices and cheats. They feed diseased animal by-products to grass-

eating animals which kills people and when it becomes illegal to do it in Europe, they export it to 80 third world countries even knowing it makes people sick and kills. Why are the board of directors of these corporations not held personally accountable for the harm they do to us? They do it for money and profit and do not care who gets hurt.

WTO and NAFTA benefits the multi-national corporations by allowing them to produce a product or food in the country with the lowest cost and export to the rest of the world. Farmers in Malawi receive 10¢ per pound for their cotton. Why buy in the USA?

All gardeners and farmers were organic until the use of chemicals in WW II [to kill people then, insects now]. No one has the moral right, and should not have the legal right, to poison our air, soil or water.

- Bayer Found Responsible for Poisoning of Children in Peru. There is criminal responsibility by Bayer in the poisoning of 42 children in Taucamarca, Peru in October 1999. The children were stricken after eating a school breakfast contaminated with the organophosphate pesticide methyl parathion. Twenty-four children died and 18 others survived with significant long-term health and developmental consequences. PANNA, August, 2002
- December 3, 1984, the Union Carbide/Dow Chemical pesticide plant in Bhopal, India exploded, killing 8,000 people. Total fatalities now exceeded 20,000 with up to 30 people dying each month. Warren Anderson, President, was charged with culpable homicide by the Indian government in an extradition order eleven years ago.

It is not a question of whether pesticides are undesirable or not. The fact is that they are superfluous. They were devised to prop up an agro-industrial framework that was misconceived from the start. When you abandon that framework, you can abandon its negative thinking pattern. We need to begin studying the natural systems of agriculture by enhancing the positive factors rather than our present focus on killing the negative factors. When we accentuate the positive, we eliminate the negative. Eliot Coleman, Organic Gardening, Nov/Dec 98

Read: Fatal Harvest: The Tragedy of Industrial Agriculture. Island Press, 2002.

### Insecticides Not an Ecological Matter

Ever since the end of World War II the nation's and the world's farmers have been fed a steady diet of "new and improved" chemical poisons, slickly obfuscated by the use of the word "pesticides." As the late brilliant and outspoken University of California entomologist Dr. Robert van den Bosch characterized it:

"Fundamentally, pest control as it is now practiced . . . is essentially not an ecological matter. It is largely a matter of merchandising. In essence, we are using the wrong kinds of material in the wrong places at wrong times in excessive amounts and engendering problems which increase the use of these materials, adds to the pollution problem, adds to the cost of agricultural pest control, and adds to what you might describe as the concern of the general public."

By emphasizing pest eradication rather than pest control the manufacturers of these chemical poisons have managed to keep farmers on a treadmill, promising with each new product that their problems with pests will be solved, which in fact often only generate new problems with both the loss of the pest predators, but also increasing the immune system of many pests as we have seen with mosquitos and DDT giving rise to whole new generations of super bugs.

Yet in the farm press, which would undoubtedly disappear over night were the chemical poison manufacturers and the farm machinery manufacturers ever to yank their advertising from its pages, continually show farmers pictures of lush green crops and weedless and pest free fields effectively propagandizing and economically seducing them into buying more of the company product.

At the same time the poisons that they can't sell to this nation's farmers because of government restrictions they export abroad which are in turned used on those crops and produce which are increasingly being imported back into the United States with less than one percent, according to the General Accounting Office, being inspected for harmful residues. At the same time a large measure of the research dollars that go into developing these chemical poisons come out of the tax payer's pockets, just as in the pharmaceutical industry, by way of the efforts of our nation's land grant university's who in many cases not only do the research and development, but through their various extension services, do the actual promoting of these poisons in our fields and orchards. The Agribusiness Examiner 165 <avkrebs@earthlink.net>

### Agro-Chemical/Multi-National Corporations

"Ambrose Bierce once defined a corporation as 'that inglorious device for obtaining individual profit without individual responsibility.' In another era they were called 'the robber barons.' Today, the ADMs, the Cargills, the Chiquitas, the ConAgras, the IBPs, the Smithfield Foods, the Tysons and others have become the merchants of greed. Former U.S. Senator Fred Harris, is fond of saying that corporations can't be made responsible because they have no soul to save nor butt to kick but they can be made accountable." A.V. Krebs, December 2, 1999. avkrebs@earthlink.net

"As I read about tax breaks for corporate farms, fast track trade decisions that allows multinational companies to decide the future of local communities and watch agribusiness brazen entrance into local politics, I, like Kirschenmann, am ever more convinced that high input industrial agriculture is not about 'feeding people' and certainly not about 'keeping people fed.' Agriculture today is about power. It's about money and profits for a few". Mary Fund, [ksruralctr@aol.com](mailto:ksruralctr@aol.com)

### WTO [GATT] & NAFTA

were created by governments for the financial benefit of the multi-national corporations. It allows them to produce food and manufacture products in the country of the world which gives them the lowest cost even if it is slave level wages. Then it allows them to export the food and products to all countries of the world

without payment of any taxes. This reduces the wages of all people in all countries to the lowest possible level or puts them out of work completely.

#### TRADE SECRETS:

A MOYERS REPORT is an investigation of the history of the chemical revolution and the companies that drove it – and how companies worked to withhold vital information about the risks from workers, the government, and the public. He relies on an archive of documents the public was never meant to see – documents that reveal the industry's early know-ledge that some chemicals could pose dangers to human health that were not disclosed at the time.

But the documentary also reports a much larger story – a never- before-told account of a campaign to limit the regulation of toxic chemicals and any liability for their effects.

Today, every man, woman and child has synthetic chemicals in their bodies. No child is born free of them. As part of the investigation for TRADE SECRETS, Bill Moyers took part in a study sponsored by the Mount Sinai School of Medicine designed to measure the synthetic chemicals present in the human body. Even though Moyers has never worked in a chemical plant – or lived near one – he learned that his body contains a chemical soup of 84 industrial chemicals, including 31 different types of PCBs, 13 different dioxins, and pesticides such as DDT. Video available. <[pbs.org/tradesecrets](http://pbs.org/tradesecrets)>.

#### Mexico

Los Tejocotes, Oaxaca (AP) - Mixteco Indian farmers used to bury cigarettes, candy and a cactus-based brew called pulque in their cornfields to give thanks to the land. Over the last few years, the age-old tradition has died out. "There's no reason to do it anymore because the land no longer gives," said Policarpo B. Salazar, 56. Bald hillsides scarred with deep gullies glare down at Los Tejocotes. All across Mexico, farmers are discovering the same thing: The land no longer gives.

Decades of too much logging, farming and grazing has ruined the land said Sr. Estrada, who is conducting a study analyzing the correlation between government policies and land degradation. The government knew decades ago that if its farmers continued to pump the land with chemicals to boost production the soil would eventually collapse, but officials refused to consider more restrained practices, Estrada said. "This is big business," he said. "The policies have supported the quasi-state and multinational companies that sell the improved seeds, chemical fertilizers, pesticides and machinery. They also support the political parties." The government farm aid program, Procampo, puts local leaders in charge of distributing vouchers for farmers to buy the products at a discount. The answer to restoring the land lies in Mexico's past, when farmers grew crops suited for each region's ecosystem, and in manual labor and organics.

Faced with infertile soil, about 900,000 people leave Mexico's land every year. Many wind up in the slums of Mexico's overcrowded cities. This book presents the farming methods that stops the migration to the cities and/or the USA.



**In God's creative wisdom, He gave us a wide diversity of life of all kinds on this planet and told mankind, "take care of the Garden, dress it and keep it" [Genesis 2:15]. To arbitrarily destroy any of this diversity and thus end its potential usefulness to man is not only poor management of the "Garden" but also the worst kind of foolishness. John Clayton, Does God Exist, Nov/Dec 2001**

### **Can Organic Agriculture Feed The World**

**Often in discussions about organic agriculture, proponents of high-input industrial agriculture use the argument that if everyone switched to organic agriculture we'd condemn millions of people to starvation. They assume we need industrial farming methods to "feed the world". Fred Kirchenmann rebuts this argument. Read: For All Generations**

**At a time when our agricultural leaders and corporate America seem hell-bent on pursuing the well beaten path of exports and high-tech, high input agriculture, Kirschenmann's comments are refreshing. In a chapter titled "Can Organic Agriculture Feed The World?...And Is That The Right Question?" Kirschenmann argues that instead of being the answer, high tech, high yield farming is a major part of the problem.**

**Industrial agriculture, the child of the Green Revolution which increased yields of a few crop varieties around the world [but kills the soil and decreases yields in the long term. KH] , contributed dramatically to this ecological disruption. Kirschenmann argues that it is not a question of "feeding the world" but "keeping the world fed". There is a vast difference. In fact, talking about the problem of hunger in terms of "feeding the world" misses the point, either inadvertently through a lack of understanding or purposefully in an attempt to protect vested interest.**

**"Power, he states, is the reason we talk in terms of 'feeding the world' rather than "keeping the world fed". 'Feeding the world' suggests that someone will take responsibility for feeding someone else, and therefore, make them dependent. 'Keeping the world fed' suggest that people will be empowered to feed themselves. Herein lies true food security". And I would add, herein lies true community and individual security as well.**

**It requires that we empower people to feed themselves. It requires an awareness that farming must be done within an ecological system; that organic farming practices are essential to feeding ourselves far into the future. As I read about tax breaks for corporate farms, fast track trade decisions that allows multinational companies to decide the future of local communities and watch agribusiness brazen entrance into local politics, I, like Kirschenmann, am ever more convinced that high input industrial agriculture is not about "feeding people" and certainly not about "keeping people fed." Agriculture today is about power. It's about money and profits for a few while the rest are made dependent upon distant resources and markets. Mary Fund, [ksruralctr@aol.com](mailto:ksruralctr@aol.com)**

## **Mexico**

San Jose Del Cabo, Baja CA Sur – Marcos Gavaaraín never thought he would be back on his father's farm. A few years ago, the now-30-year-old, left to work in the USA. He was tired of the low-paying tourism jobs. "Then I saw that the organic farmers were making money," said Mr. Gavaaraín, a member of the Rancho Del Cabo organic farming cooperative. "We've made the switch to organic and I love farming again. Last year we made \$9,000, not pesos."

Rancho Del Cabo has been so successful with former subsistence farmers that its founders and Larry Jacobs, their CA adviser, are exporting the farming plans to Nicaragua, where 40 small farmers have formed a cooperative. Ángel Salvador Ceseña B., one of the founding farmers, said. "If you do it right, you can replicate this elsewhere in Latin America." Mr. Jacobs is routinely asked how the formula can be transferred. "You don't just stop using pesticides and call yourself organic," Mr. Jacobs said. "The formula has been keeping individuals focused only on their small fields and on quality. "Small farmers working together can focus better than one big farm," he said.

But the most satisfying trend among cooperative members is seeing their children come back to the farm. Nearly two dozen have made the switch in the last three years, according to cooperative leaders.

## **Brazil**

"We must remember that one factor of the "Green Revolution" around the world was mass migration of small property-owners to the cities to swell the slums (Sao Paulo, Brazil now has 15 million people, at least half of which are rural refugees). So when the Industrial Agriculture mega-business people talk about "feeding the starving millions" they omit to mention that these millions are starving because they were forced off their lands by an agricultural model which was too expensive and too destructive for small farms to hold up under. Our experience in Brazil mirrors what is said here about the small farm. We have seen examples of successful small farms of 3-4 hectares of agroforests ( which is the appropriate model in the tropics) earn US\$300-400 per month, with practically zero costs other than family labor. This means a comfortable margin of profit which permits a very good life indeed." Marsha Hanzi. < hanzibra@svn.com.br >

**Read:** Hopes Edge: The Next Diet for a Small Planet. F M Lappé

Farmer Innovation in Africa. Reij & Waters-Bayer, Earthscan

The Next Green Revolution: Essential Steps to a Healthy, Sustainable Agriculture. Horne & McDermott

GOING LOCAL: CREATING SELF-RELIANT COMMUNITIES IN A GLOBAL AGE (Free Press, 1998) Local alternative to Agricorporations.

## **Organic Agriculture**

is growing worldwide. Customer: buy local, buy fresh, buy organic. Farmers: grow organic, sell local, sell direct. The farmers in a village in Indonesia were going broke and they had to do something. They began farming organically

and marketing their organic vegetables in a town 25 K. away.

We must have healthy soil to grow healthy plants to provide healthy food to assure healthy people. For the human population to be healthy, we need to consume healthy foods

that come from healthy animals eating healthy plants grown in healthy soil.

[C Scheaffer, VMD/holistic].

“Organic gardening and farming is more than avoiding chemicals. The organic method requires a change of attitude and a different thought process.” [H Garrett, DMN, <www.dirtdoctor.com>].

A Lubbock cotton farmer’s wife wanted him to go organic. His father, brothers and brothers-in-law [all chemical farmers] ridiculed him. The

“change of attitude and a different thought process” took him six years according to her.

**Soils:** Neither over-all concentration of nutrients in the soil nor its cation exchange capacity is of much importance. What is important is the constant access of plant roots to even very small quantities of nutrients. This explains, for the first time, why low-input systems produce such plentiful harvest. Roland Bunch, COSECHA, 2001.

**Organic Yields:** “What we can conclude after reviewing the evidence about organic yields is this: After a few years of practicing organic methods, and with very little scientific research to guide them, many farmers have come close to duplicating the high yields achieved by the world’s most intensive chemical farmers, who have been supported by decades of government and academic research. At the same time, the organic methods have repaired much of the environmental damage caused by the chemicals.” D H. Meadows, Ph.D., Organic Gardening Magazine, Sept/Oct 2000.

#### Urban Agriculture

“The largest underused agricultural resource we have is the urban poor.” Marty Strange, Soil, Food and People Conference, Sacramento CA, Mar 2000

“UA has the potential to provide many benefits to cities - in nutritional improvement, hunger reduction, income generation, enterprise development and environmental enhancement. The poor and unemployed can grow their own food. Farming converts degraded and unkempt vacant lots into healthy, green areas. Waste [grass, leaves, trees, sawdust, manure, food waste] can be composted and used on the farms as well as recycled water. City governments must recognize the potential of urban agriculture and accord it the status given to other industries and economic activities in the city.” The Urban Agriculture Network. Urban gardening is very important socially, economically, esthetically and recreationally.

Inter-Urban – The core of all large cities have extensive areas of vacant land, high numbers of unemployed people and these are in the middle of thousands of people. There are no supermarkets. No fresh fruits and vegetables. What an opportunity! The government gives food stamps redeemable only at the farmer’s markets. The people can farm the vacant land and operate farmer’s markets to sell to those around them.

Urban – The people grow some of their food because they want to avoid chemicals in their food. Most people grow some vegetables.

Peri-Urban – There are large amounts of unused land, which can be farmed. Animals can be raised. People will drive out to the farm to buy fresh food.

**Economic development** is a major concern for most towns and cities. PBA is very effective economic development. It benefits local people. In Europe & N America, thirty experienced families can sell \$35,000 each in the local farmer's market. That is "created wealth". That is \$1,000,000 added to the local economy each year. This wealth stays in the city rather than being sent to a corporate office somewhere; even abroad.

**Micro-entrepreneurship:** Most urban agriculture is directed by NGO's but there are unlimited opportunities for private minifarms all over every city. They are surrounded by market. Employment is limited and most jobs are low paying. Urban homesteading and PBA are realistic options. High schools should be training students in PBA.

**Urban:** From 25% to 75% of the food consumed in any third world city is grown within the city by both home gardeners and market gardeners. Some families produce their own meat.

**Read:** Urban Agriculture Magazine, [www.ruaf.org](http://www.ruaf.org)

Farming From the City Center to the Urban Fringe. Download free. [Cfsc@foodsecurity.org](mailto:Cfsc@foodsecurity.org)

## Rural Agriculture

There is a grassroots movement back to family farming. PBA is the answer and is being used by the many 'new' people entering agriculture as well as innovative farmers. USA young people growing up on farms do not want to be farmers. Is it any wonder? Everything they hear about farming is negative. **USA farmers must get off the government welfare roll and support themselves. This will restore their self-esteem, dignity and pride.** Most of these funds go to mega-farms and corporations. Mini-farming/ranching offers excellent financial opportunities.

**Family Farming/Ranching:** "I believe we are on the way to the rebirth of the family farm on a human and humane scale. It will be a painful rebirth. More of those 'farming tigers' [farmers of the 60s and 70s] and the professors that fostered the 'get big or get out' dogma may have to depart life's stage. We are beginning the age of the 2.5 to 10 acres farm." K. Klobber, Small Farm Today, Jan 01

"I love farming. I have never worked harder. I have never made less money. I have never been happier." David Little, Little Organic Farm, CA.

"Farmers have to understand that we are the most important people in the world because we feed people. And we manage the most valuable of all natural resources - the soil." Carlos Corvette Lamarca, no-till farmer, Chile

## Third World Agriculture

Third world subsistence farmers [many are females] are uneducated but they are very skilled at producing food using what little they have in the most productive manner. Their minds contain centuries of knowledge. I admire them. Many have access only to the poorest, most eroded, steepest land. The big farmers and multinational corporations have the good land producing export crops. Third world farmers do not receive a government welfare check like the farmers in Europe, Canada and USA. They are on their own. For centuries Mali has exported its beef to Cote d'Ivoire. In 1995, the EC dumped beef on the world market below the cost of production so that one could purchase EC beef in Cote d'Ivoire cheaper than from Mali. That decimated the Mali ranchers. In 2000, American corn was selling in Honduras below the cost of production. That decimated the Honduran farmers.

“If I had taken what I learned about agriculture at TX AMU to a third world country, I would have starved to death”. Mike Sullivan, ECHO Ag Missions Conference 1998, quoting his son.

## Mini-Agriculture

### Vegetable Garden

It takes very little land to produce all the vegetables and fruit a family can eat.

### Forage Garden

Most families can produce meat using small animals. If a little land is available, raise grass and grains.

Mini-Farm [vegetables, flowers, herbs, grains, fruits]. People can have a comfortable income, a high quality lifestyle, and a great way to raise children. A lady took a PBA course, returned to Alaska, prepared her land and grossed \$20,000 the first year. Then had a six months winter vacation!. Value-added increases income.

### Mini-Farm [Fibers]

These crops can be processed by hand on the farm

and made into various value-added products for markets.

### Mini-Ranch [meat]

Produce organic, grass-fed meat, eggs, etc which sells everywhere. Grass-fed ranching will have lower production of meat per acre but will be the most profitable. The only feed cost is grass.

### Mini-Ranch [fibers]

A mini-rancher can produce various fibers and using value-added with small processing equipment can compete with any company.

### Mini-Dairy

Africa is 95% short of dairy production. Grass-based dairying has lower production per cow but provides the highest profits.

## Marketing

A mini-farmer/rancher should market directly at a farm/street stand and/or to farmer’s markets, city market stall, farm store, CSA, restaurants, farmer-owned marketing cooperative, etc. Many farmer’s markets in the USA need farmers to sell. Some have not been able to open due to the shortage of farmers.

I visited a farmer’s market in 1989 in the Dominican Republic. The city of La Paz, La Paz, Honduras, does not charge farmers for a stall in the city market [2001]. Most states have few laws [or they are not enforced] governing food when the farmer is selling directly to the consumer. “Organic certification is necessary only when the food is not sold locally.” S Ogden, Straight Ahead Organics A Texas rancher, who has grown, processed and sold his organic meat for 15 years, said “Why should I be certified? My customers trust me.” Never, Never, Never market by contract with a corporation!! chickens, hogs, etc.

**Farmer’s Market Mall: Most farmers want to farm; not sell. Now farmers could market directly to the consumer, at retail prices, without personally selling. Farmers could rent display space and stock their produce/products. Items would be pre-packaged and/or labeled. Customers would take their**

selections to the check-out counter to pay. This could be open-air, or if there is interest, inside space could be provided.

### **Value-Added**

is using family labor to add value to your farm production before marketing it such as the examples below:

**USA-** Farmer raise and processes their own meat and the customers drive to the farm to buy it.

A farmer grows chiles and sells fresh, dried, canned, etc.

A lady “paints” pictures using flower petals out of her garden.

Farmer grows seven acres of broomcorn, makes brooms and sell them retail/wholesale.

**Honduras –** A woman grows, harvest, roast and grinds her coffee and sells it in her community.

### **Niche Market**

is finding the crop and its market that you want to produce as above. For example, a woman was mini-farming flowers of all varieties. She preferred sunflowers and found that the farmers’ market had ready buyers. She continued growing more and more sunflowers until now she grows only sunflowers and has over 50 varieties. Markets seed, etc. She is the sunflower guru of America.

**Malawi -** A farmer grows wheat, only one in that part of the country, and sells it to a nearby pasta business.

**USA -** A dairywoman sells raw milk at the farm for \$6 per gallon.

### **Agri-Tourism**

Use your farm for guests who pay you for your services. Many people living in the cities would like to spend time on a farm. One day or several days and nights as they prefer.

### **Successful Entertainment Farming Enterprises & Techniques (farm recreation and hospitality businesses)**

- Arts & crafts demonstrations
- Cider pressing
- Maple sugaring
- Sheep shearing
- Wool processing
- Sorghum milling
- Apple butter making
- Fee fishing/hunting
- Farm vacations
- Bed and breakfast
- Farm tours
- Horseback riding
- Camping
- Hayride

- Sleigh rides
- Picnic grounds
- Campground
- Dude Ranch
- Educational tours
- Farm Schools
- Outdoor Schools
- Herb walks
- Workshops
- Festivals
- Cooking demos
- Pick-your-own
- Corn Mazes
- Crop Art
- Living history farms

- Heirloom plants and animals
- Native village
- Frontier village
- Farm theme playground for children
- Gift shop
- Crafts
- Crafts demonstrations
- Food Sales
- Cold drinks
- Restaurant
- Farm animals petting zoo

## Books

“Reducing Food Poverty with Sustainable Agriculture: A Summary of New Evidence”, Jules Pretty, <jpretty@essex.ac.uk>

“Trust Us-We Are Experts” How corporations use information and deceit to misinform the public.

“Sustainable Agriculture and Resistance – Transforming Food Production in Cuba” Food First, [www.foodfirst.org](http://www.foodfirst.org)

## New Crops/Animals

Corn, beans, rice, wheat, coffee, cacao, etc. are not profitable to sale unless innovative marketing is used. Therefore, farmers must try other things to grow and sell. Third world farmers are more interested in seeds for new crops than anything I present in my workshops. Plant cuttings and animals opens up even more new opportunities. I tell the farmers it is an experiment because many will probably fail. Remember that chocolate, papaya, tomatoes, corn, potatoes, peanuts [Velancia], avocados, cassava, cashews, rubber, squash, chilies, stevia, colored cotton, tobacco, sunflowers, pineapples, sweet potatoes, lima beans, dyes, turkeys and Muscovy ducks came from Latin America. No one in the other countries of the world had these until after Columbus arrived in the new world. A missionary introduced potatoes into Uganda 50 years ago and the people would not eat them. Now they are a major part of the diet. The following are successful in one or more countries.

| 1. Fruit/Vegetables  | 2. GM/CC/Forages  | 3. Animals   | 4. Industrials/V-A   | 5. Grains   | 6. Crafts   |
|--|---|--|--|---|---|
| 1. Stevia-sweetener<br>2. Tomatillos<br>3. Squash-spaghetti<br>4. Strawberry-alpine<br>5. Tomatoes – spoon<br>6. Banana – FHIA<br>7. Soybeans-green<br>8. Grapes – tropical<br>9. Blueberries<br>10 Potatoes – sweet<br>11 Berries - various | 1. Kudzu – tropical<br>2. Peanuts-perennial<br>3. Buckwheat<br>4. Spirulina<br>5. Crotalaria<br>6. Sudan grass<br>7. Alban rye<br>8. Turnips-forage | 1. Ducks – Muscovy<br>2. Cattle – miniature<br>3. Pigs – miniature<br>4. Goats – miniature<br>5. Rabbits<br>6. Water buffalo | 1. Broomcorn<br>2. Cotton – colored<br>3. Sorghum-syrup<br>4. Hemp-industrial<br>5. Grains-flour,meal, parched, popped.<br>6. Milk-Cheese, yogurt<br>7. Flowers<br>8. Fruit-dried<br>9. Vegetables-dried | 1. Corn-baby, sweet, popping, parching<br>2. Amaranth-leaf, popping, grain<br>3. Spelt<br>4. Sorghum-pop-ping, vegetable<br>5. Millet – popping, grain<br>6. Quinoa | 1. Gourds – bowls, rattles, decorated<br>2. Corn – colored leaves, shucks, grain<br>3. Flowers<br>4. Grains<br>5. Cotton<br>6. Bales-miniature straw, cotton, hay<br>7. Stalks/Bundles : corn, sorghums, millet, cotton |

## Vegetarianism

The vegetarian myth is disproved. It is often stated that meat produces one-fourth to one-tenth the food that using that same land for a vegetarian diet would produce. That is not the whole picture. Animals who transform one-fourth of their food into meat transform three-quarters of their food into manures (high value fertilizer if properly managed and used) which is transformed into humus which is transformed into crops for both livestock and people. Organic agriculture recycles everything and transforms inert minerals, air, water and sunshine into increased biota through feeding the microherd a full diet including animal wastes. There is more life created into existence out of the dead planetary chemistry than vegetarians are able to account for with their tired false myth. [Lion Kuntz] Much of the land in many countries is suitable only for pasture which can be used only to produce meat.

### Livestock Management

The following management is the proven methods for a farm/ranch operation to be profitable and sustainable. There is unlimited documented proof that the following are the most successful way to farm and ranch.

- I. Dairy farm: pasture-based using paddocks and seasonal calving.
- II. Ranch: Rotation using small paddocks.
- III. Poultry: Range raised meat and eggs using moveable pens in pastures.
- IV. Swine: Hoop houses on pasture.

There is a farming system that farmers in every country can adopt which is so successful that it stopped the migration from the targeted area to the cities of Honduras (COSECHA). It can restore profitability to farmers in every country.  
That farming system is as follows.

### Permanent Beds

#### 1. Using farm machinery

Dr. John Morrison, ARS, Temple TX, researched permanent beds, using tractors and farm machinery, for 15 years. He used beds 101" wide but to accommodate the wheels of harvesting equipment, used alternating beds of 40" and 80". Wheels run in permanent tracks. Due to no compaction of the soil, this resulted in increased yields of 10%. He used them for corn, cotton, sorghum, etc. They were destroyed in 1998 because "I got tired of proving a farming method that few farmers were interested in." He was ahead of his time.

Thousands of acres are in raised beds in Australia and New Zealand. The Sustainable Agricultural Machinery Developments Pty. Ltd. manufactures equipment for forming the beds and has developed a Permanent Bed Management system for organic, no-till farming.

#### 2. Using hand labor

They have been used in Asia [Indonesia, China, Vietnam, PNG], Latin America [Mexico, Guatemala, Bolivia, Peru, Belize] from 2000 years BC and in Europe [France] and USA [FL, MI, WI]. I saw a few while living in Guatemala. Abandon for various reason, there is a worldwide movement back to using them. They work.

The use of permanent beds in modern times began in France in the late 1800s and in Germany R. Steiner began what he termed Biodynamic Gardening. An Englishman, A. Chadwick, went to the UCA, Santa Cruz, in the 50s and began what he called Biointensive Raised Bed gardening. J Jeavons, a

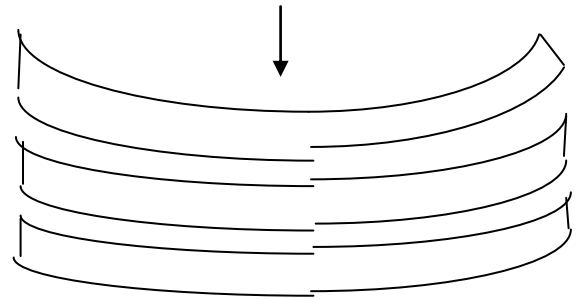
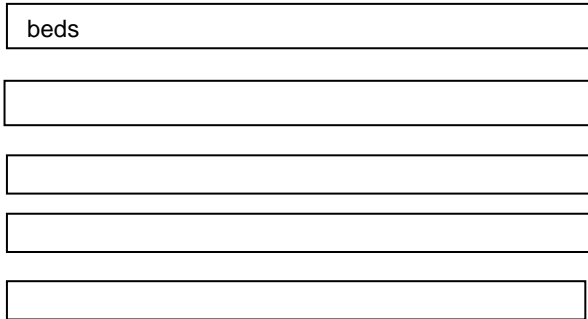


student of his, began the present-day movement with his research and the writing of the book “How To Grow More Vegetables.”

**Raised fields:** long-term labor requirements are low; harvests are bountiful; production is sustainable; technology can be managed by families using available tools.” C Erickson, UPA. He is helping farmers restore beds [surrounded by water] in Bolivia.

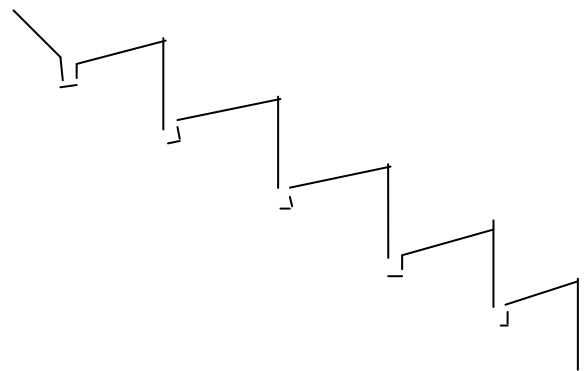
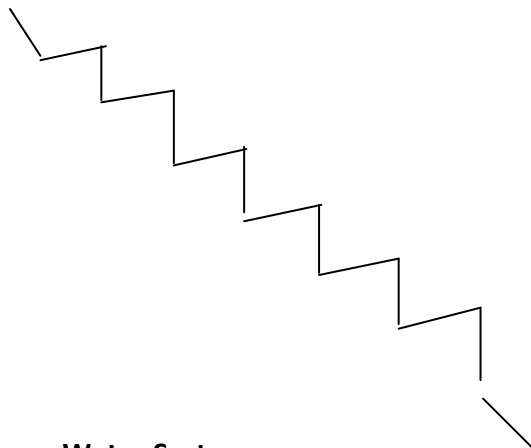
### Bed Layout

|                      |   |
|----------------------|---|
| <b>1. Level land</b> | <b>2. Sloped land – beds on the contour</b> |
|----------------------|---|



|                                     |                                      |
|-------------------------------------|--------------------------------------|
| <b>3. Steep land - low rainfall</b> | <b>4. Steep land - high rainfall</b> |
|-------------------------------------|--------------------------------------|

There are permanent beds, like these below, in Honduras that were made in 1994. During Hurricane Mitch when one meter of rain fell on the beds, there was no erosion. They work.



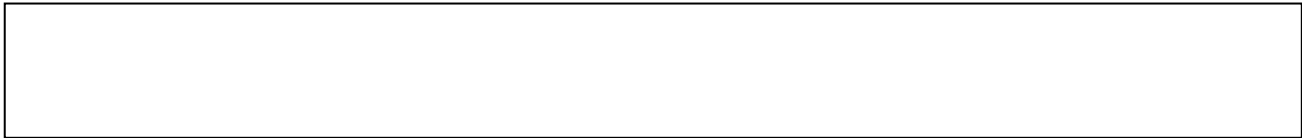
### I. Water System

The beds in Bolivia and the “Floating Gardens of Xochimilco” [most have been destroyed] in Mexico City are surrounded by water. The aquatic plants and animals produce food and the muck on the bottom is used for fertilizer. In Bolivia they were and are used in the Amazon basin [holding of water for the dry season] and in the altiplano around Lake Titicaca [farming at 12,000 feet is impossible without the moderating effect of the water to create a micro-climate.]

water

Beds are various meters wide.

**Water- various meters wide**



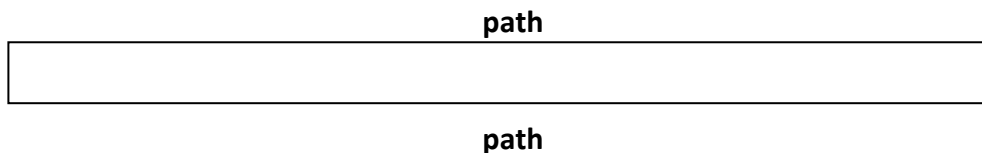
**Water**

**II. Single Dug**

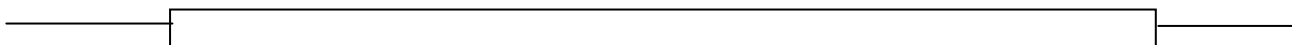
**Conventional gardening with beds**

Mark off the beds, loosen the soil and proceed as you usually garden. You still save money and work.

**Top view**



**Side view**

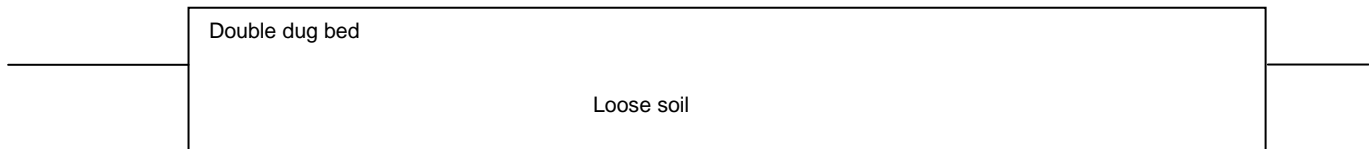


**III. Double Dug**

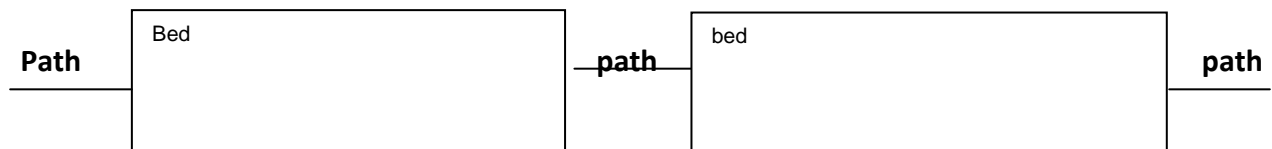
**5. Double dug**

People, who have a limited amount of land and must produce as much food as possible, should use biointensive, double dug, permanent raised beds. It is very labor intensive to construct them but they are very productive. Thousands of farmers in western Kenya are using them as well as people in many countries around the world.

**Side view**



**End view**



#### IV. No-Till Gardening

##### 1. OG Research Gardens

**WHEN YOU STROLL** through the demonstration garden at The Rodale Institute, you are likely to be struck by two things: the wide diversity of plantings and the simplicity of the techniques. The gardens demonstrate that organic methods work.. The staff once laboriously double-dug beds, added copious amounts of manure, and controlled pests and diseases with insecticidal soaps and hot-pepper sprays, says Eileen Weinsteiger, the chief gardener since 1973. "If we've learned anything over the years, it's that organic gardening can be very simple," she says. "We've abandoned many of the practices we once thought were necessary." They marvel at the integration of hundreds of food plants and ornamentals, the array of colors and aromas, and the rich bird and insect life within the dozens of raised beds. "There's a lot of good news here for gardeners," she says. "Put in a lot of plants, mix up your flowers and vegetables. and enjoy"

**Biological controls:** Institute gardeners still use BT (*Bacillus thuringiensis*) against cabbage loopers and traps against Japanese beetles, but that's about it. The days of using rotenone, pyrethrins, and other botanical insecticides are long gone. There's simply no justification to use anything that kills good bugs along with bad bugs, says Weinsteiger. Most diseases and insects can be controlled with row covers, diverse plantings, borders that are attractive to beneficial insects, birdhouses that bring in insect-eating birds, and simple handpicking, she says.

**Diversity:** No single plant type dominates any of the raised beds. Such diversity limits the spread of diseases and bugs. And many of the flowers draw beneficial insects, such as lacewings and lady beetles, which protect the food crops. **Wildlife:** Insects, toads, and birds thrive here. Lured in with birdhouses, a bog pond, and lots of plants that provide habitat and food, they are all part of the diversity and natural pest control, says Weinsteiger. "The wrens, especially, are effective in keeping down the cabbage loopers," she adds.

**Compost:** The Institute promotes the use of plant materials, grass clippings, leaves and garden waste to make compost. It no longer uses manure in the demonstration garden because most home gardeners don't have access to it. says Weinsteiger. "You just use what you have".

**Fertility:** Years of composting have created rich planting beds. Organic matter makes up 5 to 10 percent of a typical raised bed at the Institute. During the growing season, they apply 1 to 2 inches of compost. The garden also makes extended use of cover crops, such as red clover, oats, and buckwheat, which return fertility to the soil.

##### Mulch Gardening

Ruth Stout perfected the art of mulch gardening. She does only three things: [1] covers the beds with mulch up to 10" deep; [2] raises the mulch, drops the seeds on the ground; puts the mulch back in place. [3] harvest the crops whether above ground or below. You must have an external source of mulch [hay/straw]. Warning: Your garden will probably fail the first year but the second year and on, you will have good yields.

|       |
|-------|
| mulch |
| bed   |

## V. No-Till Mini-Farming

Mark off the beds, add organic matter by bringing it in or use green manures/cover crops. Use hand and/or electric/gas powered garden tools.

### No-Till Agriculture

No-till agriculture is currently being practised on about 61 million hectares of land, from the tropics almost to the Arctic Circle: USA (22.2M), Brazil (14M), Argentina (10M, in only ten years), Australia [9M], Canada (4M) and Paraguay (1M) 90% of the mechanized farms use no-till, Mexico [1M], Bolivia [.75M], Venezuela [.4M], Chile [.2M], Colombia [.1M], Uruguay [.1M], Others [1M]. The system has been adapted for grains, pulses, sugar cane, vegetables, potatoes, beets, cassava and fruits. "Conservation Agriculture reaches yields comparable with modern intensive chemical-based agriculture but in a sustainable way." FAO Assistant Director-General Louise Fresco, 2001.

In 2001 there were 100,000 acres of no-till farming in Asia. In 2002, It is estimated that there are 300,000 acres. The surprise is not they they are there but the surprise is how fast it has spread.

**Ploughing is bad for the soil.**

A minority of agriculturalists have been saying so for years and FAO is now adding its voice to the call in order to slow land degradation around the world. Conventional tillage with tractors and ploughs provokes soil compaction and biological degradation. No-till/zero-tillage leaves a protective blanket of leaves, stems and stalks from the previous crop on the surface. This cover shields the soil surface from heat, wind and rain, keeps the soil cooler and reduces moisture loss by evaporation.

FAO Agricultural Engineer, Theodor Friedrich. Basically we do not need to plough the soil to receive a good crop. It is that simple. A natural

healthy soil is the best environment for crop production. With tillage we damage the soil and it is a major contributor to the destruction of soil which leads to erosion and the loss of soil. [Every time we plow, we loose organic matter.] We don't simply stop tilling and still produce. We replace tillage by managing the fields. A soil, left alone, develops a good structure through biological processes. That structure cannot be improved by tillage. Of course, if we have an already degraded and compacted soil, we have to go step by step and assist the process of soil structuring before we can farm completely without any tillage. The first step is usually not to use the plough any more and restore the organic matter.

Do you have strong financial arguments to convince farmers to shift to conservation tillage?  
The financial arguments are the strongest for our new approach. The immediate result for

the farmers is that labour and energy costs are reduced dramatically. They do not need tractors anymore for soil tillage. Soil tillage is the operation in farming that is most energy intensive.

No-till is great once the soil is loaded with organic matter and has become healthy with microbes and earthworms. You need to establish permanent walkways and beds. Keeping mulch on the ground year-round is critical. To do the plant-through-the-mulch procedure, you'll have to start by planting the cover crop. Cut the plants off in the spring, leaving the cuttings on the soil to serve as a mulch. Then plant right into the undisturbed roots without tilling or adding fertilizer. Additional mulch might need to be added after planting if any soil is left exposed. Tests by the USDA showed that this technique gave a 100 percent increase in production over conventional fertilizer and tilling. Howard Garrett, <.dirtdoctor.com>, Dallas Morning News, 3 March 00.

"Farm equipment dealers in the towns where the farmers have switched to no-till have closed. There was not enough bussiness for them to stay." Catholic Archbishop, meeting in Amarillo, TX [2001]. No-till is profitable.

"South American farmers are provided no subsidies [farmer welfare-KH] and when a new farming system makes sense, makes money and cuts their workload, the adoption rate is phenomenal. With this new farming system, they've tripled their income in less than five years." Leading Edge, Dec 01

No technique yet devised by mankind has been anywhere near as effective at halting soil erosion and making food production truly sustainable as no-tillage (Baker , 1996)

A new method of farming requires a new way of looking at things. And a thick skin would help. "You may have to deal with walking into the coffee shop and having the whole room go silent," Head said, explaining the reaction a farmer might expect from his fellow farmers if he decides to change to "zero-till" farming. "Zero-till is as much mental as it is mechanical. Perceptions are very important. You have to have the right mind set." Head said one of the big challenges for innovative farmers who go to zero-till is to change the way they look at their fields. The conventional view of a good looking field may be one that is plowed and manicured, while in zero-till farming a "good looking field" is one that is unplowed with stubble on it. "But not only do you have to get your mind around that, you also have to deal with your neighbors who haven't got their minds around it," Head said. "You have to put up with comments like, 'Man your summer fallow sure looks like hell'... When are you going to work that field?" Keith Head, agronomist and consultant, Saskatchewan, Canada

### Mental Changes

A mental change away from soil degrading tillage operations towards no-

tillage is necessary to obtain changes in attitudes of farmers. As long as the head stays conventional it will be difficult to implement

successful no-tillage in practical farming. Through time we have learned, that if the farmer does not make a radical change in his head

and mind, he will never bring the technology to work adequately. We found that this is not only true for farmers but for technicians, extensionists and scientists as well. No-tillage is so different from conventional

tillage, and puts everything upside down, that anybody that wants to have success with the technology has to forget most everything he learned about conventional tillage systems and be prepared to

learn all the new aspects of this new production system. We believe that a farmer first has to change his mind before changing his planter. Rolf Derpsch, GMZ, Paraguay

### No-Till With Permanent Beds

**India:** Mr. Mann planted rice on beds. He obtained 8.3 tons/ha on one field with 50% savings in water. He will be experimenting further on 0-till wheat on beds this season. He had excellent fields with these techniques.

Mrs Shakuntla Mehla is the prime mover of zero-till technology, which caught on in Haryana like wild fire in the previous winter season. She has a 40-acre farm and experimented with rice on beds. She is planning to plant wheat into the same beds.

Mr Daler Singh, a farmer had planted 6 acres of land with rice on beds in Punjab. He obtained almost 9 tons/ha and also saved water. He intends to grow wheat on the same beds and then transplant mentha plants in the furrows before wheat harvest. In the next few years, it seems that bed planting will become a common practice for farmers in North-west India and we plan to extend this technology so as to ensure minimal field preparation for both rice and wheat.

**Mexico:** Bed planting systems for wheat reduce the ecological impact of wheat cropping. In Mexico's Yaqui Valley more than 90% of farmers have adopted the practice. In this system, wheat is planted on top of raised beds. Residues may be left on the soil surface. The reason farmers give for adopting bed planting is that the system reduces production costs—by an estimated 30%.

**USA:** We begin shifting the mini-farm toward no-till in the spring of 1995. The beds were fitted with irrigation lines, mulched and planted by confining all traffic to the walkways. Any weeds which make it through the mulch are pulled and placed on top of the litter to decompose. We are essentially sheet-mulching the beds with a per-manent cover of continually decomposing organic matter which serves as weed barrier and fertilizer. Dripping Springs Gardens, Huntsville AR

### 1. No-Till Principles

In Honduras, farmers are farming up to ten acres, organically, using no-till, with hand tools only. One third of the farmers in Argentina no longer plow. This occurred in only ten years. The results come quickly: reduced cost, reduced labor, richer soils, higher yields, no outside inputs and increased income. There are thousands of acres of no-till in Iowa but chemicals are used which is not recommended.

Farmers in Brazil, who are the most experienced no-till farmers in the world, are farming thousands of acres, practicing the following five principles.

1. Maximize organic matter production.
  2. Keep the soil covered at all times Use a crop residue, green manure, cover crop, mulch, etc.
  3. Use zero tillage. “The worst thing that can ever happen to a soil is the use of a rototiller.” USDA ag extension service agent in a video. Ditto: moldboard plow, disk, lister, oneway, cultivator, etc. Tillage is destructive to soil.
  4. Maintain biological diversity. Use many different legume/non-legume, green-manure/cover crops.
  5. Feed plants through the mulch. Spread organic fertilizers, minerals, etc. on top of the mulch.
- Roland Bunch, COSECHA, Honduras

## 2. Natural Farming

Mr. Fukuoka was returning to the family farm by train. He noticed along the railroad tracks that rice was growing. It was not planted each year, was not irrigated, was not fertilized and was not sprayed with anything but it came up and produced every year. He wondered why rice could not be produced that way on the family farm. After some failures, he succeeded and been practicing what he calls Natural Farming for over 60 years. He applied it to the orchard and nearly half the trees died. But he learned how to manage the orchard naturally. Thousands of people have been to his farm for tours and to study. Natural Farming yields are equal to or greater than conventional farming. Inputs are almost zero. Seed balls are used for planting [see library].

“Make your way carefully through these fields. Dragonflies and moths fly up. Honeybees buzz. Part the leaves and you will see insects, spiders, frogs, lizards and many other small animals bustling about in the cool shade. Moles and earthworms burrow beneath the surface. This is a balanced rice field ecosystem. Insect and plant communities maintain a stable relationship here. It is not uncommon for a plant disease to sweep through this area of Japan, leaving the crops in my fields unaffected.

Now look over at the neighbor’s field. The weeds have all been wiped out by herbicides and cultivation. The soil animals and insects have been exterminated by poison. The soil

has been burned clean of organic matter and microorganisms by chemical fertilizers. *These rice fields, which have been farmed continuously for 1500 years, have now been laid waste by the exploitive farming practices of a single generation.*” One Straw Revolution, M Fukuoka.

He follows these four principles:

1. No cultivation: Farmers have assumed that the plow is essential for growing crops. However, non-cultivation is fundamental to natural farming. The earth cultivates itself naturally by means of the penetration of plant roots and the activity of microorganisms, small animals and earthworms.

2. **No chemical fertilizer:** People interfere with nature.
3. **No weeding by tillage or herbicides:** Weeds play their part in building soil fertility and in balancing the biological community. Weeds should be controlled, not eliminated.
4. **No Dependence on chemicals:** From the time that weak plants developed as a result of such unnatural practices as plowing and fertilizing, disease and insect imbalance became a great problem. Nature, left alone, is in perfect balance.

### **No-Till Demonstration Garden**

On 18 July 01, Andrea Holman and I took a plot in the South Plains Food Bank Market Garden to have a demon-stration garden using organic, no-till, permanent beds. Over the years I have read several books and many articles about no-till. I was impressed but that is nothing compared to doing it and seeing it in a garden. I will never again garden or farm any other way. It works. As the health of the soil is restored, we have much less weeds. The worms are everywhere whereas before there were almost none. During five months in the winter, we received only two inches of rain yet the beds never dried out under all that mulch. We wanted to have a winter garden but the water is turned off.

**Beds:** Seven beds, 2 m. wide and 22 m. long. The paths between them are app. ½ m. wide. Drip irrigation is used. Beds 1-5 were covered with straw; Bed 6 was covered with sawdust and horse manure from a stable; Bed 7: one-half was double dug and the other half was covered with several inches of compost.

**Paths:** 1-6 was covered with tree chips [groundup limbs from trees trimmings]. June 02 the chips were mostly decomposed. In July, we covered all the beds with pecan shells except the southern half of path 3 where we used tree chips. Much of the paths are covered with the vines of gourd, squash, etc. Cannot walk down some of them.

**Weeds:** After spreading the mulch on the beds and paths, the weed population was low. After nine months, There are almost no weeds. The weeds are very weak. By pulling at the ground level, several inches of roots come out with the weed because the soil is so soft.

Andrea did all the planting. She just opened up a hole in the mulch and planted the seed. You should see what she has growing. I will never garden or farm any other way and I now teach this in my workshops.

### **Reference**

#### **1. Soil**

is made up of different size particles from coarse sand to fine clay and organic matter. There are soils of pure sand to pure clay. The amount of organic matter varies widely. Sandy soils do not hold water in the root zone and clay soils hold too much. Adding organic matter corrects both problems.

#### **2. Soil life**

A teaspoon of soil contains billions of microscopic organisms. These are a must for a healthy soil. Worms are an indicator of the health of a soil. Good soil will have at least 10 per square foot They plow the soil. Chemicals are a poison and kill the life.



### 3. Soil pH

The acidity or alkalinity [basic] of soil is measured on the pH scale. It is 0 to 14 with 7 being neutral. Below 7 is acidic and above 7 is alkaline. Some plants need [or must have] an acid soil and others alkaline

### 4. Soil test

This is not a “must-do.” First, increase the organic matter [OM] in the soil. The ag extension service can provide a lot of basic information. A good quality organic soil test is \$75 [USA].

### 5. Organic

means that everything done and used in/on the beds copies nature. No inorganic chemicals [insecticides, herbicides, fungicides, pesticides, fertilizers, etc.] are used. It is low or no inputs except seed and one can save ones own seed. The principle is: healthy soil.

### 6. Organic matter

The secret to healthy soil and increased yields and profit is the amount of organic matter in the soil. Soil containing very little organic material will not absorb water when it rains. It runs off causing erosion. Soil high in organic matter will absorb the water and hold it for the present and/or future crops. The best source of OM is crop residues. Never burn it!. It can be increased by intercropping the crop with a green manure crop; using some beds for green manure crops and others for food; planting cover crops during the winter; bringing organic matter from the outside: sawdust, food waste, manure, leaves, grass, etc.

### 7. Beneficials

Nature maintains a balance of “good” and “bad” insects. If you kill all the bad insects, using a poison, what will the good ones eat; you will probably kill the good ones, too. Grow

plants that attract good insects and grow plants that repel the bad insects. Insects are the pollinators of our crops-we must have them. Beneficial insects can be purchased for release into the beds. Birds, toads, lizards and bats live on insects. Give them a home.

### 8. Pests and diseases

Pests attack unhealthy plants. It is proven that healthy plants produce chemicals that repel bad insects. Therefore, the key to controlling pests is healthy soil. Plants under stress, such as with low moisture, are susceptible to attacks, also.

### 9. Pesticides, insecticides, fungicides,

Never use inorganic chemicals. Never use the organic pesticides [tobacco, etc.] except in an emergency. They are very poisonous also. When it is absolutely necessary to spray for pests, use garlic, chilies, Neem, pepper, solutions made from insects, etc. Manure tea and compost tea are pesticides. Many you can make. Pheromones [female scent], lures, traps, tapes are effective controls. Many botanical, biological and mineral products are available.

### 10. Weeds/Herbicides

Weeds are not bad. Nature never leaves the soil bare. Nature uses weeds. They add OM to the soil. As the soil becomes more healthy, the varieties of weeds growing in the beds will change. Never use inorganic herbicides. Vinegar and corn gluten meal are natural herbicides.

### 11. Weeds

As your soil becomes fertile, you will have less weeds. Never let weeds go to seed. The amount of seeds that are produced each season varies from nutsedge, 2400, to nightshade, 178,000. The years the seed can remain viable, buried in the soil, vary from

quackgrass, 6 years, to up to 40 years for lambsquarter. Therefore, every time you plow, you bring to the surface a new crop of weeds.

## 12. Fertilizers

Do not use inorganic fertilizers. They poison the soil life. Grow your own nitrogen using legumes or use the organic N available in your area. For example, in Kenya I found a by-product of the coconut industry with 30% N. The leaves of a number of trees are high in N and can be coppiced.

Worm casting [manure] is the world's best fertilizer. That is just one of the reasons they are so beneficial. Microorganisms must break down natural fertilizers into substances the plants can absorb and they do that at the rate the plants need it. The N in chemical fertilizer is water-soluble and most of it goes into the water supply with the rain. Organic fertilizers are naturally slow-re-lease. Micros change them so plants can use them.

Some soils are low in minerals and metals. These must be purchased but do not add any until you have added OM. It moves the ph toward neutral whether high or low. Phosphorus is mined from the ground and only in a few places in the world. Trace minerals must be purchased when lacking in the soil.

Foliar feeding: Plants can have fertilizers put on as a spray and it is absorbed within hours. Fish, seaweed, manure tea and compost tea can be made and sprayed.

## 13. Seed

Use open pollinated seed and you can save your seed from year to year. Hybrid seed require high inputs of chemicals, fertilizers, etc. New seed must be purchased every year. Do not use Genetically Modified seed [GMOs]. . "The companies tell the US patent office that these plants are novel and unique to get a

patent but they tell the FDA/EPA that that they are natural and not new and not subject to regulations." [S Ogden, Straight-Ahead Organics, 1999]. Buy only from those seed companies that have signed the "Safe Seed Initiative."

## 14. Windbreak

High winds can reduce production considerably. Wind protection can greatly increase yields. They greatly increase forage production on ranches, also.

## 15. Companion planting

Certain plants will produce more when planted in combination with certain other plants. On the other hand, certain plants will produce less when planted in combination with others. There are some plants that produce a substance that prevents other plants from growing within their area.

## 16. Tools

Some little known are: broadfork; digging fork [diamond & square tines]; scythe; manure/hay/compost forks; weed cutter, planting hoe, jab planter, Earthway push planter, fertilizer spreader. The local blacksmith can make some of these. A garden cart is a must.

## 17. Row covers

These extend the growing season in early spring and early fall, gaining several weeks. There are two kinds: a] plastic supported by frames or hoops and b] floating supported by the plants.

## 18. Crop rotation

Never grow the same crop in the same bed year after year. Move each crop to a new bed every year. This breaks the cycle of soil diseases. If planting more than one bed in the same crop, do not plant them in adjacent beds.

Alternate beds with crops. This confuses the bad insects entering the field. Put some beds in g/m crops.

#### 19. Intercropping

is the planting of two or more crops in the same bed. For example, in several tropical countries, the corn is planted and after three or four weeks, beans are planted in the same row as the corn. They cover the whole bed and climbs up the corn stalks. The corn yield does not decrease and there is an additional bean crop. The beans fix N, provide ground cover, stops weeds, provides food and adds OM.

#### 20. Green manure/Cover Crop

are those crops that are planted to keep the bed covered. It can be intercropped or be grown alone to be killed by cutting the tops before the next planting. Leave on top of the bed unless it is necessary to prepare a fine seed bed. Otherwise, open up a space for the planting leaving the remainder of the bed covered.

#### 21. Contour

On sloped land, place all beds on the contour to control erosion. Use a transit or an A-frame

#### 22. Seed balls

A mixture of powdered clay and water is used to coat the seed. This can be done by hand or by a simple machine. When sown, they are left on top of the soil. They are used in intercropping, dry sowing and are ideal for seeding desert areas.

#### 23. Compost

is a mixture of dry materials [carbon], green materials [nitrogen], air and water which microorganisms break down into a wonderful fertilizer. It can be made in a pile or in a bin. There is no need to add soil and no need to layer. Put the materials in the bin as available.

Do not make compost unless you have no place to immediately use the organic materials as mulch.

#### 24. Organic livestock

All the feed must be organically grown. Antibiotics and hormones cannot be used in any form. Grass-fed meat is the most profitable.

#### 25. Organic dairy

All feed must be organically grown. Antibiotics and hormones cannot be used in any form. Seasonal, grassland dairying is the most profitable.

#### 26. Value-added

One of the best ways to increase farm income is to add value to your crop before selling it. For example: sell roasted coffee rather than beans; sell meal instead of grain; sell cheese instead of milk; sell bouquets instead of flowers.

#### 27. Biointensive

Most people plant in rows but by staggering the plants, 10% to 20% more plants can be in a given space. This provides a living mulch to shade the ground.

#### 28. Biblically based agriculture

God "in the beginning created the heavens and the earth." He said "it is good." and "work it and take care of it." One who wants to obey God cannot poison the earth nor do anything to harm it nor harm anything in or on it. He teaches that we must treat animals humanely.

#### 29. Biotechnology

is the moving of a gene from a plant or animal to another plant or animal. This is impossible in nature. No one knows the results, yet the corporations have been allowed to put genetically engineered [GE] products on the

market without testing. They put insecticides, herbicides, etc. on the market without testing and now we are taking them off the market because they are so dangerous to the earth and people. They do it for profit and do not care who gets hurt or what gets hurt.

### 30. Landscape fabric

should never be used. Several layers of newspaper or a layer of cardboard accomplishes the same thing.

### 31. Micro-climate

is a climate in a defined area that is different from the climate in general due to special features such as a bluff, mountains, etc. as at a banana plantation in southern CA. This is possible because of a micro-climate created between some cliffs and the beach. This small area has a very warm climate all year in contrast to the climate outside the area.

### 32. Organic Research

is almost non-existent in the land grant universities in the USA. 885,863 acres for agriculture research and 151 acres of that is for organic agriculture. <ofr.org>

### 33. Global Warming/Ozone

One hundred scientists signed a document warning us about global warming but hundreds refused to sign it noting that it is a natural

occurrence we cannot change. If you study a plant zone map of the USA from several decades ago and compare it to the present map, the lines are actually moving south just a little. We are actually getting cooler. It should be noted that the freon that was outlawed, worldwide, had a patent owned by Du Pont. It had expired. The replacement is owned by guess who: Du Pont.

### 34. Farm Prices

are determined by supply and demand but super-markets the highest price the the customer will pay.

### 35. Urban Livestock

Is a major source of food in some cities. This may range from a few chickens to a cow. A survey in Mexico City found that families average 20 head of livestock plus a garden.

### 36. Pasteurization of food

began with milk. People were getting TB from milk and pasteurization was offered as the solution. This was the hi-tech solution to a simple problem. The proper solution was TB-free cows.

### 37. Radiation of food

has been promoted as the way to assure that all our food is germ free. Sanitary conditions in processing is the solution. Radiation has not been proven safe.

## Irrigation

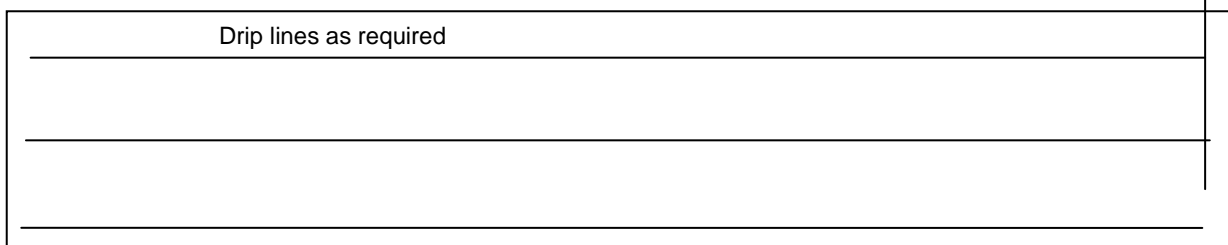
### 1. Drip Systems

Available from Chapin Watermatics and Submatic.

Top view

Path

inlet



Path

### 2. Drip - Agroforestry

Drip tape connected to water line.

Line of trees ○ ○ ○ ○ ○

Drip tape around

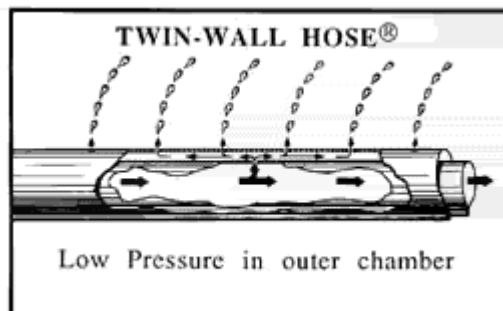
trees

#### 1. Soaker hose

#### 2. Drip tape

Water exits out hundreds of tiny holes all over

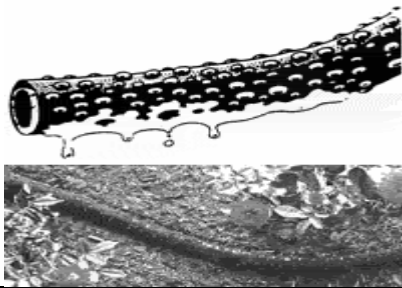
Available with drip outlets 4", 12", 24", etc.





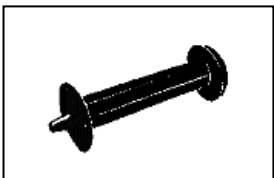
apart.  
the hose. PVFS

### Chapin Watermatics



### 3. Jet nozzle for spraying a bed sown broadcast

tools



### Submatic Irrigation

### Gravity System - Irrigation

### Bucket Drip Irrigation System Transforms Ethiopia

“The drip farm in Seneteria is very beautiful. We are using it to feed our preacher training students, needy members of the church and teachers of the deaf.” This quote illustrates the power that a few dollars can make in changing people’s lives around the world. During the past four years, Ethiopia has been in the midst of a severe drought and famine.

Only in recent months have rains in the region helped to relieve the suffering. The situation had become so alarming at one point that an Ethiopian preacher wrote us saying, “So many of our brethren are dying that I cannot attend all the funerals.”



From the initial training, these 10 preachers went and trained 100 other men, and “survival gardens” started to spring up all across Ethiopia. The churches in Woliata, Badwacho, Mozoria and Jajura are also implementing this program very successfully. Now thousands of raised bed gardens with simple drip irrigation kits are being tilled and formed through an ever expanding training program set up by brethren in Ethiopia.

The technical assistance and the funding for this program have come through the efforts of HHI and The church of Christ. The wonder and beauty of this method of increasing food production in drought or famine conditions is its simplicity. Linked by God’s natural law of gravity, the simply, but high-tech designed drip tape costing \$12.00 attaches to a five gallon bucket. The water is then gravity fed through the drip tape to feed the garden. Ten gallons of water, or two fills of the bucket a day, will provide enough precious but limited water to grow 200 row feet of various vegetables by alternating the drip tape every other day between two beds, each 50 feet long. This would be enough to keep a family of five fed during the year-long growing season in equatorial regions like Ethiopia.

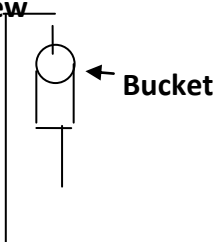
Many of the Ethiopian people had been nomadic herders of livestock roaming from pasture to pasture. With the lack of rainfall and green pastures, many of these people have become “seed scattering” farmers in search of more modern, yet simple ways to gain greater production from the limited land and water resources. Properly engaging these simple systems and techniques, thousands are now learning how to provide for themselves, improve their standard of living and secure the hope of a longer and more fruitful life. From HHI.

### Irrigation - Gravity System

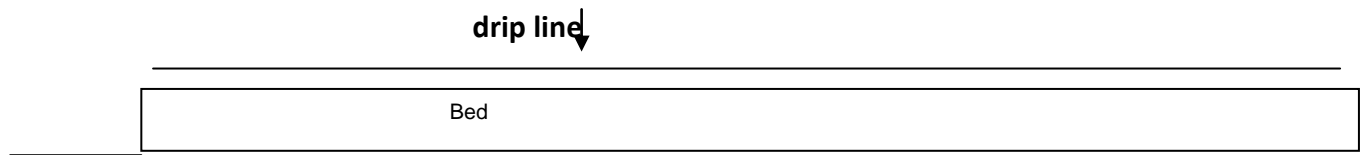
#### 1. Drip: bucket system

Chapin Living Water Foundation

Side view



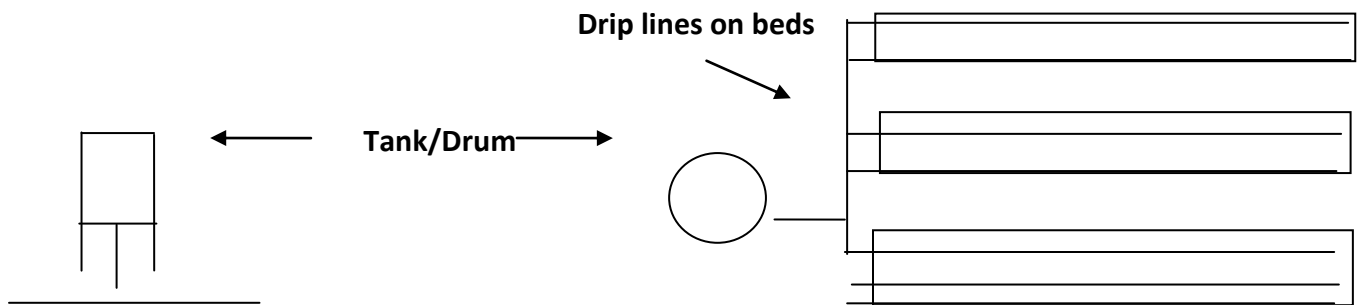
Two kits will grow all the vegetables a family [7] can eat [Kenya].



Top view

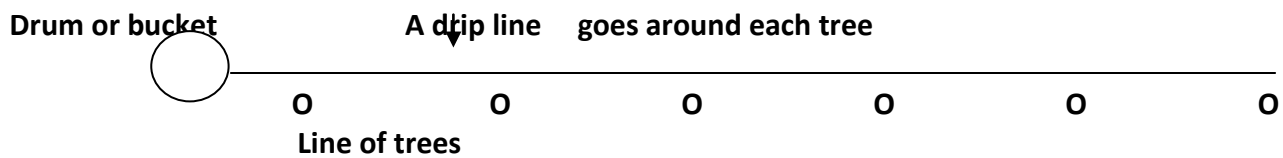


## 2. Drip – Tank or drum



## 3. Drip - Agroforestry

Top view





Some farmers here invented a cheap, simple drip irrigation system. They buy the black poly tubing. Then they punch holes in it where they want them. They take short sections of the same hose, cut it lengthwise, and place it over each hole. This sleeve only lets out a little water, like a drip. Maintenance is also simple, because if a hole plugs up, you can often unplug it merely by taking the sleeve off and then replacing it. Roland Bunch, COSECHA, Honduras

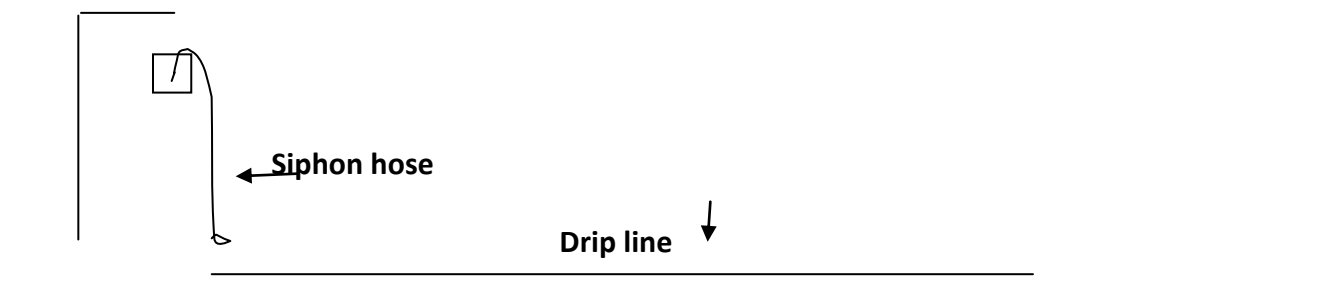
**DIY drip tape**

Tubing with holes punched.



**Siphon System**

Bucket on post one meter above ground.



**Intercropping**

"In Mexico, it takes 1.73 hectares of land planted with corn to produce as much food as one hectare planted with a mixture of corn, squash and beans." The difference, he says, comes from "the reduction of losses due to weeds, insects and diseases and a more efficient use of the available resources of water, light and nutrients". Monocultures breed pests and waste resources, he says. Miguel Altieri, University of California, Berkeley.

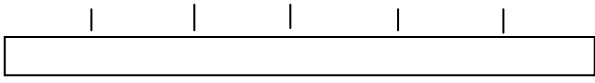
Corn

Corn & Beans

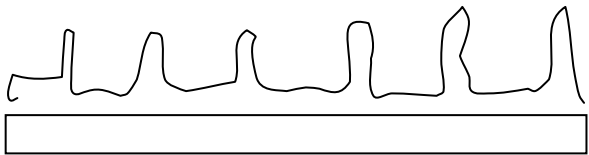
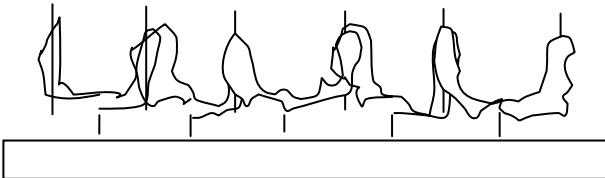
It is the growing of two or more crops together.



bed



**Corn [harvested] & Beans** **Beans**



Wind Protection

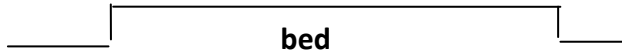
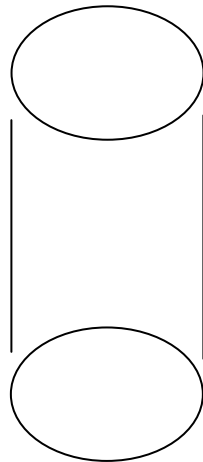
**1. Tall crop** **2. Plant cage [wrapped]**

Tall crop ↘

Wind →

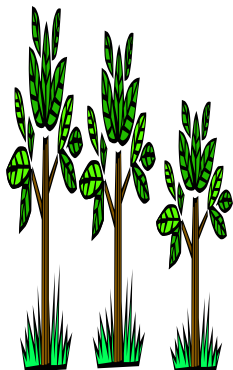


Crop ↓

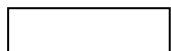
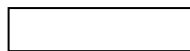


**3. Shelterbelts for crops**

The benefits are proven.



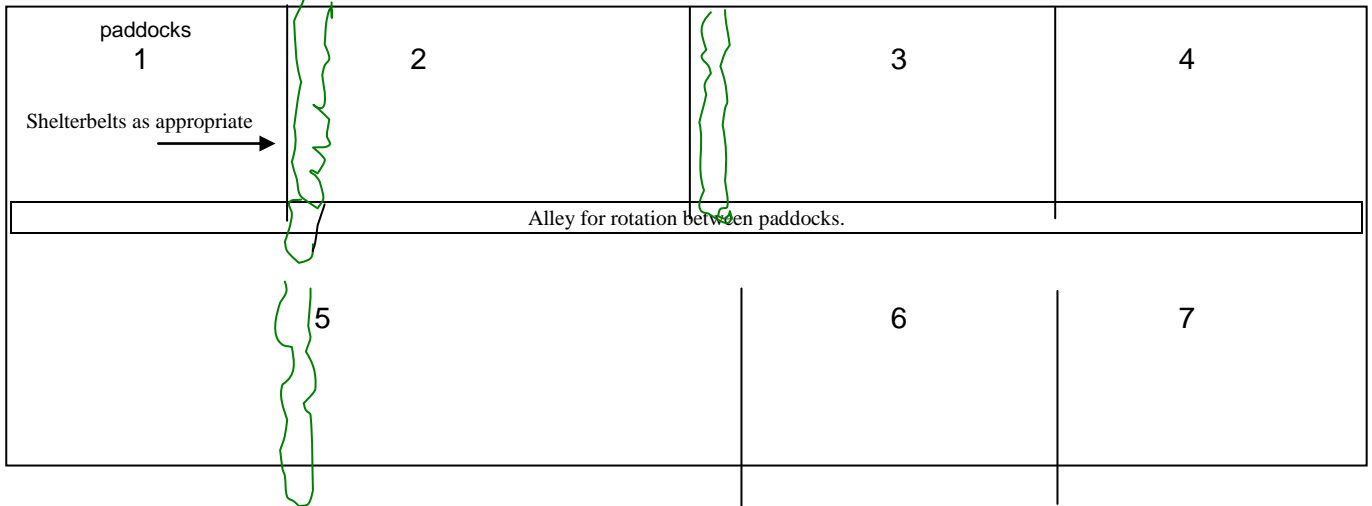
beds



#### 4. Shelterbelts for livestock

Climate has enormous effects on the productivity of pasture-raised animals. Studies prove that shelters [trees and bushes] improve livestock performance. Windbreaks not only protect the animals but improve pasture production. The plan must be designed for each farm/ranch considering: wind direction, temperatures, etc.

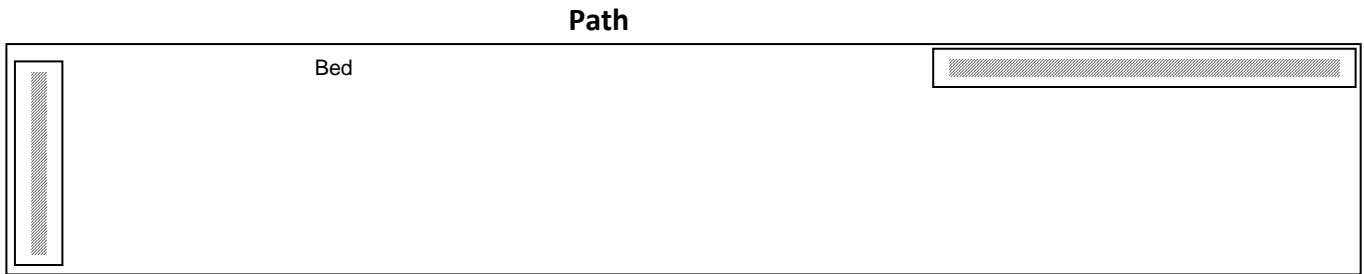
#### Farm/ranch plan.



Trellis

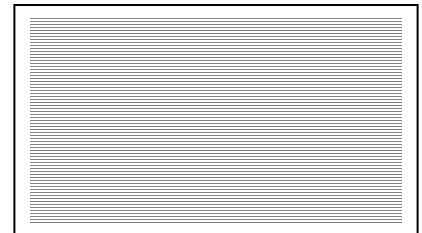
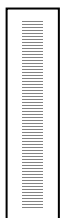
#### 1. Fence

#### Top view



Path

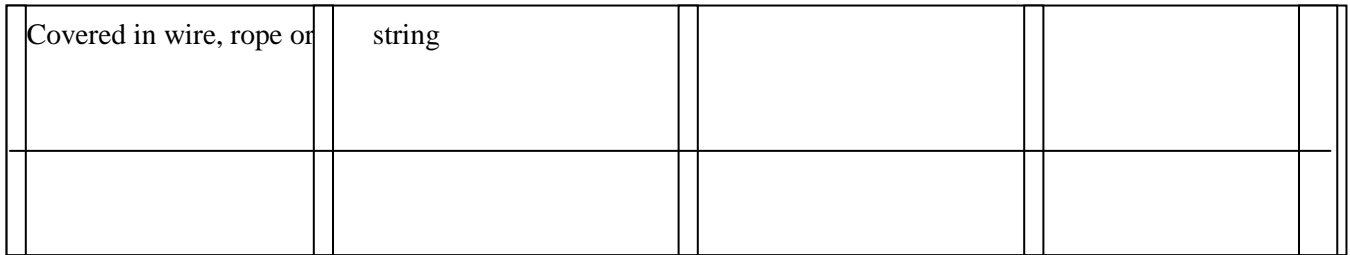
#### Side view



Bed

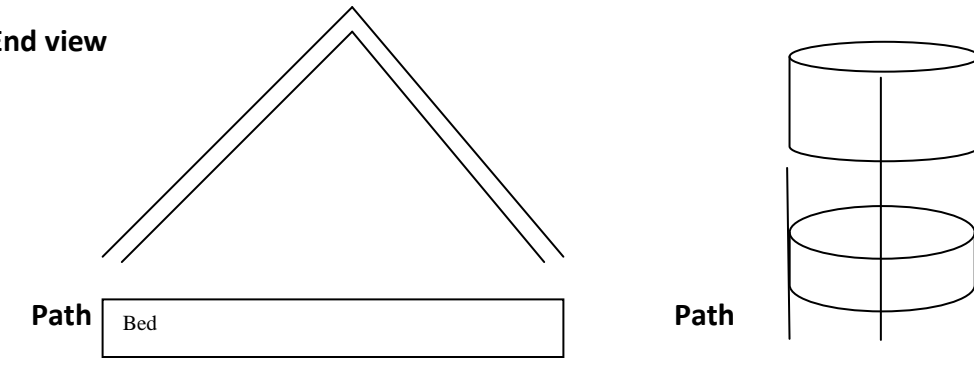
## 2. A-frame

### Top view



## 3. Plant cage

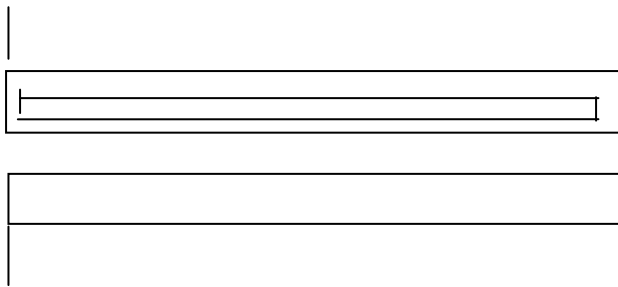
### End view



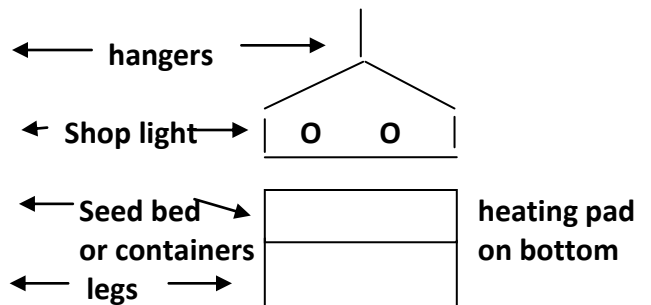
## Transplants

### 1. Indoors

#### Side view

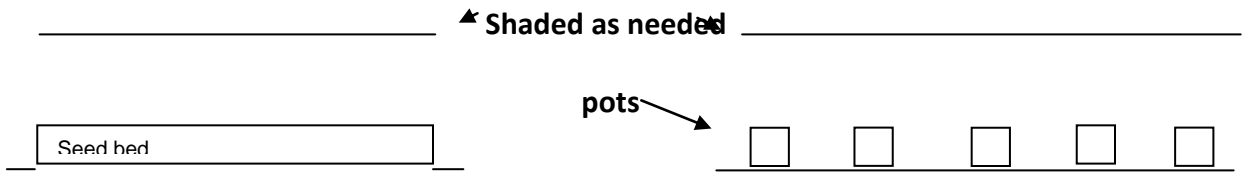


#### End view



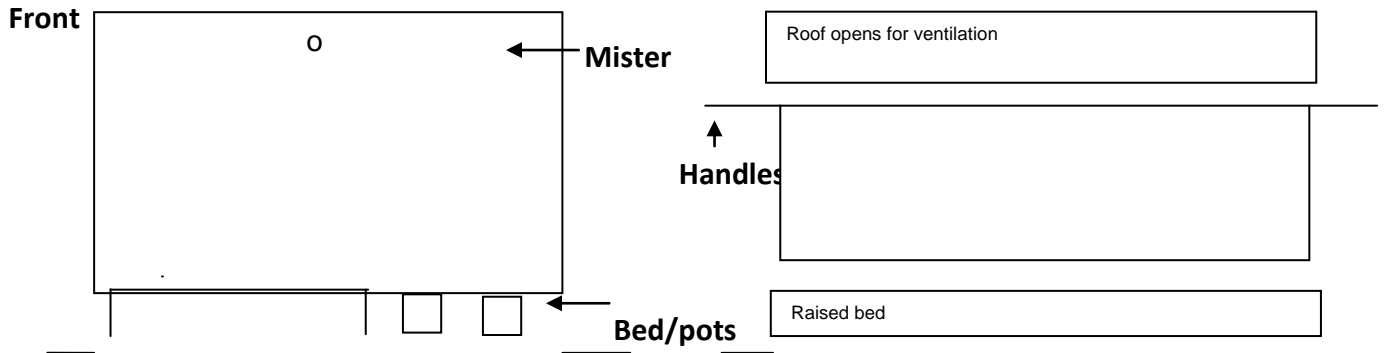
**2a. Beds**

**2b. Containers**



**3. Mist chamber**

**4. Mini-greenhouse, portable**



**5. Coldframe**

**6. Thermal chimney**

See page 29.4

See page 29.3

**7. Starter pots**

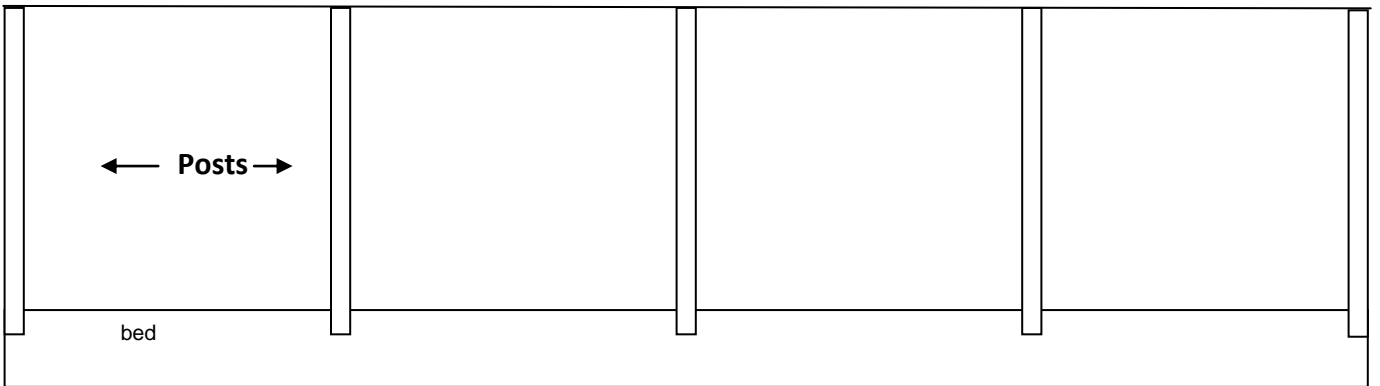
can be made, by hand, out of newspaper. Works very well. Or make them using a soil blocker. Use foam cups, yogurt or orange juice containers. Many types are available from the gardening supply stores.

People must understand that being a farmer, granjero, fazendeiro, campesino, fermier, is honorable.

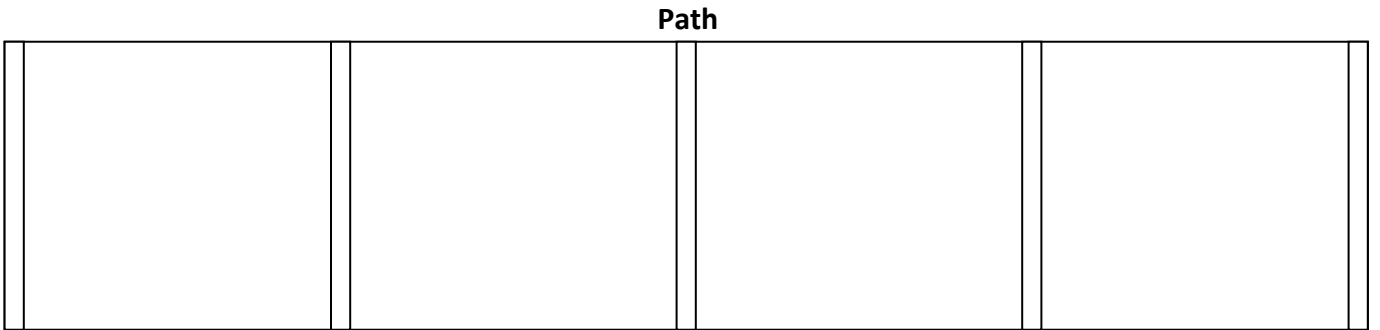
Shade

**Designs**

Side view - Top covered. [shade cloth, etc]



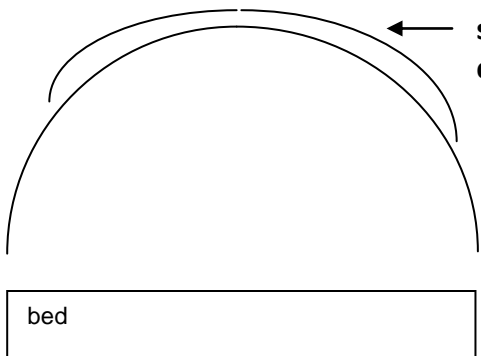
Top view



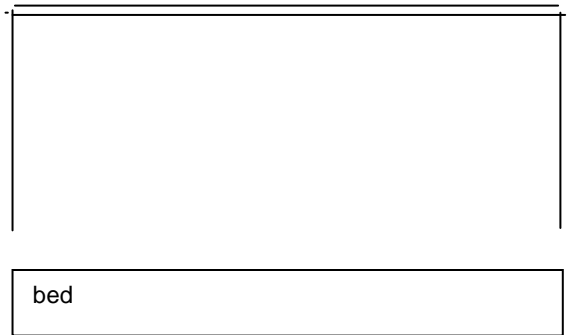
Path

**1. Round**

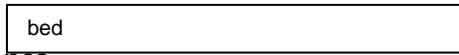
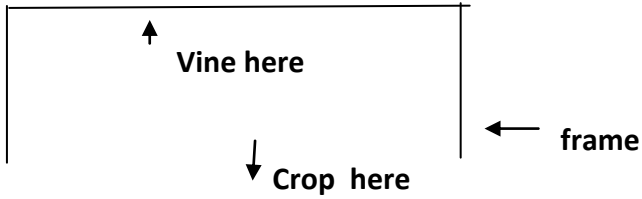
**2. Square**



shade cloth



### 3. Natural shading

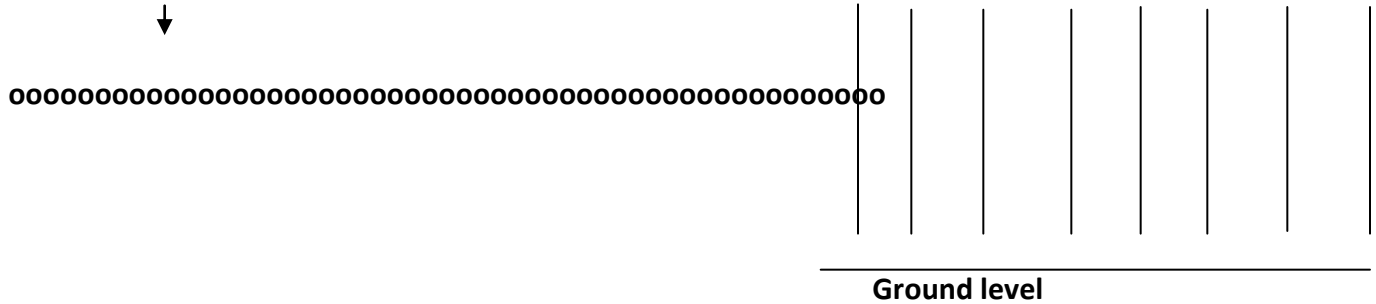


Living Fence

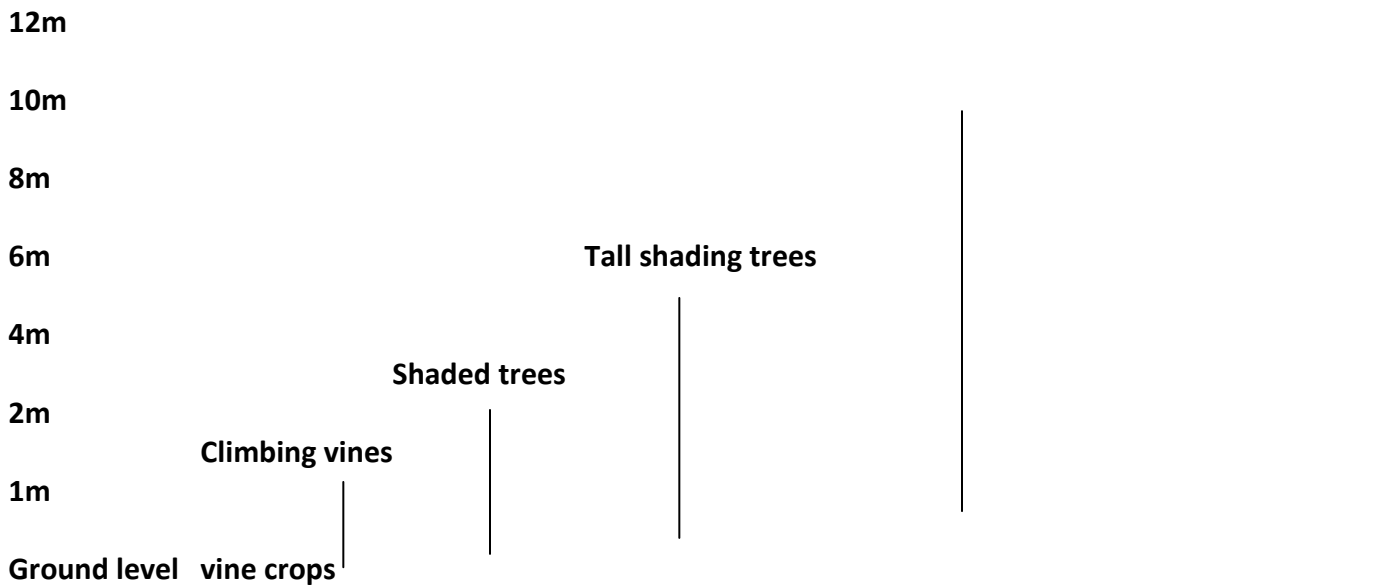
### 1. Top view

### 2. Side view

Specific specie of tree on property line or boundary.



### Multi-Story Production



## root crops

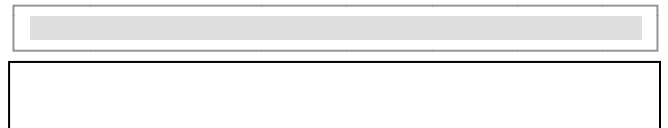
### Mulch

#### Soil covering

#### Top view



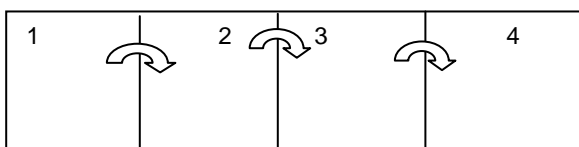
#### End or side view



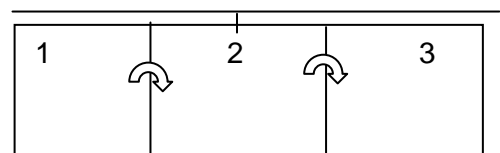
If no crops are growing in the beds and no green manure crop will be planted, the bed should be mulched. Never leave the soil bare. Use any organic matter such as hay, straw, hulls, sawdust, leaves, nutshells, etc. At planting time, open an area to put the plants or seed and leave the mulch. All crops should be in a gm/cc or mulched.

### Compost

#### Bins- open



#### Bins- covered

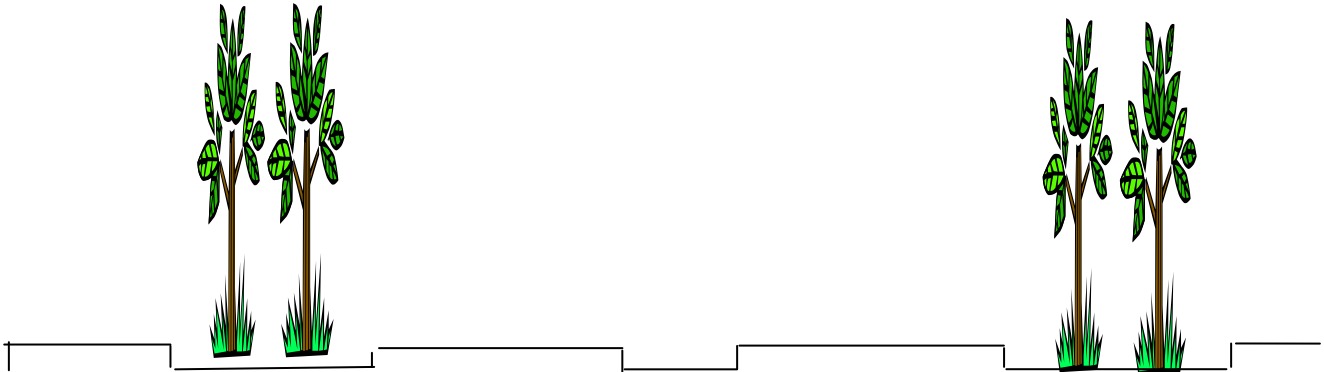




Use all organic matter as mulch. Any surplus should be composted for later use as a mulch and fertilizer.

### Alley Cropping

#### Beds with trees [coppice]



Trees bring up nutrients from below the root zone of conventional plants. They replace some of the gm/cc normally used. Legume trees should be used.

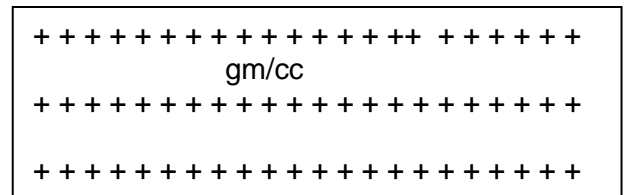
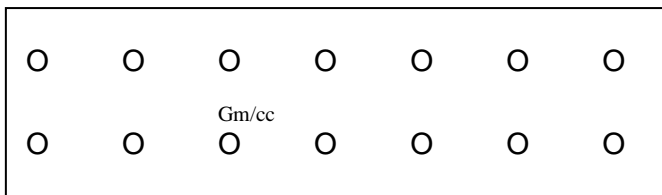
*Can you imagine the beauty of your community with all vacant lots/land in mini-agriculture, wildflowers, wildlife, forest, prairie, wetlands, stream riparians*

### Green Manure/Cover Crop

#### 1. Tomatoes - O

#### 2. Corn - +

If the bed is covered with a gm/cc when it is time to sow or transplant, open an area or row for the new crop in the gm/cc crop. Leave the gm/cc growing or cut it off at the ground level and leave as a mulch.



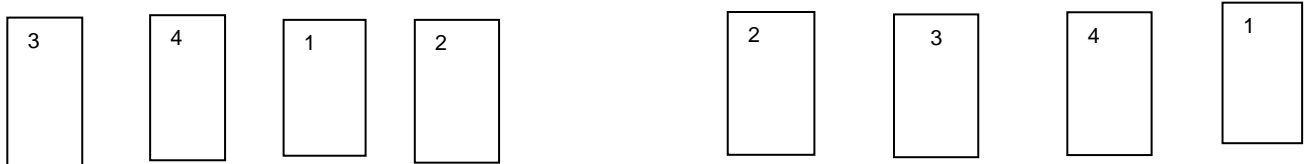
### Crop Rotation

Following is a 4-year crop rotation plan. Include food and/or forage in three beds and legume/green manure crop in one bed. Rotations are usually 3 to 7 years.

**Year 1** **Year 2**



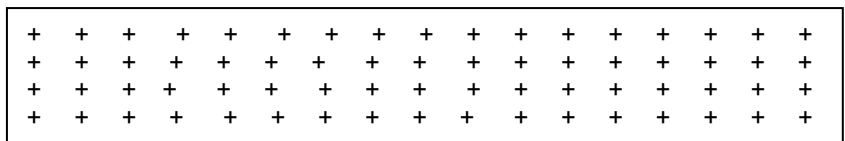
**Year 3** **Year 4**



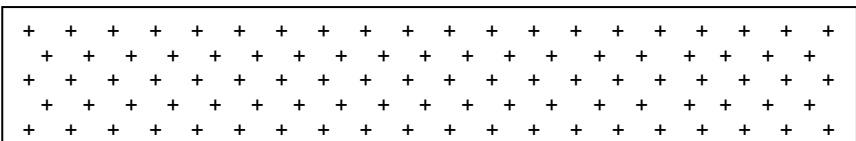
**Biointensive Planting**

**High density planting**

**Conventional planting**



**Biointensive planting**

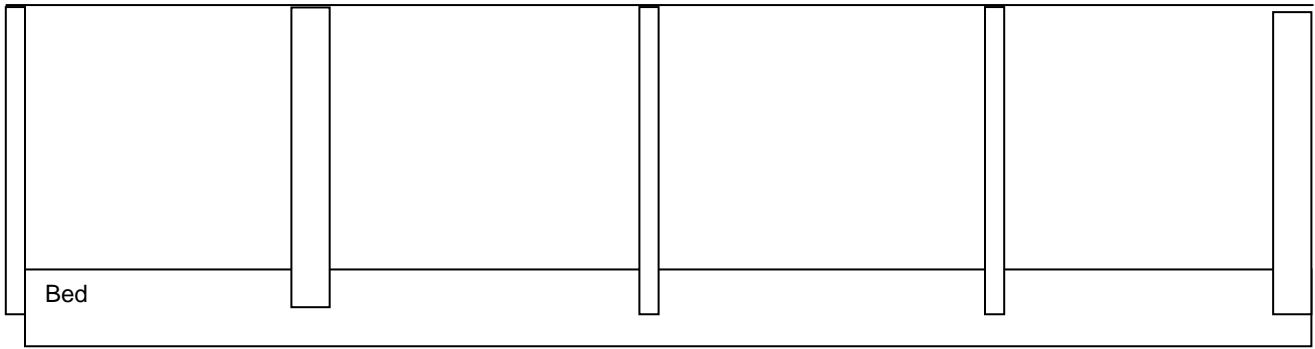


**Cold Weather Production**

**1a. Hoop house**

**Side view**

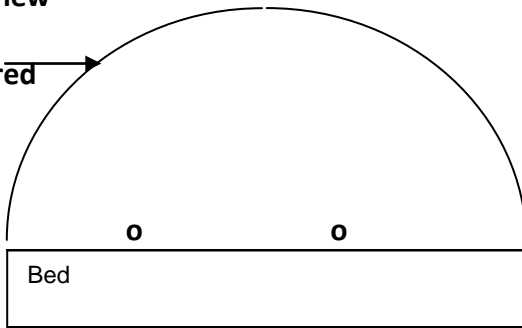
**Cover with clear plastic.**



**1b. 2. Wall-O-Water**

End view

covered



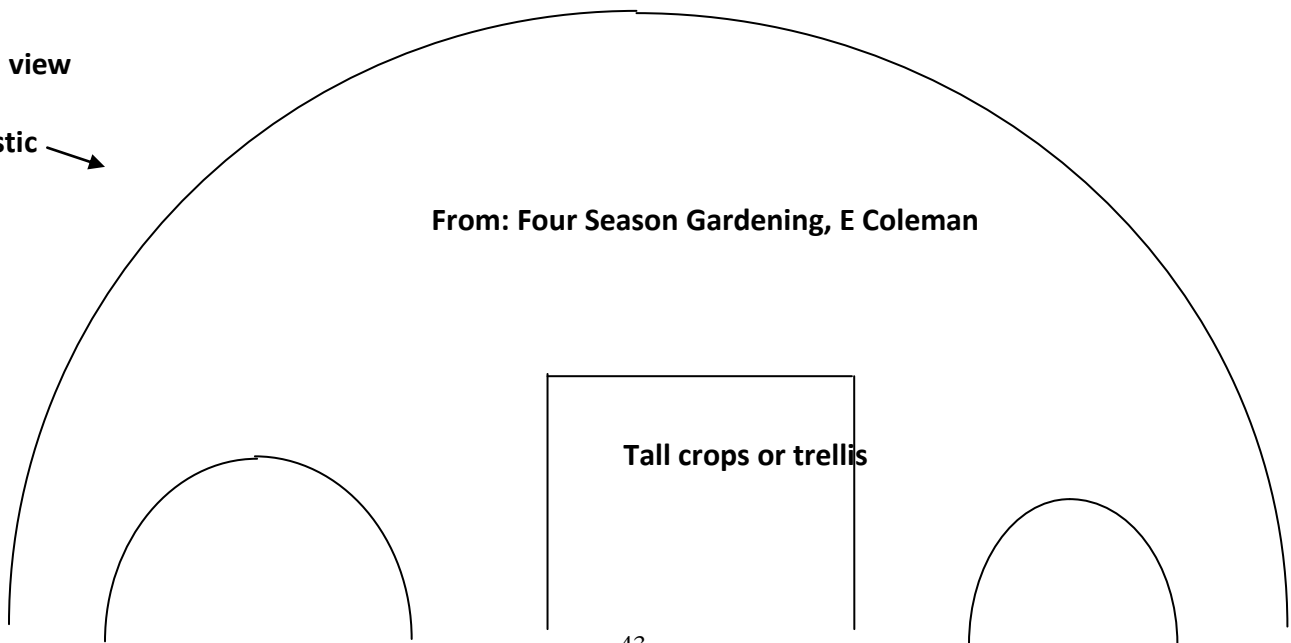
drip lines



**3. Large hoop house with small ones inside.**

End view

Plastic

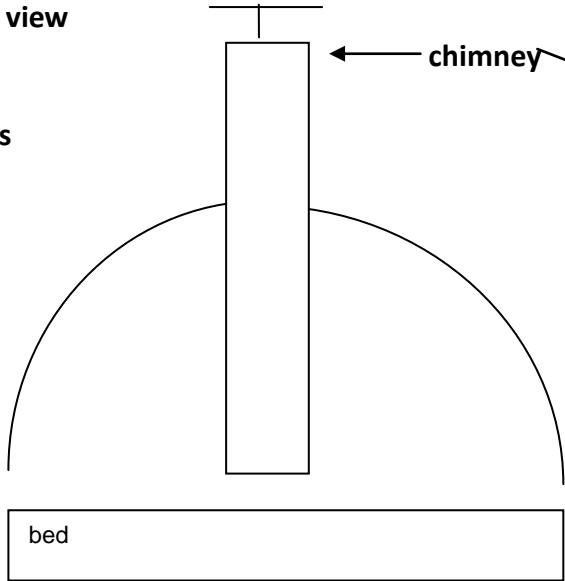


From: Four Season Gardening, E Coleman

**3. Thermal chimney**

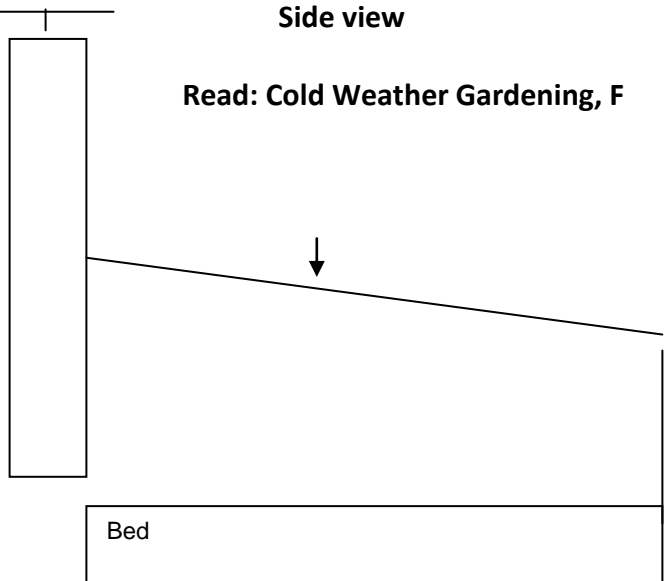
End view

Ours



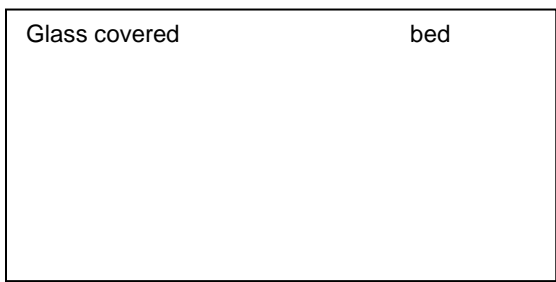
Side view

Read: Cold Weather Gardening, F

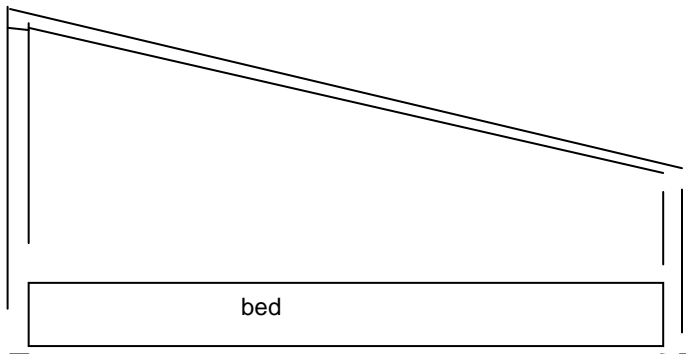


**4. Coldframe**

Top view

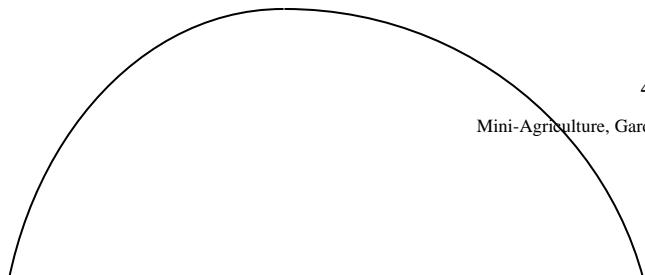


End view

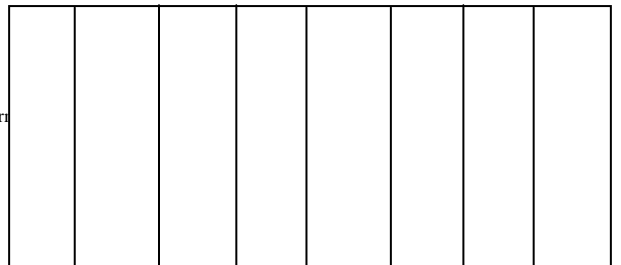


**5. Greenhouse – DIY \$100; free plans available.**

End view



Top view





**6. Greenhouse – portable. See Transplants**

**Micro-Climates**

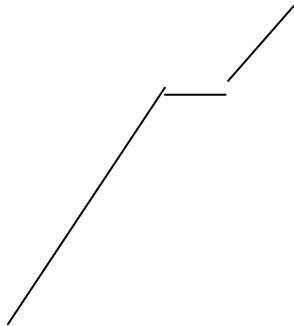
**If you can find and use a micro-climate, you can greatly increase production.**

**Cool micro-climates in a tropical climate**

**A strawberry farm in the Dominican Republic [tropical island]  
high up on the side of a mountain.**



**Plant the slope on the shady-side**



**Warm micro-climates in a temperate climate**



**Plant on the  
slope on the sunnyside**



**Planting on sunnyside of a  
structure**

bed

**1. USA banana plantation**

Seaside Gardens

Cliffs 300' high

West  
→

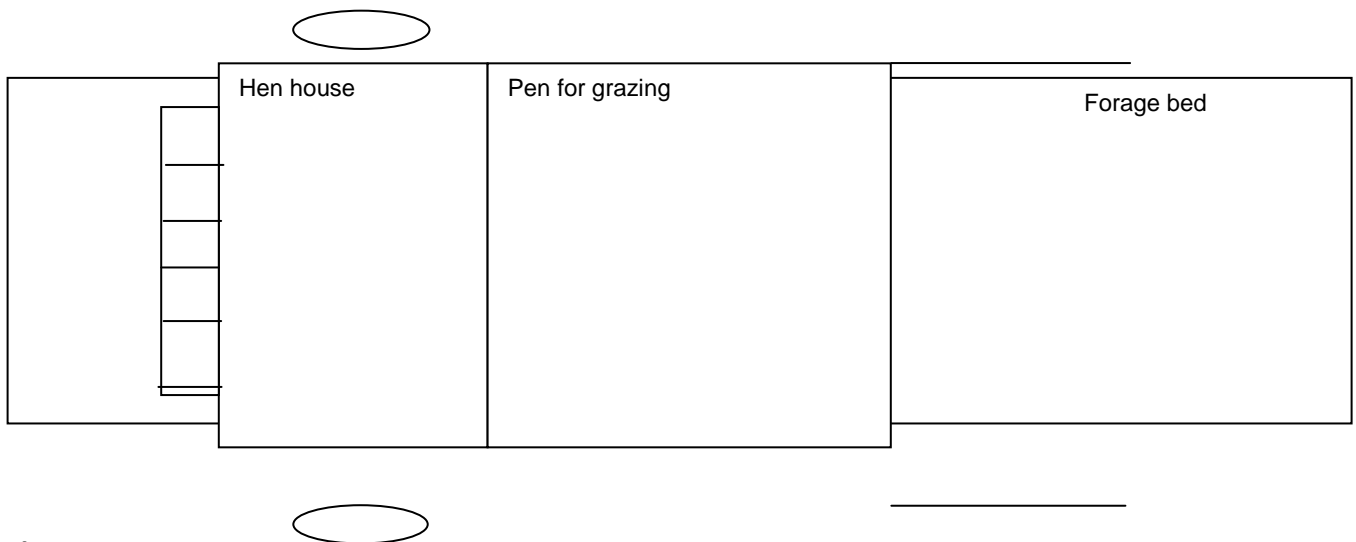
Banana plantation

Pacific Ocean

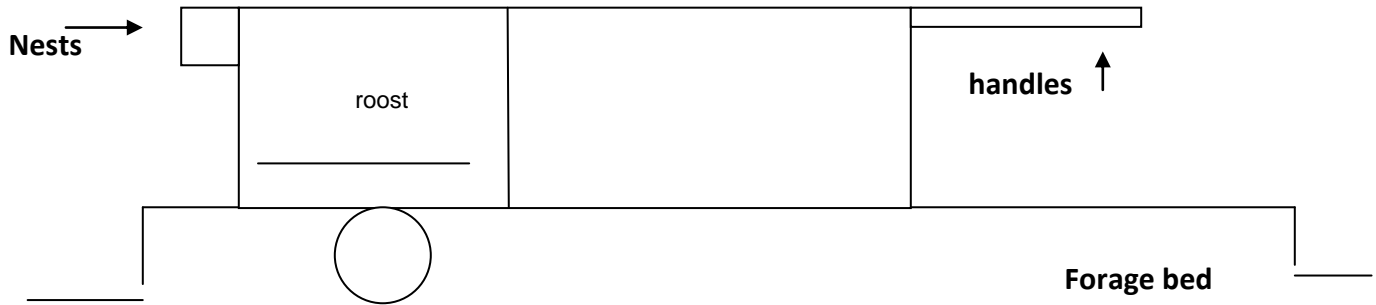
**2. Permanent beds surrounded by water: Bolivia, Mexico. See page 11.**

Forage Garden/Mini-ranch

**1. Poultry house – mobile-with or without wheels**

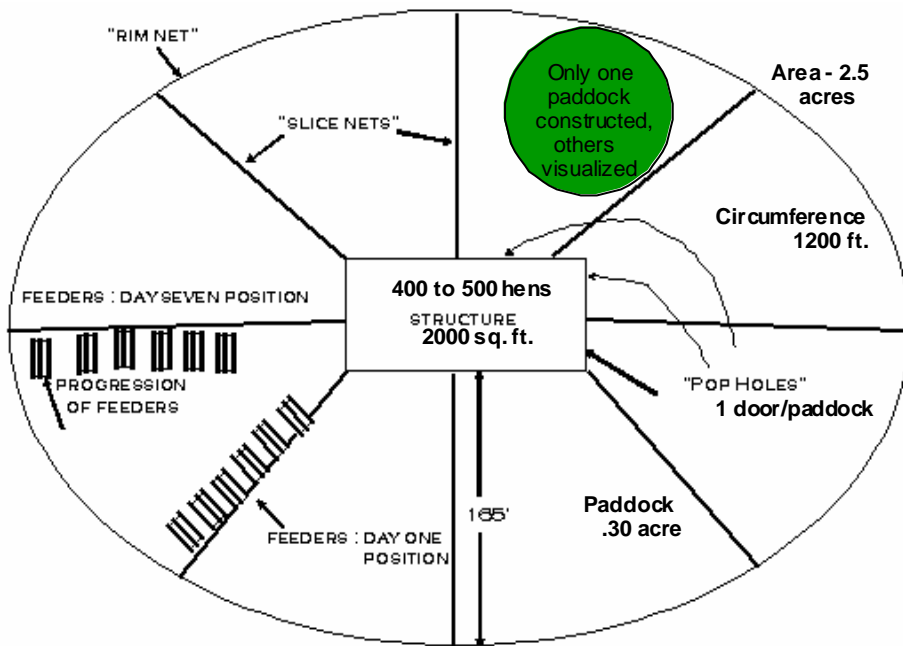


Side view

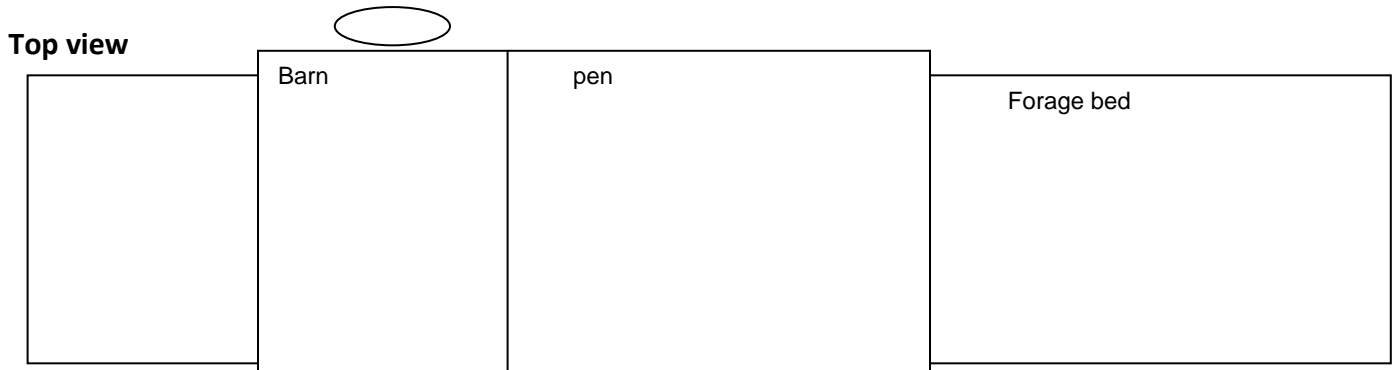


**2. Poultry house - Stationary Netting Model**

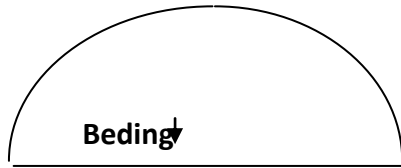
Book: The Stationary Netting Model Manual for pasturing layers by Tim Shell, [tshell@firstva.com](mailto:tshell@firstva.com). \$15 ppd.



**3. Small animal barn - mobile**



#### 4. Hoop House for hogs



#### 5. Paddocks for rotational grazing

The ranch or dairy is divided into paddocks based on quality of forage, type of forages, etc. Herd is regularly rotated between the paddocks according to rainfall, number of animals, etc. for a day or various days. Grass-based livestock and dairy production are very profitable.



**Seasonal dairying:** All cows are bred to calf at the same time so for app. two months there is no milking to be done.

|                              |                              |                                  |                                    |                                  |                                   |                                   |                                  |                                 |                                |                                  |                                  |
|------------------------------|------------------------------|----------------------------------|------------------------------------|----------------------------------|-----------------------------------|-----------------------------------|----------------------------------|---------------------------------|--------------------------------|----------------------------------|----------------------------------|
| Jan<br>Winter<br>cows<br>dry | Feb<br>Winter<br>cows<br>dry | Mar<br>Spring<br>cows<br>milking | April<br>Spring<br>cows<br>milking | May<br>Summer<br>cows<br>milking | June<br>Summer<br>cows<br>milking | July<br>Summer<br>cows<br>milking | Aug<br>Summer<br>cows<br>milking | Sept<br>Fall<br>cows<br>milking | Oct<br>Fall<br>cows<br>milking | Nov<br>Winter<br>cows<br>milking | Dec<br>Winter<br>cows<br>milking |
|------------------------------|------------------------------|----------------------------------|------------------------------------|----------------------------------|-----------------------------------|-----------------------------------|----------------------------------|---------------------------------|--------------------------------|----------------------------------|----------------------------------|

If the dairyman has a climate that provides grazing all year, when the cows are dry is not important. Otherwise, they need to calf just as the pastures are beginning to produce at their highest level. Provide the best pasture possible.



## Tools

### 1. Injector planter for no-till



### 2. Bulb planter



For subsistence farmers, IITA, Ibadan, Nigeria

### 3. Spreaders a.drop



### b. rotary



2. Planters

b. push

c. Jab

d. vegetable



4.

a. broadcast seeder

b. broadcast seeder

c. planting hoe

har



52 inch

5. Forks:

a. Digging - broadfork

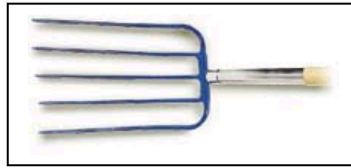
b. Compost

c. Manure

d. Digging

Available with one or two handles  
tines

Square or diamond



### 6a. Scythe

### 6b. Weed cutter or Yoyo



Scythe blades:  
16" to 24". Harvest  
up to one acre of wheat  
per day. Cut grass,  
brush, etc.



### 7. Garden cart



8. Sprayers: a. spray bottle

b. Pressure hose

c. Pump-up



9 Hoes -

a. Stirrup

b. Digging

Available in 3", 5", 7" widths.



10. Pruners – bypass, anvil 11a. Shears b. flower 12. Loppers – bypass or anvil 13. Tree trimmer

Ames/True Temper



14. 15. trowel 16. fork 17. transplanter



18. Hole Digger



20. Wheel hoe and implements

A no-till gardener/farmer has limited use for a wheel hoe. Oscillating knives shown attached. 5" to 10" and 11" to 14" in offset knives.



Minifarms Network



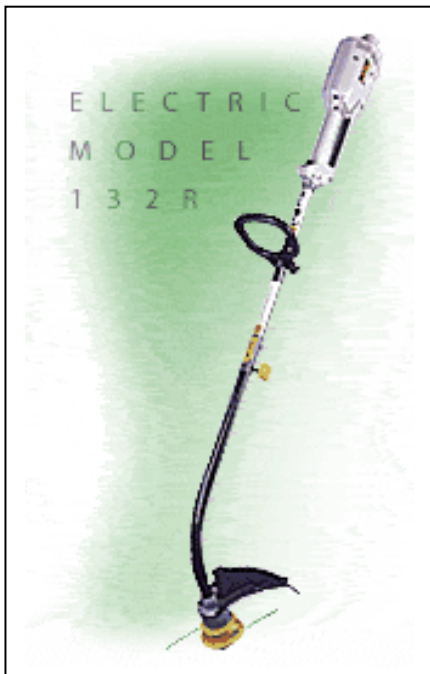
**Available from PVFS and Johnny's.**

**Wheel kit**



Wheel kit converts it to a two wheel model. Can attach two offset oscillating knives [one on each side].

21. Powered hand tools: Electric Powered with string mower Gas Powered with bush cutter



Ryobi dealerships worldwide.

Blower/Vacum

Edger

Hedge Trimmer



55

Mini-Agriculture, Gardens/Minifarms Network





¡When you kill a beneficial insect, you inherit its job!  
TX Gardener, M/A 2001

Pruner



Weed Wizard-chain cutter



Nylon available.

Turbo Blower



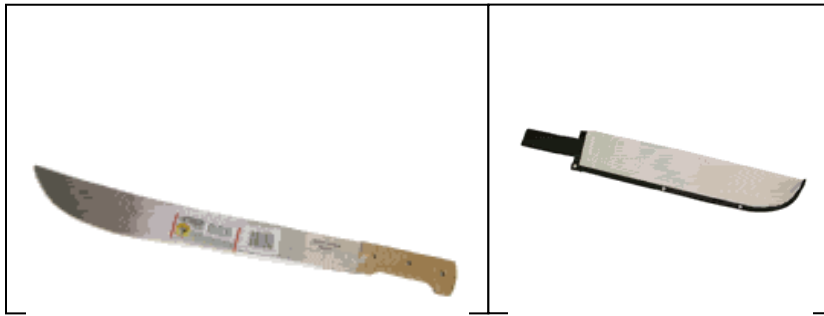
Snow Blower





22. Machete

sheath



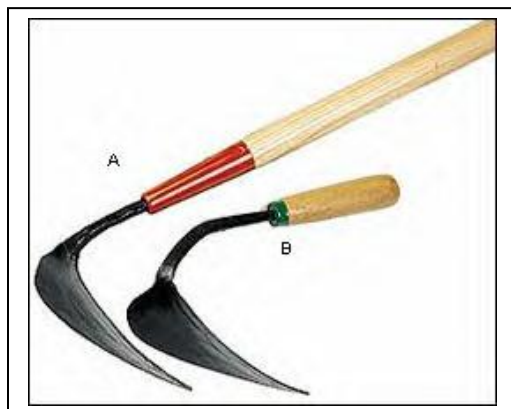
24. Quick Coupler



Fiskers  
Lee Valley  
Tools

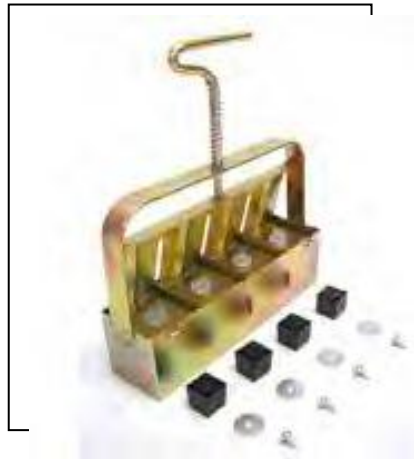
25. Hi-Mo-hand cultivator

26. Heating mat



27. Tranplanting: Soil Mini-blocker-3/4" Soil Blocker-2" 1½" or 2"

A. Soil Blocker-4" B.



PVFS <groworganic.com>

The world's family farmers can produce all the food the world's population will ever require, regardless of how high it goes, using organic Permanent Bed Agriculture.

The Lazy Dog Tool Company

Makers of radical new tools for organic weed control to eradicate injurious, noxious, invasive and harmful weeds like

Ragwort, Spear Thistle, Docks, Creeping Thistle, Burdock, Hemlock, Hogweed  
**without Chemicals**

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TELEPHONE/FAX 01751 417351

[The Lazy Dog Tool Company Website](http://www.lazydogtoolco.co.uk)

Philip Trevelyan email: [enquiries@lazydogtoolco.co.uk](mailto:enquiries@lazydogtoolco.co.uk)

After Harvest Tools

Egg incubator



Corn sheller



e. Ga



Sheep shears



Hoof trimmer



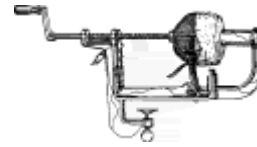
Pea sheller



Apple peeler



Apple peeler



Butter churn



Cream separator



Available from <[www.lehmans.com](http://www.lehmans.com)>  
Workshops

### 1. Urban

1. Inter-urban groups should be trained to grow food and operate street-stands and farmer's markets.
2. Urban: train gardening clubs and individuals who want to increase the yields with less labor, use organic, to live more healthy lives.
3. Peri-urban: train people to be market gardeners, minifarmers and mini-ranchers and to operate farm stands and farmer's market stalls. People will drive out to buy fresh produce, meats and raw milk.
4. Churches: Many are involved in promoting a simpler life style. Teach the members to improve their health by eating better; to increase their income; to help others.

5. Schools: Farming offers a wonderful opportunity for self-employment. Most can find land and there is unlimited market for produce, etc. The students need to be trained in organic agriculture because no one should poison God's earth. In 1998, the California legislature passed a law that all schools will have gardens.
6. Homeschoolers: There can be a cooperative effort with a garden plot to use. Free land is available.
7. Boy Scout Explorer Post: Gardeners and farmers should sponsor them as well as provide training.
8. Homes for elderly: Gardening provides food for the kitchen and is beneficial medically, physically, emotionally.

9. **Children's Homes:** Food should be produced to use in the home as well as to teach the children to work and train them in farming. Those interested could make a very good living farming. Sales would help support the home especially using value-added.

## 2. Rural

- A. Schools and churches as above
- B. Farm organizations & cooperatives need workshops to train people.
- C. Low income areas can rise out of poverty with PBA.

## 3. Developing countries

1. **Training schools:** They need the training to feed their families and/or support themselves.
2. **Prisons:** The prisoners have nothing to do but study [videos, books, correspondence, etc.] and produce their own food. Many prisons have land but no funds and the cost is very little for me to set up a gardening/farming program.
3. **Refugee camps:** These people are desperate. Many have land where they can grow food with a little help.
4. **Churches:** Teach the members to improve their health by eating better, to increase their income, to enable them to help others.
5. **Schools:** Farming offers a wonderful opportunity for self-employment. Most can find land and there is unlimited market for produce, etc. The students need to be trained in organic agriculture because no one should poison God's earth.
6. **Hospitals:** Most hospitals have land and some people are able to garden.
7. **Homes for elderly:** Gardening provides food for the kitchen and is beneficial medically, physically, emotionally.

8. **Villages:** When people in a village are hungry, they have land so they can be taught high yield gardening and grow their own food without outside inputs.
9. **Children's Homes:** Food should be produced to use in the home as well as to teach the children to work and to train them in farming. Those interested could make a very good living farming. Sales would help support the home especially using value-added for those who do not like to farm.
10. **Cities:** Many people in the large cities garden and even have livestock. A recent survey shows that in Mexico City the people have an average of 20 head of animals of some type and a garden. They have to in order to eat.
11. **Farm organizations & cooperatives need workshops to train people**

## Other helps

I can teach the following as appropriate in each country:

1. **Solar ovens:** This should be taught in refugee camps. Most people will not use them. They work.
2. **Bicycle trailers:** For those who own bicycles, these are really useful. I can make one and leave it for demonstrations.
3. **Solar panels:** DIY panels are very cheap. 3v. for radios \$1; 12v. \$10. Radios are a high priority of people in third world countries and they spend a large percentage of their income on batteries. I take a radio to all workshops. <http://diysolar.tripod.com>
4. **Micro-credit:** There is information and a video on a very successful program by Farm International.

