

# Growing Through the Winter for School, Community, and Home Gardens

By  
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Ashland, Missouri

## Wintergreen Farm

Providing fresh local produce for the *other* half of the year...





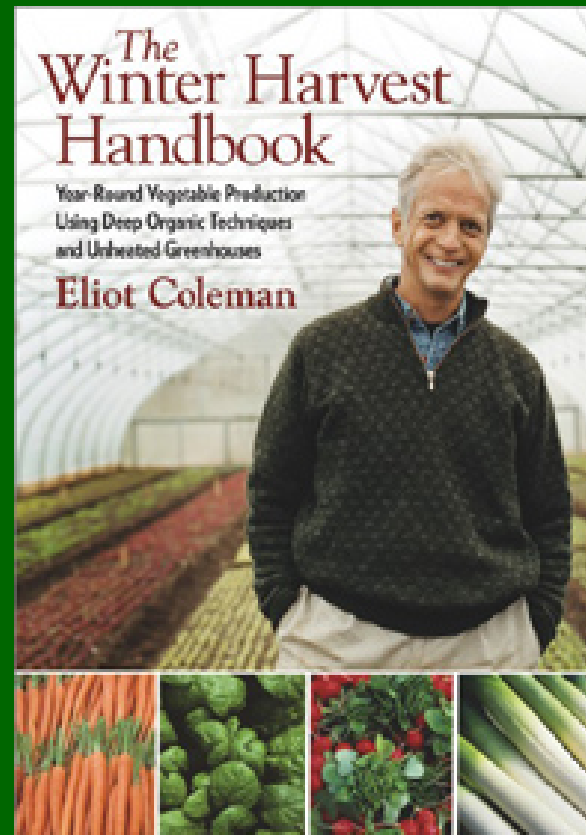
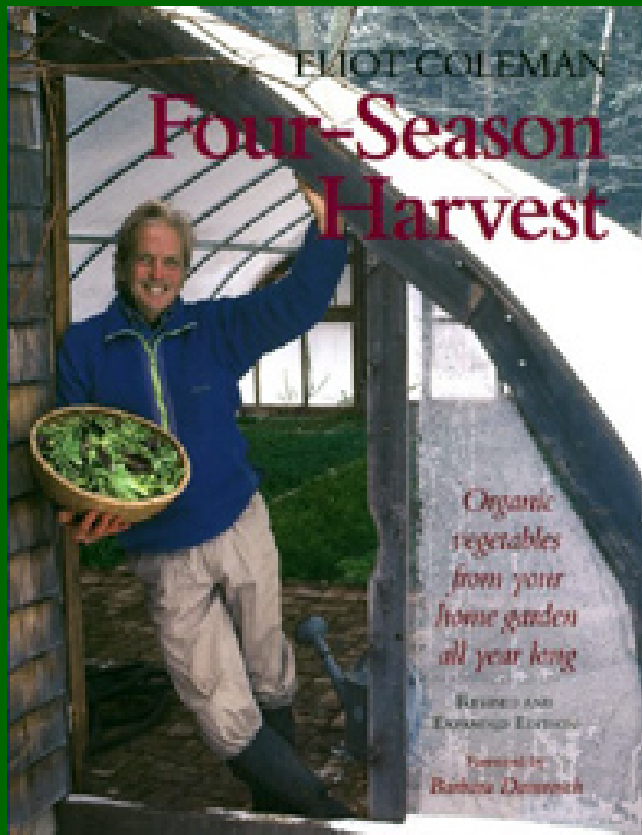
# **An Energy-Efficient Solar-Heated Greenhouse Produces Cool-Season Vegetables all Winter Long**

By Andrew L. Thomas, Anastasia Becker, and Richard Bradford  
University of Missouri-Columbia, Southwest Research Center, Mt.  
Vernon, Missouri



**Univ. of Mo - Bradford Research & Extension Center**  
**<http://aes.missouri.edu/bradford/education/solar-greenhouse/solar-greenhouse.php>**





Excellent web site: Eliot Coleman & Barbara Damrosch  
[www.fourseasonfarm.com](http://www.fourseasonfarm.com)



We applied for and received a NCR-SARE 2007 farmer/rancher grant:  
project # FNC07-668  
**“Growing & Marketing for a Winter CSA in Central Missouri”**



**There seems to be no difference in winter crop growth, survival, or productivity between the 4 types of greenhouses & cold frames we are using.**







**'High Tunnels': EZ Build-n-Gro Cold Frames  
(from Farmtek)**







## Modified 'low tunnels' over garden beds



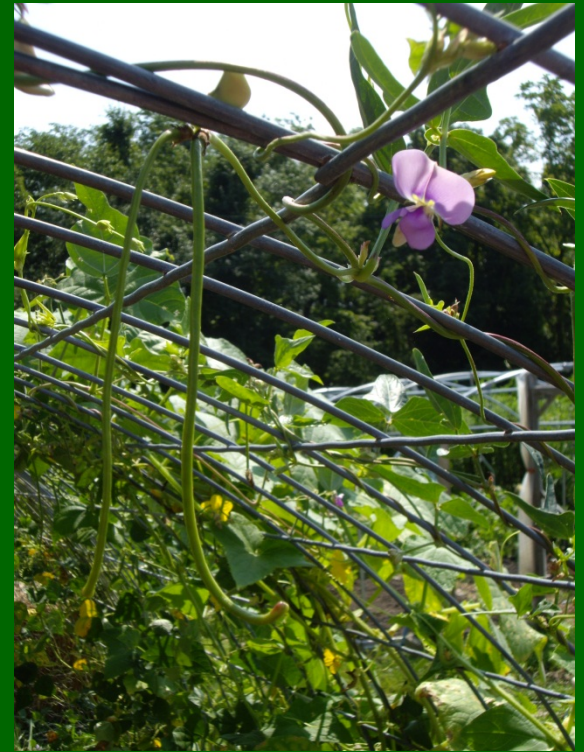


# Cold Frames





# Cattle Panel Hoop Houses: A simple, low-cost method for year-round production





# Floating Row Cover

Agribon 19





# So what are we growing?

Everything we can, which is a lot ('cole' or 'cool season' crops; most crops that don't need to flower or fruit for us to eat...)

## Root Crops:

carrots, beets, turnips, radishes,  
green onions, leeks,  
lettuce, spinach, chard, arugula,  
mesclun, collards, mustards, turnip,  
Asian greens (mizuna, komatsuna,  
tatoi), kale

## Cabbages:

bok choy, pac choy, joi choy, red  
cabbage, Napa-type cabbages

## Herbs:

parsley, cilantro, chives, fennel, dill

## Storage Crops:

sweet potatoes, winter squashes,  
onions

## Other:

celery, kohlrabi, broccoli raab







**Succession  
Plantings...**  
**Every 2-3 weeks,**  
**July through**  
**September**  
**For most crops.**  
**Through October for**  
**some.**





## Other helpful winter growing tips...

Closely spaced plantings  
work well in winter



Young plants survive the cold better. Plan your successions for this.



Cut & cut again  
--Asian cabbages  
--Greens  
--Herbs  
--Green onions





Every layer of protection  
moves you a zone south

*(Add 2<sup>nd</sup> row cover  
when very cold)*





Late October, early November... the plastic goes on.

-stays on until night temps above 32 F (mid to late March)







Mid to late November...the ends go on.  
 -stay on until night temps above 30 F (mid-March)

Late November, early December...  
 the row covers go on.  
 -stay on until night temps above 25 F (late Feb.)  
 -off on sunny days, back on before dusk





# Successes & Challenges

- **Successes**

- People *LOVE* winter veggies (esp. carrots & spinach)
- These plants are amazingly hardy
- Demand is much greater than our ability to supply right now

- **Challenges**

- Time
- Money
- Timing and amounts of succession plantings
- Learning germination and growth rates for Sept., Oct. Nov.
- Ventilation



Cattle panels are the DUCT TAPE of the farm and garden world...1001 uses!

- 16 feet long
- 52 inches tall
- 4 gauge galvanized steel



Garden trellises, cages, protective barriers, etc:

Animal shelters:





And, of course, hoop houses:





# Cattle Panel Hoop Houses:

## A simple, low-cost method for year-round production

### Primary Materials:

- cattle panels
- 2"x6" lumber for sides & ends
- 2"x4" lumber for doorways & ends
- greenhouse plastic (6 mil, 4 yr film)

### Miscellaneous Hardware:

- fencing staples,  $\frac{1}{4}$ " conduit clamps, or pipe-strapping
- hog rings, zip-ties, or insulated electric wire
- hinges & latches for doors
- spliced garden hose or pipe insulation
- 1" pvc (2 x length of hoop house)
- 1" conduit clamps or drywall screw w/washers
- battening, greenhouse tape, binder clips, or some other way to secure plastic on ends

### Ground Preparation

- weed barrier (old newspaper is great)
- mulch (free wood chips from electric co-op)
- soil/compost mix





## Getting the main frame up:

1. Install side boards.
  - if boards are 7.5' apart, arch will be ~ 6' tall at peak
  - We use 2"x6" untreated fir & oak boards
  - 2.5' stakes to anchor into ground.
  - Side boards should extend ~ 2" past panels on each end.
2. Place end of panel against inside of board and bow into arch. Then set other end of arched panel against inside of other side board.
  - Be careful...panels are springy!*** It helps to have 2 people for this.
3. Align panels with each other.
  - Make sure the tunnel is tall enough. It hurts to get your hair caught in a panel!
  - You don't want gaps or uneven spots - creates wind pockets in the plastic.
4. Attach panels to insides of side boards.
  - Large fencing staples,  $\frac{1}{2}$ " conduit clamps, or pipe strap all work well.
5. Attach panels to each other.
  - Hog rings, zip-ties, or insulated electric wire work well.





## Constructing the ends:

1. 2x6 footer across entire span works best
2. 2x4 to frame doorways on each end; attach tops to panel
3. 2x4 cross-braces for stability & as places to secure plastic





## Putting the "skin" on:

1. Cover ends of panels to protect plastic. Spliced garden hose or pipe insulation work well.





## Putting the "skin" on:

2. Attach the sides of the plastic to the side boards



or



'wiggle' wire



1" PVC/conduit  
pipe



## Putting the "skin" on:

3. Attach/secure plastic on ends & doors.

-battening, stapling, clamping, taping... Do what works!



Things to keep in mind:

-ventilation

-wind

-ease of access







In the spring & summer, these are great places to grow climbing vegetables & flowers

- pole & yard-long beans
- peas
- gourds
- cantaloupe
- cucumbers
- morning glories



Plus: the climbing plants will provide shade for greens & herbs underneath!  
-lettuce, parsley, pansies, etc.









Costs for cattle panels (4 gauge):

Orscheln - \$19.99 ea

Tractor Supply - \$ 21.99

MFA - \$22.60

Costs for greenhouse plastic (6 mil, 4yr film):

Morgan County Seed - 20'x100' roll \$168

Hummert Intl - 20'x100' roll \$267

Charley's Greenhouse & Garden - 15.5'x25' roll \$79



Costs for small pre-fab greenhouses or cold frames:

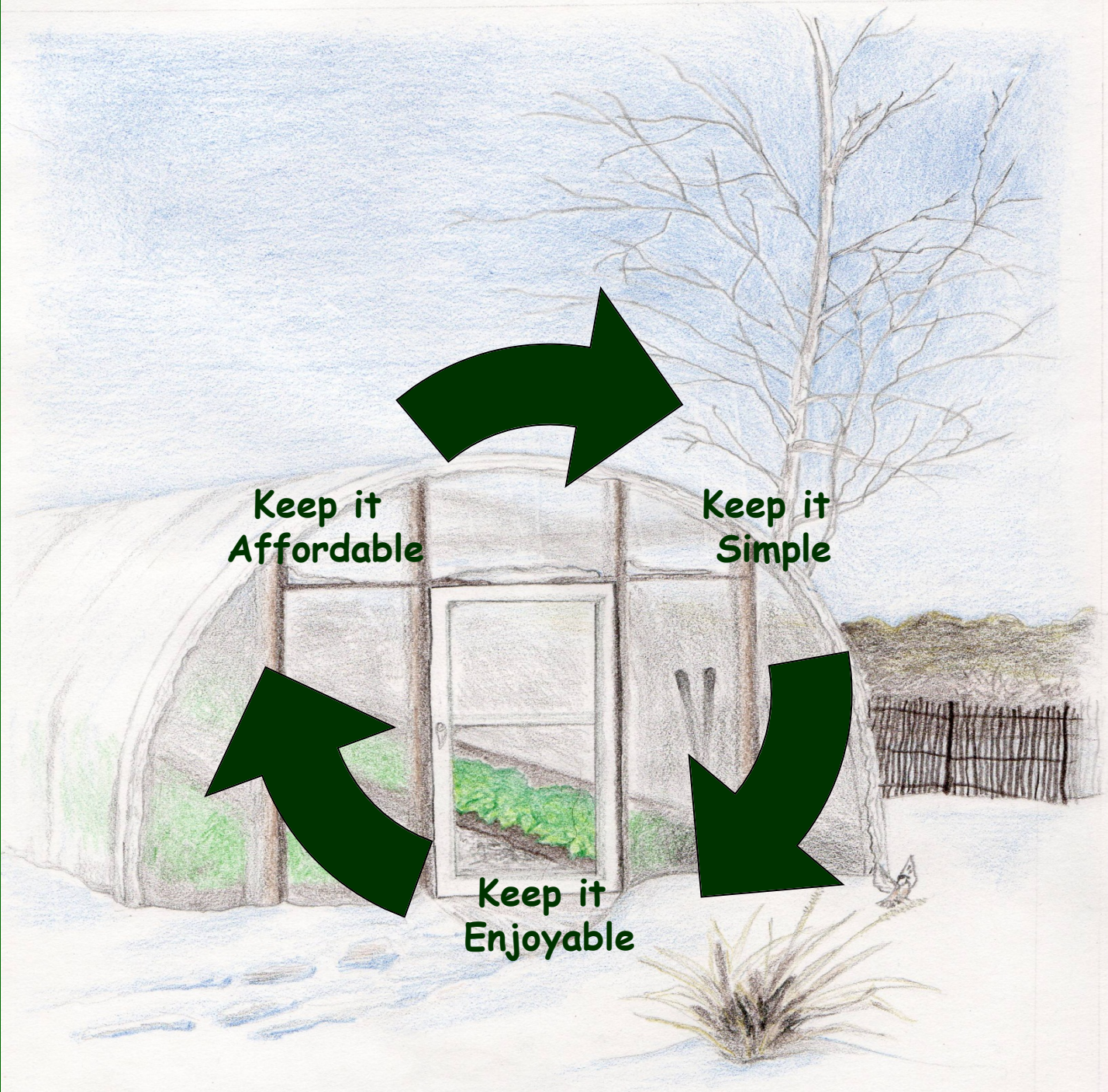
8'x6' starter houses - \$750 and up

8'x20' EZ-Build & Gro Cold Frame (Farmtek) - \$485

12'x20' greenhouses - \$1,000 and up

\*Even if you had to buy all supplies new, you should be able to build a 7.5'x22' cattle panel hoop house (5 panels long, 6' tall at peak) for less than \$350.









*"The winter was not given to us for no purpose.  
We must thaw its cold with our genialness.  
We are asked to find out and appropriate all the nutrients it yields.  
If it is a cold and hard season, its fruit, no doubt,  
is the more concentrated and nutty."— Henry David Thoreau*