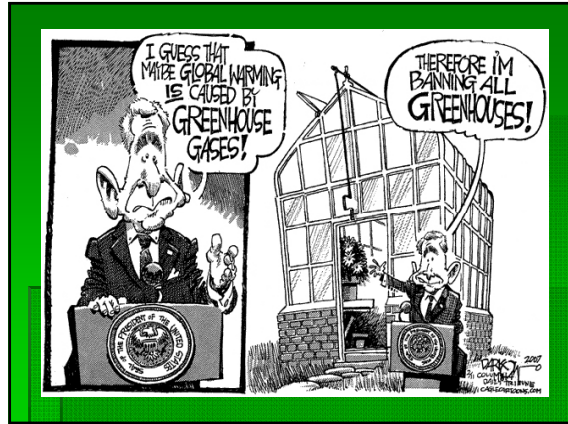


1st Steps to Move Your Greenhouse to a Sustainable Business

By Rick Holgate
Holgate Heirloom Produce,
Owner/Operator



Hell, there are no rules here
– we're just trying to
accomplish something.

Thomas A. Edison

What is SUSTAINABLE?

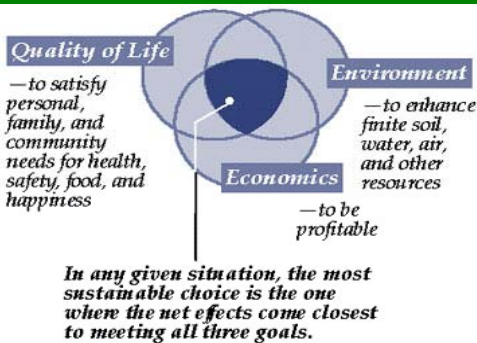
• To keep in existence; maintain; to supply with necessities or provide for
American heritage Dictionary, 4th Ed. Houghton Mifflin Comp., 2000

• A method of agriculture that attempts to ensure profitability of farms while preserving the environment.

• Integrates 3 main goals – environmental health, economic profitability, and social quality



STEWARDSHIP OF BOTH NATURAL AND HUMAN RESOURCES IS OF PRIME IMPORTANCE.



Minnesota Institute for Sustainable Agriculture (MISA)
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THE 4 BASICS

- **ENERGY** – HEATING & COOLING
- **THE "CHEMICALS"** - NUTRIENTS, PESTICIDES, HERBICIDES, and SUBSTRATES
- **WATER** - USE, CONSERVATION, and RECLAMATION
- **WASTE**

ENERGY - Heating

Compare Fuel Efficiency and Prices

- Electricity 3,412 Btu/kWh
- Liquid Propane 90,000 Btu/gallon
- Natural Gas 100,000 Btu/therm
- No. 2 Diesel 140,000 Btu/gallon
- No. 6 Oil (used oil) 150,000 Btu/gallon



❖ You can save approx. 500 gallons of fuel a year by switching from a mechanical thermostat to an electronic one with 1°F accuracy.



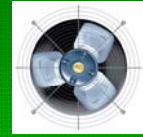
Heating Cost per pound of produce (tomato)

Bottom Heating	\$0.14
Top Heating	\$0.23



ENERGY - Cooling

• Plants grow more at night due to less food reserves lost from the plant trying to maintain cooler daytime plant tissue temperatures.



• Plant growth rate for tomatoes (some bedding flowers 70-75°F) falls off 2% at 80°F and decreases an additional 2% for approx. every 5°F that the temp. rises.

• New greenhouse designs that use roofs that open at or near the peak have dramatically decreased the need for use of sidewall ventilation fans.

Grower must actively manage the environment – be aware of day to day and seasonal changes.

ENERGY – Add. Conservation Tips



White & aluminized shade cloth works best to reflect heat away from greenhouse – used outside over top of greenhouse

Black & aluminized works best to retain heat as a thermal blanket

ALUMINIZED – THE BEST OF BOTH WORLDS!

Dirt on Greenhouse plastic or glazing can reduce light transmission by up to 20%

ADD. TIPS

Insulate knee walls – can save up to 400 gal of fuel/yr

Insulate Water and Heat Pipes

Infrared Inhibitor on your polyfilm can pay itself back in 3 months of energy savings

Install windbreaks on North side of greenhouse

Yearly Maintenance on Heating and Cooling Systems



WHAT WE HAVE DONE






WHAT WE HAVE DONE



ALTERNATIVE ENERGY



NUTRIENTS, PESTICIDES, HERBICIDES, and SUBSTRATES

HOW TO FIND SUSTAINABLE or ORGANIC PRODUCTS

<ul style="list-style-type: none"> • Grower's Supply • Manufacturer direct • Trade Magazines • Online 	<ul style="list-style-type: none"> • Extension Agents • Local Colleges / Universities • State Ag. Depts. • National Certifying Agencies
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WHAT IS OMRI

ORGANIC MATERIALS REVIEW INSTITUTE - The Organic Materials Review Institute (OMRI) is a national nonprofit organization that determines which input products are allowed for use in organic production and processing. OMRI Listed—or approved—products may be used on operations that are certified organic under the USDA National Organic Program.

COST vs VALUE – ORGANIC CERTIFICATION

- Of **ALL** consumers 75% make some sort of Organic purchase monthly.
- Earth oriented (Organic) is a very popular current trend.
- Cost is significant can increase your prices by up to 20% for the premium.
- Do you have a market for it already in place?




To certify check with your Ext. Agent, State Dept. of Ag., and National Certifying Agencies.

SUBSTRATES (Dirt – ya know!)

SUSTAINABLE ALTERNATIVES TO SOIL

- Pine Bark
- Rice Hulls
- Perlite
- Coco Coir
- Hydroton (expanded clay pellets)
- Growstones (expanded recycled glass pellets)



REUSE and REDIRECT

Reused Perlite Tomato yield
 Clean, Used perlite 23.6 lb/plant
 New perlite 22.4 lb/plant

Reason: sterilized root matter decomposes providing clean nutrient






INTEGRATED PEST MANAGEMENT

IPM is various methods used in combination to manage pest problems in our crops. The sustainable idea is to use the deterrence methods, and the least invasive pesticides first; then ramping up according to your infestation problem.

METHODS INCLUDE:

- Insect Barriers
- Temperature / Humidity Control
- Monitoring tools (sticky cards)
- Double Door Entry
- Resistant Plants (outside greenhouse)
- Attractant Plants (inside greenhouse)
- Beneficial Insects
- Pesticides (Organic 1st then regular)

WHAT WE HAVE DONE









WATER

WHERE DOES IT COME FROM?

City vs Well – WATER QUALITY



City – is it chlorinated, fluoridated, softened, how will these affect your plants or your Organic cert.

Well – Are the nitrates, choliforms, how hard is the water, and how will these affect your plants or your Organic cert.

TEST, TEST, TEST

- CONSERVATION - TIMED & DOSED IRRIGATION
- WATER RECLAMATION

2 30'x120 Greenhouse with 30" rainfall/yr will produce enough water to feed approx 600 plants for that growing year.

WASTE

COMPOST



ALTERNATIVE FEED



REDEDICATE MATERIALS



WHAT HAVE WE ACCOMPLISHED?



REFERENCES

- Dixon Power – (402) 467-3420 Lincoln, NE 68521 - Jon Dixon – An alternative energy business for farms specializing in wind and solar energy usage.
- University of Nebraska-Lincoln Extension Office David City, NE, Michael Rethwisch, Butler County Ag. Extension Educator
- Butler County Development – Willow Holoubek, Exec. Director, (402) 367-4238 David city, NE 68632
- "What is Sustainable Agriculture?" by Gail Feenstra, Univ. of California-Davis, Davis, CA 95616, <http://www.sarep.ucdavis.edu>
- "Energy Conservation for Greenhouse Growers." by Dr. David Tatum and Dr. Jimmy Bonner, Extension Specialists, Mississippi State Univ. Extension Service.
- Organic Materials Review Institute, <http://www.omri.org>
- "From Recipe to Reality," seminar, The Food Processing Center, University of Nebraska-Lincoln, Institute of Agricultural and Natural Resources, 143 H.C. Filley Hall, Lincoln, NE 68583.
- Organic Greenhouse Vegetable Production, <http://www.attra.ncat.org>
- "Greenhouse Energy Conservation Checklist," by Dr. John Bartok, Extension Professor and Ag. Engineer, University of Connecticut, Storrs, CT 06269