Farm Energy IQ

Farms Today Securing Our Energy Future

Energy Efficiency for Direct Market Farms

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NORTHEAST SARE Sustainable Agriculture Research & Education

ENERGY EFFICIENCY FOR DIRECT MARKET FARMS

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What is a direct market farm?

- A farming operation that sells some or all of its production directly to consumers

Types and Characteristics of Direct Market Farms

- Farm stands and retail markets
- U-pick
- Internet or mail order
- Restaurants and other food service establishments
- Farmers markets
- CSAs and cooperatives
- Value added (e.g., prepared foods)
- Agri-tourism

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Energy Challenges for Direct Market Farms

- Cost considerations
- Economies of scale
- Seasonal variations
- Complexity of operation

Energy Uses in Direct Market Farming

- Transportation/shipping
- Lighting
- Air conditioning
- Refrigeration
- Processing

Reducing Energy Used for Transportation

- Use advanced GPS
  - Traffic updates
  - Left-turn minimization
- Optimize routes and scheduling
- Combine pick-up and delivery trips (don't return with an empty vehicle)
- Maintain vehicles
- Avoid speeds above 65 mph
- Reduce idling
- Improve aerodynamics
- Consider wide-base (super-single) tires
- Use alternative fuels (natural gas/electric)

Energy Efficient Lighting

- Use most efficient fixtures and bulbs (use lumens per watt to evaluate lamps)
  - LED
  - HID
  - Fluorescent
- Use LEDs in exit signs
- Replace T-12 lamps and magnetic ballasts with T-8 lamps and electronic ballasts
- Clean and maintain lighting
- Add lighting controls
  - Time clocks
  - Dimmers (manual or automatic)
  - Occupancy sensors

Air Conditioning

- Select efficient units – SEER > 15 or EER > 10
- Regularly clean and maintain equipment
- Add improved controls
  - Smart thermostats
  - Use setbacks (for example, lower night setpoints)
  - Defrosting cycles
  - Calibrate sensors regularly
  - Locate sensors properly
  - Use alarm capabilities

SEER and EER

SEER and EER are measurements of air conditioning efficiency, based on ANSI (American National Standards Institute and AHRI (Air-Conditioning, Heating and Refrigeration Institute) methodologies

- ***SEER = Seasonal Energy Efficiency Ratio***

$$= \frac{\text{seasonal cooling energy delivered (Btu)}}{\text{seasonal energy input (watt–hours)}}$$

SEER is intended for typical residential and commercial applications and may not reflect actual yearly use

- ***EER = Energy Efficiency Ratio***

$$= \frac{\text{heat energy removed (Btu)}}{\text{energy input (watt–hours)}}$$

Energy Savings for Refrigeration

- Select efficient refrigerators and freezers
- Keep coolers out of direct sun
- Cooler insulation should be at least R-19, but preferably R-30
- Clean and maintain equipment
- Maintain and calibrate controls
- Check refrigerant charge
- Keep doors closed
- Hydrocooling
- Demand defrost

Using off the shelf air conditioners in walk-in coolers

- Uses custom controls to operate air conditioner unit (CoolBot™)
- Not appropriate for all applications, such as
  - Removing field heat
  - Temperatures much below 36°F
  - Coolers with frequent use of the door
  - When automatic restart after power loss is important
  - Freezing
- Not all air conditioners will work
- Air conditioners must be sized properly
- Cold room must be well insulated without air leaks

Processing and Packing Equipment

- Cooking Equipment
- Vacuum pumps
- Exhaust hoods
- Heat recovery
- Mixers, grinders and other equipment and appliances
- Cleaning and sanitation and associated equipment
- Other (e.g. scalders)

Motors

- Select high efficiency motors
- Regular maintenance (2 – 30% improvement)
  - Lubrication
  - Alignment
  - Ventilation
- Size to application and load
- Consider Variable Frequency Drive (VFD) motors

Pumps

- Provide regular maintenance and inspection
  - Impellers (wear)
  - Bearings (lubrication)
  - Seals
  - Alignment
- Minimize friction losses in piping systems
- Avoid throttling valves
- Size pumps appropriately
- Multiple pumps for variable loads (or use VFD)

Air Compressors

- Maintenance
  - Filters inspection and maintenance
  - Motor cleaning and lubrication
  - Drain trap inspection
  - Drive belt inspection where applicable
- Repair and reduce leaks
- Minimize pressure loss in piping

Energy Considerations in Retail Outlets

- Lighting
- Refrigeration
- Heating and cooling
  - Smart thermostats
  - Heat pumps
  - Combined heat and power
  - Geothermal
  - Energy recovery
  - Condensing boilers
- Controls (and data logging)
- Train and educate staff

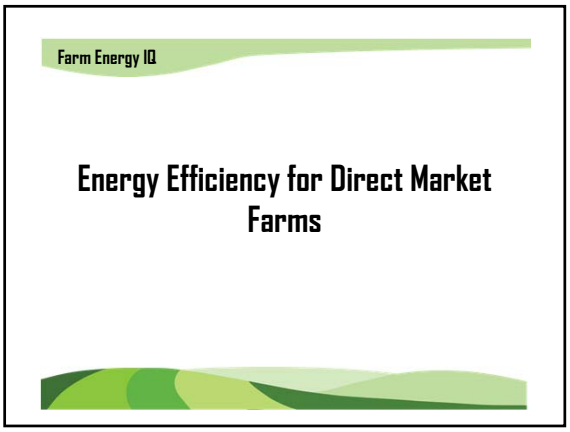
Greenhouses in Direct Market Farms

Heating and ventilating

- If possible, install thermal screens for shade and insulation
- Consider automated control
- Regularly calibrate control sensors
- Maintain glazing
- Seal openings (weatherstripping and caulk)

Horticultural (supplemental) lighting

- Understand the crop's light requirements
- Use efficient fixtures designed for greenhouse lighting
- Install and operate according to manufacturer's recommendation
- When available and feasible, use off-peak power
- For LED systems: use the appropriate light spectrum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