Rainbow Ridge Farm outside of Waverly, IA, includes 10 acres planted in potatoes, sweet potatoes, onions, melons and garlic. Farmer Jason Gomes sells the produce wholesale primarily to the University of Northern Iowa Dining Services, New Pioneer Co-op, and a few resellers. He also has 20 acres in CRP.

**Underground Cold Storage Bunker/Passive Solar Curing & Drying Chamber:**
Gomes remodeled two existing underground bunkers for increased on-farm energy efficiency. The remodeling project resulted in an energy efficient cold-storage chamber and a passive solar curing/drying chamber for season extension of sustainably produced food. Gomes also wrote an instruction manual so other farmers can replicate his project using repurposed materials when possible. [Read the manual>](#)

**Passive Solar Curing/Drying Chamber Uses:**
- **Cure Potatoes** - Curing potatoes requires warm, humid temperatures – preferably in the 75-85°F range. Potatoes must be protected from direct or indirect sunlight to prevent them from turning green.
- **Cure Sweet Potatoes** - To cure, sweet potatoes need late fall sun to partially cure skins, but the outcome depends on favorable weather (sunlight and temps that aren't too hot or too cold). The underground curing system captures solar heat during the day and maintains a sufficient curing temperature during the night (roughly 75-80°F) either through supplemental heat or conservation of daytime solar heat.
- **Drying Onions/Garlic**
  Onions and garlic require a warm, dry environment with good air circulation to cure for storage. Both crops are harvested 3-4 weeks before potatoes/sweet potatoes, so the curing/drying chamber can also be used for this crop. Fans will be used as needed to maintain airflow and reduce humidity. The passive solar unit will also serve as a small greenhouse for starting melons and squash in the spring.

**Cold Storage Bunker/Walk-in Refrigerator Primary Needs: Root Vegetable Storage**
The basic task is to store root vegetables to extend the farm’s marketing season. Because it is underground, the walk-in refrigerator in this bunker will cool efficiently and allow for durable storage of potatoes and sweet potatoes through August/September/October. Potatoes/sweet potatoes will be stored at high humidity at approximately 40°F. Insulation and use of heat from the curing/drying chamber is expected to produce enough heat in the walk-in to keep produce from freezing over the winter months.

**Reasons for Repurposing Underground Bunkers:** Gomes wanted to take advantage of two things:

- Repurpose two south-facing concrete cinder block bunkers below the garage on his farm that were not being used efficiently.
- Take advantage of the constant underground temperature of about 50°F for cold season cold storage for the potatoes and sweet potatoes.
- Make use of a renewable resource – solar – to cure and dry the onions and sweet potatoes. This would also reduce his current use of propane heat for curing/drying. Before this he had high utility bills to produce enough heat to dry the onions so they could be stored and he could expand his selling time through the fall/winter months.
<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (USD)</th>
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<tbody>
<tr>
<td>Compressor/Refrigeration Unit</td>
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<tr>
<td>Passive solar panels</td>
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<td>Lumber, frig walls, misc hardware</td>
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<td>4 mil. nursery plastic</td>
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<td>Total</td>
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**Financing:** Iowa Farm Energy Working Group demonstration grant for labor and some materials

**Project Benefits:**
- Underground cold storage bunker will be 50% more energy efficient than the alternative above ground refrigeration unit.
- Cold storage bunker's low temperature microclimate will increase storage life for potatoes until January/February, thereby increasing the amount of produce Gomes can continue to sell.
- Drying/curing bunker's passive solar replaces propane heat.
- Curing sweet potatoes and potatoes more rapidly with solar energy will result in hardened skins that reduce the possibility of disease and increase storage life time so the farmer can continue selling as much of the crop as possible.

**Project Roadblocks:**

**Additional energy efficiency/renewable energy plans:**

**Technical Specifications:** See online manual

*Walk-in Cold Storage Bunker*  
*Passive Solar Curing/Drying Bunker*