

2015 Southern Wisconsin
Vegetable Production Workshop
Pack Sheds



John Binkley
Equinox Community Farm

Chris McGuire
Two Onion Farm

Cate Eddy
Ridgeland Harvest

Location	Waunakee	Belmont	Viroqua
Acres in Vegetables	~7	4	25
wash greens	by hand with hand-scale equipment	by hand with hand-scale equipment	by hand with hand-scale equipment
dry greens	with a machine	by hand with hand-scale equipment	with a machine
pack greens	by hand with hand-scale equipment	by hand with hand-scale equipment	by hand with hand-scale equipment
clean tomatoes	by hand with hand-scale equipment	I do not do this task	by hand with hand-scale equipment
pack tomatoes	by hand with hand-scale equipment	by hand with hand-scale equipment	by hand with hand-scale equipment
clean onions	by hand with hand-scale equipment	by hand with hand-scale equipment	with a machine
pack onions	by hand with hand-scale equipment	by hand with hand-scale equipment	by hand with hand-scale equipment
clean potatoes	by hand with hand-scale equipment	I do not do this task	with a machine
pack potatoes	by hand with hand-scale equipment	by hand with hand-scale equipment	by hand with hand-scale equipment
wash carrots	with a machine	by hand with hand-scale equipment	with a machine
pack carrots	by hand with hand-scale equipment	by hand with hand-scale equipment	by hand with hand-scale equipment
farming style	certified organic	certified organic	certified organic

History	<p>Our pack shed was a pre-existing pole shed/garage. I replaced the existing walls with steel and put in a new concrete floor and exterior concrete pad which is where we do most of our washing. These renovations took around 6 weeks. We also built a walk-in cooler after installing the floor, this took an additional 4-6 weeks.</p>	<p>The packing shed is a pole barn constructed circa 1980 as a hog finishing barn. It had a concrete floor and was enclosed on three sides. We gutted and powerwashed the building in spring 2004 at the beginning of our first year as full-time farmers. We've added and modified walk-in coolers, washing areas, and other parts of the building gradually as time went on.</p> <p>Major changes 2004-installed cooler #1 2006-built cooler#2 2009-installed rollup curtain on previously open east wall 2009-built cooler #3 2013-built onion drying stage, renovated cooler #2 interior, rewired much of barn</p>	<p>HISTORY: 2000 - 2008: Improvised a packing area & Planned our ideal packing shed 2008: First phase of building a new packing shed 2012: Second phase of building 2014: Third phase of building We planned for the future while being true to our budget.</p>
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<p>Key Functions and Considerations</p>	<p>Relatively small existing structure size limited options. Installed exterior concrete pad to keep nearly all water & drainage issues outside of the structure. Added overhead door in 'back' of structure to facilitate product flow.</p>	<p>We had a number of outbuildings on the farm. We chose to use this one as our packing shed because: -Electricity. The shed had 100 amp service when we purchased the farm -Complete concrete floor. -Drainage. Floor is sloped gently to one edge where it empties into the top of a grassed waterway</p>	<p>We had simple goals: food safety, efficient work space, bigger coolers</p>
<p>Product Flow See Pack Shed Diagrams</p>	<p>Product flows as follows: 1 -> 2 -> 3 -> 4 -> 5 1 - Exterior washing area 2 - Sorting, bunching, packing area; includes washing machine for greens drying 3 - Walk-in Cooler 4 - Conveyor packing line 5 - Delivery Truck</p>	<p>Generally we harvest into vented harvest crates. When we bring harvested produce into the shed through the sliding door, we usually immerse entire crates of produce into plastic tubs ("Soaking Tubs") with cold well water inside. If there is too much produce to fit into the soaking tubs, excess produce gets stacked on pallets inside the door and is hosed off with cold well water while it waits to get placed in a soaking tub. After soaking, produce is moved to hands-free sinks for washing if needed or taken directly to cooler. On CSA box packing mornings, we take produce out of coolers and arrange along packing line. Packed boxes are placed on pallets and moved into cooler #3 for temporary storage until we load our delivery van a few hours later.</p>	<p>Dirty produce is unloaded at loading dock or large side door and brought into one of three cool areas. Clean produce comes from one or three cool areas directly into trucks for delivery at loading dock or large side door.</p>
<p>Important/Favorite Features</p>	<p>Divided walk-in - allows for one section cooler, one warmer for storage of different crops Separate washing & sorting/packing areas</p>	<p>-Lots of space! -Service carts - great for moving produce around and making temporary work surfaces -Mini pallet fork and pallets - great for moving produce on rough old concrete and navigating through narrow walk-in cooler doors. -Worktables - 8' x 15" long and lightweight for moving around as needed within shed</p>	<p>1. Flexibility of space 2. Cooler zones 3. Loading dock</p>

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<p>Desired Improvements</p>	<p>Exterior washing area is uncovered & exposed to rain. I'd like to be able to put an awning over that area. A larger space would be nice.</p>	<p>-Roof is developing leaks -Not rodent proof -Broken, chipped and uneven concrete makes moving produce difficult -Uninsulated walls and lack of heat problematic in late fall when temps can be below freezing. -Homemade doors on coolers #2 and #3. A homemade cooler is pretty simple to build, but don't build your own doors - buy an insulated door for good sealing!!!</p>	<p>Changes and additions we see for the future: 1. Bathroom & hand washing area 2. Increase loading dock width to 16-20 foot 3. Insulate remaining overhang 4. Solar</p>
<p>Key Equipment See Equipment Lists</p>	<p>Walk-in Cooler - essential for product storage, acquire asap Salad Spinner - washing machine on spin, acquire asap, relatively inexpensive Conveyor Table - greatly facilitates box packing, especially at 75+ boxes</p>	<p>-Coolers - indispensable at any scale -Service carts are used constantly and inexpensive at suitable at a small scale. -Mini pallet fork and pallets are great for moving produce on rough surfaces. -A packing shed manager - definitely not equipment, but very important and a good investment as soon as you can afford it. Having a competent person inside the shed constantly on harvest days makes a big difference in produce getting washed and cooled quickly and improves labor utilization (not having to shuttle workers back and forth between washing and picking as often).</p>	<p>1. Ice machine (this was our first purchase, first cooler, and remains valuable) 2. Pressure washer 3. Fork lift 4. Pallet jacks 5. Variety of scooters & rolling carts 6. Tables 7. Brush washer 8. Onion topper</p>
<p>Which piece of equipment did you live without for too long?</p>	<p>Barrel Washer - significantly faster washing of topped root crops</p>	<p>We don't have much equipment, and I can't think of anything which fits this description.</p>	<p>Fork Lift: back saver & space saver Purchased used for \$5,500 in 2012</p>
<p>Coolbot or Traditional Refrigeration</p>	<p>Coolbot - chosen due to cost considerations. Pros: cheaper, a/c units easily replaceable Cons: imprecise control of temp, less rapid cooling, limit to cooling capability</p>	<p>Cooler #1 and #2 have standard refrigerator compressor/evaporator, #3 has coolbot. #3 is used for storing "warm" crops like tomatoes and cucumbers, for briefly holding CSA boxes packed with already cooled produce, or for storing "cold" crops like brussels sprouts and spinach in late fall. None of these applications place high demand on cooler so we felt coolbot would be okay. The coolbot is cheap and simple.</p>	<p>Traditional refrigeration run off electricity</p>

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Coolers	<p>Custom built, insulated with 5" of spray foam. Approximately 16'x8' split into two 8'x8' rooms. -Divided into two rooms with cooling in interior room. Results in ~15-20 degree difference between rooms. Allows for warmer storage or tomatoes, etc in warmer room. Plastic curtain on doors. Heavily insulated floor & ceiling</p>	<p>We should have made coolers #2 and #3 larger. Additional materials and labor time in constructing a slightly larger homemade cooler are small.</p>	
Packing Crates	<p>Intercrate swing-bar containers. Approx 16"x24" with depth of 6.5" or 8.5". Much more durable/sturdy than bulb crates, nesting & stackable with swing bar. Very highly recommend these crates. Relatively expensive.</p>	<p>Bulb crates - are cheap but flimsy and don't hold up really well under constant use. We use them for harvesting and drying onions and garlic and they work fine for that since they only get handled a few times per year. Since they don't nest, they take up a lot of space in storage.</p> <p>We use nestable/stackable harvest crates from Jordans for most harvesting. They are durable, and we have no complaints. We also use them for storing produce overnight in coolers, in which case we usually stack crates on a mini-pallet and cover them with an upside down large, gusseted "stack-covering bag" to retain moisture.</p> <p>We use waxed produce boxes with plastic liner bags for most long term storage (e.g., root vegetables) in our coolers. This is inexpensive and boxes are easy to move and handle by hand but they are not very durable and the boxes and bags take a lot of space and labor when they are set out to dry.</p>	<p>Black bulb trays - very versatile but be careful that they match for stacking</p> <p>Totes - easy to clean, water drains easily, nesting capability for storage</p> <p>Wooden Bins - purchased used from apple orchards</p> <p>Buckets - we purchased our first new ones this past year to help color-code food safe buckets verse cleaning buckets or animal feed buckets</p>

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Hand Washing/ Sanitation in Pack Shed	Inadequate - handwashing in house.	Everyone has to wash hands with soap when starting work in packing shed or after using bathroom. We have a sink dedicated to hand washing near employee entrance.	<p>Hand washing is done in the bathroom or hand washing sink (never in tanks or with hoses).</p> <p>Employees must wash hands prior to work each morning (even if going to the fields). Hands must be washed after working in the fields, eating, applying sun screen or insect lotions, using the bathroom, blowing your nose, touching the floor mats, emptying the trash or compost bins, etc.</p> <p>Employees must use rubber gloves when bagging produce. New gloves must be used if they touch anything other than clean produce.</p>
Pack Shed Cleaning	Cleaned after each major harvest day. Exterior can be swept & hosed clean. Interior swept, infrequently hosed clean.	We hose down entire floor one time per year in spring. Floor in washing and cleaning areas of shed is hosed down at end of every day they are used.	<p>Sweeping and spraying the floors on weekly production days.</p> <p>Mopping floor with Simple Green weekly or as needed.</p> <p>Monthly scrub down of tables with Simple Green then bleached overnight.</p> <p>Walls & doors scrubbed about once a month or as needed</p> <p>Coolers scrubbed 2-3 times a year with Simple Green</p>
Equipment Cleaning	Cleaned after each major harvest day. Hosed and/or wiped clean.	Soaking tubs are hosed out and turned upside down to dry after each use.	<p>Cleaning products that we may use: Simple Green or Bleach.</p> <p>Brush washer: cleaned after each use by spraying out with water to remove all produce, parts & pieces, and dirt on catch trays especially.</p> <p>Sorting Table: wiped off with water or maybe light bleach/water solution prior to use.</p> <p>Onion topper: no water used, carefully pulling and scraping out debris.</p> <p>Bulk tanks, Sink and Bubblers cleaned out after each use. Sanitized the night before salad greens are cut/washed, then as needed.</p>

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Cooler Cleaning	Swept as needed.	We don't put dirty produce in coolers so they stay fairly clean. Mud being tracked in on boots is biggest problem. We mop with water or vacuum as needed.	We clean and scrub our coolers usually in April when they're close to empty. Everything is cleaned - ceiling, walls and floor. We use a bucket of simple green water, scrub brush, ladder and elbow grease. Last step is to pressure wash to rinse off.
Harvest Container Cleaning	Hosed clean after each use. Wiped clean as needed.	<p>We hose out crates after every use, and brush them if there is particularly sticky residue. Crates are arranged upside down on drying racks to dry.</p> <p>Liner bags are turned inside out, produce residue is shaken off or picked off by hand and they are hung to dry on clotheslines inside the shed. Liner bags which have gotten nasty because of juicy vegetables are washed or recycled.</p> <p>Waxed produce boxes which are used for on-farm storage generally stay clean because they are protected by liner bags. If needed they are hosed out but generally they are just stacked to dry.</p>	Totes, trays and buckets cleaned often and sprayed out with water after dirty produce.
Total Construction Costs	Initial renovation costs ~\$25,000 -Incurred within ~2 months	<p>No cost for construction of original building. \$3500 spent over 10 years for building repairs, new wiring, lights, and new plumbing. Wiring was biggest part of that - we replaced service panel and have added or replaced almost all of the wiring in the building over the years.</p> <p>Also spent an additional \$1600 to install buried water line to, and hydrant in, packing shed. Before that we ran a hose above ground from our house to shed. The hydrant also feeds our entire irrigation system as well as packing shed.</p>	\$163,00.00

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<p>Total Equipment Costs (excluding coolers, see equipment lists)</p>	<p>\$9,280</p>	<p>Roller conveyor \$100 Fans \$666 Onion drying stage \$152 Mini-pallets \$303 Mini pallet fork \$633 Misc other stuff \$1666 Scales \$178 Service carts \$638 Washing and soaking \$728</p>	<p>\$20,000</p>
<p>Total Cooler Costs</p>	<p>Walk-In construction & Insulation ~\$5,000 Cool-bot - ~\$250 Existing a/c unit - \$0 Replacement a/c unit - ~\$400 Initial costs incurred all at once, replacement a/c after 2 years of use</p>	<p>Cooler #1 (9x7): \$2264 - bought used in 2003, cost includes hiring install & wiring of compressor and evaporator and several repairs over years Cooler #2 (8x16): \$5968 - built primarily by us in 2006; cost includes rewiring interior and new interior plywood installed in 2013, and several repairs and maintenance to compressor over the years. Cooler #3 (8x12): \$2848 - built primarily by us in 2009.</p>	<p>Warm cooler = 1 HP compressor, used since 2000, cost \$50 Cold cooler = 5 HP compressor, used since 2008, cost \$8,000 Dry storage = many fans, cost \$500</p>
<p>Pack Shed Operating Costs (excluding labor)</p>	<p>Electricity ~\$50-\$150/month</p>	<p>Electricity for coolers, fans, lights, well pump for wash water: \$1200 per year is a very rough estimate (should be less after solar electric panels installed in fall 2014).</p>	<p>Energy Bill Annually \$4600 or \$385 per month. This is lights, heating in winter, fans, compressors in coolers and pump on well for packing shed, irrigation system, greenhouse & high tunnel.</p>

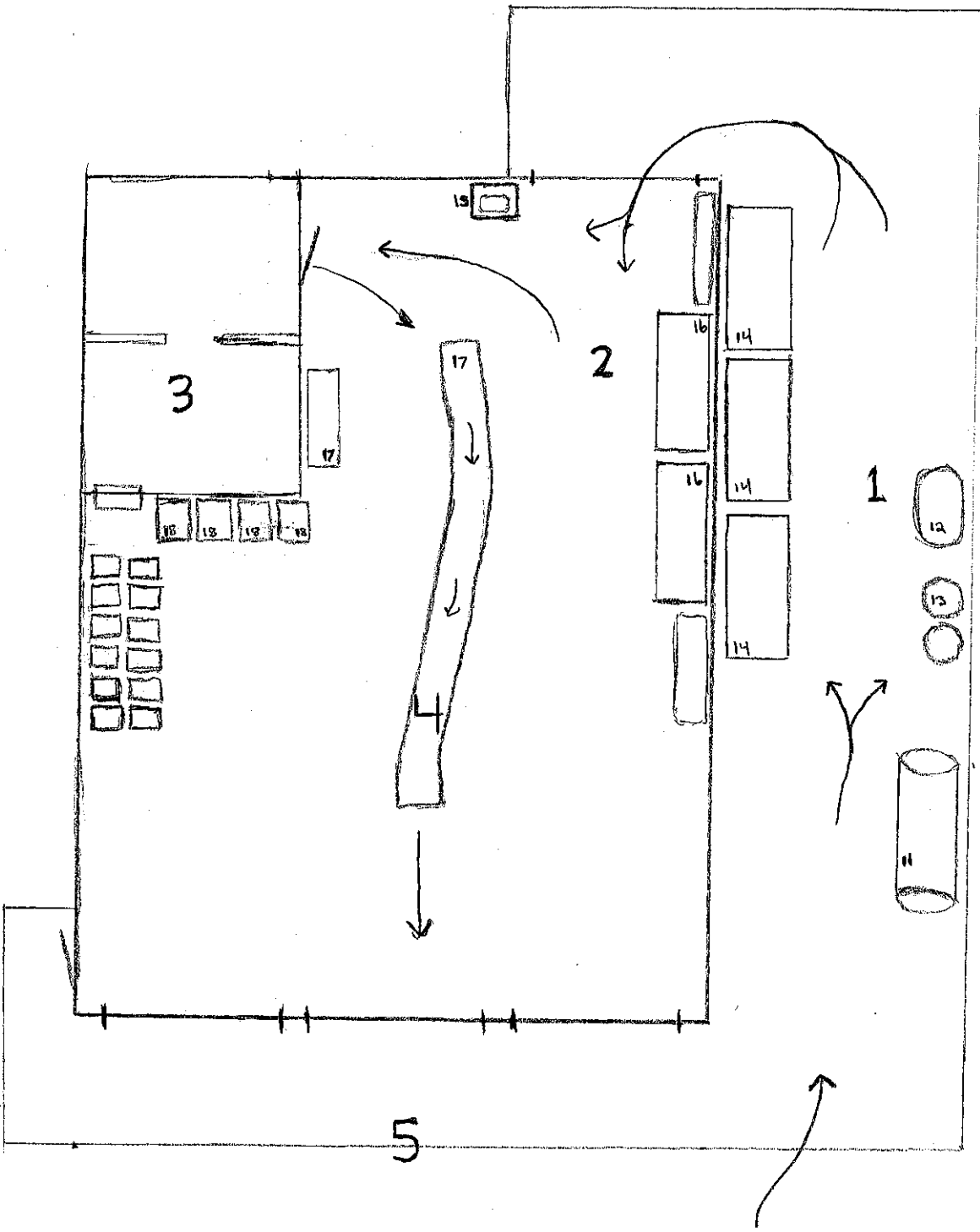
2015 Southern Wisconsin Vegetable Production Workshop
Pack Shed Design & Flow



Equinox Community Farm Pack Shed Equipment List

Map #	Name	Make/Model	Size	Supplier	Used for	Cost	Notes
11	Barrel Washer	Homemade	26" x 8'		Washing topped roots	~\$2700 for pre-made version	Makes a huge difference for root washing, particularly carrots. Justified at 3+ acres, depending on how many roots you grow
15	Washing Machine	used	standard household size		spin drying greens	\$100 used	Purchase asap - cheap and makes a big difference for drying greens
	Mesh Bags (4)	Nylon Net Co - no longer available	~24"x24"	Nylon Net Co - no longer available	holding greens for drying	~\$30	Essential for drying loose greens in washing machine
14	Produce Washing Tables (3)	Homemade	30"x8'		Washing produce	~\$50	Hardware cloth top to allow you to spray through the table. Recommended asap
16	Stainless Steel Tables (2)		24"x6'	Used	Bunching, sorting, bagging, etc	~\$100 each, used	Easy to clean, durable. Not essential but nice to have.
17	Conveyor Table	Nestaflex® 22614024-P Flexible Conveyor	24" wide, expandable to 24'	Global Industrial	CSA box packing	~\$1,200	Facilitates packing CSA boxes. Recommended ~75+ boxes
13	Wash Tubs (2)	Half of 55 gal barrel			Washing, dunking, hydrocooling	\$0-\$20	Cheap, functional. Sufficient for small scale
12	Stock Tank		100 gal		Washing, dunking, hydrocooling	~\$75-\$150	Vastly superior to half-barrel wash tubs.
18	Harvest Crates (350)	Intercrate Container Corp 6.7 & 8.5	16"x24" with depth of 6.7" or 8.5"	Intercrate Container Corp	Everything	~\$11-\$13	Substantial upgrade from bulb crates. Purchase when feasible.
	Attached lid Distribution boxes (100)	T97257809BL	22"x15"x13"	Global Industrial	Storing produce in cooler	~\$10-\$12	Prevents dehydration in cooler. This 'Global Premium' style is not especially durable but is ~1/2 as expensive as the more durable brand.

Total: \$9,280



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Pack Shed Design & Flow



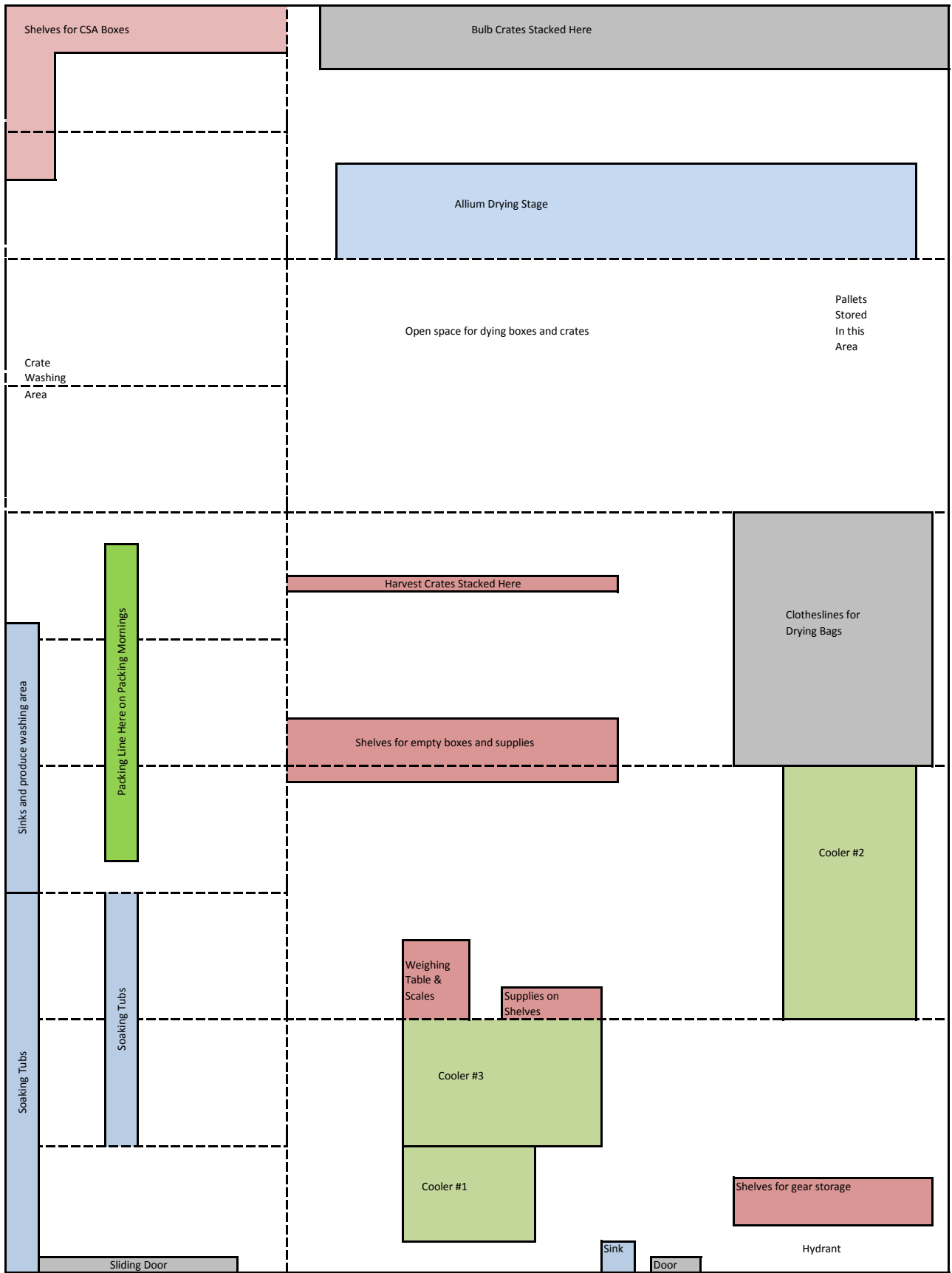
Two Onion Farm Pack Shed Equipment List

Name	Make/Model	Size	Supplier	Used for	Cost	Notes
Cooler #1	used	6'x8'			\$2,264	
Cooler #2	homemade	8'x16'			\$5,968	
Cooler #3	homemade	8'x12'			\$2,848	with coolbot
Germination chambers	homemade	each 9'x7'			\$1290 and \$1590	Two insulated 9'x7' germ chamber in potting shed (near packing shed) used for storing excess produce in autumn - one has coolbot other has room AC without coolbot
Hands free sink	Homemade			Washing stuff	low	Use Watts quick connect elbow from Menards for an elbow which swivels under pressure and never
Packing/work tables	homemade	8'x15"		csa box packing, work surfaces, etc	\$40 each?	Useful and handy at any scale
Soaking tubs and stands	Plastic rubbermaid tubs				\$20 each	Plastic rubbermaid tubs on homemade wooden stands. Crates of produce can be immersed in tubs
Onion drying stage	homemade	6'x36'		drying onions, garlic	\$342	Two 24" Maxx-Air tilt fans from farm and fleet blow air into plenum of stage. Stage is framed with wood. Crates of onions and garlic stack on top. Wanted a means of forcing air thro onions during curing. Works well but takes up a lot of space.
Drying stands	homemade				\$6	stand made from 2x4's to keep crates off ground while drying
Fans	Maxx-Air 24" tilt fans		Farm and Fleet		\$100	for drying alliums which don't fit on stage
Mini pallet fork	Valley Craft item number F84738A8 (Pneumatic tires, long shoes,)		Rand Materials Handling	Moving pallets	\$631.99	Probably worthwhile at about 2-3 acres of produce. Everyone loves it. Works well on rough surfaces and fits through narrows cooler doors
Roller conveyor table	used	18"x10'			\$100 used from another farm	Useful as soon as you have 3-4 people on packing line
Service carts	Rubbermaid service cart (Northern item # 196233)	47x26" 2 shelves	Northern Tool & Equipment	Moving stuff, temporary work surfaces for light work	\$120 each	We have three plastic carts and three metal - plastic are more durable

Two Onion Farm Pack Shed Equipment List

Name	Make/Model	Size	Supplier	Used for	Cost	Notes
Large vented harvest crates	Jordans "Medium" size	15.5x23.5x11.75	Jordan Seeds		\$14.20	
Small vented harvest crates	Jordans "Small" size	15.5x23.5x7.75	Jordan Seeds		\$10.30	
Large solid harvest crates	Jordans "Medium" size	15.5x23.5x11.75	Jordan Seeds		\$14.40	
Bulb crates				onions, garlic	\$2.25 in 2009	
Liner bags	Uline S-3783	20 x 18 x 30" 2 Mil Gusseted Poly Bags	Uline			Used inside waxed produce box for keeping produce moist while in cooler
Stack covering bags	Flexpack.com item FP22-9-01A	24x20x72x.008	Flexpack	Covering a stack of crates in cooler	\$178.03 for 25 (!)	Pricey but well worth it. Cover a stack of crates on a min-pallet with one bag for moisture retention
Waxed produce box		1/2 and 3/4 bu	Jordans		\$1.50 for 1/2 bu and \$2.00 for 3/4 bu	For on-farm storage and for CSA boxes

East side of packing shed. Curtain wall on this side. Water flows out thro grating at bottom of curtain wall



□ =1 square foot

2015 Southern Wisconsin Vegetable Production Workshop
Pack Shed Design & Flow



Ridgeland Harvest Pack Shed Equipment List

Name	Make/Model	Size	Supplier	Used for	Cost	Notes
Washing Machine	used		Craig's List	spinning salad greens	\$25	
Pressurer washer	Pump & eletric motor	15 gallons per minute, 2900 psi, 7.5 hp motor	Ronco (pump) Laakor (motor)	Roots: beets, carrrots, turnips, radishes, rutabagas, etc.	\$1,500	We also have a quick attach so a separate wand and hose is used for outside and keeps the one for produce clean.
Jacuzzi motor & pvc parts			Pool supply company	moves produce around and lightly bubbles off dirt	\$200 per tank	Very effectively removes soil on roots, drastically reducing time and water usage for final spray
Ice Machine	used			Broccoli, kale, sweet corn, parsley	\$1,560	Was source of our first cooling system. Gets things cooled down quickly without overloading our coolers (icing them up). Also keeps things cold at the market and delivery days to stores.
Brush Washing Line & Round Sorting Table	4-pieces, 24" wide		Market Farm Implement	Cucumbers, Eggplant, Peppers, Potatoes, Winter Squash & Pumpkins	\$3,960	Round sorting table has adjustable legs and we use for many things. Purchased at 5 acres under production.
Onion topper	Used	8-rollers	Roeters Farm Equipment	Onions	\$1,850.00	Huge efficiency over hand-trimming. Made a dumping stand from wood for onion entry and use our round sorting table at end. Purchased when we started growing 1 acre of onions.
4-compartment Stainless Steel Sink	used	10'	Auction	Salad greens and small batch items	\$200	Requires a lot of space. Nice to have for on-farm events/dinners.
Scales (4)	Avery, CAS, O Haus	30 & 60 pound		General use	\$250-400 each	Good scales last a long time
Pallet Jacks (2)			Northern tool	General use	\$300 each	
Fork Lift	Cat Pneumatic V30D			Everything!	\$5,560.00	Purchased at 20 acres under production, should have purchased when we were at 10 acres!

Ridgeland Harvest Pack Shed Equipment List

Name	Make/Model	Size	Supplier	Used for	Cost	Notes
Spray Tables (4)	Handmade tables	2' x 8' and 32 inches high	Tops made with Polymax kennel flooring from FarmTek	Spraying produce, packing CSA boxes, general work station	\$50/top	The height of your tables should match the height of the worker and what is regularly on top of the table.
Stainless Steel Work Tables (2)	new	6' x 2'		packing and bagging	~\$100 each	These stainless steel tables can easily be found at auctions or ordered through used restaurant equipment stores. They vary considerably.
Bulk Tanks	300 gallon & 500 gallon	3.5' x 6.5' (small) 5' x 8' (large)	Old dairy farmer neighbors	Everything	\$300 & \$600	
Harvest Black Trays (600)	Used bulb trays		Various sources	Tomatoes, zucchini, garlic, shallots	\$1-2 each	Careful they match together for stacking
Harvest Buckets (20)			Uline	Peppers, garlic scapes, peas, beans, bulk carrots	\$2 each	Great for clearly communicating usage of bucket (blue = harvest; white = cleaning no produce; black = livestock; etc.) We used free buckets through deli & bakeries in the past
Rolling boat	used		auction		\$50	Great for narrow storage
Rolling cart	used		auction		\$50	
Rolling scooters (25)	handmade & used	various	many places	storage, CSA line, bagging stations	\$4-15 each	Good casters are worth the added expense as they can hold a lot of weight! Measure your crates/trays carefully so you're sure to be getting the right size. Also measure cooler spaces you want to fill in with scooters and try out crates sitting both the long and shorts ways to see what is best.
Pallet Racking	Used	4 sections of 10'	Bernie's Equipment	Vertical storage of boxes	\$1,000	Great way to save space for not a lot of money
Rubber Bands	new	various sizes	Jordan's Seeds	bunching	sold by the pound	
Pallet bags	new	various lengths/sizes	Associated Bag	Covering pallets and lining bins	~\$2 each	Keeps humidity where you want it
Waxed Boxes	new	5/9 bu green, 3.4 bu, 1 1/9 bu, 2 doz.	Monte Packaging	csa boxes, stores	\$1.15 - \$2 each	Get in on bulk buys with neighbors to keep costs down

