Alternative Crops for the Blues

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Why grow alternative crops?

- ROTATION
- Improve soil conditions
- Reduce disease or insect problems
- Diversify operation
- Adding extra income
- Produce forage or feed for on-farm use
- Enhance environmental sustainability

Today’s question

- What alternative crops are available to pea growers?
Characteristics of the region

- 10 to 22 inches precipitation – primarily winter rains
- 75 percent of land with slopes 2 to 8 percent
- Deep silt-loam soils
- Dryland Crops: wheat, barley, canola, mustard or cannery peas

http://www.sare.org/publications/steel/reeder.htm
Challenges to crop production

- Amount & seasonal precipitation distribution
- Heat units
- Night time temperatures

http://www.climate-zone.com/climate/united-states/oregon/pendleton/
Cropping advantages

- Rare to have crop failures (Midwest weather extremes)
- Deep rich soils
- Low relative humidity
- Relatively few pests & diseases
- Moderate in temperature and season

http://images.cnhi.zope.net/images_sizedimage_174005927/lg
Crop Adaptation

- Different varieties adapted to different areas
- Latitude is important (esp. tropics to temperate - day-length sensitivity)
- Plant maturity must match season
- Required growing degree days must match heat accumulated
- Water requirements must match that available
- Geography & elevation affects climate
Environmental components

- Difficult to control:
  - Temperature
    - Extremes, heat units, length of season
  - Light (day-length)
  - Soil type
  - Moisture
    - Amount, timing
- Easy to control:
  - Fertility
  - Timing of operations

www.isws.illinois.edu/data/altcrops/giclim.asp
Frost Hardiness or Cold Tolerance

- **Hardy (able to withstand heavy frost)**
  - spinach, onion, rhubarb, various cruciferous vegetables such as cabbage, collards and kale

- **Semi-hardy (withstand light frost)**
  - beet, carrot, parsnip, lettuce, chard, pea, artichoke

- **Tender (no frost tolerance)**
  - bean, tomato, eggplant, pepper, corn, melons and squash, sweet potato
Optimum temperature range

- **Cool season:**
  - (55-65°F) cauliflower, pea, spinach, brussels sprouts
  - (60-70°F) broccoli, Chinese cabbage, head cabbage, celery, collards, kale, head lettuce, rutabaga, turnip
  - (65-75°F) beet, bulb onion, chayote, carrot, leaf lettuce, mustard, Irish potato

- **More tolerant, wide range of adaptability:**
  - (60-80°F) cucumber, green onion, squash
  - (65-80°F) bean, chard, corn, cowpea, muskmelon, parsley, pepper, radish, soybean, tomato, New Zealand spinach

- **Warm season:**
  - (70-85°F) eggplant, okra, sweet potato, watermelon, peanut
Fiber & Forage

- Bird seed (sunflower, proso millet, canary grass, etc.)
- Forage brassicas - turnips, rutabagas, radish
- Kochia
- Medics
- Sainfoin
- Forage grasses
Fiber, Fuel, Edible and Industrial Oils...

- Borage
- Broomcorn
- Canola
- Castor beans
- Comfrey
- Corn (for oil)
- Crambe
- Cuphea
- Dandelion
- Flax
- Lupine
- Meadowfoam
- Milkweed
- Perilla
- Safflower
- Sesame
- Sunflowers
- Vernonia
Food Grains, Pseudocereals

- Amaranth
- Barley
- Einkorn
- Emmer
- Kamut
- Spelt
- Triticale
- Wheatgrass
- Wild rice
- Malting barley

- Buckwheat
- Hops
- Indian corn
- Jerusalem artichokes
- Popcorn, white and colored
- Psyllium (medicinal)
- Quinoa
- Sesame (seeds)
- Sorghum (syrup)
Legumes, etc....

- Adzuki beans
- Dry edible beans
- Field peas
- Garbanzo beans
- Lentils
- Mung beans

- Peanuts
- Soybeans, incl. natto, tofu, tempeh; and Edible soybeans (edamame)
- Wedge pea
- Asparagus pea
Specialty and Ethnic Vegetables:

- Asparagus
- Baby vegetables
- Cabbage
- Carrots
- Celery
- Chinese water chestnuts
- Cole crops (broccoli, cauliflower, Brussels sprouts, kohlrabi)
- Corn, miniature
- Fenugreek
- Edible flowers
- Garlic
- Gourds, ornamental
- Herbs - culinary and medicinal
- Horseradish
- Luffa gourds
- Onions (transplants, shallots, sweet, early)
- Peas and pea shoots
- Peppers - specialty types (purple, hot, etc.)
- Pumpkins
- Red beets
- Salad greens - mesclun
- Sprouts (alfalfa, bean, etc.)
- Squash
- Sweet corn
- Sweet potatoes
- Tomatoes - specialty types
- Wasabi
Fruits and Nuts:

- Apples
- Asian pears
- Brambles - blackberries, raspberries, loganberries, blackraspberries, etc.
- Blueberries
- Cranberries, currants
- Elderberries
- Gooseberries

- Kiwi, hardy
- Lingonberries
- Melons - specialty types
- Paw paw
- Rhubarb products
- Strawberries, day neutral types
- Table grapes
- Wine grapes
Horticultural/Nursery:

- Bedding plants - annual flowers, herbs
- Field grown cut flowers
- Flowers for drying
- Potted annuals
- Native plants/wild flowers and seeds
- Regionally hardy shrubs and perennial flowers
Families with drought tolerant spp.

<table>
<thead>
<tr>
<th>Family</th>
<th>Common name</th>
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<tbody>
<tr>
<td>Alliaceae (Amaryllidaceae)</td>
<td>Onion</td>
</tr>
<tr>
<td>Amaranthaceae</td>
<td>Pigweed</td>
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<tr>
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<tr>
<td>Cucurbitaceae</td>
<td>Pumpkin</td>
</tr>
<tr>
<td>Fabaceae (Leguminoseae)</td>
<td>Pea and Bean (Pulse)</td>
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<tr>
<td>Poaceae (Gramineae)</td>
<td>Grass</td>
</tr>
<tr>
<td>Portulaceaceae</td>
<td>Purslane</td>
</tr>
<tr>
<td>Solanaceae</td>
<td>Nightshade</td>
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<tr>
<td>Asparagaceae (Liliaceae)</td>
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Families of cultivated plants with species adapted to winter rains, cool season

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What processed/fresh market vegetables grown on large acreage?

- Sweet corn
- Snap beans
- Onions
- Tomatoes
- Chili peppers
- Potatoes
- Green peas
- Snap peas

- Broccoli
- Cauliflower
- Cabbage
- Carrots
- Table beets
- Summer squash
- Pumpkins
- Spinach
Onion family

- Onion (*Allium cepa*)
- Welsh Onion (*A. fistulosum*)
- Garlic (*A. sativum*)
- Leek (*A. ampeloprasum*)
- Elephant Garlic (*A. ampeloprasum*)
Onion family

- Onion (*Allium cepa*)
- Welsh Onion (*A. fistulosum*)
- Garlic (*A. sativum*)
- Leek (*A. ampeloprasum*)
- Elephant Garlic (*A. ampeloprasum*)
Carrot family

- Anise  *Pimpinella anisum*
- Caraway  *Carum carvi*
- Carrot  *Daucus carota*
- Celery  *Apium graveolens* var. *dulce*
- Celeriac  *Apium graveolens* var. *rapaceum*
- Coriander  *Coriandrum sativum*
- Chervil  *Anthriscus cerefolium*
- Chervil (turnip rooted)  *Chaerophyllum bulbosum*
- Dill  *Anethum graveolens*
- Fennel  *Foeniculum vulgare*
- Lovage  *Levisticum officinale*
- Myrrh  *Myrrhis odorata*
- Parsley  *Petroselinum crispum*
- Parsley (root)  *Petroselinum crispum* var. *radicosum*
- Parsnip  *Pastinaca sativa*
- Skirret  *Sium sisarum*
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- Skirret  *Sium sisarum*
Sunflower family

- Lettuce  *Lactuca sativa*
- Chicory (witloof)  *Cichorium intybus*
- Endive (escarole)  *Cichorium endivia*
- Salsify (Spanish)  *Scolymus hispanicus*
- Salsify (black)  *Scorzonera hispanica*
- Salsify (oyster plant)  *Tragopogon porrifolius*
- Dandelion  *Taraxacum officinale*
- Artichoke (globe)*  *Cynara scolymus*
- Cardoon  *Cynara scolymus*
- Artichoke (Jerusalem)*  *Helianthus tuberosus*
- Tarragon  *Artemisia dranunculus*
- Burdock  *Arctium lappa*
- Garland Chrysanthemum  *Chrysanthemum coronarium*
Sunflower family

- Lettuce  *Lactuca sativa*
- Chicory (witloof)  *Cichorium intybus*
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- Tarragon  *Artemisia dranunculus*
- **Burdock**  *Arctium lappa*
- Garland Chrysanthemum  *Chrysanthemum coronarium*
Cabbage (head)  *Brassica oleracea* var. *capitata*
Cauliflower  *Brassica oleracea* var. *botrytis*
Broccoli (sprouting)  *Brassica oleracea* var. *italica*
Brussels Sprouts  *Brassica oleracea* var. *gymnifera*
Kale and Collards  *Brassica oleracea* var. *acephala*
Kohlrabi  *Brassica oleracea* var. *gongyloides*
Rutabaga  *Brassica napus* var. *napobrassica*

Mustard (leaf and brown)  *Brassica juncea*
Turnip  *Brassica rapa*
Chinese Cabbage (Pai Tsai)  *Brassica rapa* var. *pekinensis*
Chinese Cabbage (Pak Choy)  *Brassica rapa* var. *chinensis*
Radish  *Raphanus sativus*
Horseradish  *Armoracia rusticana*
Watercress  *Rorippa nasturtium-aquaticum*
Garden Cress  *Lepidium sativum*
Upland Cress  *Barbarea vulgaris*
Mustard (cabbage) family

- Cabbage (head)  *Brassica oleracea* var. *capitata*
- Cauliflower  *Brassica oleracea* var. *botrytis*
- Broccoli (sprouting)  *Brassica oleracea* var. *italica*
- Brussels Sprouts  *Brassica oleracea* var. *gemmafera*
- Kale and Collards  *Brassica oleracea* var. *acephala*
- Kohlrabi  *Brassica oleracea* var. *gongyloides*
- Rutabaga  *Brassica napus* var. *napobrassica*
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- Turnip  *Brassica rapa*
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- Garden Cress  *Lepidium sativum*
- Upland Cress  *Barbarea vulgaris*
Goosefoot family

- Beet  *Beta vulgaris*
- Chard  *Beta vulgaris var. cicla*
- Orach  *Atriplex hortensis*
- Spinach  *Spinacia oleracea*
- Good King Henry  *Chenopodium bonus-henricus*
- Quinoa  *Chenopodium quinoa*
Goosefoot family

- Beet  *Beta vulgaris*
- Chard  *Beta vulgaris var. cicla*
- Orach  *Atriplex hortensis*
- Spinach  *Spinacia oleracea*
- Good King Henry  *Chenopodium bonus-henricus*
- Quinoa  *Chenopodium quinoa*
Pea and Bean (Pulse) family

- Pea  *Pisum sativum*
- Garden, Common or Kidney bean  *Phaseolus vulgaris*
- Scarlet Runner bean  *Phaseolus coccineus*
- Lima bean  *Phaseolus lunatus*
- Tepary bean  *Phaseolus acutifolius var. latifolius*
- Gram, mung, moth, adzuki, rice bean  *Vigna mungo, V. aureus, V. aconitifolius, V. angularis, V. calcaratus*
- Faba bean  *Vicia faba*
- Asparagus or Yard Long bean  *Vigna unguiculata*
- Cowpea or Blackeye Pea  *Vigna unguiculata*
- Soybean  *Glycine max*
- Velvet bean  *Mucuna utilis*
- Kudzu bean  *Pueraria hirsuta*
- Jicama  *Pachyrhizus tuberosa*
- Winged Pea  *Tetragonolobus purpureus*
- Winged Bean  *Psophocarpus tetragonolobus*
Pea and Bean (Pulse) family

- Pea  *Pisum sativum*
- Garden, Common or Kidney bean  *Phaseolus vulgaris*
- Scarlet Runner bean  *Phaseolus coccineus*
- Lima bean  *Phaseolus lunatus*
- **Tepary bean  *Phaseolus acutifolius var. latifolius***
- Gram, mung, moth, adzuki, rice bean  *Vigna mungo*, *V. aureus*, *V. aconitifolius*, *V. angularis*, *V. calcaratus*
- Faba bean  *Vicia faba*
- Asparagus or Yard Long bean  *Vigna unguiculata*
- Cowpea or Blackeye Pea  *Vigna unguiculata*
- Soybean  *Glycine max*
- Velvet bean  *Mucuna utilis*
- Kudzu bean  *Pueraria hirsuta*
- Jicama  *Pachyrhizus tuberosa*
- **Winged Pea  *Tetragonolobus purpureus***
- Winged Bean  *Psophocarpus tetragonolobus*
- **Wedge Pea  *Lathrus sativus***
Fava bean

- Cover crop (excellent soil builder)
- Small & large seeded types
- Used as dry grain, shell-out, & processed
- Fits pea niche very closely
- Overwinter or spring plant

http://www.snakeriver.org/wscpr/LibraryDocs/FabaBean.pdf
Processed Favas

- Most if not all imported for ethnic market
Fresh fava bean use

vivelevegan.blogspot.com/2008_07_1_archive.html
Lentils

- Pulse or grain legume
- Can get by on ~ 12 in.
- Spring and Winter forms
  - Winter types 1-2 weeks earlier maturity
  - Less soil water depletion?
- USDA-ARS has released ‘Morton’ winter type

http://en.wikipedia.org/wiki/Lentil
Asparagus or Winged Pea

- *Tetragonolobus purpureus*
- Young pods are pickled or cooked whole
- Early spring niche
- Tolerates
  - Drought during seed fill
  - Wide range of soil types
- Markets?

![Image of Winged Pea]


[Image link: http://1.bp.blogspot.com/_w4QdbesideA/TVB3RPI-LPI/AAAAAAAAD7M/9UWT_JSzyl/s1600/2011_SpE06.jpg]
Tepary bean

- Warm season crop
- Closely related to common bean
- Very drought tolerant (does not require moisture after flowering begins)
- Rapid maturity
- Limited markets
Dryland common beans

- Anasazi & Pinto
- Emergence & early growth on residual moisture
- Waits for thunderstorm to complete growth
Camelina sativa (Brassicaceae)

- Annual or an over wintering herb
- Self-pollination although they can be cross-pollinated by visiting insects
- Small oilseed that contains high levels of omega 3 fatty acids
- Leftover meal can be used in feed
- Grows in arid conditions and doesn’t require extensive fertilizers, herbicides, and pesticides
- Grown in marginal areas
IF YOU HAVE ACCESS TO IRRIGATION:
Soybean (& Edamame)

- Broadly adapted & relatively easy to grow
- Oilseed and edible dry grain types
- Main limitation in PNW is cool nights
  - Clint Shock at Malheur R&E C has adapted dry grain types
- Vegetable types (edamame)
  - Large seed
  - Reduced antinutritional factors & better flavor
  - Higher sugar content
  - BUT shatters easily (seed pdxn)

Carol Miles (WSU Mt. Vernon) has trialed edamame varieties

Brassica vegetables

- Kohlrabi
- Asian leafy vegetables
- Kale
- Cabbage
- Brussels sprouts
- Broccoli
- Cauliflower
- Radish, rutabaga & turnip
Asian leafy greens
Vegetable greens

- A winter salad without lettuce
- Radicchio, Endive & Frisée
- Juncea mustards
- Rapa mustards
- Arugula (Rocket)
- Corn salad
- Winter cress
- Kale
Sugar Alternatives:

- Sugar currently receiving a bad rap
- Need to identify natural low calorie sweeteners
- Local expert: Clint Shock, Malheur Research Station

http://www.npr.org/blogs/thesalt/2012/02/06/146309816/californias-stevia-growers-bet-on-fast-track-to-sweetener-success
Funding sources:

- Specialty Crop Research Initiative (www.nifa.usda.gov/funding/ rfas/specialty_crops.html)
- Sustainable Agricultural Research and Education Program (www.sare.org/)
- Risk Management Agency (www.rma.usda.gov/)
- Organic Farming Research Foundation (www.ofrf.org/)
- Small Business Innovation Research (www.sbir.gov/)
- Oregon Specialty Crop Block Grant Program (www.oregon.gov/ODA/ADMD/grants_spec_crops.shtml)
More Information on Alternative Crops:

- http://plants.usda.gov/alt_crops.html
- http://mysare.sare.org/publications/diversify/diversify03.htm
Steps to take before choosing to grow an alternative crop

- Identify your goals
- Assess your resources
- Assess the crop growth and production requirements
- Get connected to others with experience
- Develop a marketing plan
- Seek start up funds
- Assess production costs, yields, and prices
- Begin with a small test plot