Pea and Lentil

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USDA - WSU

HORT 320, Olericulture

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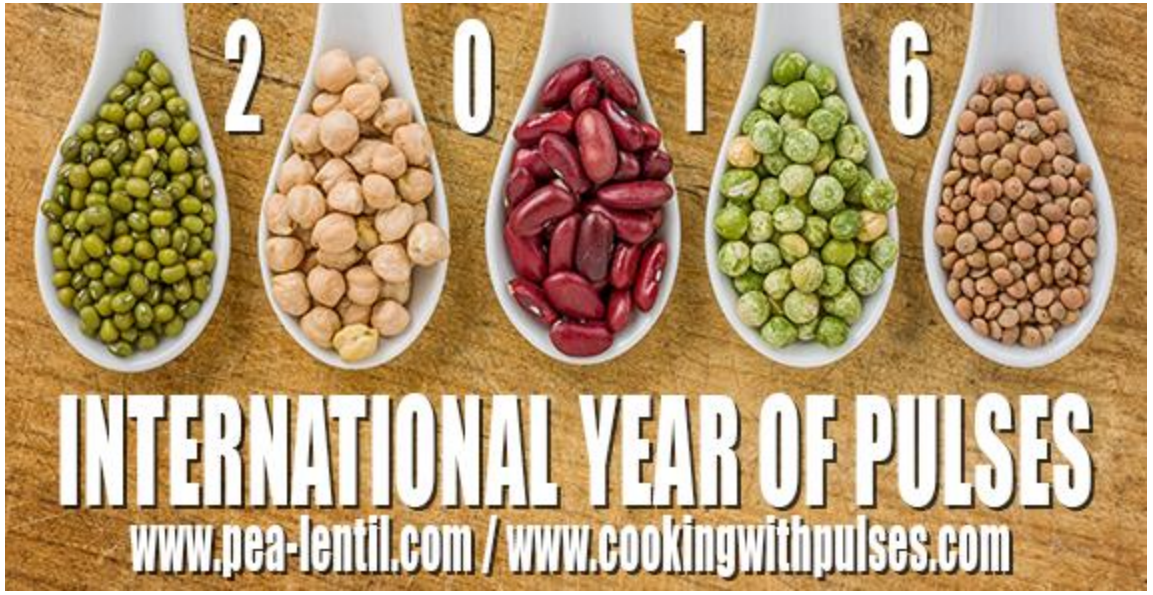
USDA

The Future Grows Here 50 USDA Agricultural Research Service

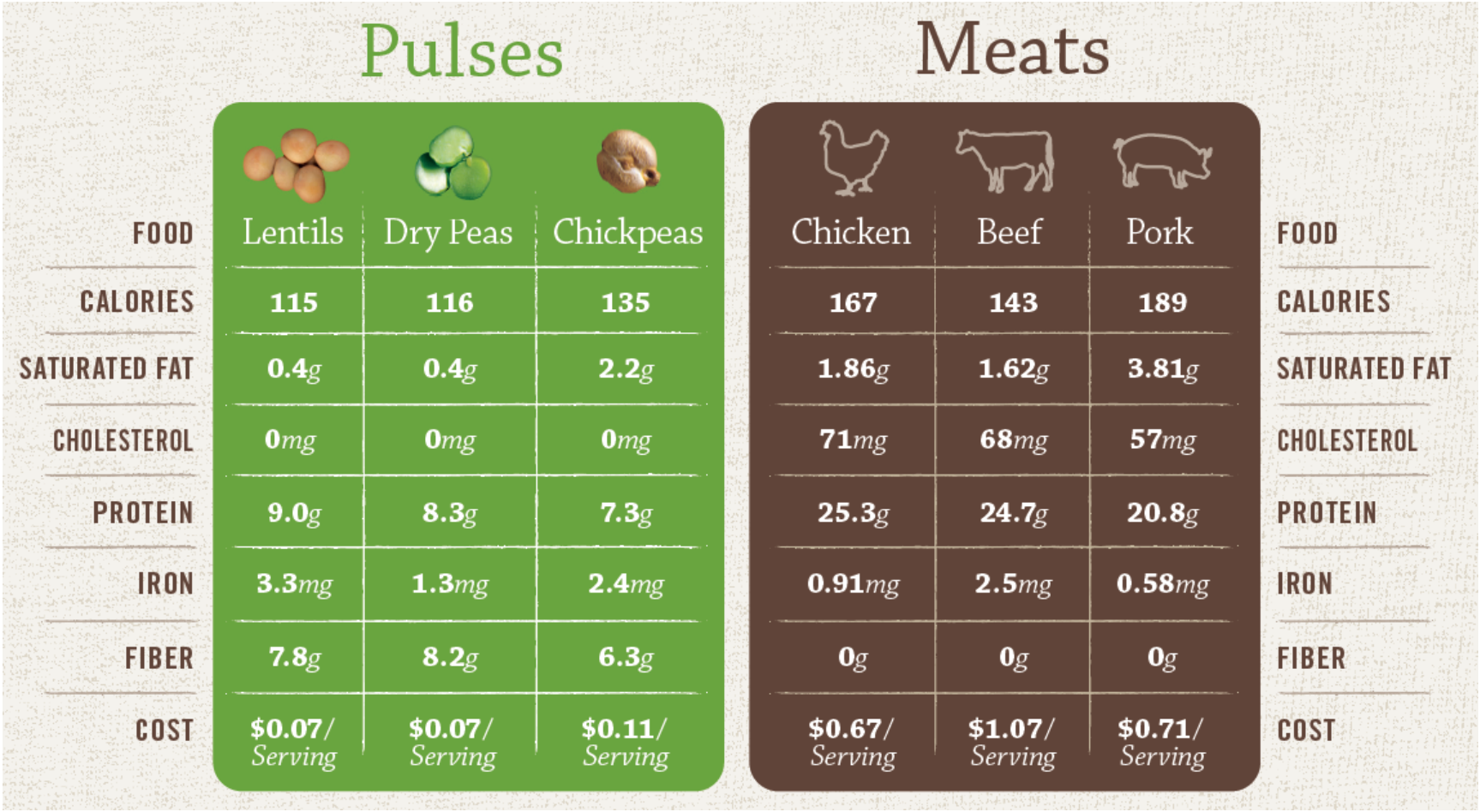
WASHINGTON STATE UNIVERSITY

Pullman's National Lentil Festival

Protein rich foods



Pulses high protein, low fat



	Pulses			Meats			
FOOD	Lentils	Dry Peas	Chickpeas	Chicken	Beef	Pork	FOOD
CALORIES	115	116	135	167	143	189	CALORIES
SATURATED FAT	0.4g	0.4g	2.2g	1.86g	1.62g	3.81g	SATURATED FAT
CHOLESTEROL	0mg	0mg	0mg	71mg	68mg	57mg	CHOLESTEROL
PROTEIN	9.0g	8.3g	7.3g	25.3g	24.7g	20.8g	PROTEIN
IRON	3.3mg	1.3mg	2.4mg	0.91mg	2.5mg	0.58mg	IRON
FIBER	7.8g	8.2g	6.3g	0g	0g	0g	FIBER
COST	$0.07/ Serving	$0.07/ Serving	$0.11/ Serving	$0.67/ Serving	$1.07/ Serving	$0.71/ Serving	COST

Lecture Goals

- Botanical classification/taxonomy
  - Family, genus, species, [variety, if appropriate]
  - Related species/crops
- Use and importance
  - Center of origin
  - Story of domestication and early uses
    - What cultures have historically used it and how
  - Current uses [and where it is grown/used]
    - Culinary and/or medicinal
  - Economic and cultural importance, specific to Washington
- Production [geared to Washington]
  - Propagation
  - Production/culture
  - Disease and pest issues
  - Disease and pest control
  - Harvest
  - Post-harvest handling
- Marketing and financial implications
  - Primary marketing channels for WA grown

Botanic classification

- Pea
- Family *Leguminosae*
- Genus *Pisum*
- Species *sativum*

Pea (*Pisum sativum*)

Center of Origin

- Fertile Crescent –
  - Israel, Lebanon, Syria, Turkey, Iraq
- *Central Asia*
  - Iran, Afghanistan, Pakistan and Turkmenistan

Domestication

- One of the oldest domesticated crops
- 10,000 BC in the Near East and Mediterranean regions
- Europe- Stone and Bronze ages
- India 200 BC


30°E
35°E
40°E
50°E
40°N
35°N
Black Sea
RUSSIA
GEORGIA
Tbilisi
Istanbul
Ordu
Sakarya
Halys
ARMENIA
AZERBAIJAN
Baku
Kars
Yerevan
Ankara
TURKEY
Karasu
Lake Van
AZER.
Aras
Caspian Sea
Izmir
Van
Tabriz
Adana
Lake Urmi
Mosul
Aleppo
Tehran
Latakia
Fertile Crescent
Kharun
Tharthar Lake
Nicosia
SYRIA
IRAN
Zagros Mountains
LEBANON
Mediterranean Sea
Beirut
Damascus
Euphrates
Kermanshah
Baghdad
Tigris
Esfahan
Haifa
Razzaza Lake
Tel Aviv
Amman
IRAQ
ISRAEL
Jerusalem
Gaza
Khabur
Dead Sea
JORDAN
Basra
Khorramshahr
Shiraz
SAUDI ARABIA
Rafha'
Al Aqabah
Kuwait
Bushehr
Tabuk
Persian Gulf
0 Miles 200
0 Kilometers 300
The Fertile Crescent
Forest
Subtropical woodland
Steppe grassland
Desert grassland
Site of ancient settlement
Modern cities
Modern city on ancient site

Lentil (*Lens culinaris*)

Center of Origin

- Fertile Crescent –
  - Israel, Lebanon, Jordon, Palestinian Authority, Syria, Turkey, Iraq

Domestication

- One of the oldest domesticated crops
- One of 8 founder crops
- 11,000 BP in the Near East and Mediterranean regions
- Pre-Pottery Neolithic period

Botanic classification

- Lentil
- Family *Leguminosae*
- Genus *Lens*
- Species *culinaris*

Other *Leguminosae* crops

- Legumes!
- Soybean
- Bean (next lecture)
- Peanuts
- Chickpea
- Forages
  - Alfalfa

- Symbiosis
  - Symbiotic bacteria (*Rhizobia*) fix atmospheric nitrogen in root nodules
- Pods

Uses of pea and lentil

Food ⇧ value

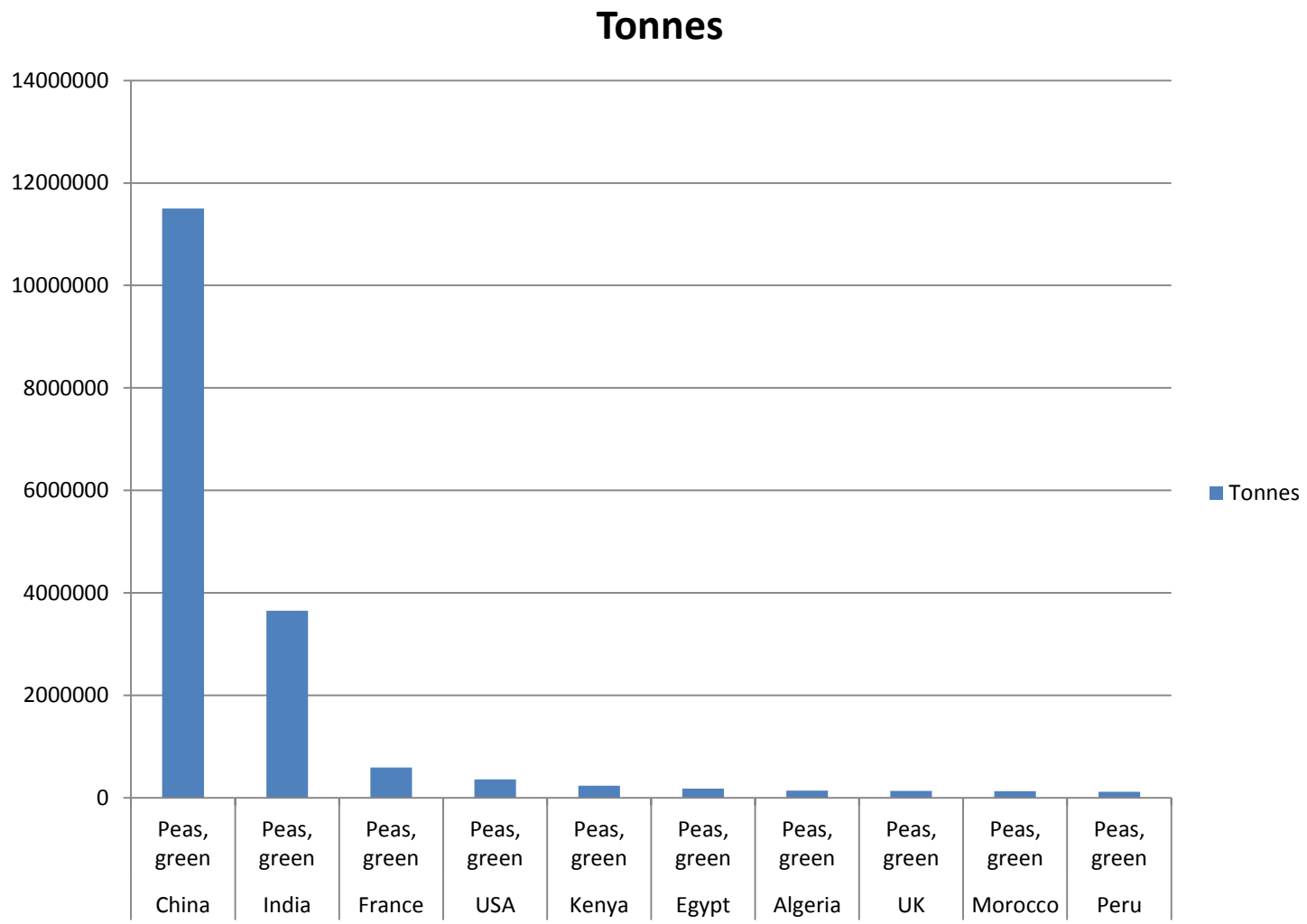
- Immature pea
  - Vegetable
- Dry pea seed
  - Soups
  - Flour
  - Starch
- Dry lentil
  - Soups
  - Flour

Feed and fodder ⇩ value

- Seed for animal feed
- Plant for animal fodder

Immature pea - vegetable

Green pea, world production

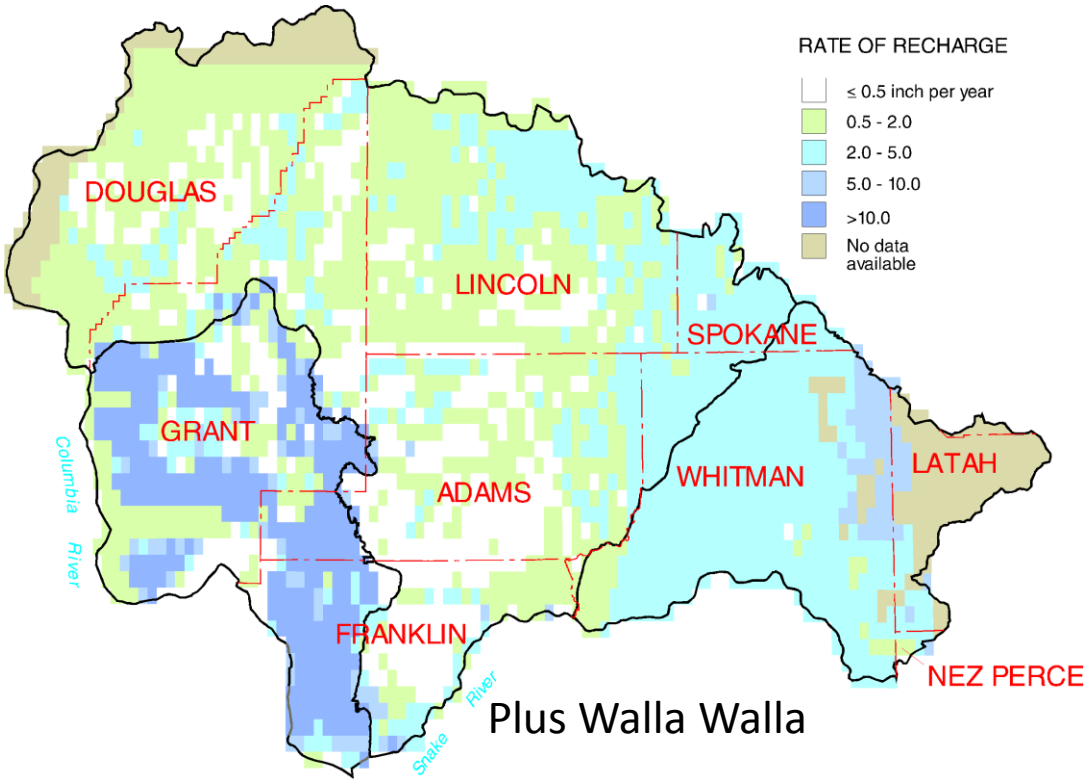


Significance to WA agriculture

- Vegetable pea
- Two markets
  - Growing the seed crop
  - Growing the vegetable for frozen market

- 2012
- Green processing pea
  - #25
  - $35.2 million
- Wrinkled seed pea
  - #40
  - $6.7 million

Green pea production in WA



U.S. Geological Survey Open-File Report 95-445
Nitrate Concentrations in Ground Water of the Central Columbia Plateau
http://wwwdwatcm.wr.usgs.gov/ccpt/pubs/ofr-95-445.html

10 years ago, Skagit County would be included, production moved to the Columbia Basin.

Growing green pea

Preparation

- uniform fertility, soil type, slope, and drainage
- good supply of available soil moisture
- optimum soil temperature is 50-75 F
- plowed, harrowed and a cultipacker used lightly to ensure a firm seed-bed.

Timing

- lower Columbia Basin, pea planting begins in late February, and ends about mid-May at the higher elevations -foothills of the Blue Mountains.
- Orderly harvest
  - accumulated heat unit (AHU) system

Accumulated heat unit (AHU) system

- AHU is defined as the accumulated difference between the base temperature for crop growth and the mean of the daily maximum and minimum air temperatures.
- Used to select early and main season varieties
- Using a 40 F base, early varieties currently used require about 1200 heat units and late varieties about 1500 heat units to reach a 100 **tenderometer** maturity

Planting green pea

-most is grown on contract
-except market gardeners

Planting green pea

- 1.5 – 2 inches deep
- 480,000 plants per acre
  - Uniformity is key for uniform color and uniform maturity
- Inoculate with *Rhizobium* bacteria
- Soil sampling to determine fertilization requirements
- Band with
  - 15-20 # **N**/A
  - 40-75 # **P**/A
  - 60 # **K**/A
- The processor determines time of harvest according to tenderometer reading
- late May through late July harvest

Variety selection

Green Pea Specifications

Variety	Leaf	Western Heat units	Node to First Bloom	Days to 100 TR	Plant Height (inches)	Pods/ Peduncle	Peas/ Pod	Sieve Size Index	Percent Distribution at 100 TR							Disease Resistance			
									1	2	3	4	5	6		Fusarium Wilt Race(s)	PM	En	BLRV
									9/32	10/32	11/32	12/32	13/32	14/32	(inches)				
									7.14	7.94	8.73	9.53	10.32	11.11	(mm)				
Processing/Freezer Peas																			
Marias	Normal	1290	10	59	14-16	2	8	3.60	3	9	28	46	13	1		1			
Span 290F (International)	Normal	1300	9-10	59	14-16	2	8	3.53	2	5	46	32	15	0		1			
CMG-307F	Normal	1315	10	60	19	2	8	3.86	1	7	22	46	23	1		1			
CMG-416AF	Afila	1320	10-11	60	21	2	8-9	3.90	0	3	24	53	20	0		1			
Portage	Afila	1325	10	60	22	2-3	7-8	3.78	1	7	22	53	17	0		1			
Savannah	Afila	1370	10-11	61	22	2	7-8	4.01	2	9	20	33	27	9		1			
Samish	Normal	1465	12	65	24	2-3	8-9	3.84	1	10	24	39	21	5		1			R
Bonito 264F	Normal	1540	14-15	67	24-26	3-4	8-9	3.84	1	8	23	43	24	1		1	5	6^T	R
Hudson	Normal	1540	15	67	25	2	9-10	3.82	2	9	20	45	22	2		1 2		R	R
Lochsa 420AF	Afila	1550	15	67	20	2	8-9	3.69	2	6	31	43	18	0		1 2 5		R	

Vegetable pea field

University of Delaware

Green pea pod stripping harvester

Speed to freezer!

Sugar snap pea harvester

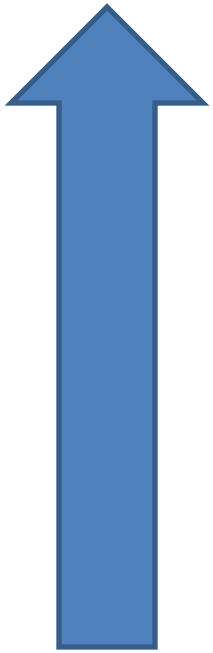
pod stripping harvesters
May to early August

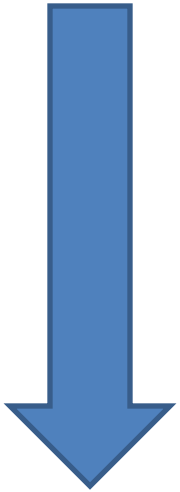
Snap pea harvest

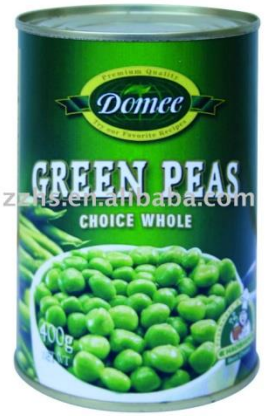
- Edible pod peas tend to lose part of their sugar content, on which much of their flavor depends, unless they are **promptly cooled to near 32 F** and maintained at a **relative humidity of 90-95%,** after picking.
- **Forced air cooling**, using 32 F air with 90-95% humidity, is the preferred method of cooling since it does not result in surface moisture, and minimizes the risk of decay should subsequent temperatures during handling go over 34 F.
- **Hydrocooling** may be used when the producer is close to the market, and temperature can be held to 32 F throughout all marketing steps to the consumer. With hydrocooling, edible pod peas packed in baskets can be hydrocooled from 70 to 34 F in about 12 minutes when the water temperature is 32 F.
- **Vacuum cooling** also is possible, but the edible pod peas must be pre-wet to obtain cooling similar to that by hydrocooling.
- After precooling, the peas should be **packed with crushed ice (top ice)** to maintain freshness and turgidity. Adequate use of top ice provides the required high humidity (95 %) to prevent wilting.

Marketing

- Vegetable green pea consumption pattern- in USA is flat
- Frozen and canned





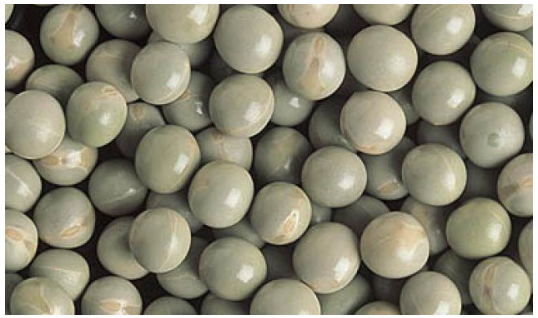


Marketing – snap pea

- Consumption increasing, frozen

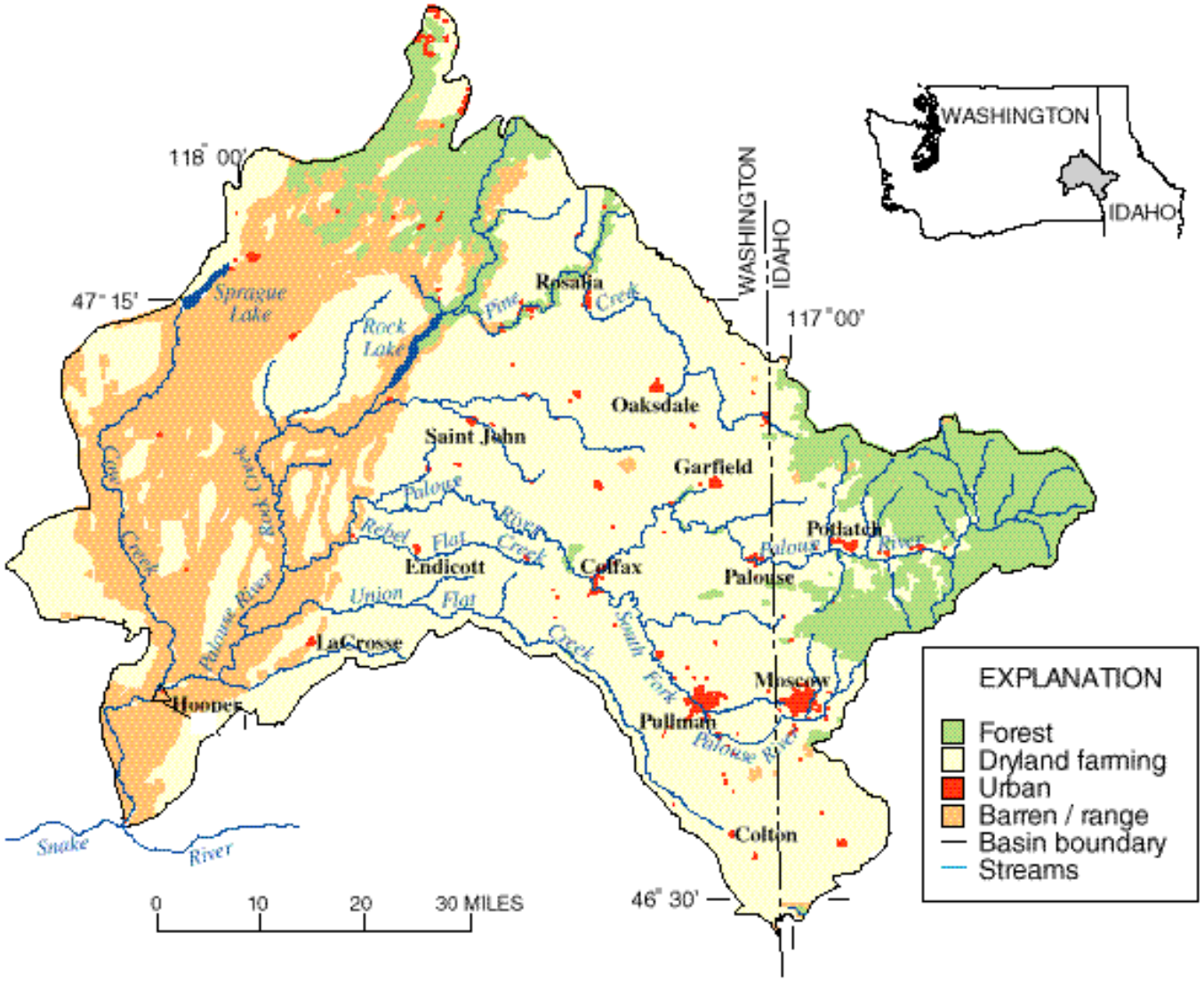
Significance to WA agriculture

- Dry edible pea
- Lentil



- 2012
- Dry edible pea
  - #28
  - $21.6 million
- Lentil
  - #27
  - $23.3 million

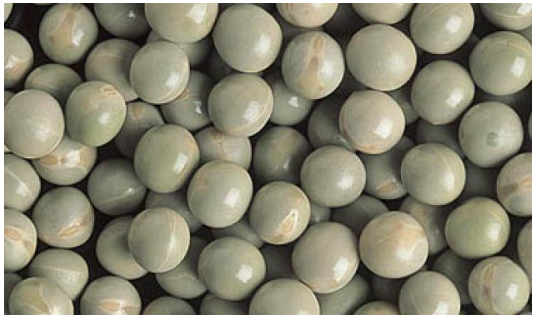
Dry pea and lentil production in WA -the Palouse



Dry pea market classes

Dry pea

Yellow



Green

Split and decorticated

Marrowfat (minor)

Austrian winter feed pea (minor)

Dry pea

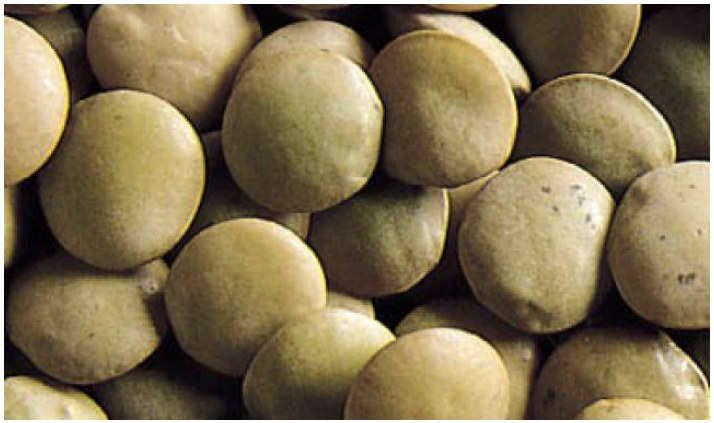
Dry pea - food

Winter pea - feed

Lentil market classes

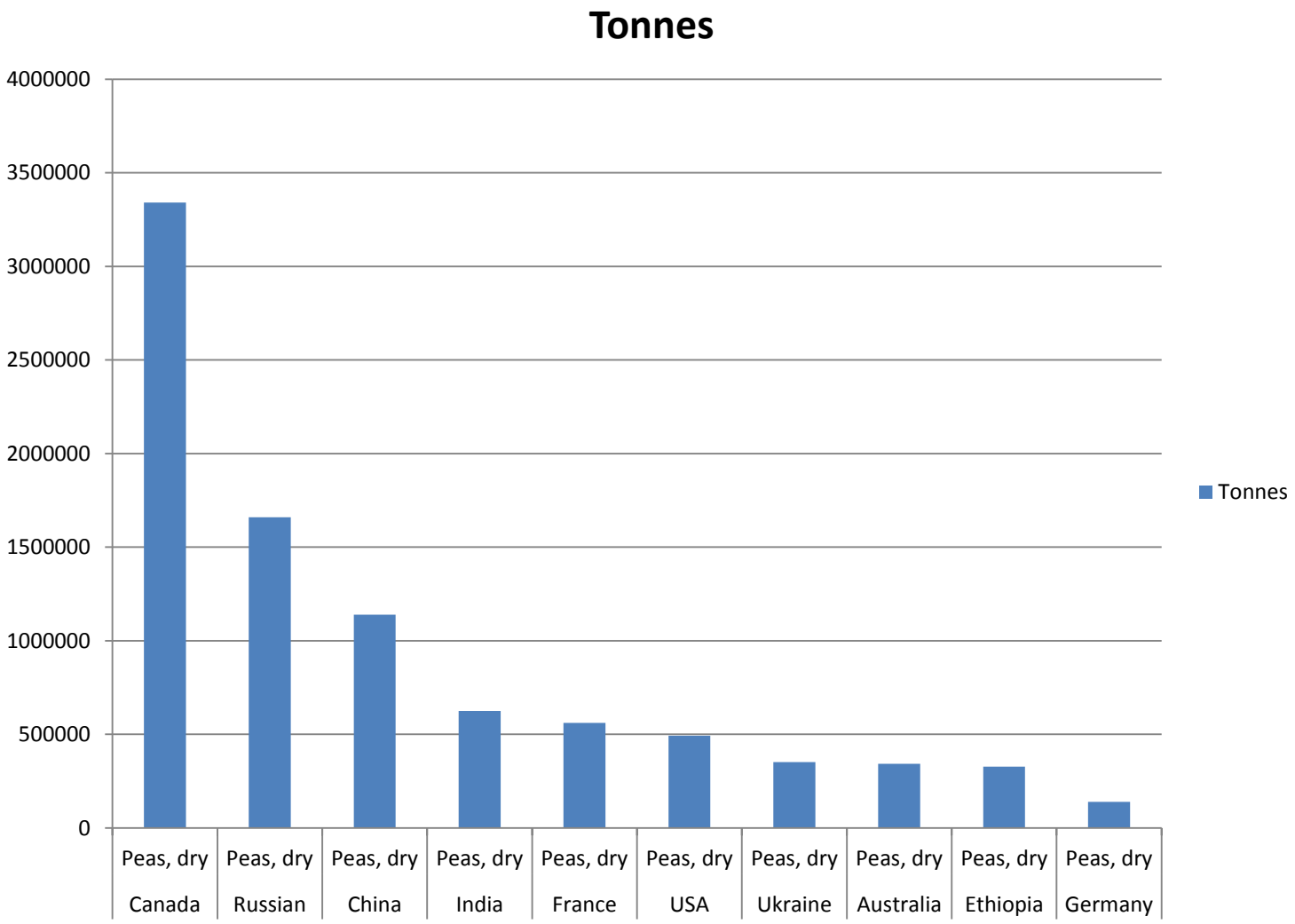
Small brown lentil

Red Lentils (decorticated)

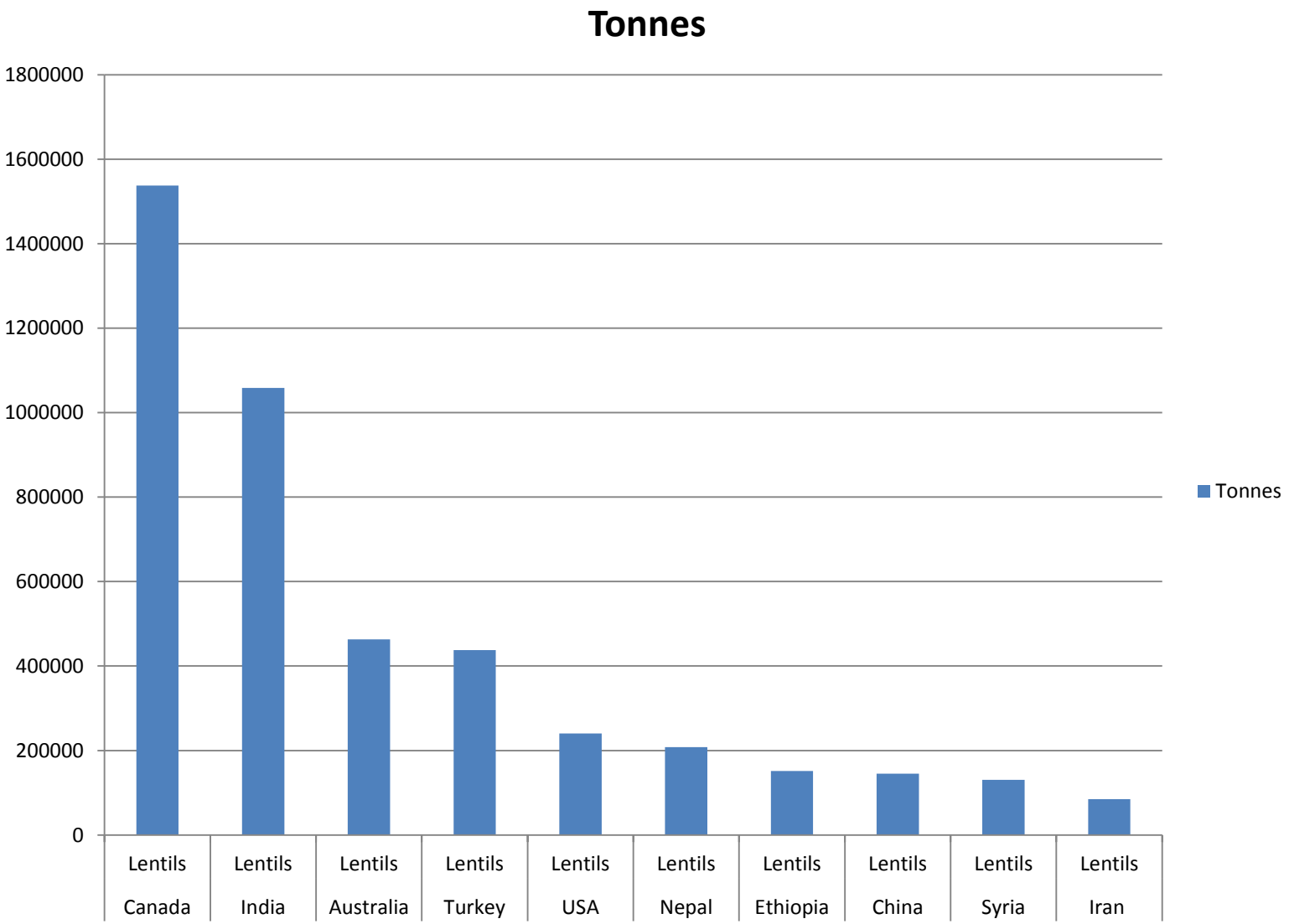


Large green lentil

Dry pea, world production



Lentil, world production



Dry pea and lentil production notes

Preparation

- Seed treatment
  - Fungicides (Phythium)
  - Insecticide (wire worms, leaf weevil)
  - Moly
- Seedbed
  - Finely worked or no-till
- Soil temperature
  - Above 40 F (April-May)

Planting

- Air seeder or grain drill
  - 1 to 3 inches deep
- Plant April-mid May
- 300,000 plants/A
- Soil test
  - 20-30 # **N** available
  - Additional **P** and **K** (pea heavy feeder)

Planting lentil and pea

Weed control

- Pea and lentil poor competitors
  - Cultural practice
    - Crop rotation
    - Mechanical/field preparation
  - Herbicides
    - Challenging environment for registration due to the minor crop status of pea and lentil
    - No GMO pea or lentil grown in the world due to market conditions

Lentil field

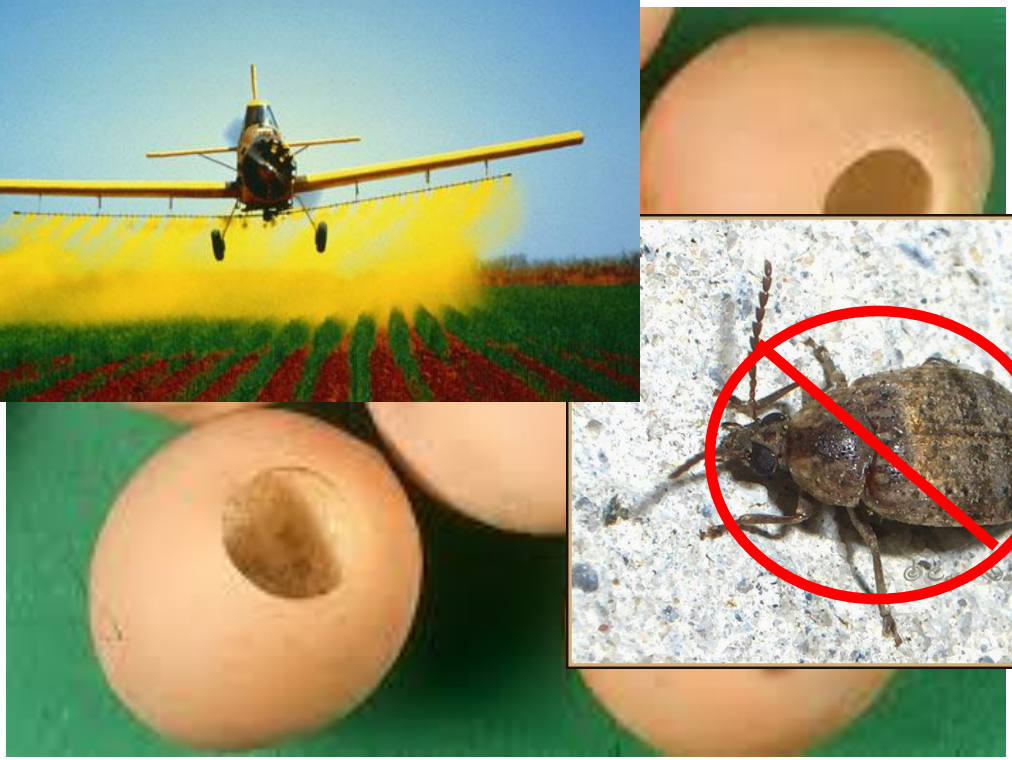
Pests

Aphid – important pest of pea and lentil – spreads viruses

Seed weevil –
main pest of dry pea production

Pests-Control

Aphid – Insecticidal spray



Seed weevil – insecticidal spray

Disease problems on pea in WA

Fusarium wilt

Root rots

Ascochyta blight (minor)

Powdery mildew

Bacterial blight (minor in irrigated vegetables)

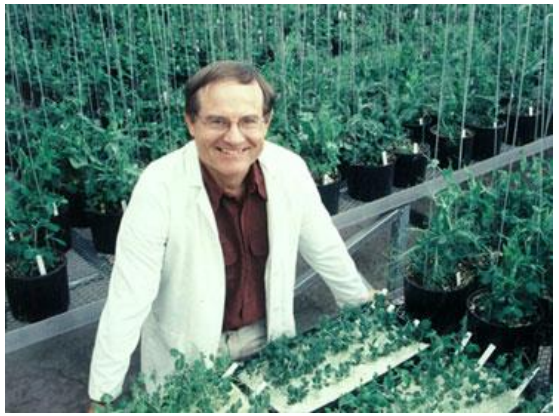
Disease control on pea in WA

Fusarium wilt

Root rots

Plant breeders use genetic resistance

Powdery mildew



Bob Arthur, Crites Seed breeder

Disease of lentil in WA

White mold – minor problem

Control – genetic resistance

Dry pea harvest Carefully!

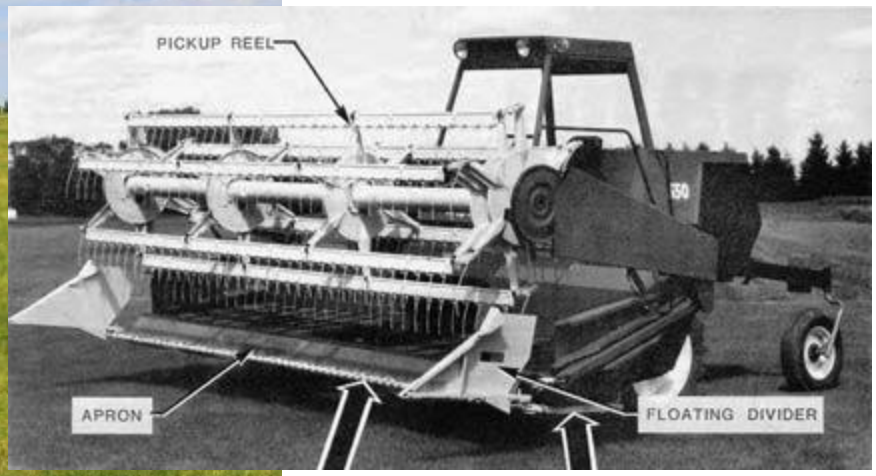
August-determinate, afila type

Lentil harvest problem, it’s a short plant

Lentil harvest

Lentil maturing

Lentil combine after windrowing

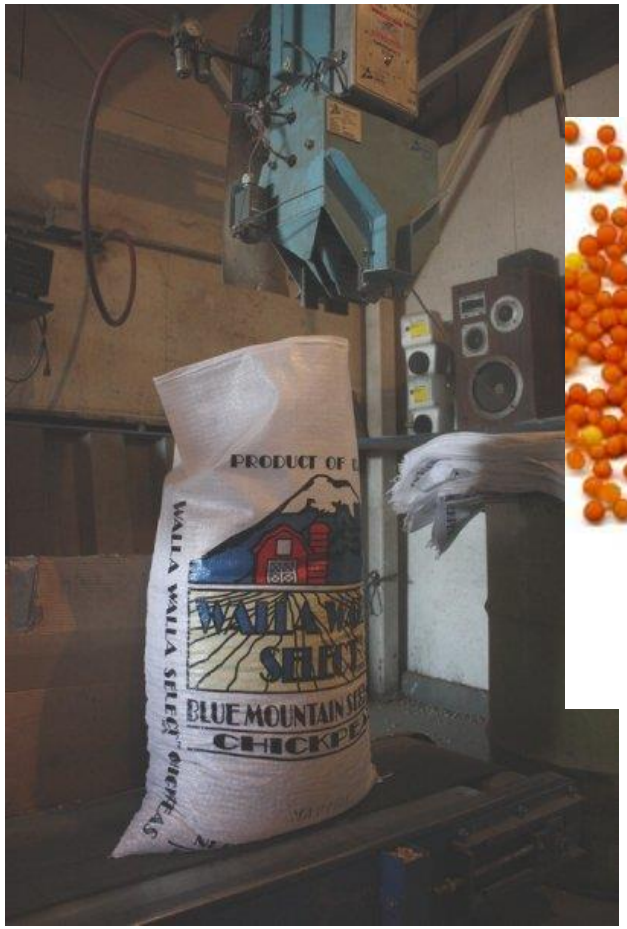


Solution-windrowing

- Swathing occurs when about 30 percent of the lowermost pods turn tan and their seeds rattle. Doing so under conditions of higher humidity may reduce shattering

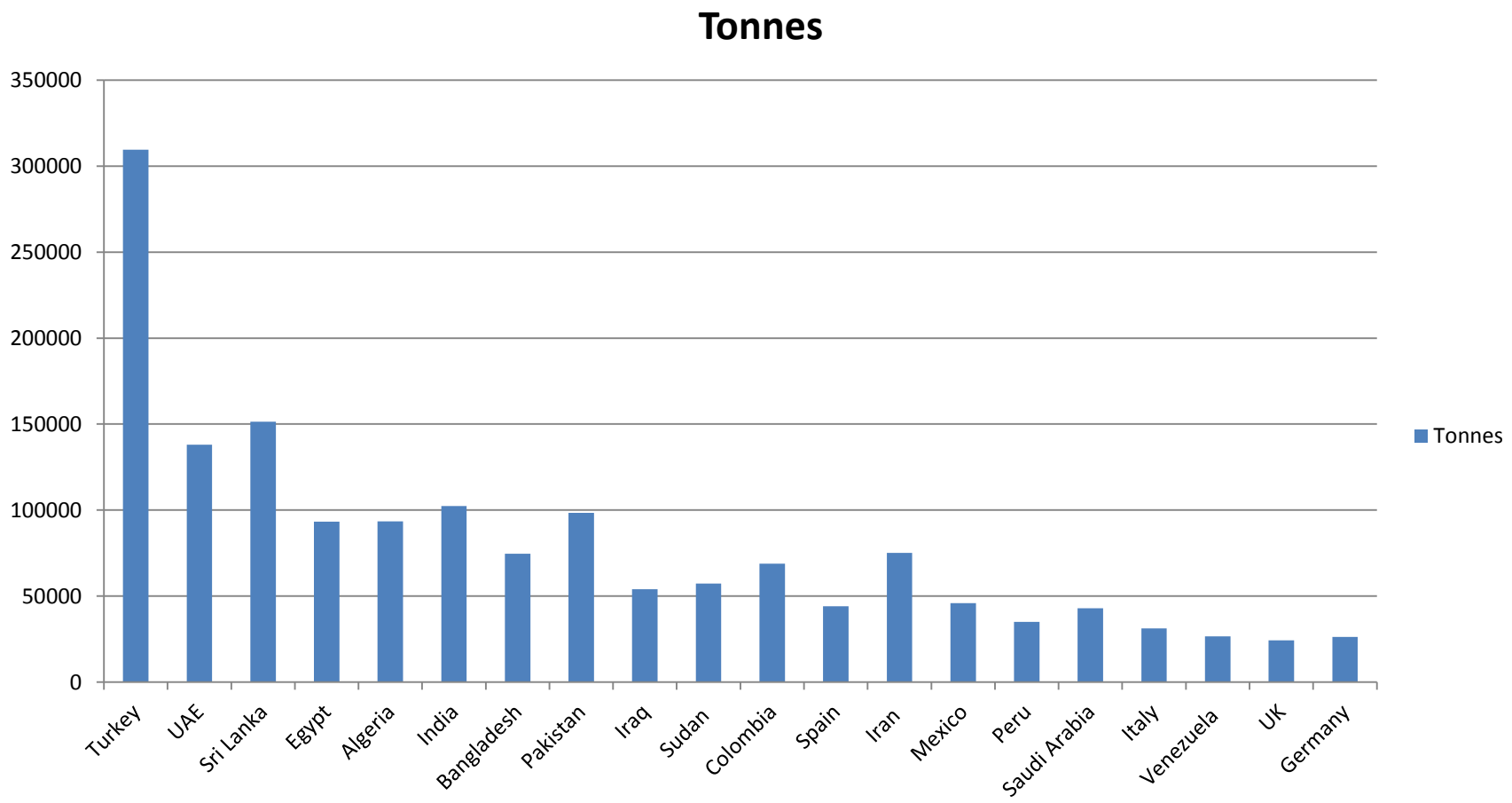
Combining

Marketing
Dry pea and lentil, commodities

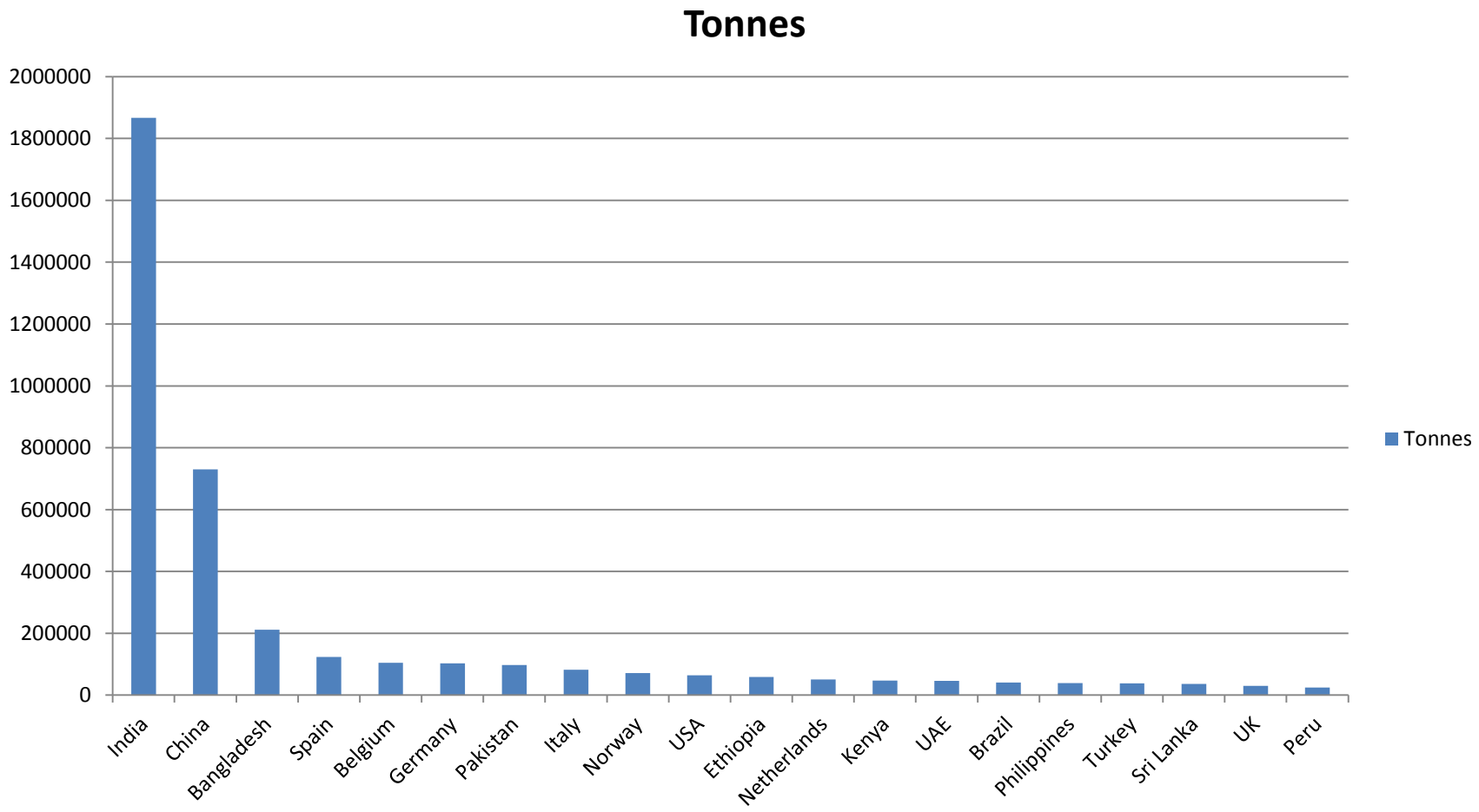


EXPORTED

Countries USA exports lentils to:



Countries USA exports dry pea to:



Marketing commodities- dry pea and lentil

- Cooperatives, eg PNW
- Exporters, eg Brocke & Sons
- USA Dry Pea and Lentil Council
  - network of staff managing offices worldwide, the USADPLC maintains and develops new markets with new product launches, informative and awareness campaigns and promotions

History on the Palouse
Lentil 1916
Pea 1920s

Rulen Ladle Planting Wheat Up on Seventeen (Cobblestone)

Thank you for your attention

- Questions?
- Clare Coyne, coynec@wsu.edu