



Cropping system improvements and innovation

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**Transitioning Cereal Systems
to Adapt to Climate Change**

November 13-14, 2015



Global Cropping Systems Designs for Mitigating and Adapting to Climate Change

*Dr WL Pan, Washington State University
moderator*

- Rotational Designs
- Nutrient balances, management
- Water Use
- Conservation Systems
- Livestock/Crop Integration

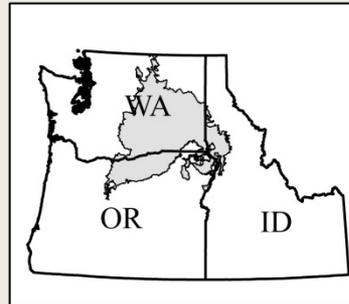
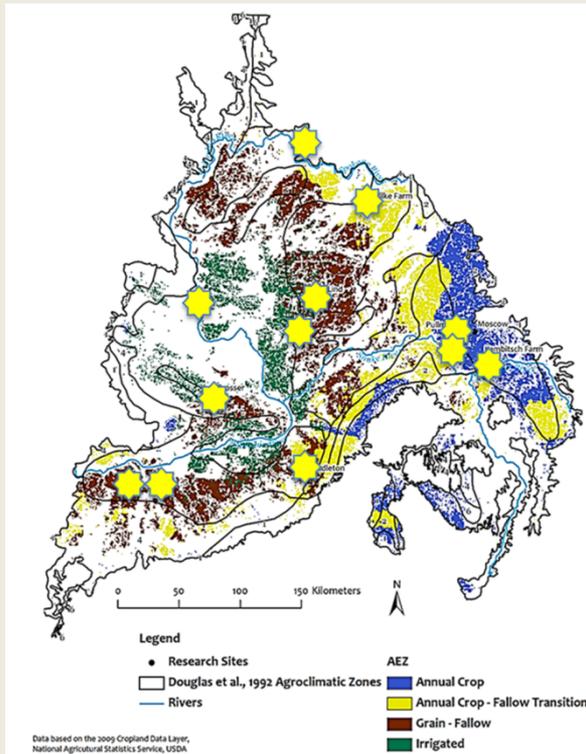


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Inland Pacific Northwest US Cropping Systems Research

PNW experiments distributed amongst 4 zones representing annual available water gradient from **200-600 mm rainfed + irrigated**



Major AECs defined:

1. Annual Cropping (<10% fallow)
2. Annual Crop-Fallow Transition (10-40% fallow)
3. Grain-Fallow (>40% fallow)
4. Irrigated (continuous cropped circles)

3 million ha, 27% fallow, 45% wheat

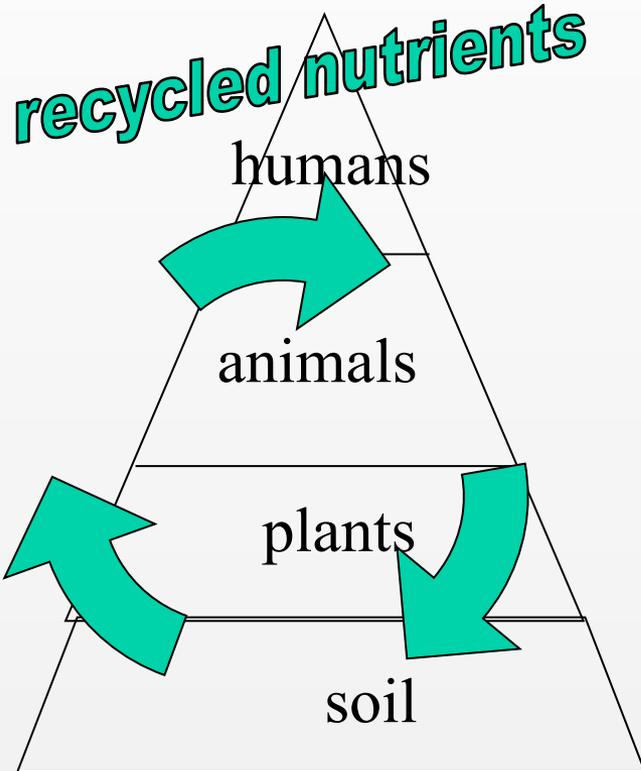




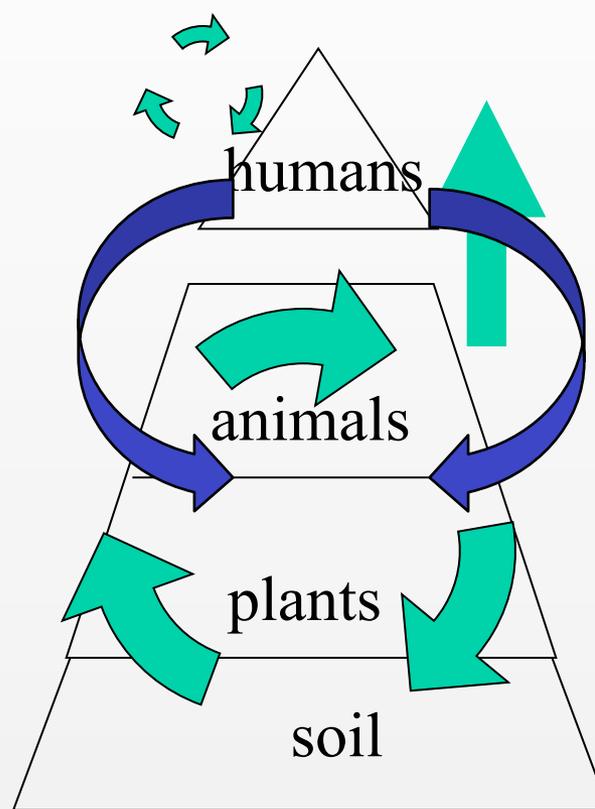
Shift in Nutrient Cycling

Agricultural Changes in Nutrient Cycling Trophic pyramid (modified from Magdoff et al., 1997)

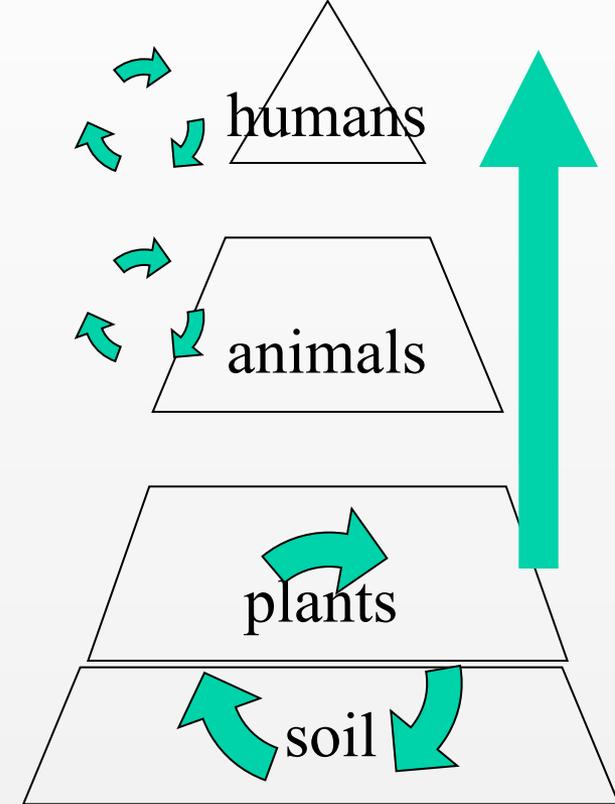
recycled nutrients



1. Primitive agriculture



2. Urbanization



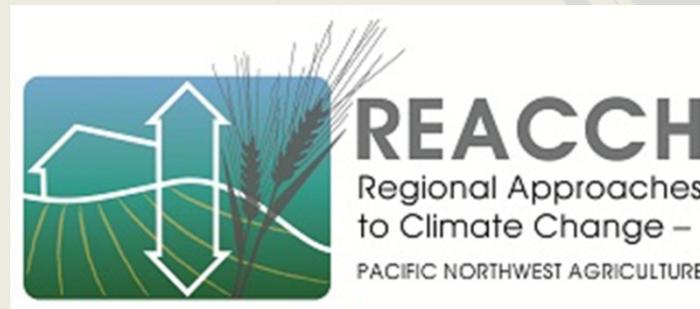
3. Industrial Agriculture



4. Livestock/crop re-integration?

Climate Change Need Areas

- ❑ Intensification and diversification
- ❑ Ecophysiological and economically driven agronomic systems design
- ❑ C, N, H₂O balances
- ❑ SOM quality and quantity
- ❑ Subsoil quality



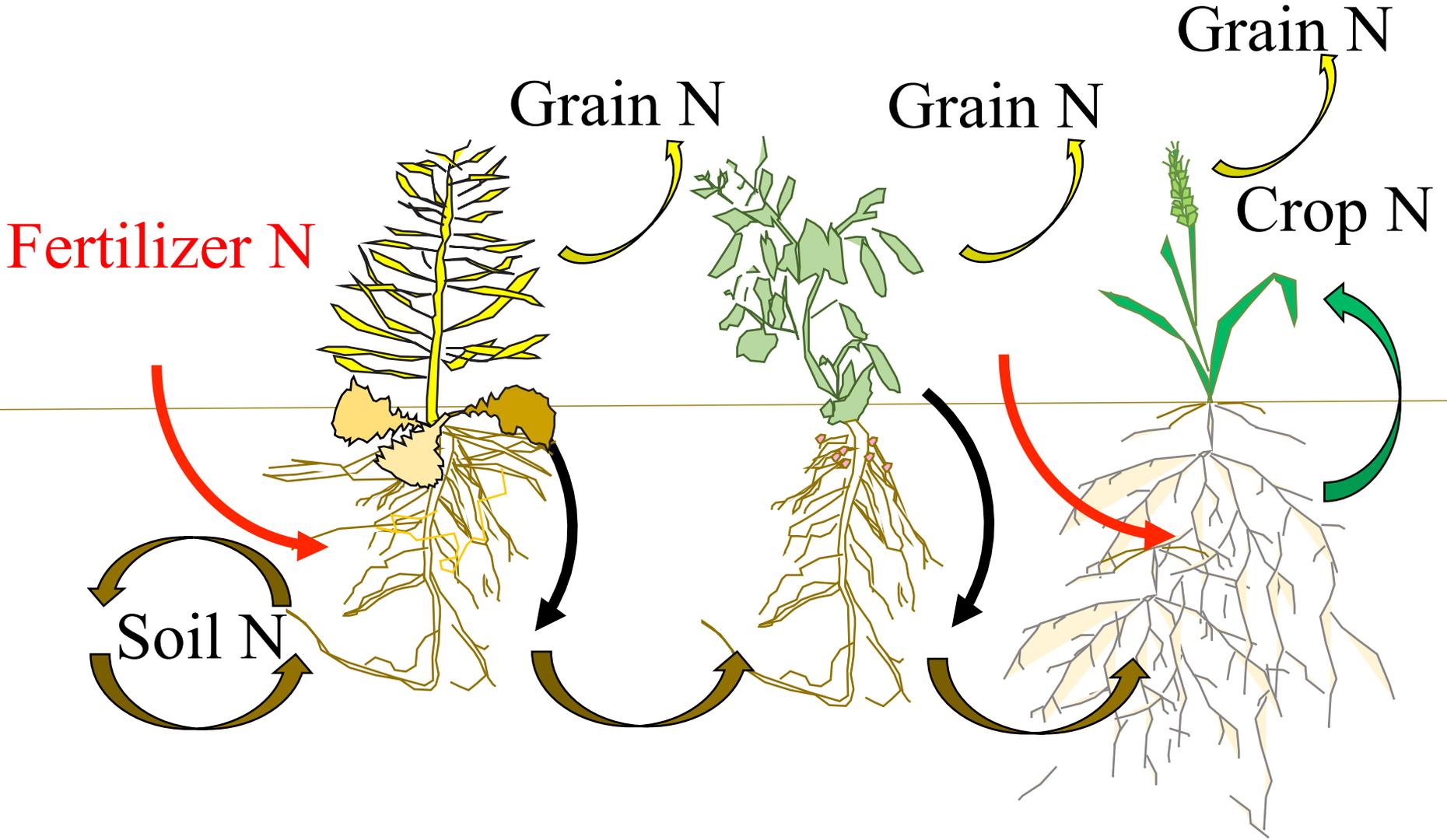


Figure by Tai Maaz

AEZ-specific Alternative Systems; Win-Win Scenarios

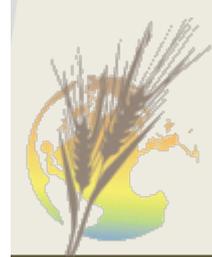
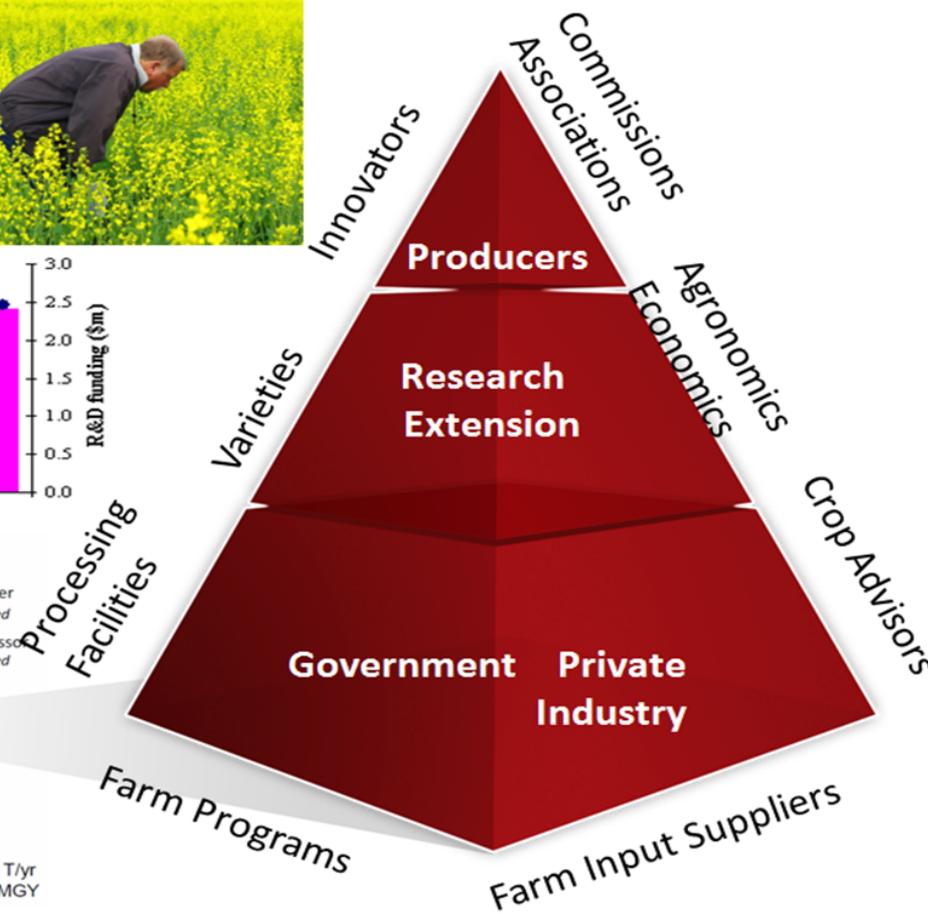
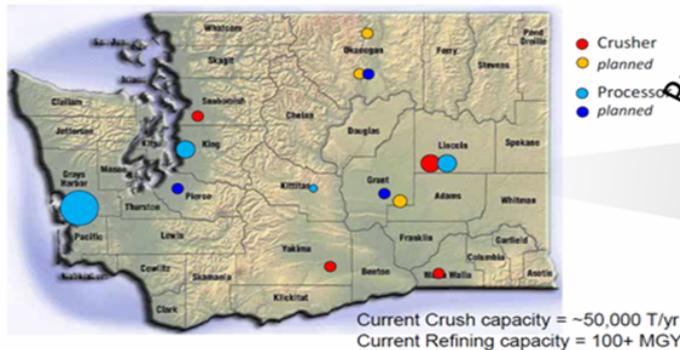
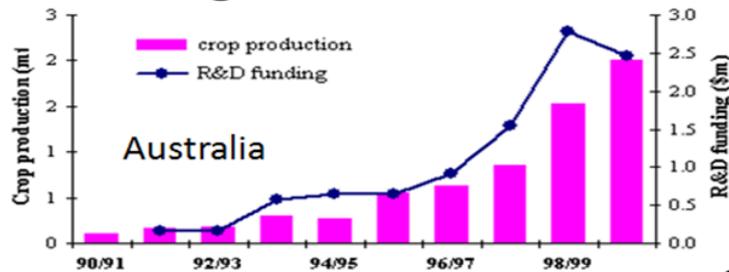
AEZ	Convention	Alternative rotation	Alternative res/soil mgt	Win – win			
				GHG	NUE	\$ Red WUE	pest cntrl
High rainfall	RTill 1.WW 2.SW 3.Leg	1.WW 2.SC 3.Leg	DS, precision nutr. & straw harvest	Y	Y	+/-	Y
Intermediate rainfall	RTill 1. WW 2. SW	Flex 1.WW/WC/WL 2.SC/SL/F 3.F	DS, prec. N, organic supplement s	Y	Y	+/-	Y
	1. WW 2. F						
Low rainfall	RTill 1. WW 2. F	1.WW/WC/WL 2. Chem F	DS, stripper header, organics	Y	Y	+/-	Y
Irrigated	Till 1..WW 2.Corn 3.Potato	1.WW-CC- 2.corn-CC- 3. <u>Potato</u>	RT/DS, green manure CC, straw harvest, prec. nutr.	Y	Y	+/-	+/-
		1. <u>FP-WCF</u> 2. <u>WCG-SC</u> 3. <u>Potato</u>					



Case Stories:

System Wide New Crop Adaptation

Transdisciplinary
Research and
Stakeholder
Integration





Thank you!

University
of Idaho

WASHINGTON STATE
 UNIVERSITY



Oregon State
UNIVERSITY

OSU

United States Department of Agriculture
National Institute of Food and Agriculture

Pacific Northwest
Farmers Cooperative



Monsanto



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REACCH
Regional Approaches
to Climate Change –
PACIFIC NORTHWEST AGRICULTURE