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Cooperative Extension

Arizona Ag Water: Consumption, Production, & Exportation

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Water & Arizona Agriculture



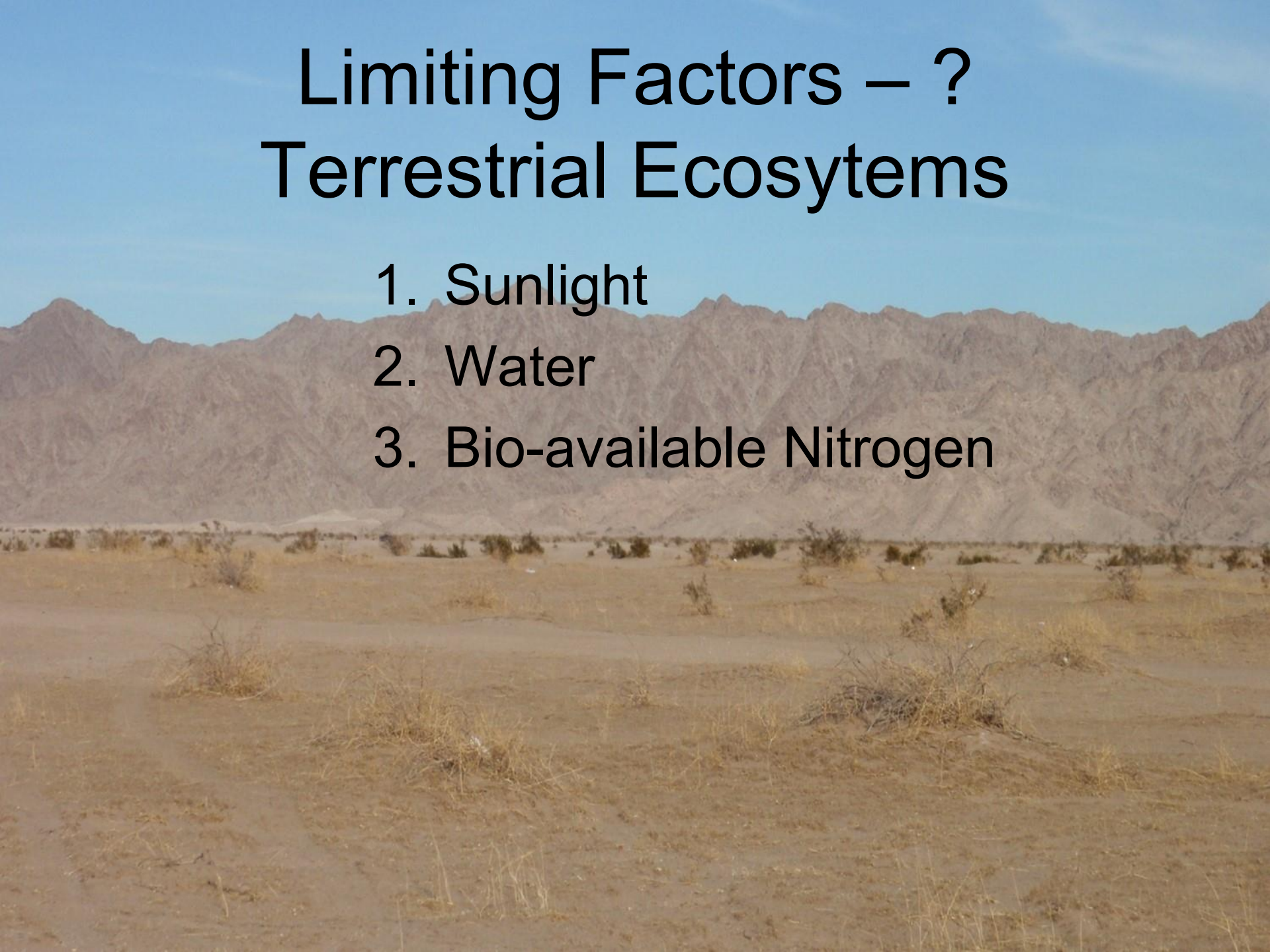
Water & Arizona Agriculture

- **Arizona ag water use**
- **Agricultural production**
- **Ag exportation**
- **Food importation**



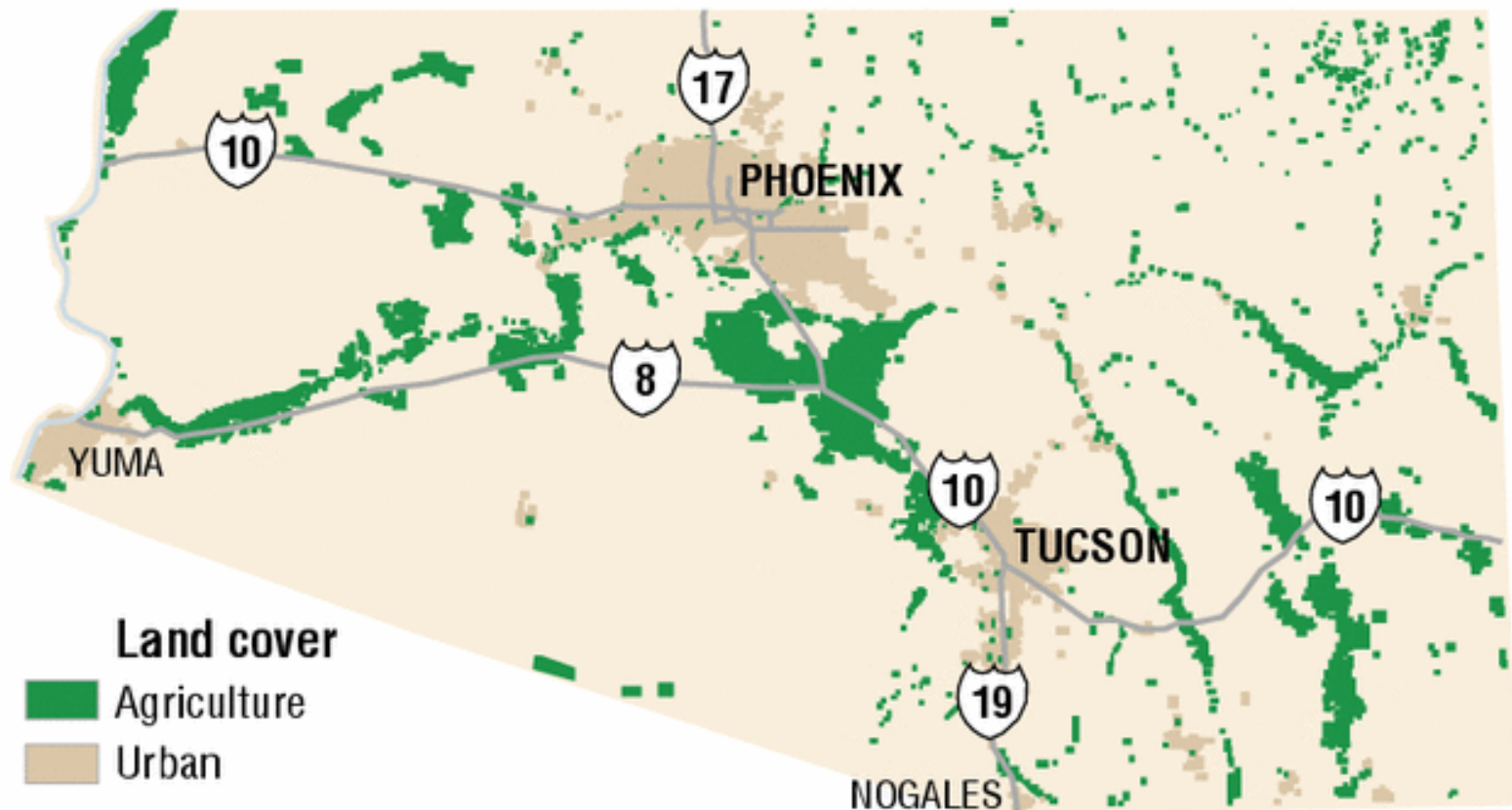
Limiting Factors – ? Terrestrial Ecosystems

1. Sunlight
2. Water
3. Bio-available Nitrogen



Arizona farms and urbanized areas

As Arizona's urban areas gobble up more land, many farmers are getting offers they can't refuse and selling.



SOURCE: Arizona Gap Analysis Project

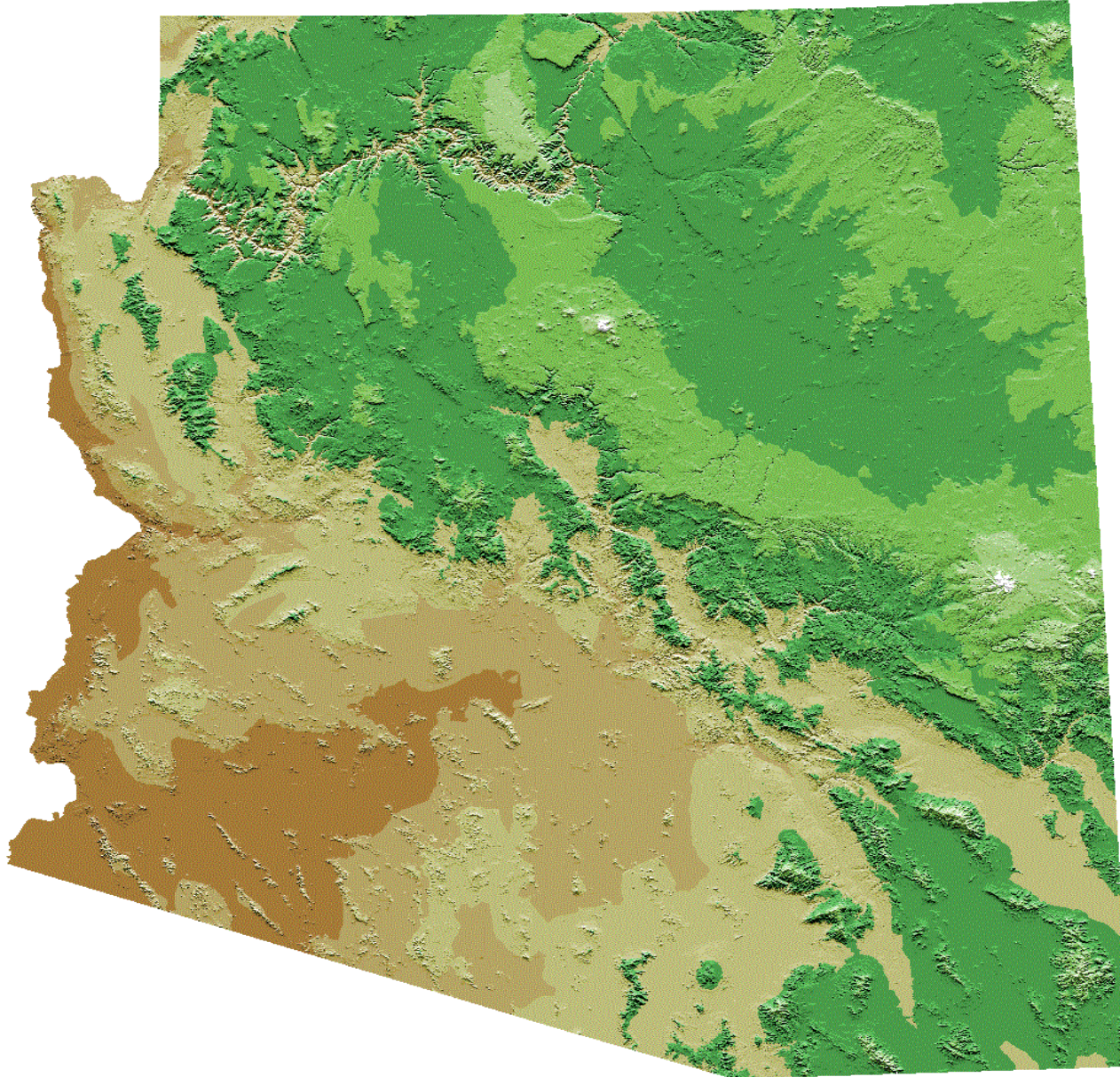
Dave Castelan / Staff

~1,222,000 acres (2022) <https://www.usfarmdata.com>



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The Great State of Arizona



Arizona Ag Water Use

ARIZONA'S WATER USE BY SECTOR (2019)



Source: ADWR, 2 August 2023



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Colorado River Water

70-80%  Agriculture
(conventional estimates)



Water Use – United States

80%  Agriculture

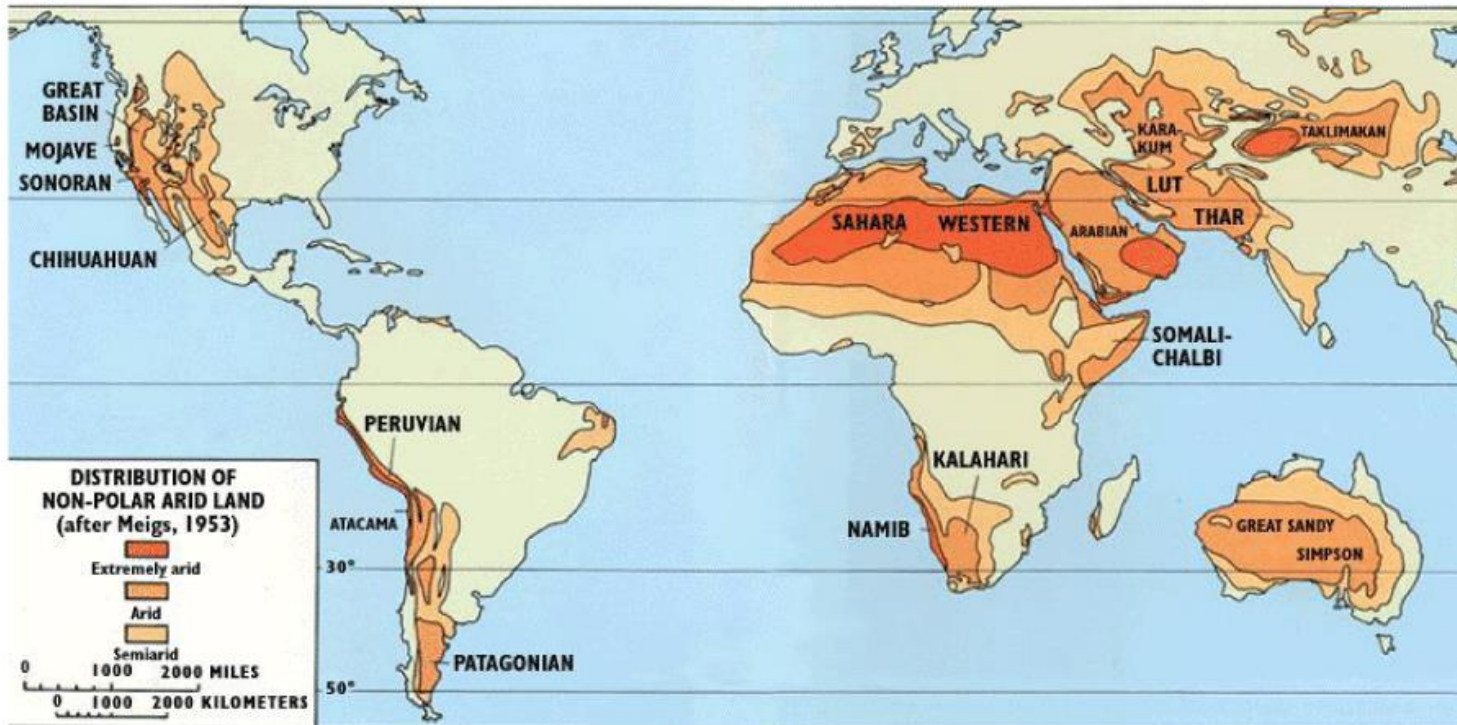


Global Fresh Water Use

70%  Agriculture

**Primarily in arid
& semi-arid regions**





Arid/Semi-Arid Regions

- ~ 40% of total crop production
- ~ 60-65% of grain production
- ~ 40-45% of global population



Increasing Global Demand Food & Fresh Water

- **By 2050**, feeding a planet of **9B people** will require:
 - **50 percent increase - agricultural production**
 - **15 percent increase - water demand**



Arizona Water

- Arizona consumes ~ **7M acre-feet (AF)/year**
- 72% used by agriculture ~ **5 MAF**
- Each Arizonan uses ~
146 gallons water/day*
- 7.6M Arizonans  **1.2 MAF/year**
(wet water)

*ADWR, <https://www.azwater.gov/conservation/public-resources>



Arizona Agricultural Production

- Highest yields per acre (unit area).
- High quality crops
- Maximize genetic potential
 - Crops
 - Animals
- Robust seed industry
 - National
 - International



Arizona Agricultural Economic Production

- **\$30.9B** to the state's economy *
- Includes direct, indirect, and induced economic impacts.
- **Supporting over 126,000 jobs**
 - **\$7.2B in labor income**
 - contributing significantly to stable employment and the state's overall economy.

* Montaña, C., D. Duval, G. Frisvold, J. Quintero. 2024. Arizona's Agribusiness System in the State Economy: An Economic Contribution Analysis for 2022. Department of Agricultural & Resource Economics, University of Arizona Cooperative Extension



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Direct Agricultural Production

- Value of agricultural products sold in Arizona reached **\$5.2B in 2022.**
 - Crop production: 58%
 - Livestock: 42%. } ~ 60/40 Split
- Major agricultural products by value:
 - dairy products,
 - cattle and calves,
 - and vegetables/melons.

* Montaña, C., D. Duval, G. Frisvold, J. Quintero. 2024. Arizona's Agribusiness System in the State Economy: An Economic Contribution Analysis for 2022. Department of Agricultural & Resource Economics, University of Arizona Cooperative Extension



Growth & Diversification

- **\$30.9B 2022 = 35% increase in 5 years**
 - \$23.3B figure reported in 2017
- **Increased diversity of ag production:**
 - Urban specialty crops
 - Greenhouses
 - Alfalfa
 - Dairy farms

* Montanía, C., D. Duval, G. Frisvold, J. Quintero. 2024. Arizona's Agribusiness System in the State Economy: An Economic Contribution Analysis for 2022. Department of Agricultural & Resource Economics, University of Arizona Cooperative Extension



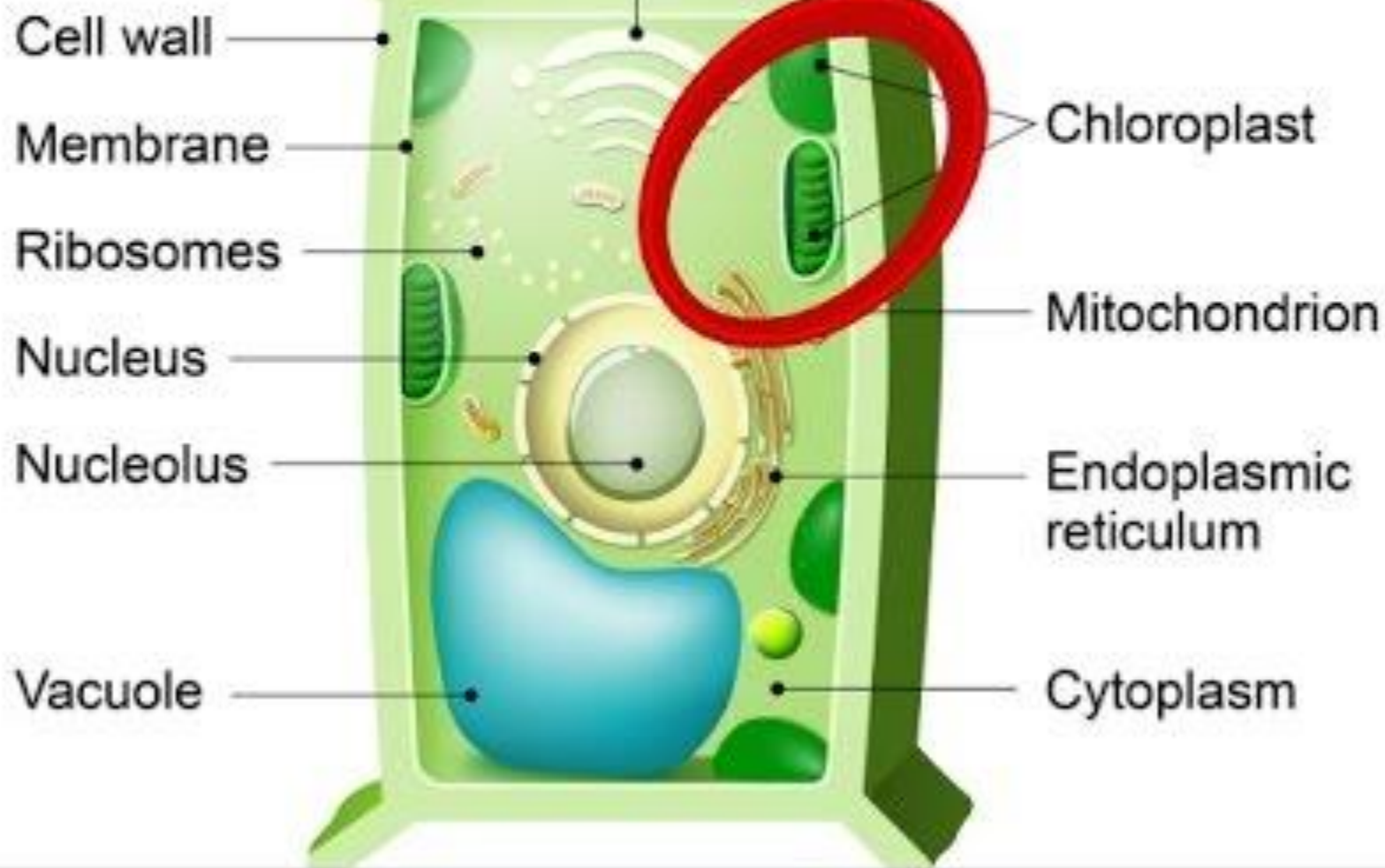
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Crop Water Use

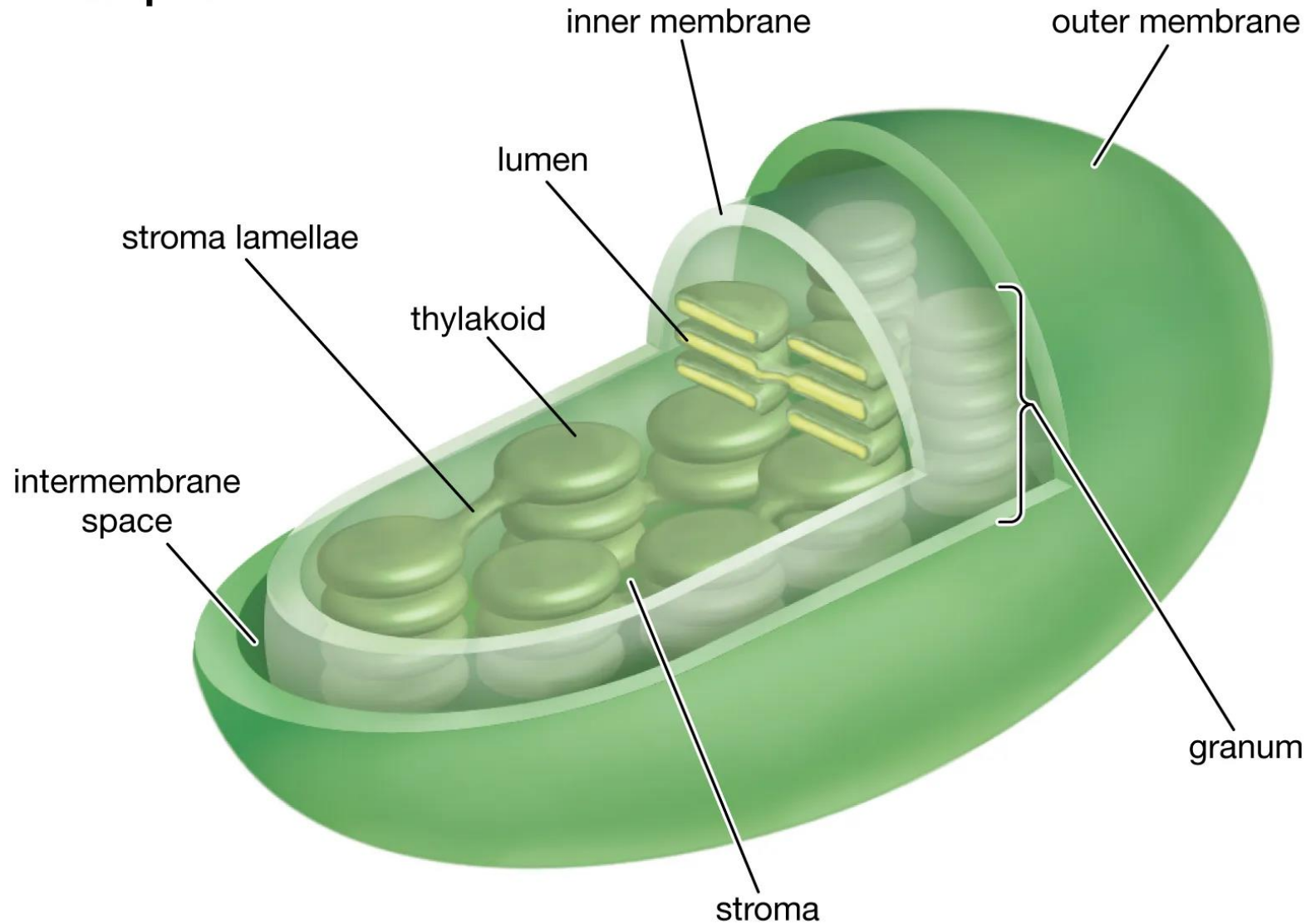
A wide-angle photograph of a vast agricultural field filled with rows of green leafy crops, possibly lettuce or cabbage. The plants are densely packed and stretch far into the distance under a clear, bright sky. The perspective is from a slightly elevated position, looking down the length of the field. The soil between the rows is a reddish-brown color. The text "Crop Water Use" is superimposed in a large, white, sans-serif font across the middle of the image.



Chloroplasts



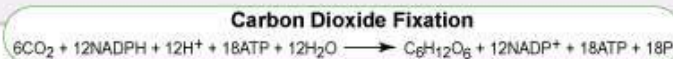
Chloroplast



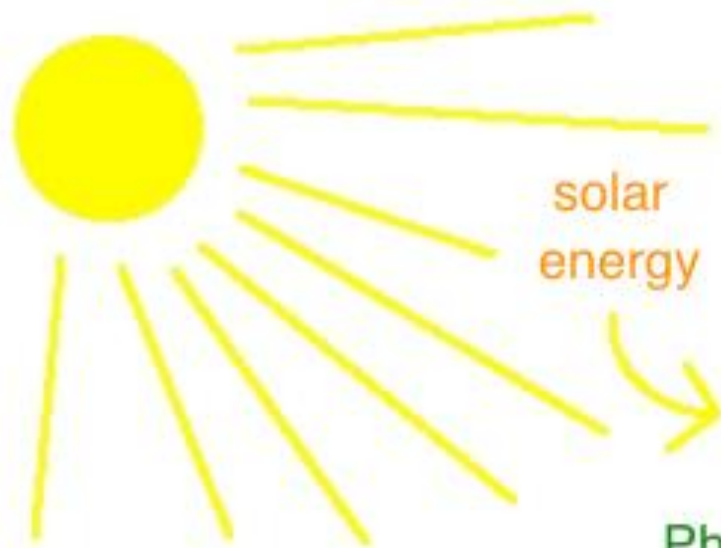
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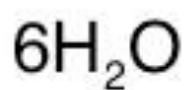
ENZYMES					
1.2.1.13	Glyceraldehyde-3-P dehydrogenase	2.7.1.19	Phosphonibulokinase	4.1.1.39	Ribulose-bis-P carboxylase
		2.7.2.3	Phosphoglycerate kinase	4.1.2.-	Aldolase
1.18.1.2	Ferredoxin-NADPH+ reductase	3.1.3.9	Glucose-6-phosphatase	4.1.2.13	Fructose-bis-P aldolase
2.2.1.1	Glycolaldehydetransferase (Transketolase)	3.1.3.11	Fructose-bis-phosphatase	5.1.3.1	Ribulose-P epimerase
		3.1.3.37	Sedoheptulose-bis-phosphatase	5.3.1.1	Triosephosphate isomerase
2.2.1.2	Dihydroxyacetone transferase (Transaldolase)	3.6.1.34	ATP synthase	5.3.1.6	Ribose-5-P isomerase
				5.3.1.9	Hexose-P isomerase



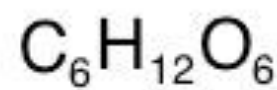
solar
energy



+



Photosynthesis



carbon
dioxide

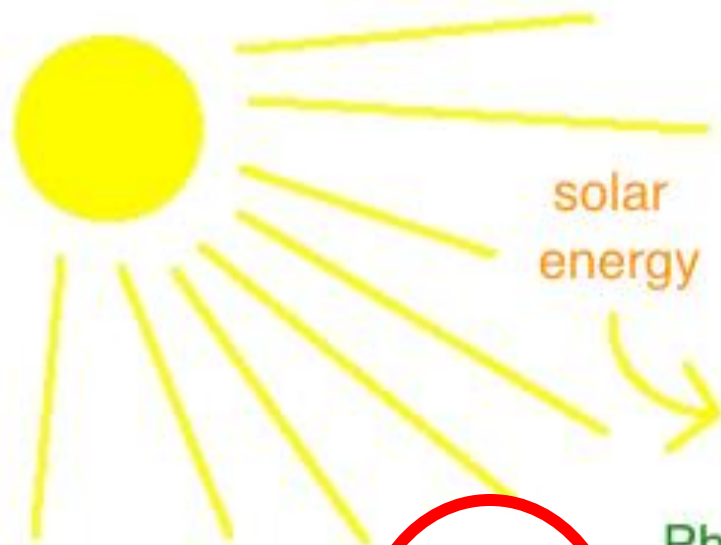
water

glucose

oxygen



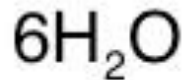
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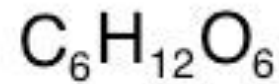
solar
energy



+



Photosynthesis



carbon
dioxide

water

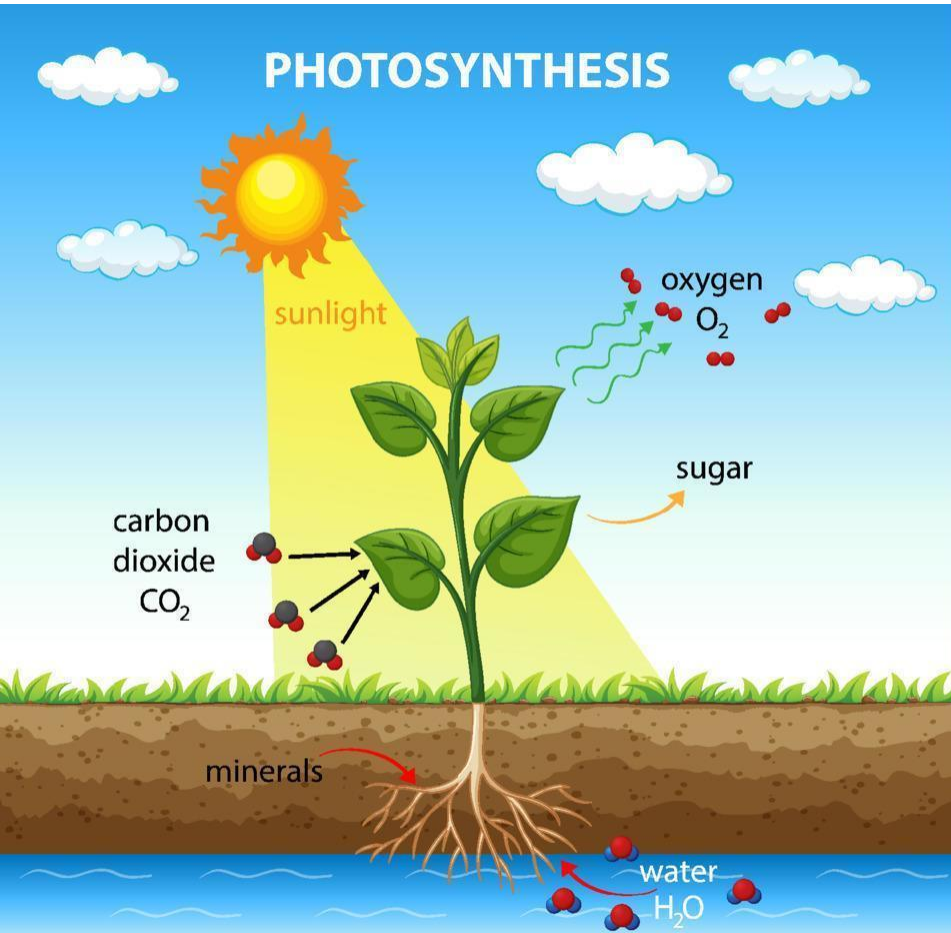
glucose

oxygen

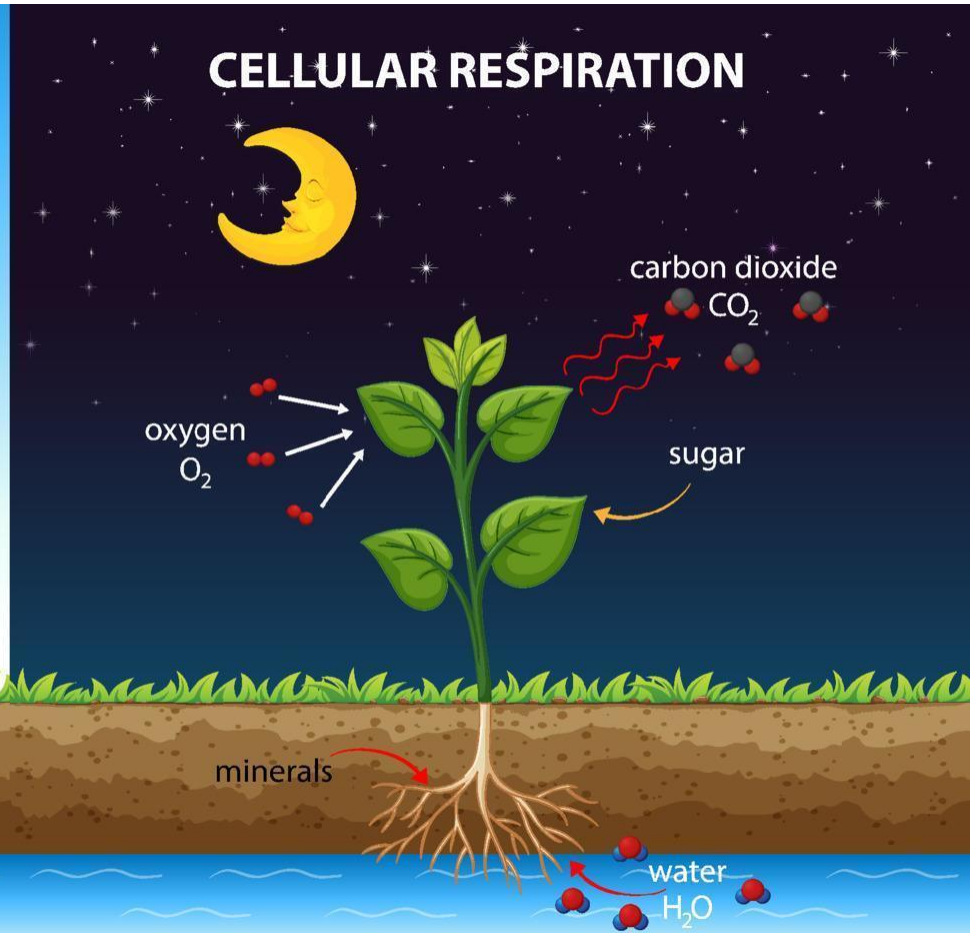


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PHOTOSYNTHESIS



CELLULAR RESPIRATION



Evapotranspiration



Good Stewards of Arizona Land & Water Resources



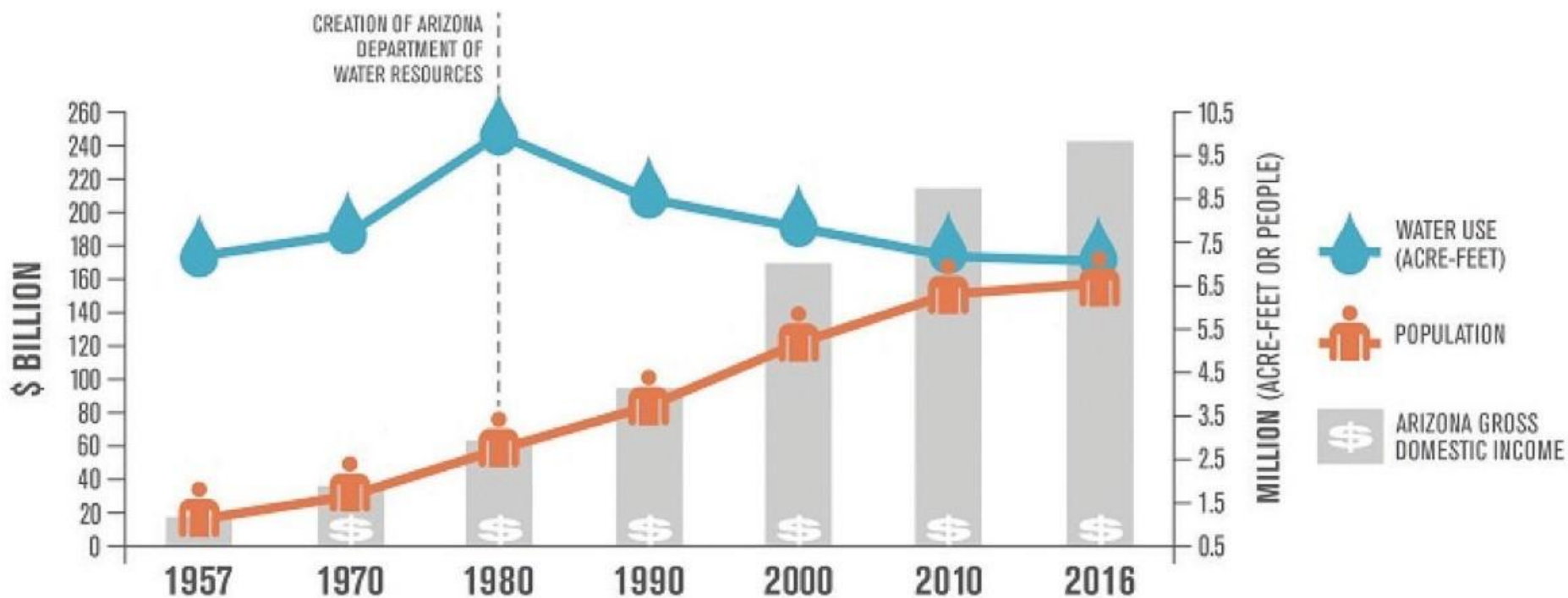
Photo Credit: Wayne Connelley Agriculture Photo Collection

Decades of Improvements

- **Yields and efficiencies of production have increased in Arizona.**
 - **Higher yields**
 - Highest yields and quality of crops in the world.
 - **Less land utilized**
 - **Less irrigation water utilized per acre**
 - Less crop inputs, e.g. pesticides & fertilizers
 - Increased diversification of crops and cropping systems.
 - Including extensive seed production



ARIZONA WATER USE, POPULATION, AND ECONOMIC GROWTH (1957-2016)

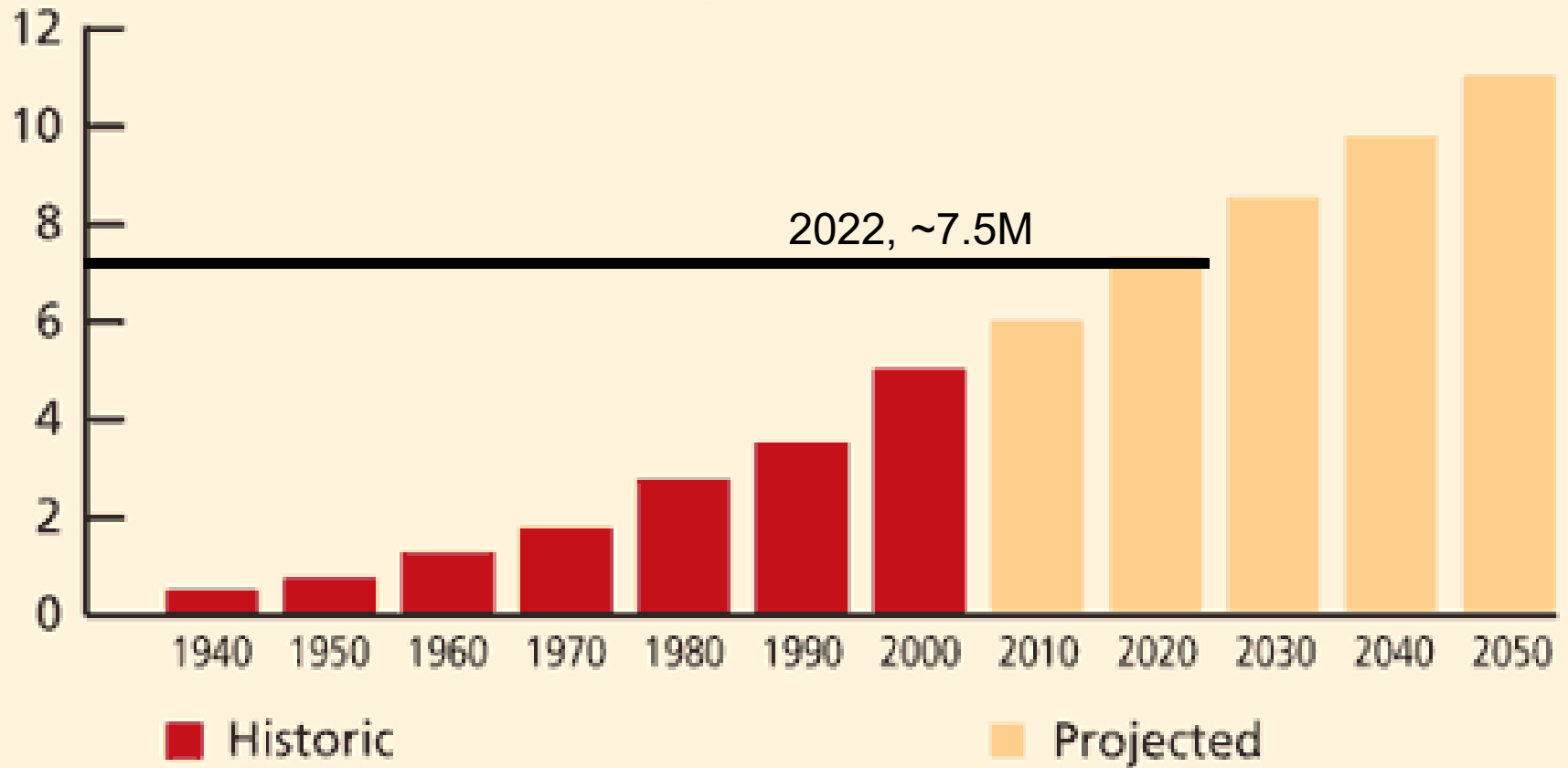


SOURCE: ADWR, 2017



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Arizona's Population (Millions)



Source: U.S. Census Bureau and *MoveAZ Plan Phase I Report* (Cambridge Systematics, Inc., Lima & Associates, et. al., 2002).



Urbanization - 2022

Entity	% Urban Residents
Global	57*
U.S.	83 (86)
Arizona	90
California	95
Mexico	81

*60% by 2030, 68% by 2050 (UN)



Water to Feed Arizona

- Water required to feed one person
(Virtual Water)

800 – 2,000 gallons water/day

- Range is dependent upon meat consumption
- **Average is close to 2,000 gallons/day/person**

- Using 1,000 gallons/person/day

7.6M Arizonans = 8.3M AF/year



Arizona Water Footprint

- 7 MAF wet water consumed

5 MAF used by agriculture

- 8.3 MAF required / year

—to feed 7.6M Arizonans

- Balance:

- 3.3 MAF (deficit) to feed AZ



Arizona Agriculture & Exportations



Arizona Ag Exports

- **Foreign Exports account for 8% of Arizona agricultural sales**
- **Arizona Foreign exports:**
 - **88% of cotton,**
 - **39% of fruit,**
 - **24% of other crops and hay,**
 - **9% of vegetable and melon sales.**

The Contribution of Agricultural Exports to Arizona's Economy

Claudia Montaña, Dari Duval, George Frisvold

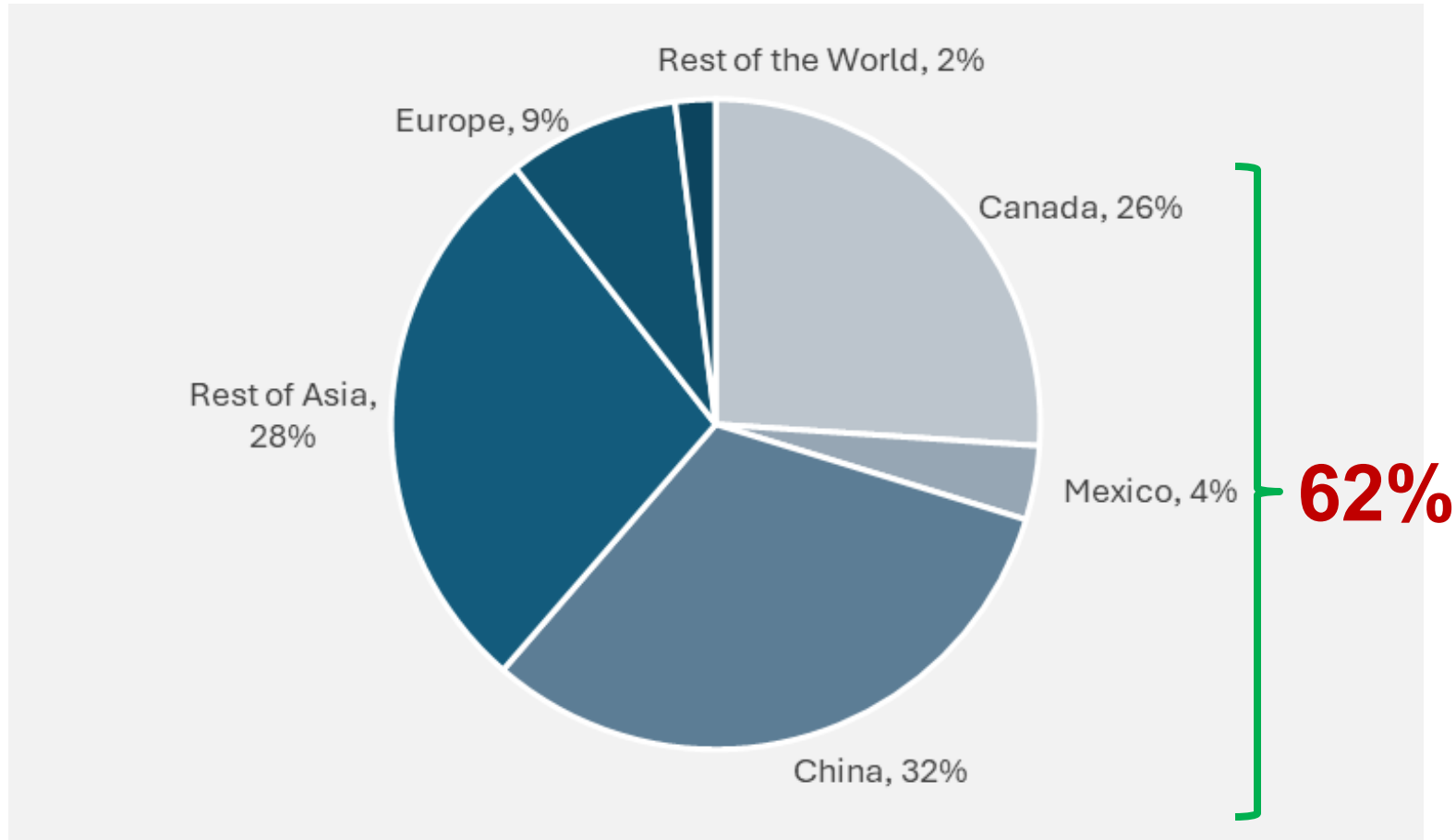
Department of Agricultural & Resource Economics, University of Arizona Cooperative Extension

March 2025.



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Destination of Arizona's Primary Agriculture Exports, in 2022 USD



The Contribution of Agricultural Exports to Arizona's Economy

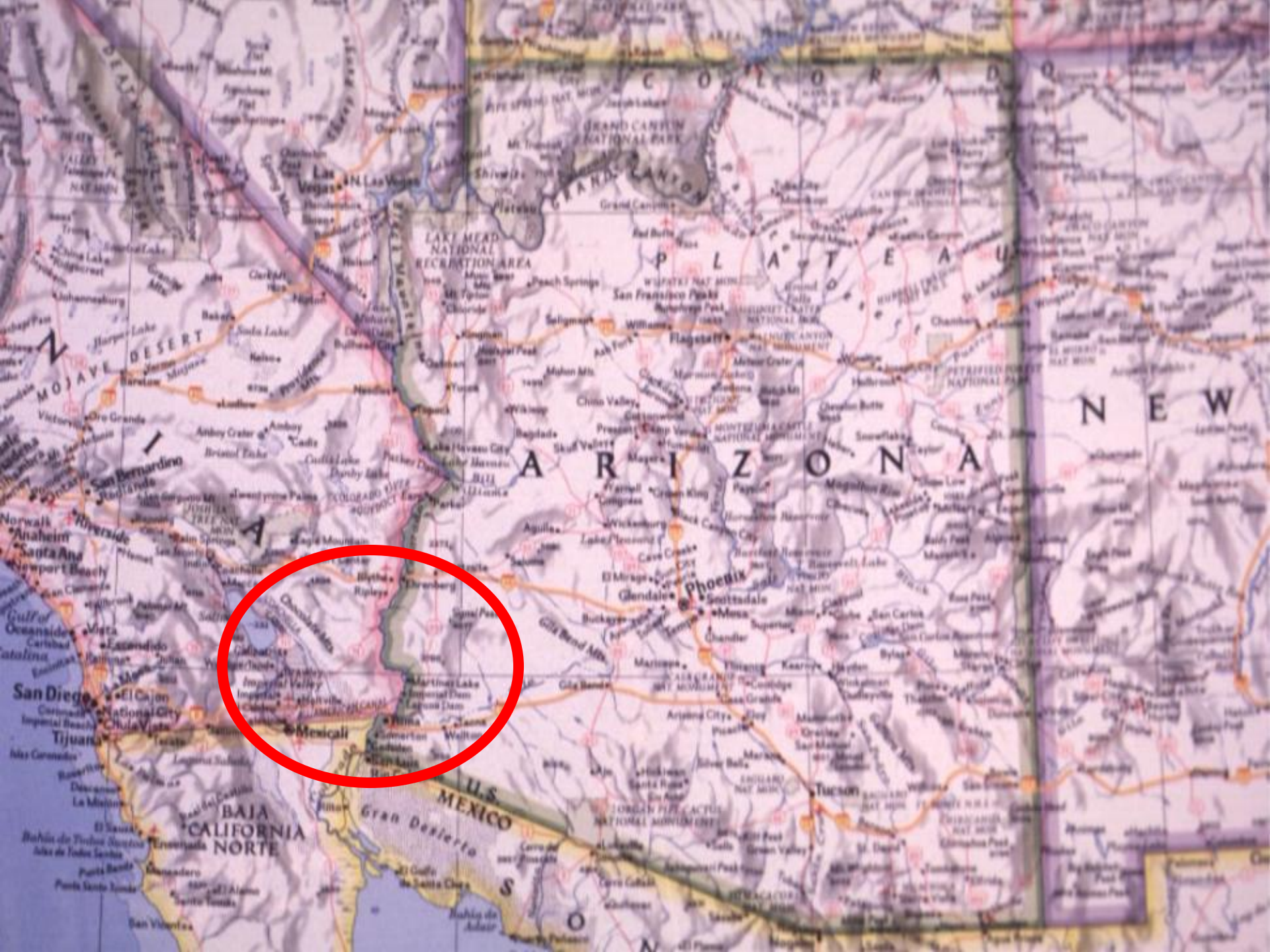
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Winter Vegetable Production

- Southwest Arizona
 - Yuma Valley, Lower Colorado River Valley
- Principle winter vegetable production center for the U.S.
 - November to March
 - approx. 150,000 acres

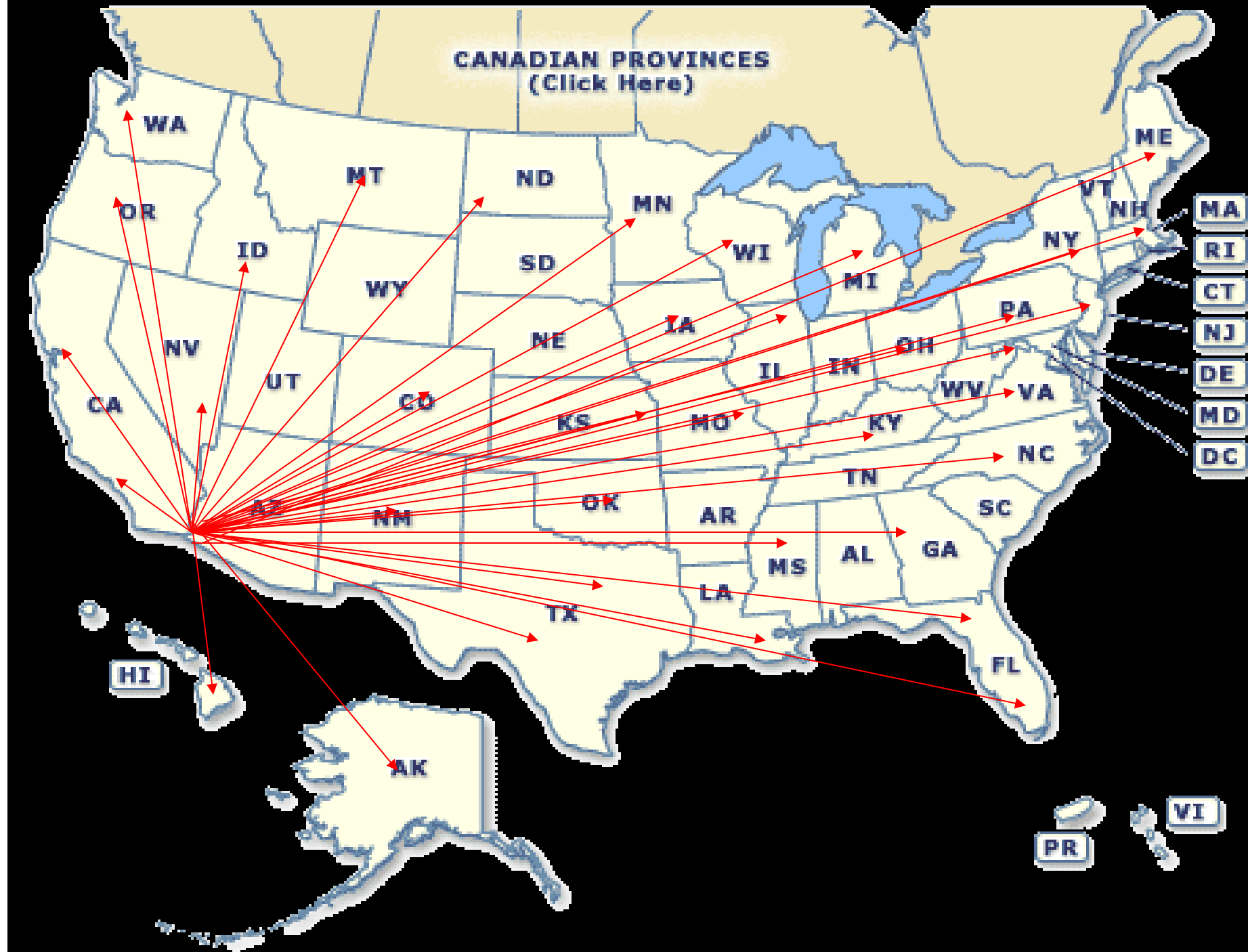












Arizona Lettuce/Leafy Greens

- **90% of the U.S./Canada winter supply of leafy green vegetables**
 - **Yuma, AZ**
- **25% of the nation's annual LGV production**



Arizona Leafy Green Winter Vegetable Production

- **\$4.4B to Arizona's economy (2022)**
 - 56% of the state's agricultural GDP.



U.S. Agriculture & The Global Economy



Global Economy

- **On the average, the U.S. exports ~20% of annual agricultural production.**
 - Top categories:
 - Grains, soybeans, and livestock

Source: USDA – ERS, 2025



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Global Economy

U.S. imports ~15% of annual national food supply.

- Seasonal and climatic factors drive U.S. food imports
 - popular types of fruits, vegetables—and tropical products, such as cocoa and coffee.

Source: USDA – ERS, 2025



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The United States is a Net Agricultural Importer

- U.S. imports exceeding exports by:
\$21 B in 2023
- The deficit projected to reach
\$39 B in 2024
 - increased demand for high-value imports i.e., **fruits, vegetables, processed foods**,
 - **Strong U.S. dollar** making imports cheaper,
 - **Rising consumer demand**

Kaufman, J. USDA-ERS. 2025. U.S. agricultural import values outpaced export values again in 2024. <https://www.ers.usda.gov/data-products/chart-gallery/chart-detail?chartId=58310>

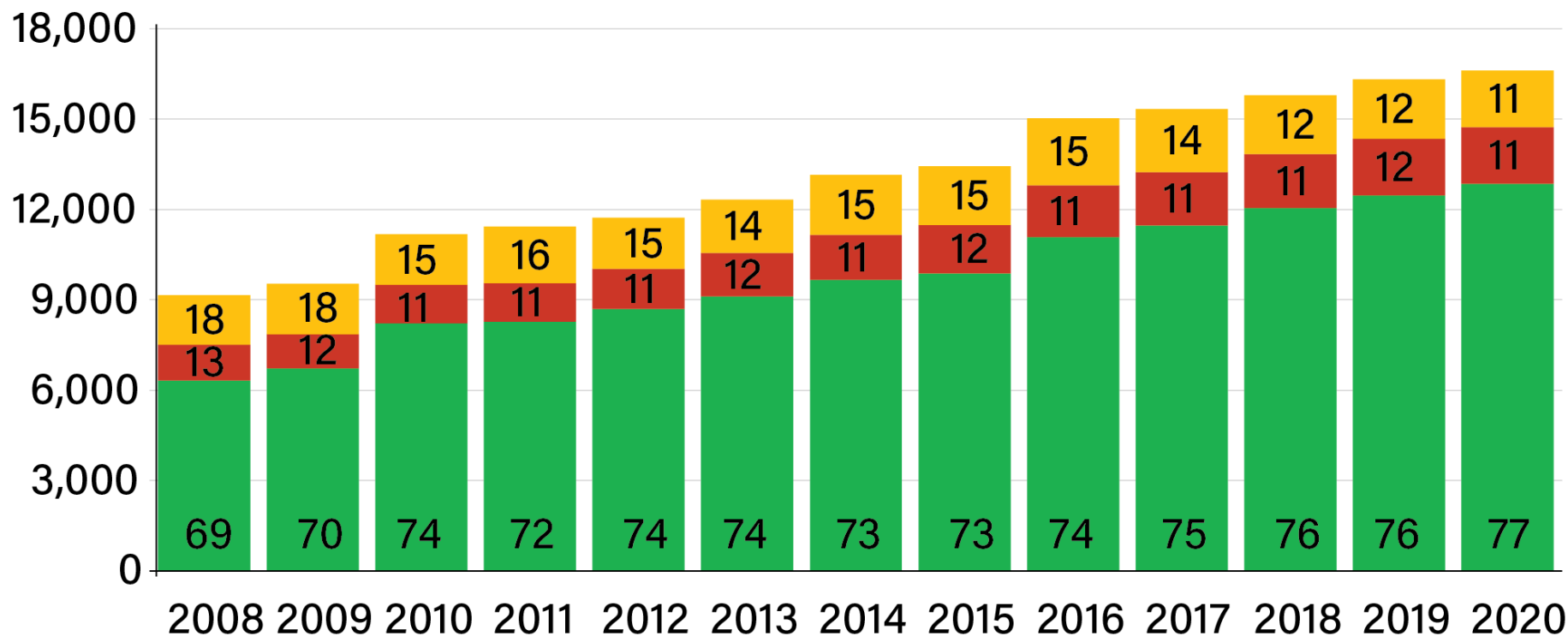


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U.S. fresh vegetable import volume continues steady growth

Million pounds

Mexico Canada All other countries



Numbers inside bars represent share of import volume

Notes: Fresh vegetables exclude potatoes and pulses (such as dry beans, lentils, peas, e.g.). See July 2021 Vegetables and Pulses Yearbook Tables 12-41 for the fresh vegetables included.

Source: USDA, Economic Research Service calculations using U.S. Department of Commerce, Bureau of the Census data.

Mexico Ag Imports to the U.S. Economic Value - Nogales, AZ

- **Fresh Produce imports totaling \$18.7B, 2022**
 - Fruits, vegetables, and nuts
 - Fresh, frozen, and processed
 - **Fresh produce accounting for nearly 89% of the total.**
- **Mexico's agricultural imports into the U.S. reached \$44.2B, 2022**



Conclusions

- Arizona produces the **highest yields and quality of crops** – anywhere in the world.
- Arizona crop **water use efficiency has steadily improved** in the past 40 years.
- Arizona contributes to the regional, national, and global food supply.



Conclusions

- Overall, **Arizona exports account for 8%** of agricultural sales.
- **On the average, the U.S. exports ~20%** of annual agricultural production.
- U.S. is a net importer of ag products

\$39B in 2024



Conclusions

- **Arizona consumes much more water through the food required to support the population than is used in statewide ag production.**

5 MAF used in Arizona for food/fiber production

8.3 MAF to feed Arizonans

3.3 MAF Deficit

Water













