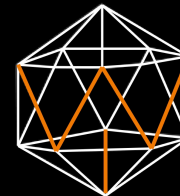


# Personal Water Footprints Identify Consumer Food Choices Influencing Local Water Resource Conservation

*DL 'West' Marrin, PhD*  
*Consulting Hydrochemist*  
*Water Sciences & Insights*



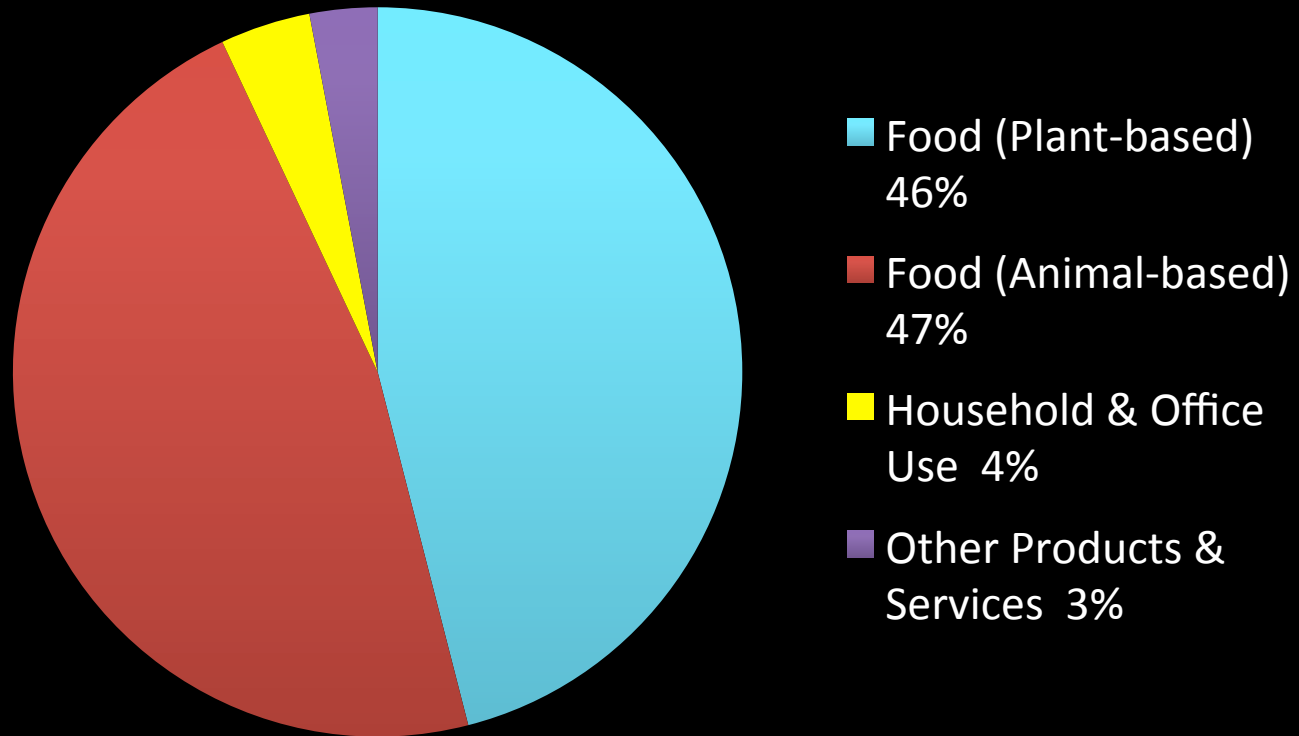
2015 AGU FALL MEETING (WATER FOOTPRINT ASSESSMENT)



# Challenging Questions for California

- Can the drought be addressed solely by supply-side solutions (i.e., producing more water)?
- Which demand-side solutions are most efficient?
- What changes in consumer behaviors could best conserve scarce local water resources?
- Can the food habits of residents affect local water resources?

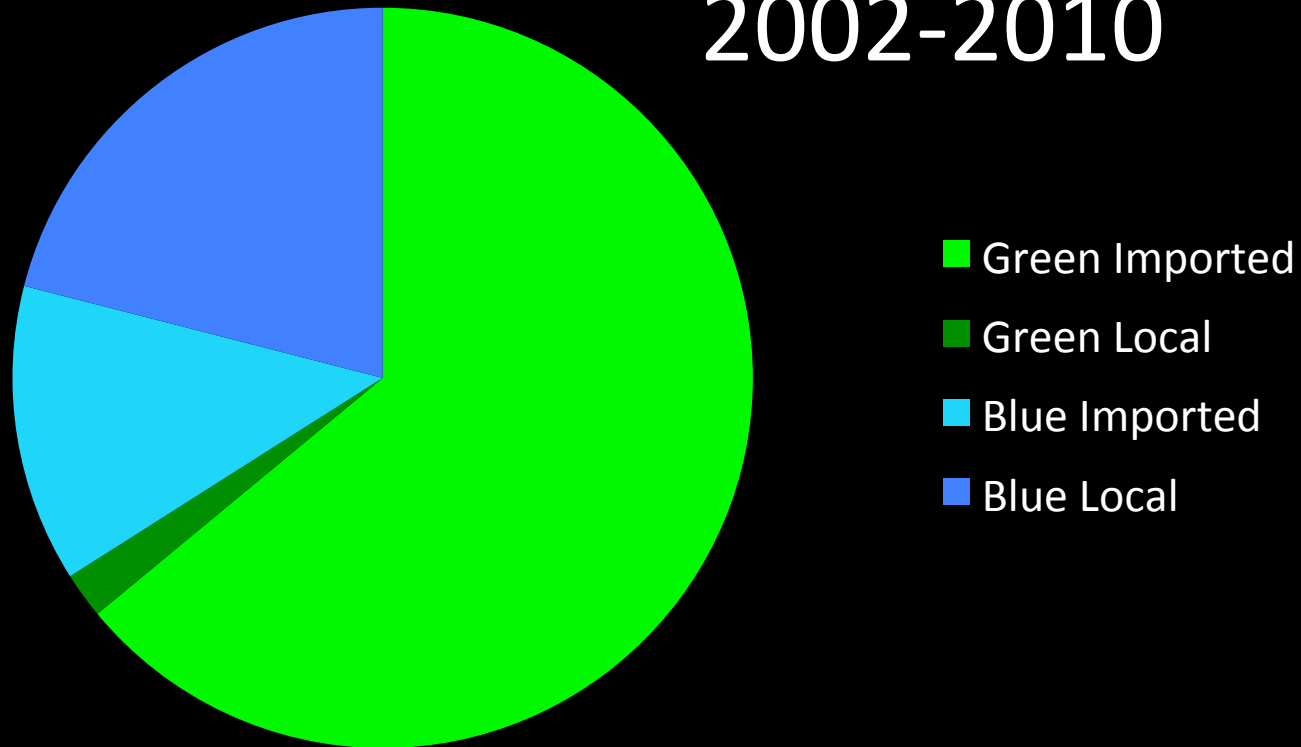
# A Californian's Water Footprint



Based on  
data from  
Fulton et  
al. 2012

Primary conservation goal is reducing household uses 25% and restricting water allocations to agriculture as required.

# Blue-Green Water Footprint 2002-2010



Based on  
data from  
Shilling et  
al. 2013

Most of the local blue water is devoted to food, with the remainder used in households and other products.



# California Blue Water Conservation

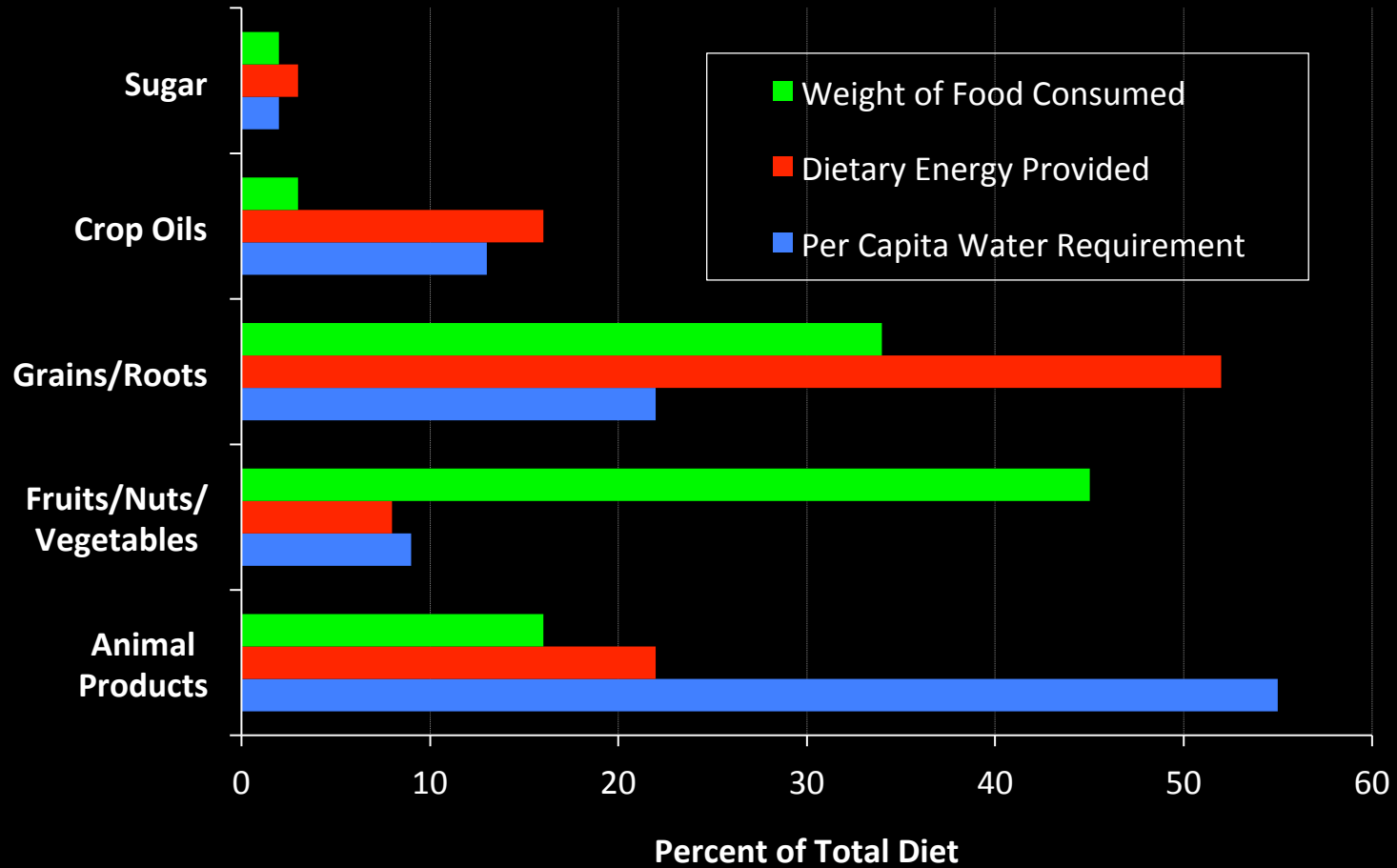
- Household use conservation could save 3-6%
- Irrigation efficiency could save 14-18%
- Single largest use of blue water is irrigation of crops for animal feed (e.g., alfalfa)
- Reduced consumption of animal products one day per week or one meal per day could save 6-14%
- Reduced food wastage could save 3-7%



# Focusing on the Food Sector

- Wasted food now accounts for 30-40% of total
- Animal-based foods require more land, energy and water than plant-based foods
- Overconsumption of dietary protein in Western world at 2 to 3 times recommended
- Reducing consumption/waste by one-third would address global resources and human health

# Water Required vs. Food Energy and Mass



Based on data from Liu & Savenije 2008

# Analysis of Food Related Sectors

Activity	Energy Required (Mwh/yr/capita)	Energy for 1 kg of Food (kWh)	Contribution to Waste
Agricultural Producing	2.4	Beef/Pork 6-15x Grains/Fruit/Veg	32%*
Handling & Transporting	1.5	Beef/Pork 2-3x Grains/Fruit/Veg	22%
Processing	1.9	Beef/Pork 3-5x Grains/Fruit/Veg	11%
Distributing	1.2	similar	13%
Consuming**	3.6	similar	22%

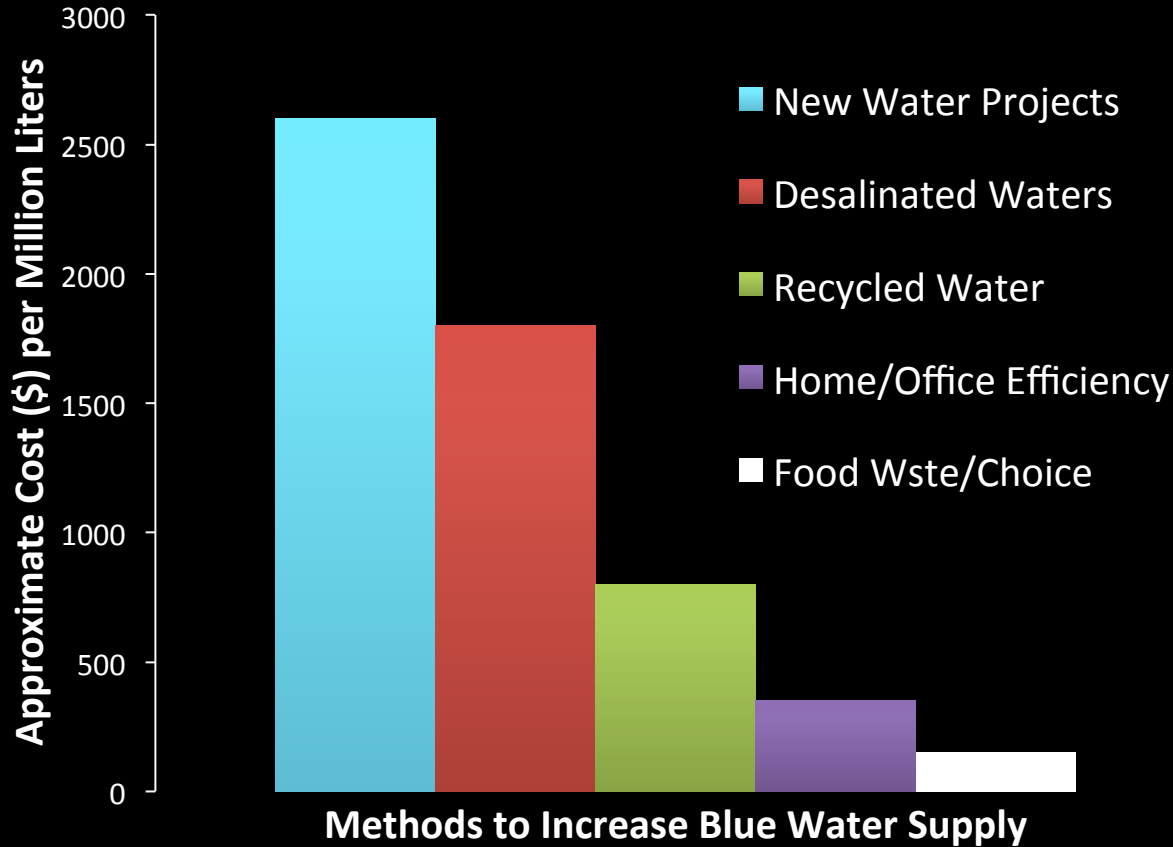
\* A major driver of agricultural waste is consumer preferences

\*\* Includes storage, preparation, and acquisition

Based on data from FAO 2013; Heller & Keoleian 2000.



# Relative Costs of Increasing Blue Water



Data from California Water Plan 2013; Marrin 2014



## Some Answers, If Not Solutions

- Major short-term shortfalls cannot be addressed by supply-side factors alone
- For demand-side actions, consumer food habits have most impact on local blue water resources
- Consumer food choices and wastage restrictions are unlikely be mandated for various reasons
- Changing food habits as a means of conserving water must be initiated by consumers