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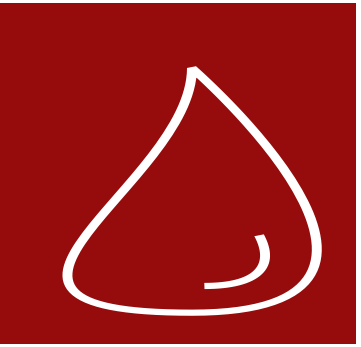
Modules on Sustainable Agriculture MOSA



Water and water use

for a sustainable agriculture

Brain Storming

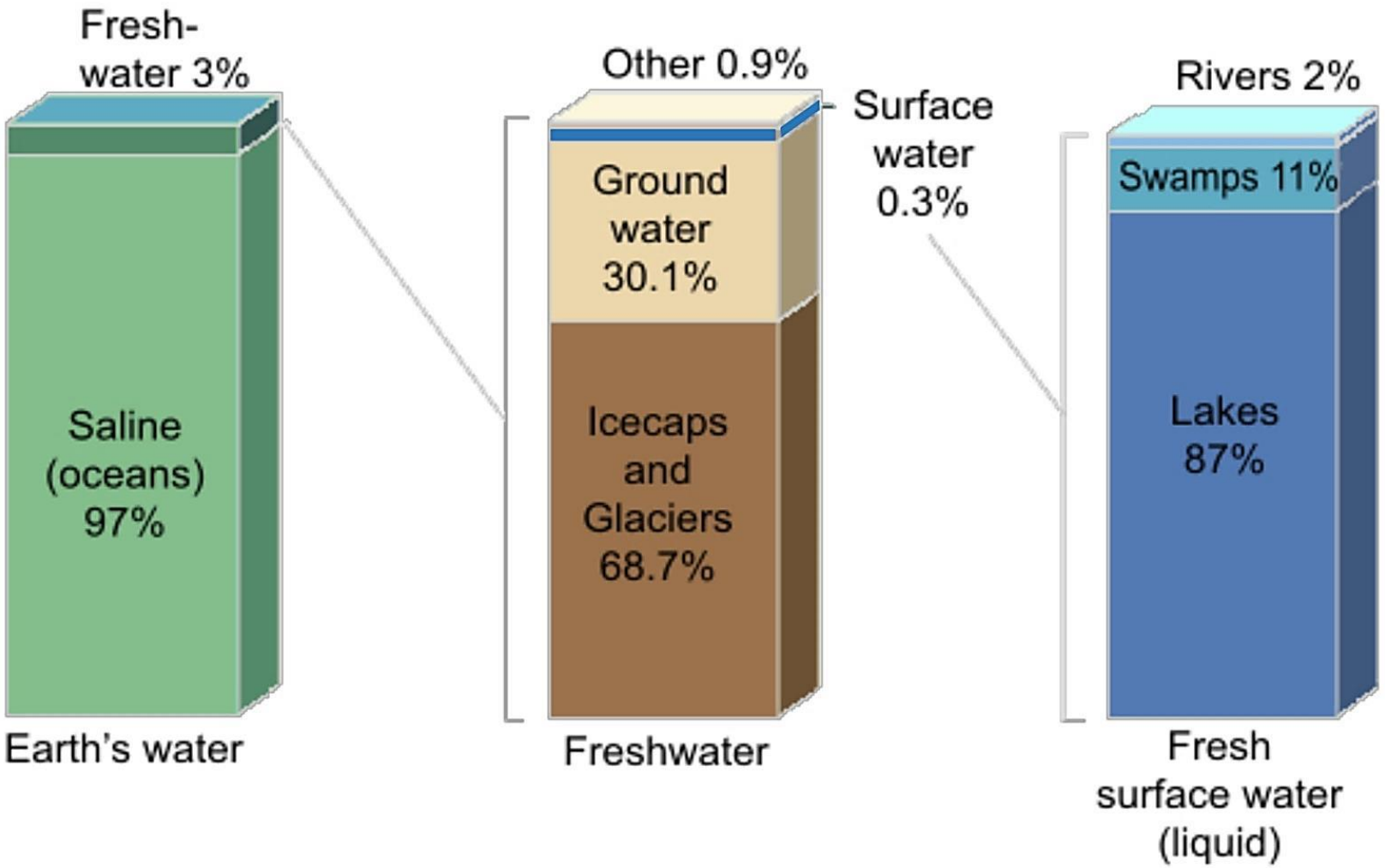
What are the biggest challenges in your country in terms of water for sustainable agriculture?

Learning Objectives:

- Identify different water sources for agriculture
- Familiarize the types of irrigation system
- Enumerate some methods on increasing soil infiltration and methods on soil movement reduction
- Identify the linkage between water grabbing and land rights
- Identify the contributory factors on water stress and water pollution

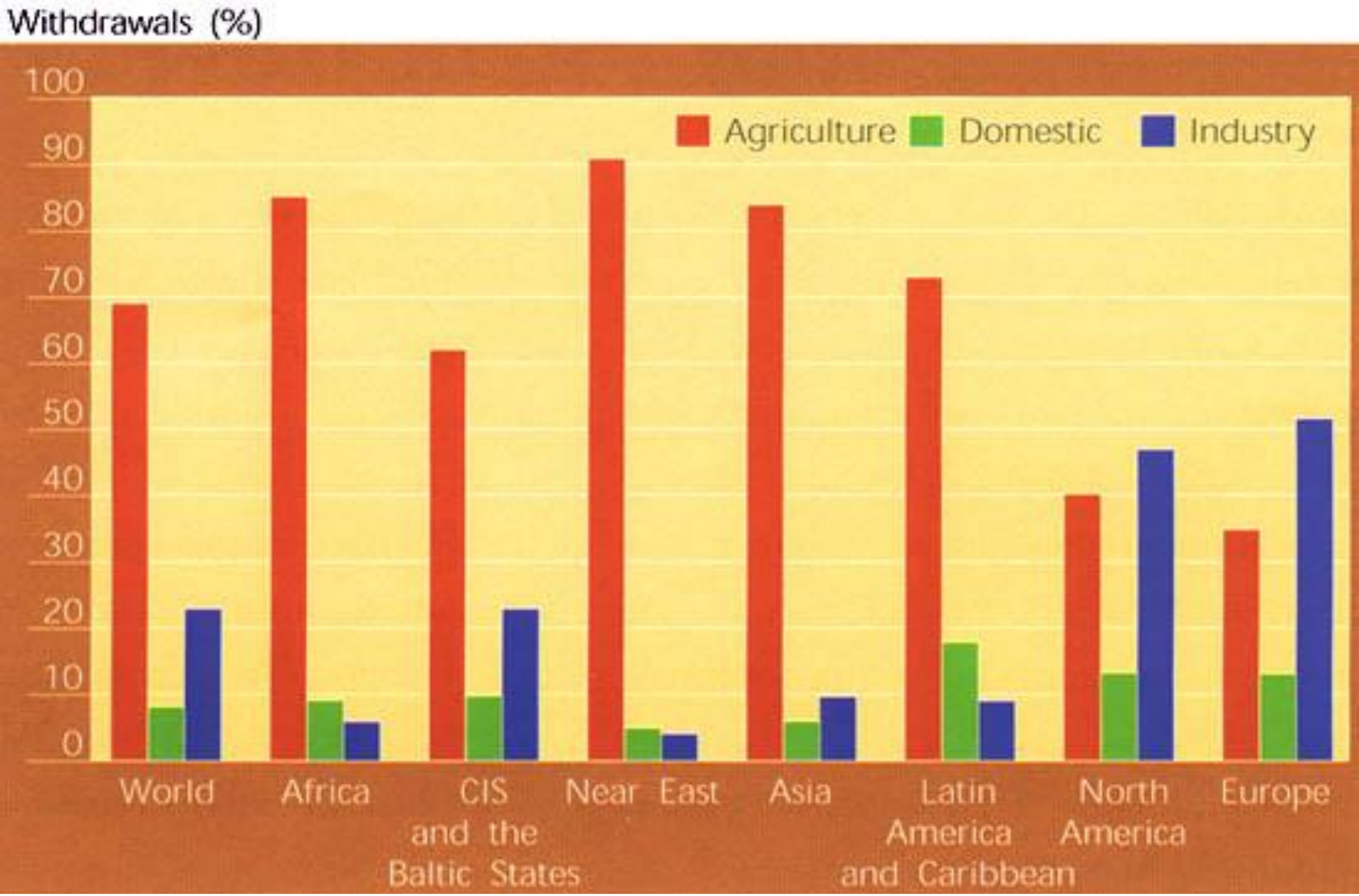
David Molden IWMI

Distribution of Earth's Water



Source: Gleick, P. H., 1996: Water resources. In Encyclopedia of Climate and Weather, ed. by S. H. Schneider, Oxford University Press, New York, vol. 2

Water withdrawals by region and by sector



Source: Crops and drops. FAO, 2002

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Our Water Footprint

How Much Water does it take to Produce...

1 Litre Tap Water	1 Litre Bottled Water	1 Cup Tea	1 Cup Coffee	1 Kg Corn	1 Kg Wheat	1 Kg Soybeans	1 Loaf Bread
							
1 Litre	5 Litres	30 Litres	140 Litres	900 Litres	1300 Litres	1800 Litres	960 Litres

1 Whole Orange	1 Glass Orange Jc	1 Whole Apple	1 Glass Apple Jc	1 Dozen Eggs	1 Kg Chicken Meat	1 Kg Pork	1 Kg Beef
							
50 Litres	170 Litres	70 Litres	190 Litres	2400 Litres	3900 Litres	4800 Litres	15,500 Litres

Choose more often to DRINK TAP WATER, EAT WHOLE UNPROCESSED FOODS and reduce your carbon footprint by BUYING LOCAL PRODUCTS

Visit www.waterfootprint.org to learn more

supported by SQUAMISH can climate action network

Source: www. Waterfootprint.org

World Average on Virtual Water Content of Products:

PRODUCT	Amount of water used to produce 1-kg (in liters)
Livestock Products	
Beef (boneless)	15,497
Pig meat	4,856
Sheep meat	6,143
Chicken meat	3,918
Eggs	3,340

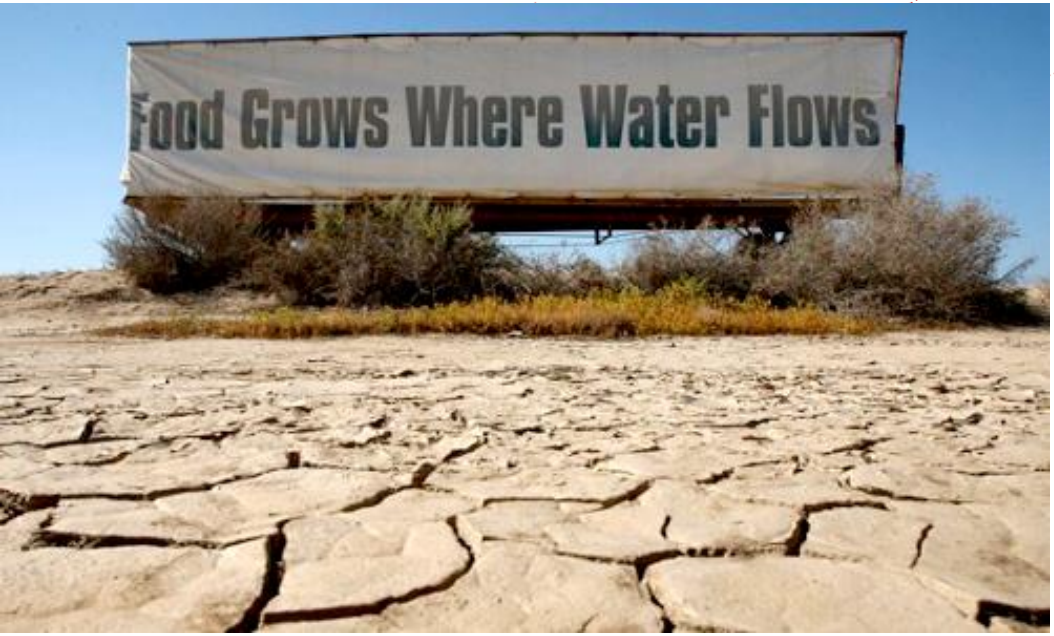
PRODUCT	Amount of water used to produce 1-kg (in liters)
Plant Products	
Rice (paddy)	2,291
Maize (corn)	909
Wheat	1,334
Soy beans	1,789

https://safenewzealand.org/2015/06/04/do-we-have-a-looming-water-crisis/

Global physical and economic water scarcity

Already by 2025, 1.8 billion people will be living in countries or regions with absolute water scarcity, and two thirds of the world population could live under water stress conditions.
(UN Water, 2013)

Source: World Water Development Report 4, World Water Assessment Programme (WWAP), March 2012



Source: http://ecowatch.com/wp-content/uploads/2013/12/droughtFI.jpg

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The Challenge

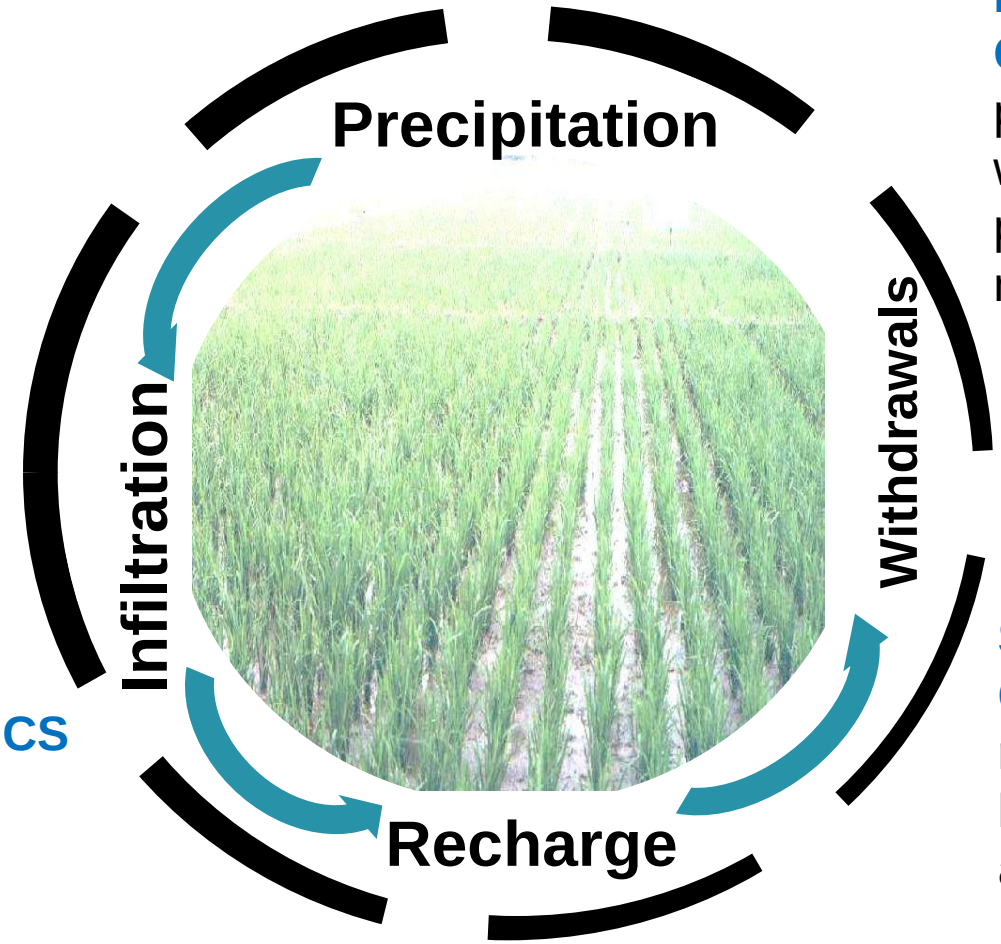
How to reduce withdrawals from water resources for agriculture while at the same time increasing agricultural production and maintaining essential environmental flows?

In other words:

How to promote sustainable enhancement of systemic water productivity in agriculture: on the field and in the water catchments?

Water Balance

CLIMATE
precipitation
temperature
humidity
evaporation
transpiration



DEMAND & OTHER OUTFLOWS
population dynamics
water price
pumping rate
natural discharge

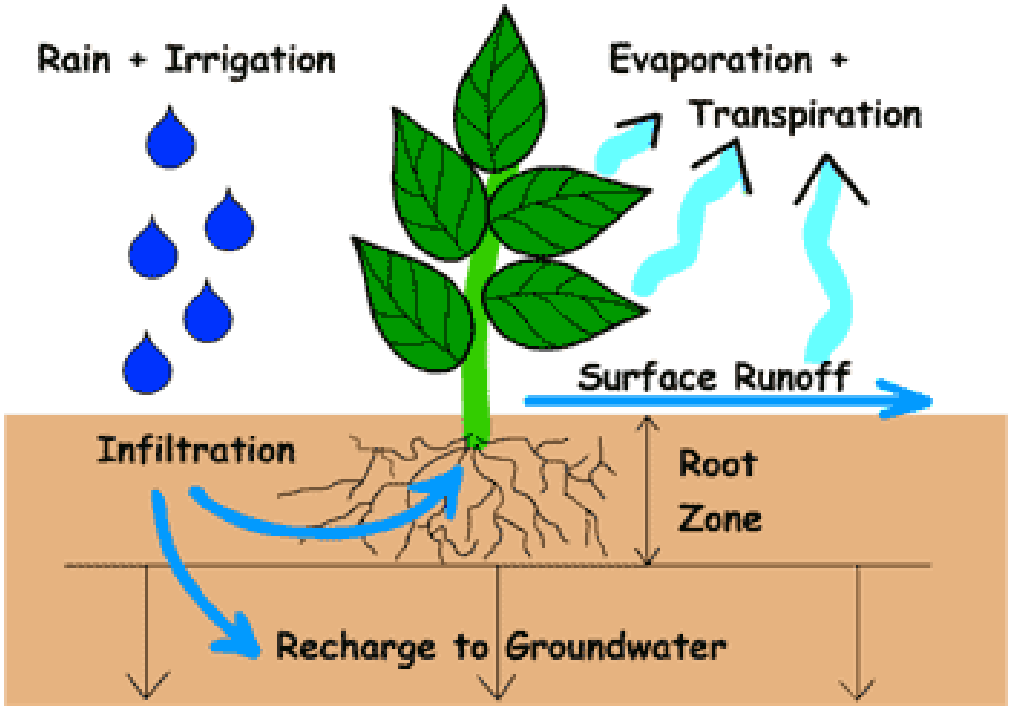
LAND SURFACE CHARACTERISTICS
soil types
soil moisture
land use
catchment areas
streams
runoff

SUB-SURFACE CHARACTERISTICS
rock types
hydraulic properties
aquifer storage

https://www.google.com.ph/search?biw=1366&bih=662&tbm=isch&sa=1&q=water+balance+in+agriculture&oq=water+balance+in+agriculture&gs_l=img

Crop water need

"[…] The crop water need (ET crop) is defined as the depth (or amount) of water needed to meet the water loss through evapotranspiration. In other words, it is the **amount of water needed by the various crops to grow optimally**[…] ."



ET crop = crop evapotranspiration = crop water need

Source: https://laulima.hawaii.edu/access/content/group/

Reference: Irrigation Water Management: Irrigation water needs, Training Manual No.3, FAO

Typical sources of agricultural water:

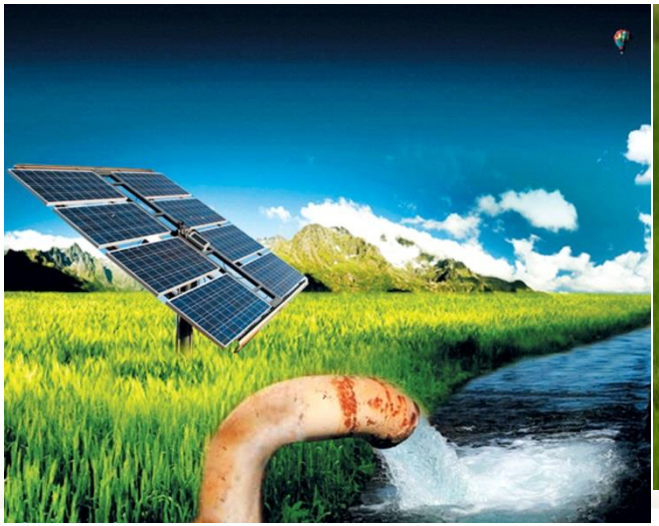
- Surface water
  - **Rivers, streams, and irrigation ditches**
  - **Open canals**
  - **Impounded water such as ponds, reservoirs, and lakes**

Source: Bureau of Soils and Water Management, 2010

Typical sources of agricultural water:

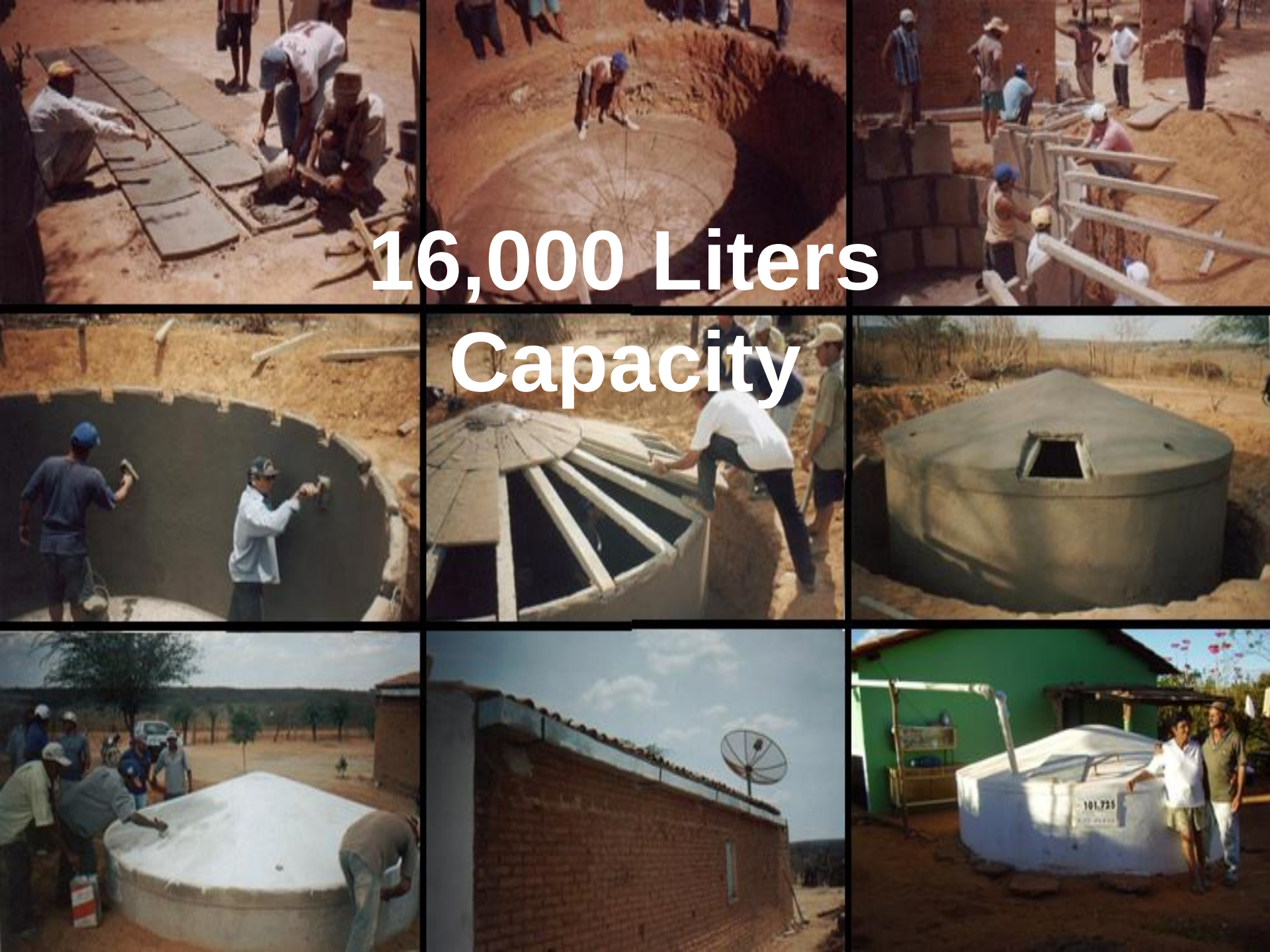
- Groundwater from wells
- Rain Water
- Locally collected water such as in cisterns and rain barrels

Source: Bureau of Soils and Water Management, 2010



Source: http://gptsolar.in/index.php/solar-water-pumping-system-description/

Source: http://www.worldwatch.org/looming-threat-water-scarcity-0


16,000 Liters
Capacity

Types of irrigation systems

- Surface irrigation
- Subsurface irrigation
- Sprinkler irrigation
- Drip irrigation

Depending on

- Natural conditions
- Type of crop
- Type of technology
- Previous experience with irrigation
- Required labor inputs
  costs and benefits

Source: http://nrcca.cals.cornell.edu/soil/CA3/CA0324.php

Drip irrigation

Low cost systems

© Teca/FAO adapted from Agromisa 2002

Source: Bureau of Soils and Water Management, 2011

Plastic bottles – simple and very efficient

Photo Source: Mr. Elnard Ympal, 2016

Soil and water conservation (SWC) – main points

Technical principles of conservation

- Reduce erosive power of rain drops by keeping the soil covered
- Fight erosion at its source and retain water where it falls (facilitate infiltration)
- Reduce speed of water flowing down slopes with constructions

Organizational aspects

- SWC requires a collective action
- Catchment approach and village land-use planning

Institutional support

Source: Bam Alegre, 2015 DA-CARAGA

Increasing the infiltration

Contour trenches

Source: http://iasmania.com/soils-in-india/

Semi-circular bunds

Source: http://www.slideshare.net/ifad/1-dr-oweis-ifad-retreat-oct09

Circular bunds

© Teca/FAO adapted from Agromisa 2002

Plant pits with mulch

Source: https://themicrogardener.com/20-reasons-why-you-should-mulch-your-garden/

Reduce movement of water

Contour cropping

Photo Source: Cristino Villamor, 2016

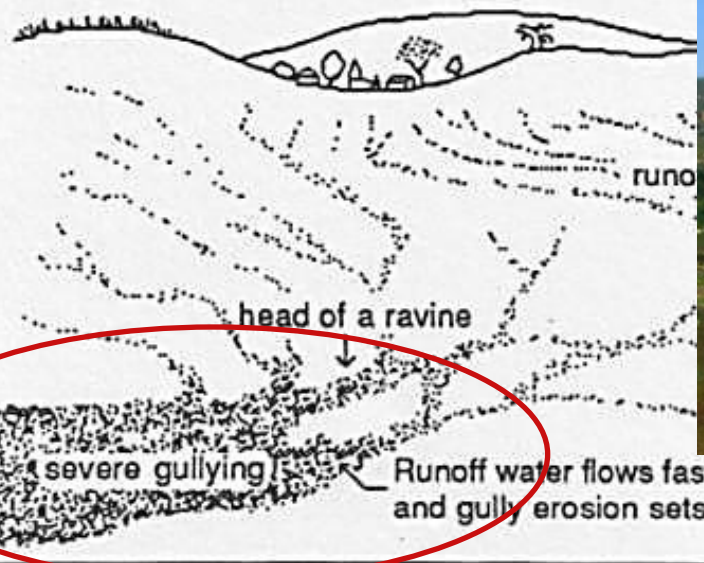
Mulching

Source: http://tallcloverfarm.com/11898/shredded-paper-as-garden-mulch

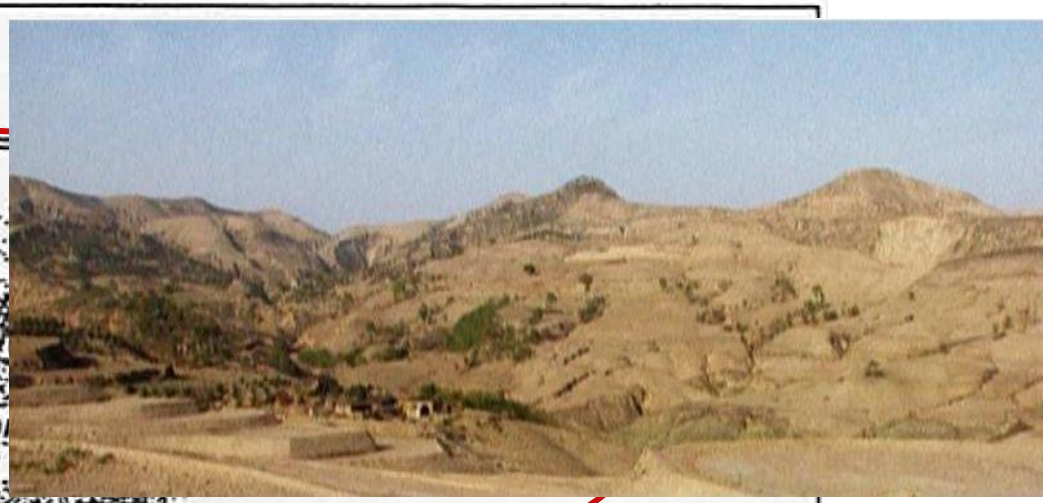
Terracing

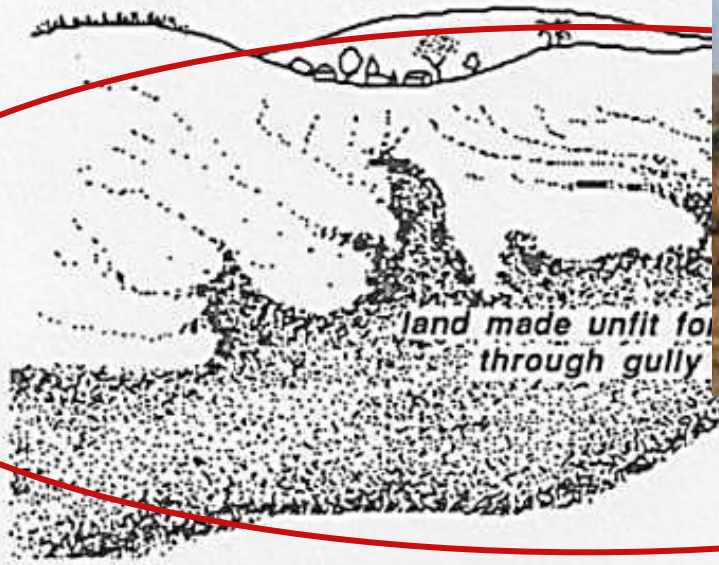
Source: http://travelercorner.com/banaue-rice-terraces/

First year



Fourth year





- Gully erosion makes its way upwards along the slopes of the channels, widening them as it goes and gradually destroying the arable land.

Source: Dupriez & de Leener

WATER STRESS

Increase in Population

Power

water evaporation from reservoirs of large hydro power projects

Domestic

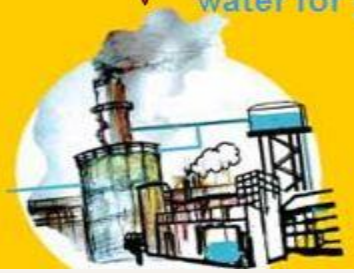
bathing, flushing, washing, cooking, drinking…

Agriculture

People require food to eat

Industry

Increase demand for goods

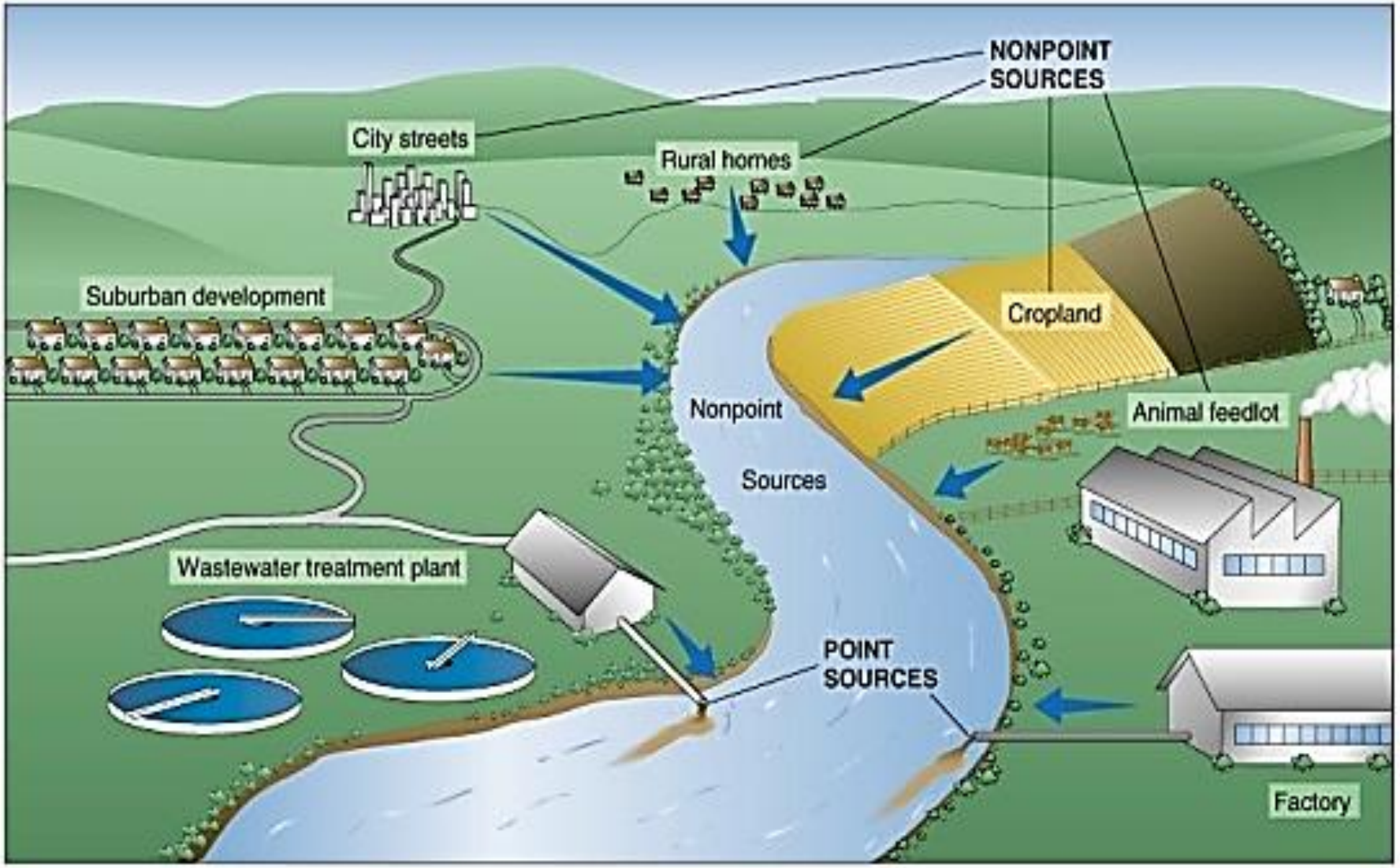


Every item that we use needs water for production

sch2ools schools.indiawaterportal.org

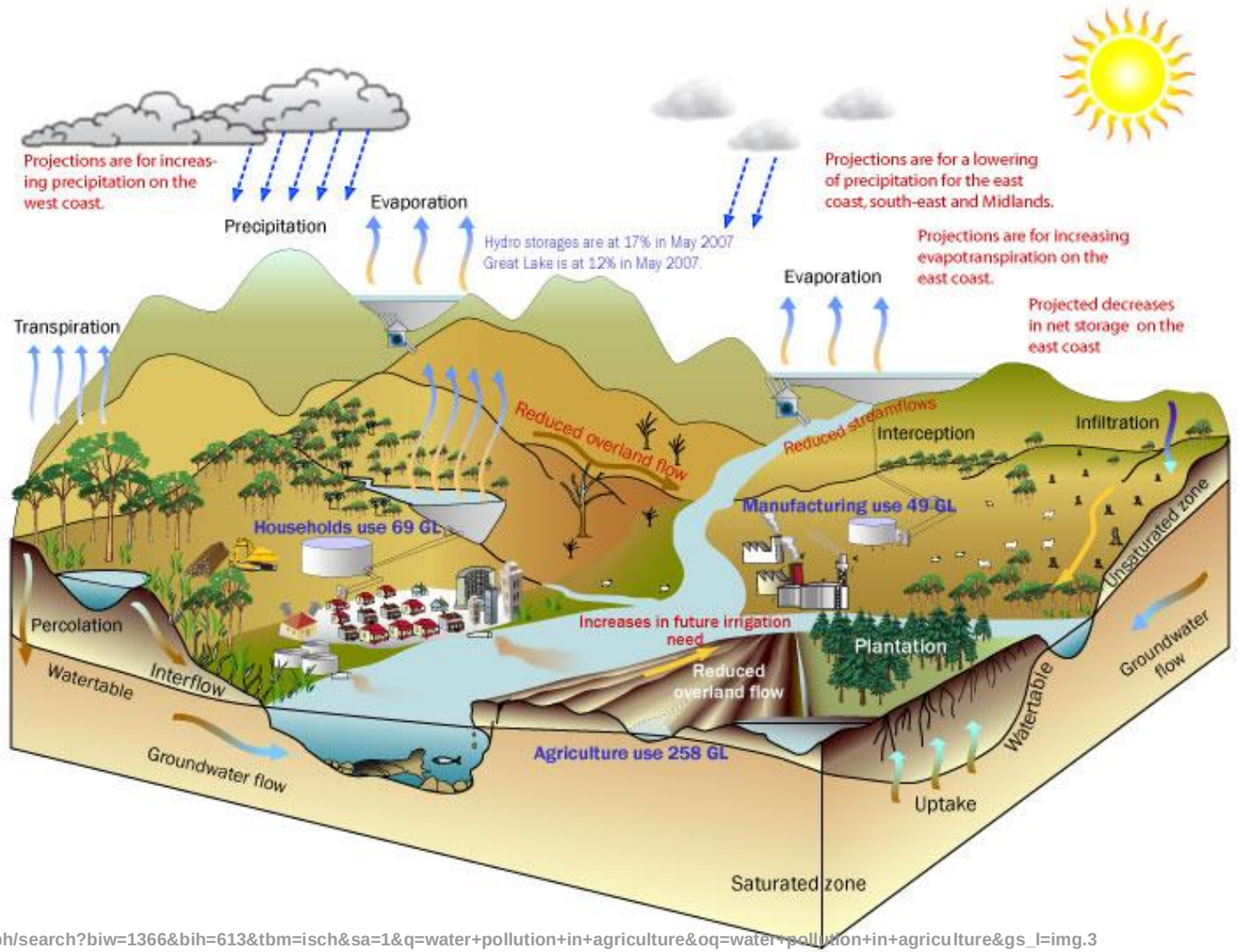
https://www.google.com.ph/search?biw=1366&bih=613&tbm=isch&sa=1&q=water+pollution+in+agriculture&oq=water+pollution+in+agriculture&gs_l=img.3

Water pollution



Source: lujiamin.wordpress.com

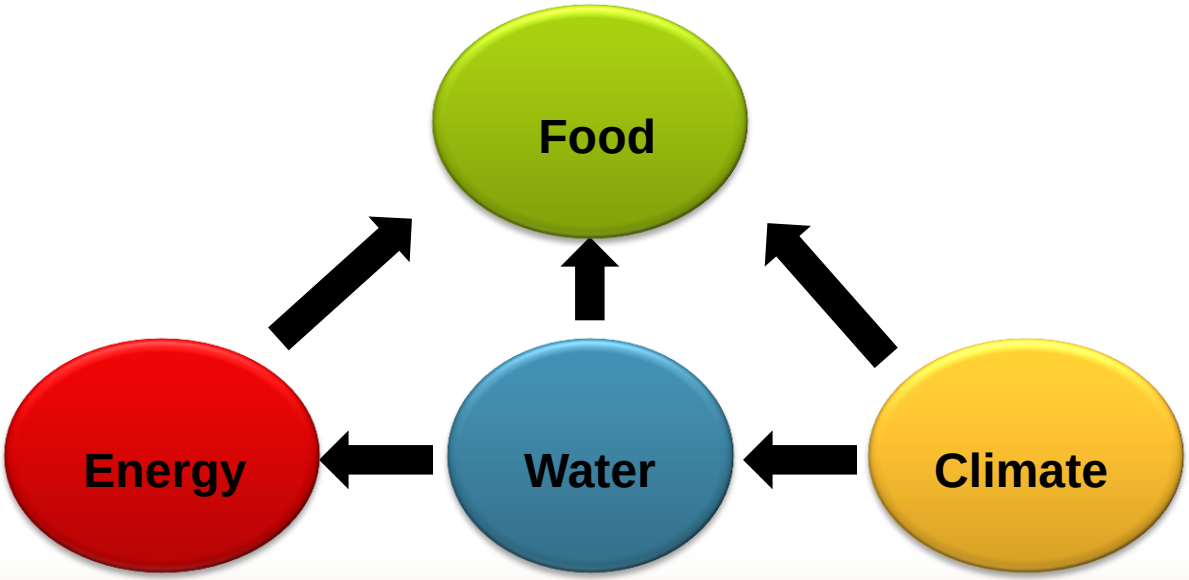
2025 Scenario



https://www.google.com.ph/search?biw=1366&bih=613&tbm=isch&sa=1&q=water+pollution+in+agriculture&oq=water+pollution+in+agriculture&gs_l=img.3

Keywords as a summary

- The nexus: water – energy – food/fibre (agriculture)
- Water scarcity calls for water efficiency
- Water harvesting and Water storage becomes important
- Agriculture depends on Water quality but also pollutes



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"Anyone who can solve the problems of water will be worthy of two Nobel Prizes – one for peace and one for science"

John F Kennedy

Thank you!

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On behalf of

Federal Ministry for Economic Cooperation and Development

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Published 2016 by
Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH
Sustainable Agriculture Project
Dag-Hammarskjöld-Weg 1-5
65760 Eschborn, Germany

Contact
E: naren@giz.de
I: www.giz.de/sustainable-agriculture

On behalf of
Federal Ministry
for Economic Cooperation
and Development