

# Water at a Glance

The relationship between water, agriculture, food security and poverty



FAOWATER



# 01

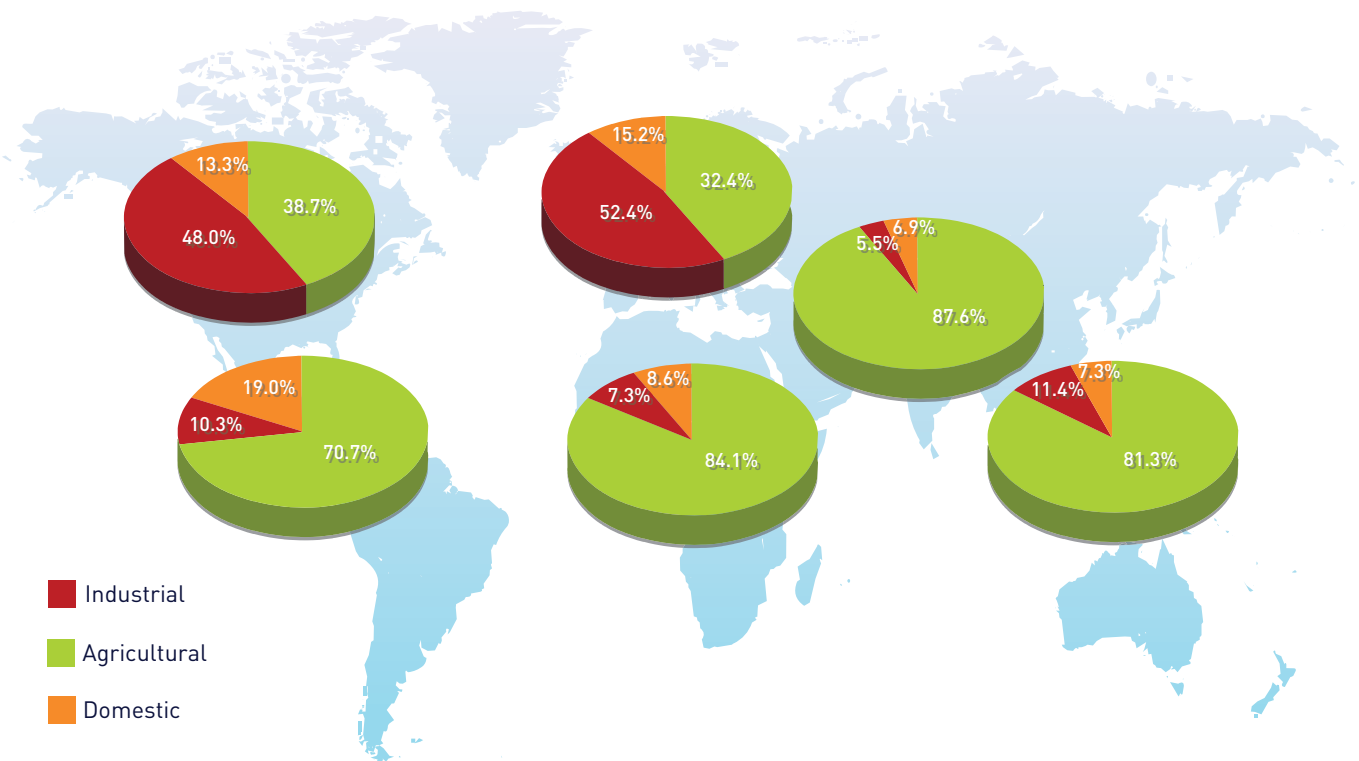
# basic facts

The world contains an estimated 1 400 million cubic km of water. Only 0.003% of this vast amount, about 45 000 cubic km, are what is called “fresh water resources” - water that theoretically can be used for drinking, hygiene, agriculture and industry. But not all of this water is accessible. For example, seasonal flooding makes water extremely difficult to capture before it flows into remote rivers.

In fact, only about 9 000-14 000 cubic km are economically available for human use - a mere teaspoon in a full bathtub when compared to the total amount of water on earth. With the population increasing by two billion by 2030, will this be enough water to sustain human life? Of course, quantity isn't the only issue. The quality of the water supply is also important.

## How fresh water is being used

Breakdown of use in developed and developing countries



### Did You Know?

- Agriculture is by far the biggest user of water, accounting for almost 70 percent of all withdrawals, and up to 95 percent in developing countries.
- The water needed for crops amounts to 1 000-3 000 cubic meter per tonne of cereal harvested. Put another way, it takes 1 - 3 tonnes of water to grown 1kg of cereal.
- The daily drinking-water requirements per person are 2-4 litres. However, it takes 2 000 - 5 000 litres of water to produce a person's daily food.



FAO PHOTO

# 02

# water & food security

Water is important for food security, which is defined as the regular access of people to enough high-quality food to lead active, healthy lives. This is especially true in developing countries. People who have better access to water tend to have lower levels of undernourishment. If water is a key ingredient to food security, lack of it can be a major cause of famine and undernourishment, especially in areas where people depend on local agriculture for food and income.

In addition, erratic rainfall and seasonal differences in water availability can cause temporary food shortages; floods and droughts can cause some of the most intensive food emergencies.

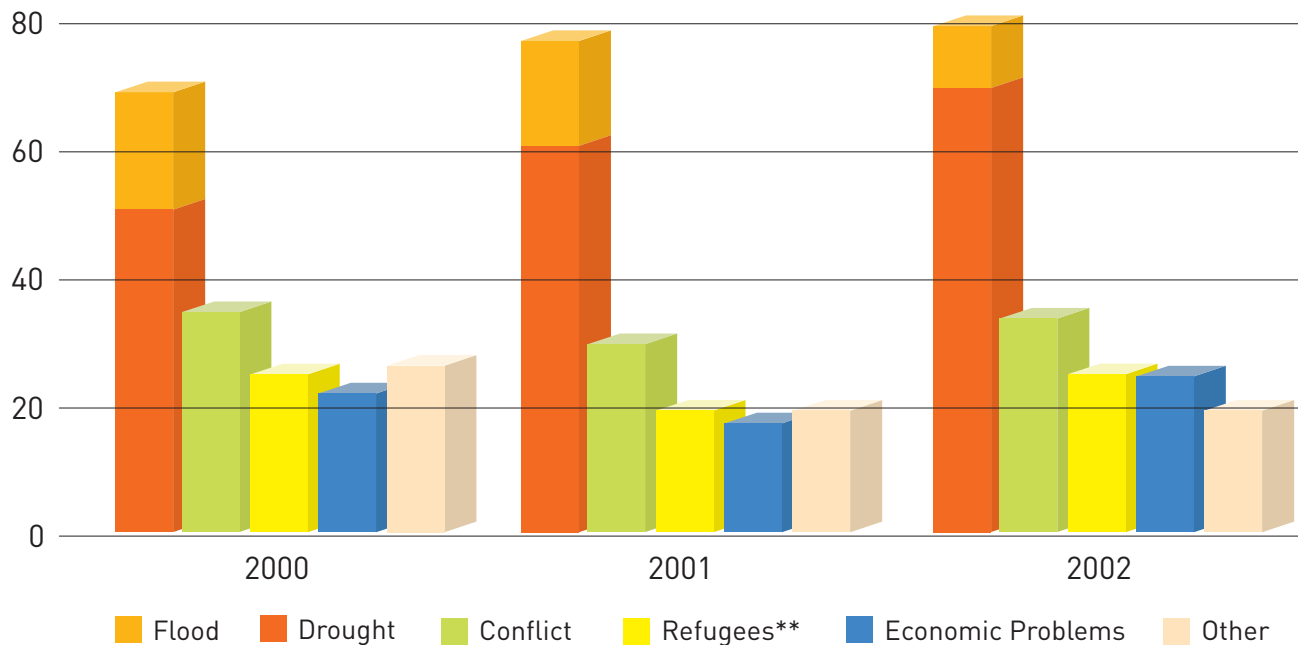
The availability of water varies dramatically by region. But even in areas with limited or erratic water supplies, maximizing their use can increase agricultural productivity enormously. That is the key to improving food security and reducing poverty, especially in the rural areas that are home to three-quarters of the world's hungry people.



FAO/R. Faidutti

## Causes of food emergencies in developing countries

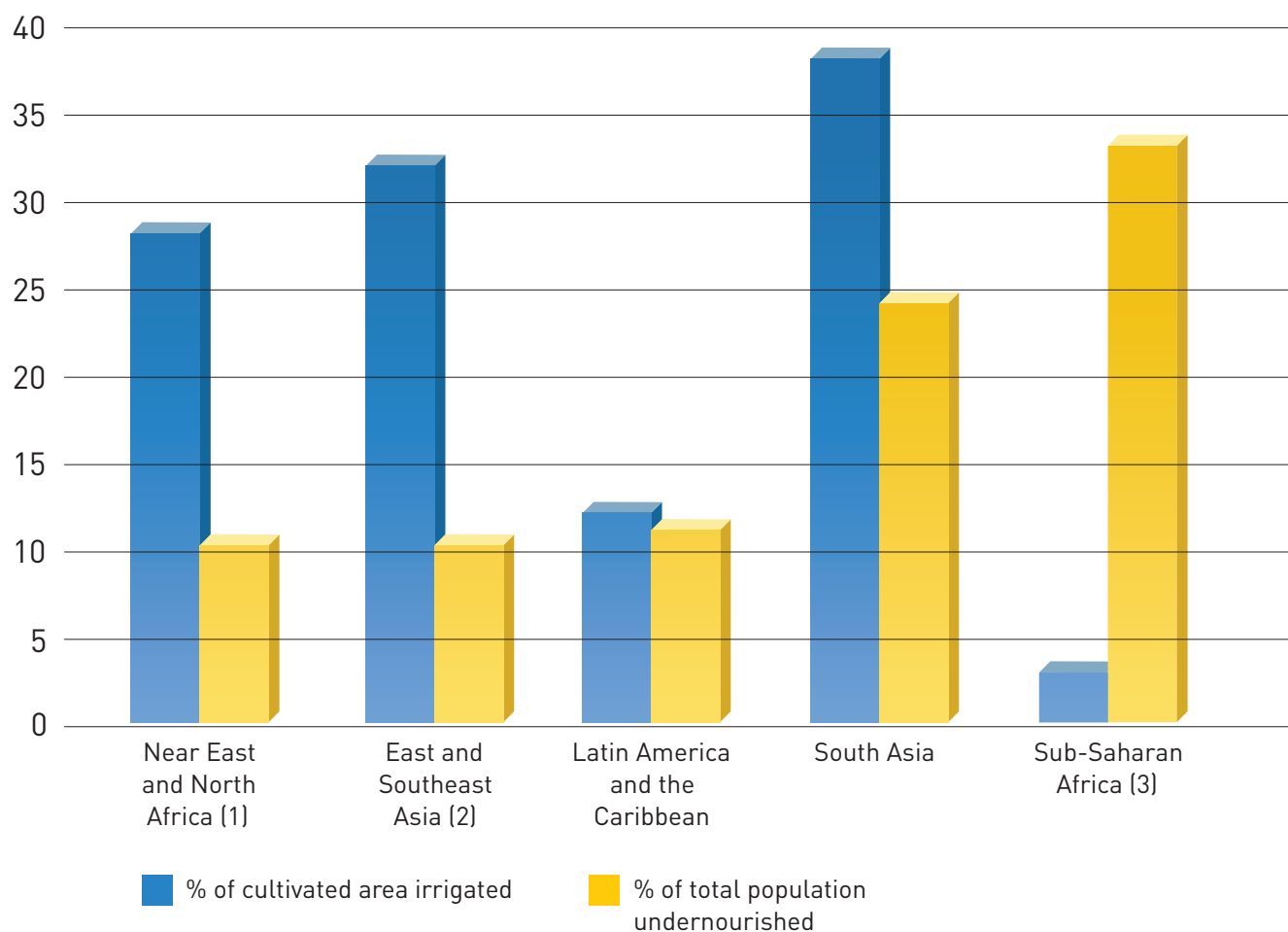
% of food emergencies\*



\* total exceeds 100% because of multiple causes and cited for many emergencies

\*\* includes internally displaced people

Irrigation and Under Nourishment, 1998-2000

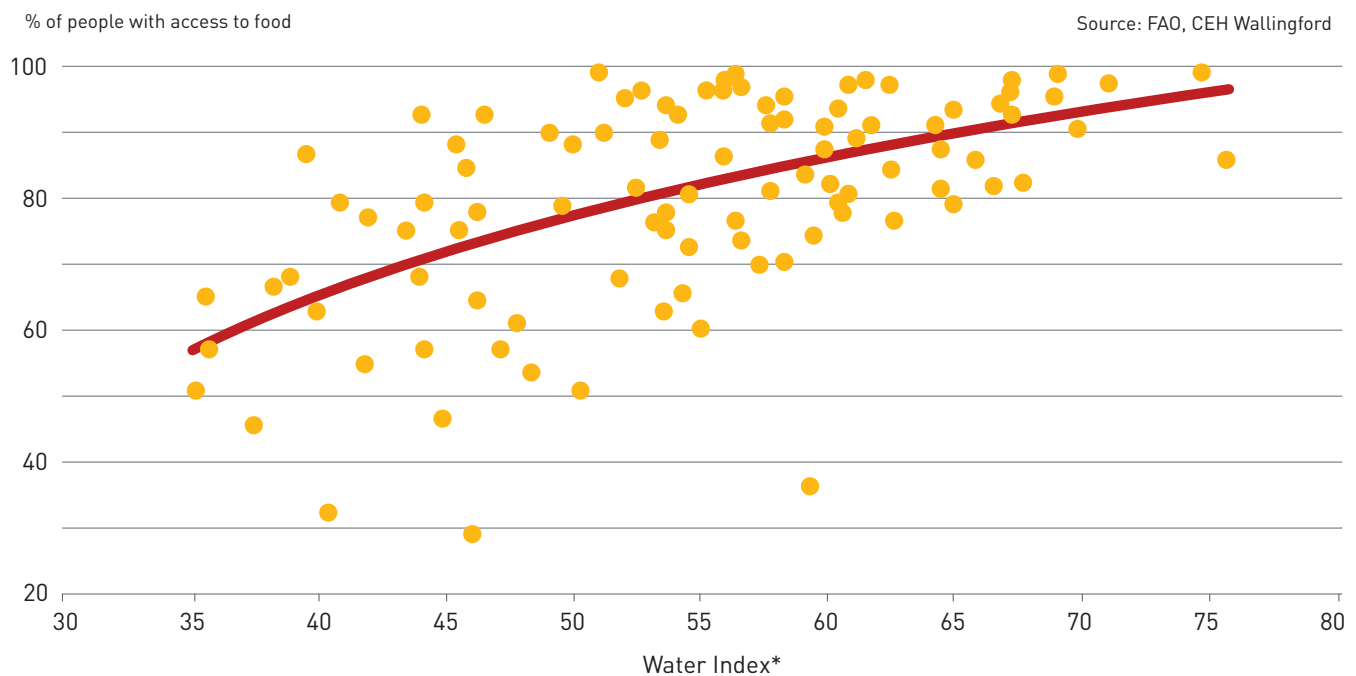


(1) excluding Israel

(2) excluding Japan

(3) excluding South Africa

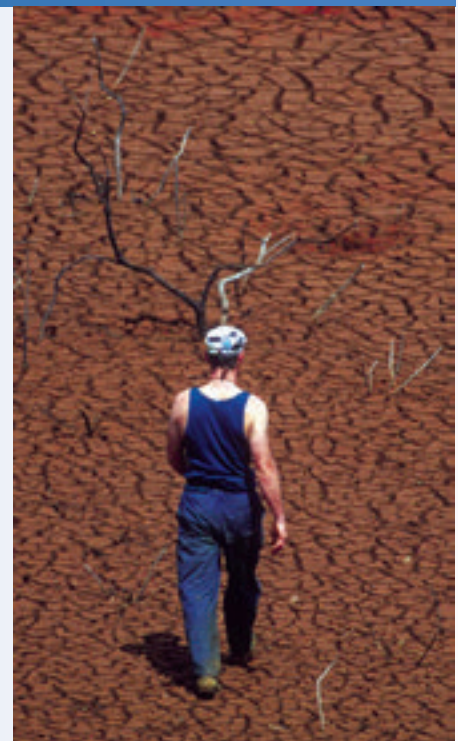
## Access to water and food security (developing countries and countries in transition)



\* A composite indicator that incorporates measures of water resources (from rainfall, river flows and aquifer recharge), access, environmental issues (water quality) and pressure on resources.

### Did You Know?

- Drought ranks as the single most common cause of severe food shortages in developing countries.
- Africa has the highest prevalence rate of hunger. After Oceania, it is also the driest continent. In Ethiopia alone, more than 57 million people have been affected by drought in the past 30 years.
- In India, more than 70 percent of annual rainfall takes place during the three months of the monsoon; most of it floods out to sea. Therefore, farmers who lack irrigation must contend with water scarcity through much of the year.
- In the United Republic of Tanzania, women who had ready access to water and no longer had to spend hours fetching water used the time to start market gardens, improving their diets and their incomes.



If water is a key to food security and poverty reduction, then managing it wisely is essential. Improving the management of water resources is a question of getting more “crop for the drop”. These improvements hinge largely on raising the water productivity of rainfed and irrigation systems.

There are two main ingredients to maximizing agricultural production from a given volume of water: people and technology. One can not go without the other. The best and most innovative technology in the world is of no use if people themselves cannot afford it, see no advantage to it, or do not understand it.

Using and managing the world’s water efficiently is everybody’s business, from government officials to small-scale farmers. There is no room in an efficient water management scheme for elitist roles for the wealthy or socially distinguished. Often, the people who most need a say in how water is managed - and who know how it should be managed - are the farmers themselves. Enabling individuals and communities to understand their options for managing water, to choose from these options, and to take responsibility for their choices could radically alter the way the world uses its limited water resources.



F. Devriese

## Did You Know?



Swiatek Wojtkowiak

- In sub-Saharan Africa, only 4 percent of cropland is irrigated, even though parts of the region have largely unexploited surface water and groundwater.
- In Latin America, less than 2 percent of the renewable water resources are withdrawn.
- In the Near East and North Africa, the water withdrawn for agriculture exceeds 50 percent of the renewable water resources.

# 04

## the “technology” side - irrigated production

The highest yields that can be obtained from irrigation are more than double the highest yields that can be obtained from rainfed agriculture. But irrigation is expensive and beyond the means of small-scale farmers in many developing countries. Irrigation can also lead to waterlogging or salinization, after which the land produces less rather than more food.

In spite of these drawbacks, irrigations holds the most promise for increasing food productivity and security, provided it is managed efficiently and combined with other inputs such as fertilizers and improved seed varieties.



FAO/J.SPAULL

**Surface irrigation**, in which most or all of the crop area is flooded. This is the most common technique and is used by many small-scale farmers.



Ursula Esser

**Sprinkler irrigation**, in which water moves under pressure through a pipe network before being delivered to the crop through a sprinkler system. This technique basically simulates rainfall and is also known as overhead irrigation.



FAO/R.Faidutti

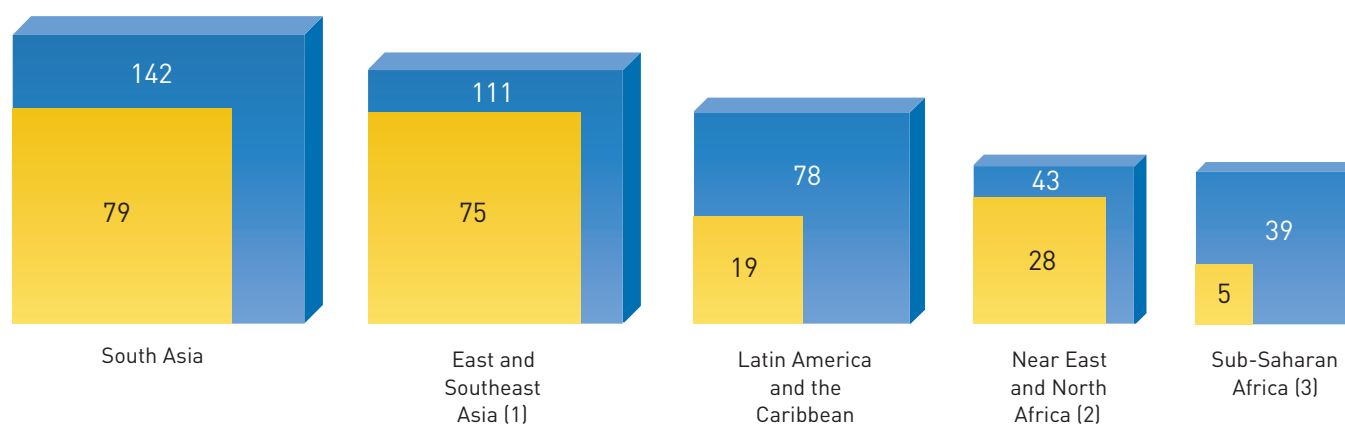
**Localized irrigation**, in which water is distributed under low pressure through a piped network and applied in small quantities to each plant or to the area immediately adjacent to it. This is an increasingly popular form of irrigation since water is used efficiently by placing it only where it is needed and little is wasted.

### Irrigated area and land suitable for irrigation, 2001 (million ha)

■ Land area suitable for irrigation  
 ■ Irrigated area, 2001

The figure shows that the potential for expanding irrigated agriculture is relatively the greatest in sub-Saharan Africa and Latin America.

(1) excluding Japan  
 (2) excluding Israel  
 (3) excluding South Africa



### Did You Know?

- Irrigation can increase yields of most crops by 100 to 400 percent.
- Farmers who switch from surface irrigation to localized irrigation can cut their water use by 30 to 60 percent.



FAO PHOTO

# 05

## the “technology” side - options for small farmers

Increasing the productivity of agriculture through better water control clearly makes a significant impact. Farmers can use a variety of simple and affordable water management techniques to increase their yields and reduce their vulnerability to erratic rainfall or drought.

For example, they can build earth barriers or furrows that channel rainwater runoff to plants or rows of plants (in situ conservation). Or they can capture water from a catchment area and direct it to the field (flood irrigation). To prepare for dry periods, they can collect rainwater in reservoirs, ponds and other basins (storage for supplementary irrigation).

Studies throughout Africa have shown that rainwater harvesting can increase yields up to three times. Not only does it provide more water for crops, but it also helps to recharge groundwater and to reduce soil erosion.



FAO/Null Al-Faraji

### Water harvesting

Irrigating crops, pastures and trees with rain runoff can significantly improve yields. Techniques vary from large-scale water catchment to simple mounds of earth that trap rain runoff at the base of trees.



FAO PHOTO

### Motorized pumps

Cheap, reliable motorized pumps have revolutionized irrigation. They are being used more and more by small-scale farmers to increase their food production.



FAO/H.Wagner

### Treadle pumps

These simple and inexpensive human-powered pumps are used widely by small-scale farmers in many Asian and African countries.

### Did You Know?

- Globally, rainfed agriculture is practised on 80 percent of cultivated land and supplies more than 60 percent of the world's food.
- Experience in Burkina Faso, Kenya and the Sudan has shown that rain harvested from one area to irrigate another can triple or quadruple production.



FAO/P.Johnson

# 06

# use and abuse

Today, agriculture is under intense pressure to stop damaging the environment, especially by depleting water sources, polluting water systems, and contributing to soil infertility and erosion. Irrigation must be managed carefully to avoid or reverse environmental damage, which is already extensive, and the spread of water-borne diseases. Overuse of water in one place means deprivation in another.



FAO/Ch.Errath

## The Aral Sea - An environmental tragedy

When water from the Aral Sea was withdrawn to irrigate cotton, the annual flow of water into the Sea was reduced by almost 85 percent.

As a result, the sea level fell by 16 metres between 1981 and 1990. Twenty of the 24 species of fish disappeared. The fish catch - which totalled 44 000 tonnes a year in 1950 and supported 60 000 jobs - literally vanished. Moreover, toxic dust-salt from the dry seabed was deposited on the surrounding farmland, killing crops.



J.P.Anderson



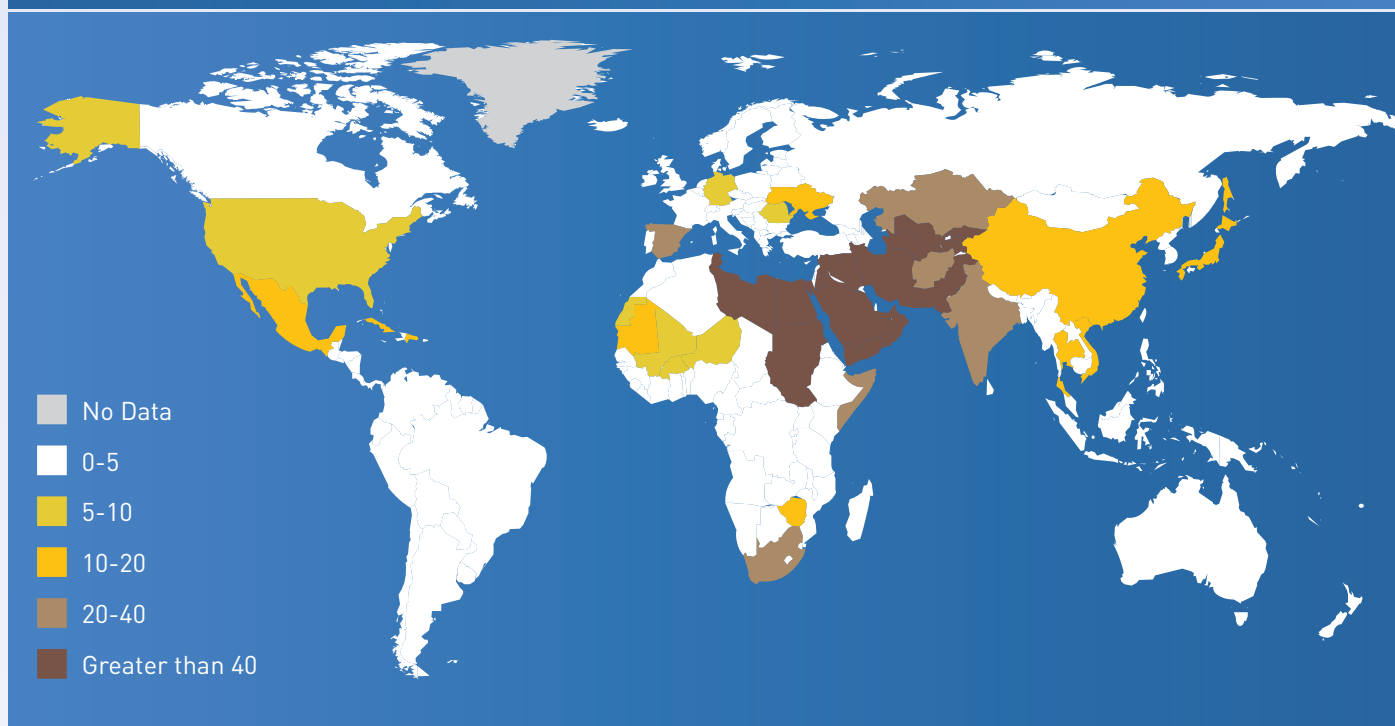
■ ORIGINAL SHORELINE      ■ 1989 SHORELINE

A high concentration of salts and toxic chemicals are making the remaining water hazardous to drink. Those who remain in the areas have lost their livelihood - and those who left have become environmental refugees.

Clearly, irrigation that benefits people in one place can have tragic impacts on the livelihoods of people further downstream.

## Agricultural water withdrawals as a percentage of total renewable water resources

Map shows where withdrawals for agriculture are critical high →40 % and indicative of water stress 20-40 %



### Did You Know?

- It is estimated that poor drainage and irrigation practices have led to waterlogging and salinization of about 10 percent of the world's irrigated lands, thereby reducing productivity.
- In India's Tamil Nadu state, overpumping in certain areas has lowered the water level in wells by 25 to 30 metres in one decade.
- In northern China, a large area of farmland is threatened by falling water levels owing to the overuse of groundwater.
- Since water and population are unevenly distributed, water supply is critical in various countries and regions. Countries could be defined as "water-stressed" if they abstract more than 20 percent of their renewable water resources. By this definition, 36 out of 159 countries (23 percent) were already water-stressed in 1998.



# 07

# looking ahead

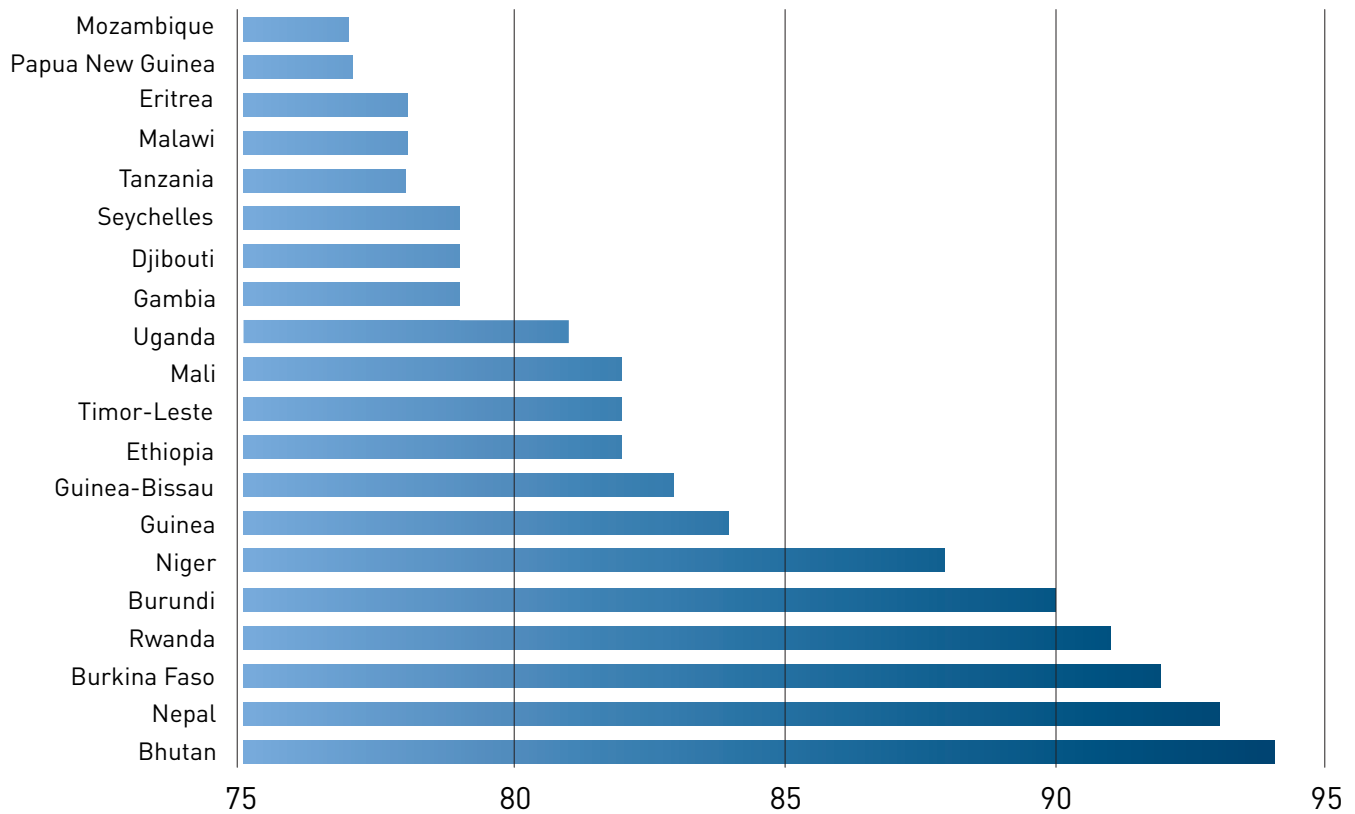
The right to food is not negotiable. Between now and 2030, the world's population is expected to grow by 2 billion people. Feeding this growing population and reducing hunger will only be possible if agricultural yields can be increased significantly - and sustainably.

With so much of the Earth's water being used for agriculture, it is clear that an improvement in the management of agricultural water becomes key to the achievement of global food security.



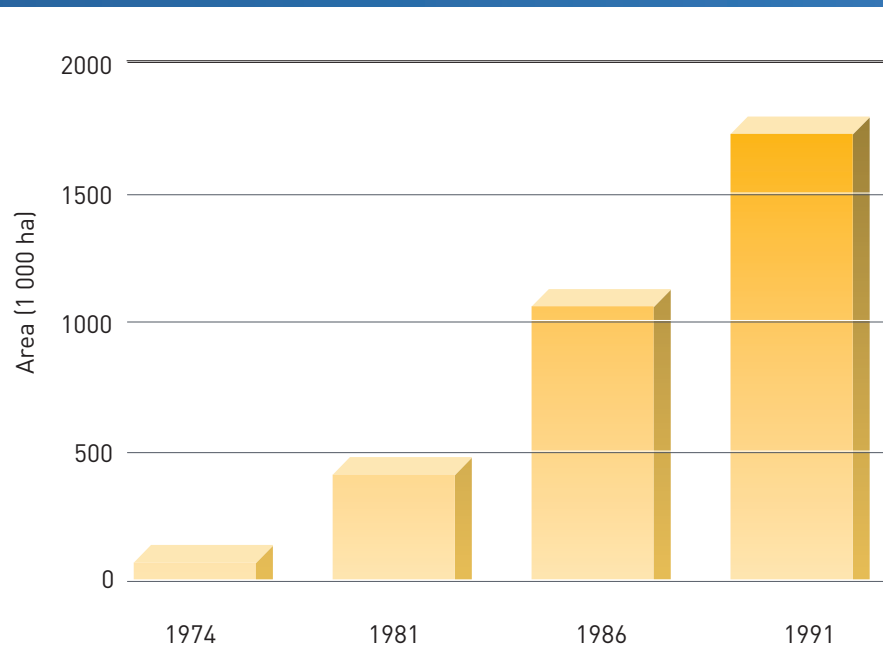
FAO/R. Messori

## The 20 Countries that Rely Most on Agriculture\*



\*People depending on the agricultural sector as percentage of the total economically active population

## Worldwide Growth of Localized Irrigation



FAO PHOTO

Localized irrigation has grown rapidly since the invention of cheap plastic pipe in the 1970s

## Did You Know?

- FAO estimates that the world's growing population will require about 50 percent more food by 2030 compared to 1998. In the last 30 years, food production has increased by more than 100 percent.
- Over the next 30 years, 70 percent of gains in cereal production are expected to come from irrigated land.
- FAO estimates that irrigated land in developing countries will increase by 34 percent by 2030, but the amount of water used by agriculture will increase by only 14 percent, thanks to improved irrigation practices.



FAO/J.Isaac