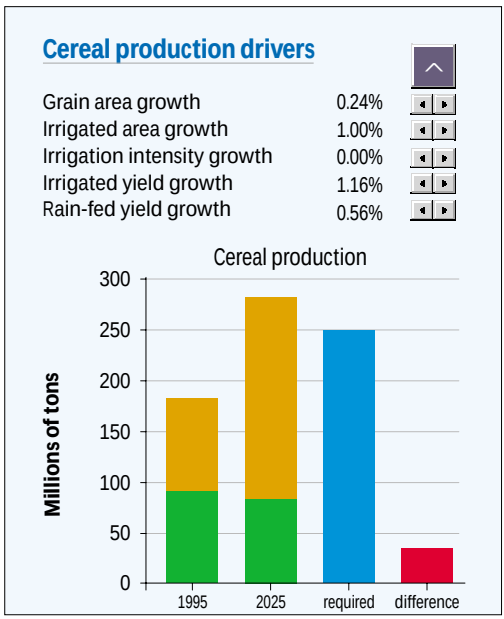
PODIUM, the Policy Dialogue Model

A water and food security planning tool

What will the world's water situation look like in 2025, with at least two billion new water users on the planet competing for a finite supply? How can developing countries best shape their water policies to avoid future water scarcity and to ensure food security?

The Policy Dialogue Model (PODIUM) helps countries determine future directions for agricultural and water resources policy. It enables them to explore potential demand and supply scenarios for food and water in 2025.



▲An overview of the key factors determining cereal production. Users can change any of the displayed values and instantly see the impact on food supply and water availability.

Using PODIUM, policy makers and planners can answer questions such as:

- If calorie consumption reaches 3,000 calories per capita per day and dietary patterns change towards increased meat consumption, how would the national grain requirements change?
- Based on this scenario, do we have enough water to produce the crops needed for national food security?
- What would this require in terms of rainfed and irrigated grain production?
- How would increased water demand affect the groundwater balance?
- What are the implications for water resources policy?

IWMI International Water Management Institute

FUTURE HARVEST
IWMI is a Future Harvest Center
Supported by the CGIAR

How can policy decisions affect future food supply and water availability?

Using PODIUM, policy makers and planners can set a goal, such as food production for an adequate level of per capita consumption, and explore ways of meeting that goal: through increasing irrigated area, rain-fed area, cropping intensity or importing more grain. They can also develop likely scenarios in terms of population growth, diet and developments in agriculture and water resources; then determine the necessary steps to ensure food security and sustainable water use.

PODIUM can help explore critical planning questions such as:

- How much improvement in irrigation efficiency would be needed to cover all Indonesia's additional water requirements in 2025?
- What would be the required rain-fed crop yield in India if all additional cereal requirements were to be met by increases in rain-fed productivity?
- How much grain would Sudan have to import to feed its population in 2025, if there is no new investment in developing additional water resources?

PODIUM is easy to use and runs on a personal computer. The model maps the complex relationships between the numerous factors that affect water and food security, and displays information clearly, in both graphic and tabular formats. Projections for 2025 are determined in relation to 1995 data. Users can revise this data and change any of the variables used by the model.

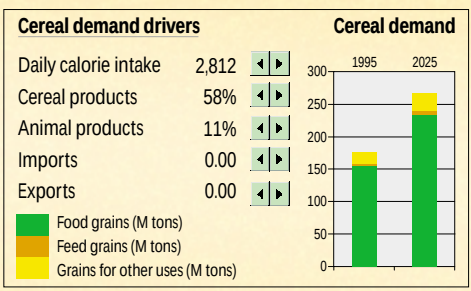
PODIUM takes planners through three basic steps:

Step 1: Determine national cereal requirements.*
Step 2: Estimate cereal production.
Step 3: Convert the predicted grain production into irrigation water demand and compare with available renewable water resources.

Step 1: How much grain will we need in 2025?

PODIUM determines national grain requirements based on assumptions about population, daily calorie intake, diet composition, and import-export volumes in the year 2025.

An example scenario: Cereal requirement for India in 2025

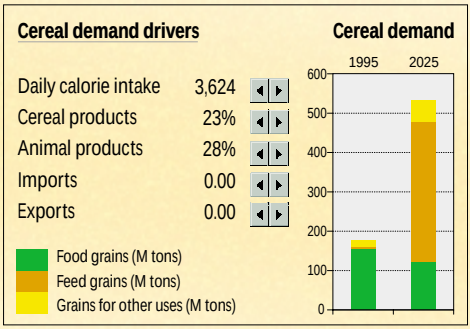


In the base scenario shown here, calorie intake increases from 2,394 (the value for 1995) to 2,812. There is a shift towards consumption of more meat products (from 7% of total calories in 1995 to 11% in 2025) and less cereal (from 63% of total calories to 58%). Import and export volumes are assumed to be zero.

Here, India's domestic grain consumption increases from 172 to 269 million metric tons. The country would need to produce an additional 97 million metric tons of grain to feed its population in 2025.

**In the current version, PODIUM focuses on cereal crops. This works well for Asian countries where a major proportion of the diet is derived from cereals, and most irrigated land is devoted to cereal crops. To more accurately reflect food consumption and cropping patterns in the Middle Eastern and African countries, IWMI is currently expanding the model to allow for a wider mix of food crops, including vegetables and root crops.*

What if Indian dietary habits in 2025 were closer to those of present-day Americans?



In India, as in most of the developing world, livestock is left to graze (or, in urban areas, forage)—costing little in the way of grain inputs. But if the demand for meat products greatly increases, the available grazing areas will not support all the additional livestock needed, and feed grain requirements will rise.

In the US, it takes an average of 1.6 kilograms of grain to produce 1,000 calories of meat. If we change the default feed-meat conversion ratio for India (0.05 kg of feed grain to produce 1,000 calories of meat) to reflect the more realistic world average (0.73 kg of feed gain for 1,000 kcal of meat), India would need to produce 534 million tons of grain. This is almost three times current production levels and nearly twice the grain required under the first scenario.

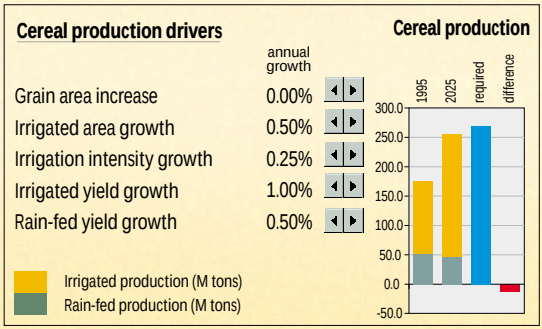
Step 2: Can we produce enough grain to ensure national food security?

The model projects cereal production in 2025 based on the growth in area under cereal cultivation, irrigated area, irrigation intensity, and yields per hectare for both irrigated and rain-fed crops. The model calculates projections of average yield, gross irrigated yield, gross rain-fed yield, and total production from irrigated and rain-fed areas.

Cereal production in India in 2025

In the base scenario for India, the area under cultivation is assumed to increase slightly. Around 16 million additional hectares are irrigated, with small increases in irrigation intensity, irrigated yield, and rain-fed yield.

Based on these assumptions, India is able to produce a total of 257 million tons of grain—12 million tons short of the demand estimated in step 1.



What are the alternatives for making up the shortfall, besides importing more grain?

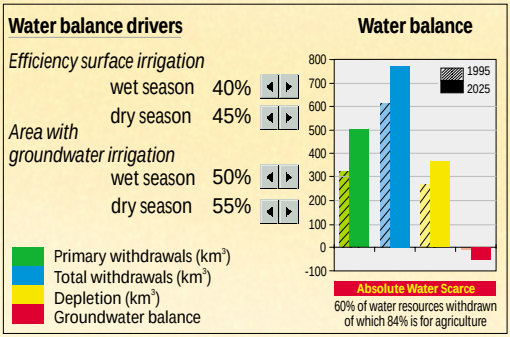
According to PODIUM, it is possible to achieve national food security by increasing:

- rain-fed yield from 1.1 tons/ha to 1.4 tons/ha
- irrigated yield from 2.7 tons/ha to 3.8 tons/ha
- irrigation intensity (reflects the degree of multiple cropping in irrigated areas) from 133% to 155%
- the total area under cereal cultivation by 11 million hectares
- the net irrigated area (the amount of irrigated area under crops in an annual cycle) by 9 million hectares

Step 3: Do we have enough water to produce the crops needed?

Water demand is affected by numerous factors. Two of the primary determinants are the area irrigated with groundwater and surface irrigation efficiency (the amount of water that crops actually need, minus the amount supplied by rainfall, compared to the amount of water diverted for irrigation). Impacts of increased water withdrawals are assessed in terms of the country's groundwater balance.

India's water demand and supply in 2025



In the example scenario for India, there is resonable gain in surface irrigation efficiency, and 50% of the irrigated area is irrigated with groundwater. The model shows that there is a deficit of 62 km^3, which is assumed to come from groundwater. In this scenario, groundwater use is unsustainable—62 km^3 more water is being extracted from the country's aquifers than is available to replenish them.

Water balance definitions

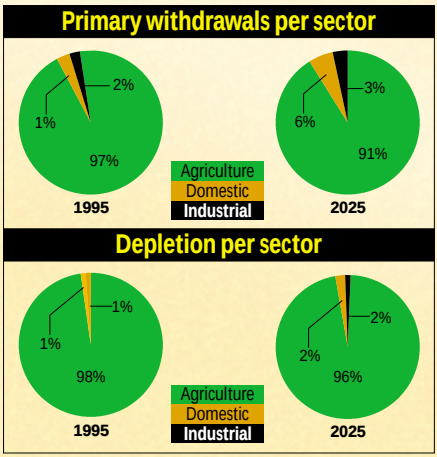
- **Primary withdrawals**—total amount of water diverted for irrigation, industry and domestic use, minus water recycled. Recycled water is water diverted for irrigation, or other purposes, that flows back into the river and is 'reused' further downstream.
- **Total withdrawals**—primary diversions and recycled water. *Often, estimates of water use do not take into account recycling—resulting in an overestimation of water demand.*
- **Depletion**—the use of water (such as evapotranspiration of crops) that renders it unavailable for further use.
- **Groundwater balance** reflects the levels in a country's aquifers. A positive value indicates more water is flowing into the aquifers than is being pumped out. A negative value indicates unsustainable use—more water is being withdrawn than is being replenished.

How much water for industry and households?

PODIUM also considers industrial and domestic demands. The user can specify the amount allocated for industry, the percentage of the population with access to piped water and the daily use per person. Very little of this water is actually depleted; most flows back into the system and is recycled.

India: Water for people and industry

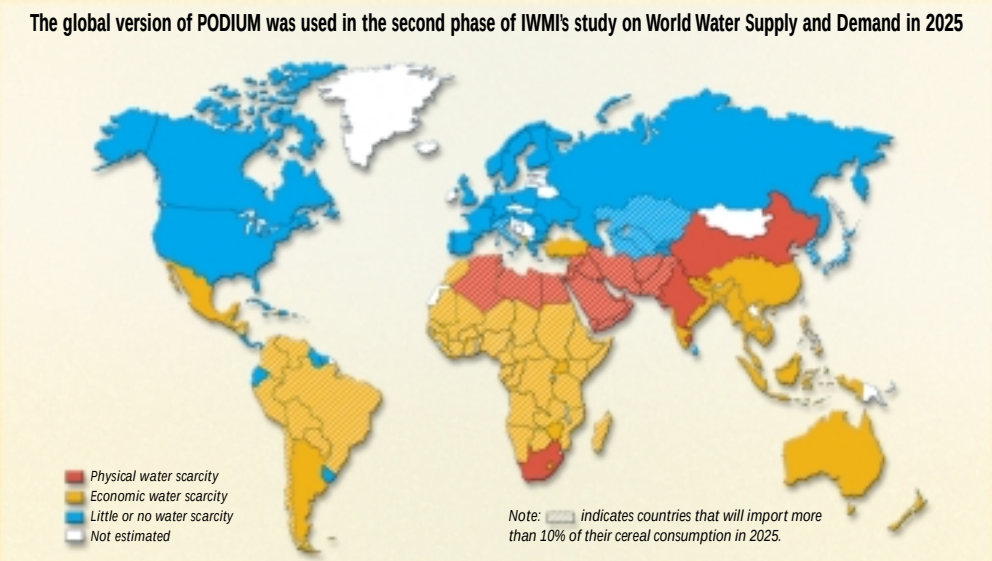
In the example scenario, 100% of the population has access to piped water in 2025 and people are using approximately 26 more liters per day. Industrial water use remains the same. According to these assumptions, 5.6 km^3 are depleted by domestic consumption (up from 2.1km^3 in 1995) and 5.5 km^3 is depleted by industry.



Applications for PODIUM

- PODIUM was used to explore potential impacts of the water and food security scenarios discussed during the Second World Water Forum. It was also used to generate discussion in the eight regional dialogues held as part of the Vision 2025 exercise.
- The International Commission on Irrigation Drainage (ICID) has evaluated PODIUM and is recommending it as a policy tool to its member countries.
- India's Central Water Commission is revising PODIUM with more detailed local data to estimate water demands and supply on a state-by-state basis.
- The Center for Chinese Agricultural Policy is using PODIUM to analyze data for Chinese provinces and major river basins. The results will help inform the country's water resources policy.
- PODIUM has been used in meetings attended by national planners and policy makers in India, Sri Lanka, Nepal and Morocco. IWMI is interested in collaborating with other countries to refine PODIUM to meet their specific needs.

The global version of PODIUM was used in the second phase of IWMI's study on World Water Supply and Demand in 2025



This phase of the study focused on 45 countries, which represent all the major regions of the world and count for over 80% of its population. PODIUM showed that by 2025, under the moderately optimistic but realistic assumptions of the IWMI base scenario, 33%, or some 2 billion people, will live in countries or regions with absolute water scarcity. This means they will not have enough water to meet all agricultural, domestic and industrial needs.

Some 45% of the population of the 45 countries—roughly 2.7 billion people—will live in areas where water resources must be developed by at least 25%—development many countries will not be able to afford (economic scarcity). According to PODIUM's global analysis—17% more irrigation water will be needed for the world to feed itself in 2025, with significant gains in irrigation effectiveness.

Download PODIUM from the IWMI website at **www.iwmi.org**

Postal Address
P O Box 2075
Colombo
Sri Lanka

Mailing Address
127, Sunil Mawatha
Pelawatte
Battaramulla
Sri Lanka

Telephone
+94-1 867404

Facsimile
+94-1-866854

E-Mail
iwmi@cgiar.org

Website
www.iwmi.org