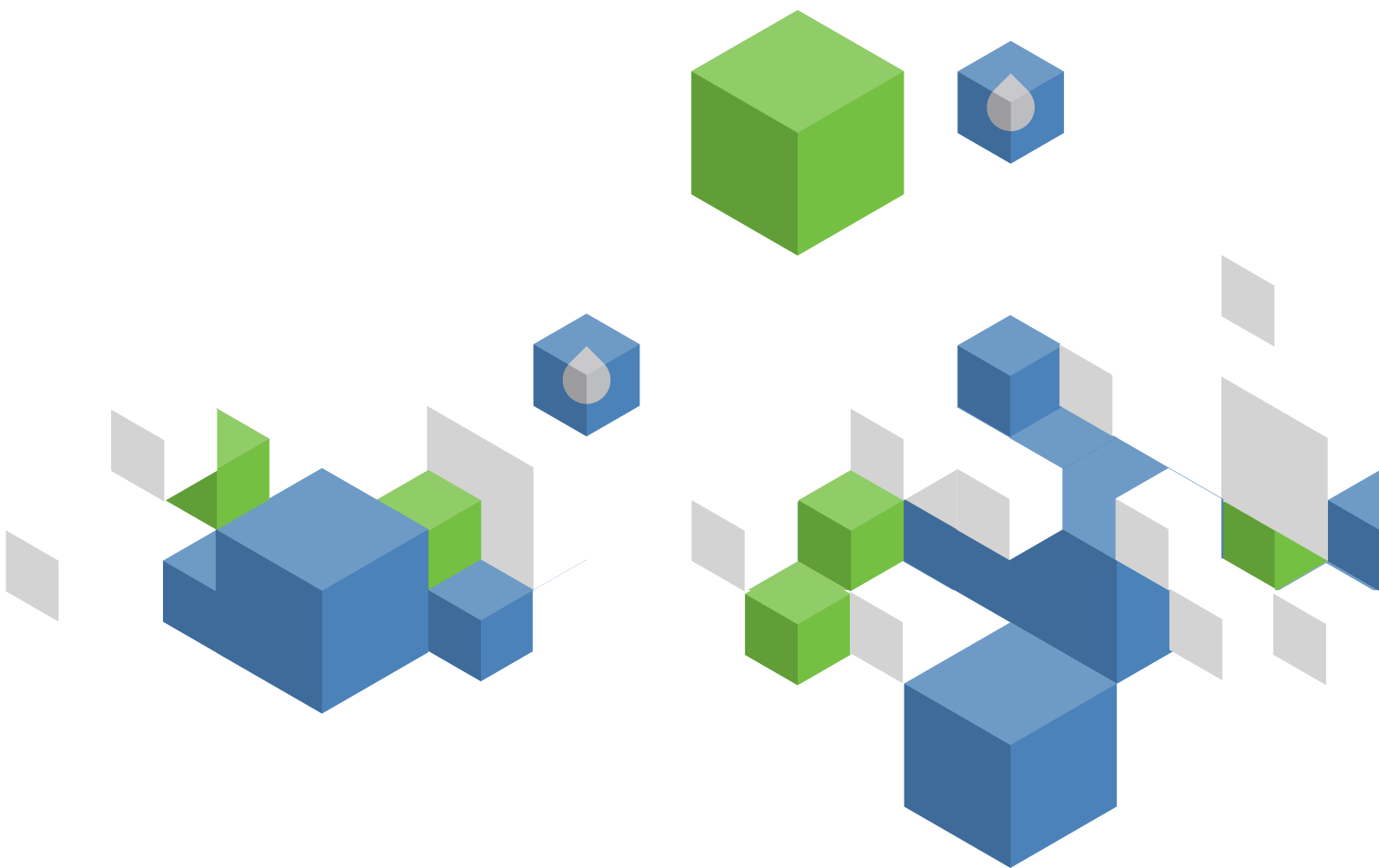




Food and Agriculture Organization
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Reports

Irrigation water requirement and water withdrawal by country



Irrigation water requirement and water withdrawal by country¹

Authors²: Karen Frenken³ and Virginie Gillet⁴

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Abstract

Agriculture, and especially irrigated agriculture, is the sector with by far the largest consumptive water use and water withdrawal. To estimate the pressure of irrigation on the available water resources AQUASTAT, FAO's global information system on water and agriculture, has undertaken a major review of irrigation water requirement and water withdrawal for irrigation for 167 countries. Detailed irrigated crop calendars have been prepared by country. The improved methodology used has made it possible to show additional variables in the **AQUASTAT database**: water withdrawal for irrigation, irrigation water requirement, as well as harvested irrigated crop areas.

Regional and country **tables** have been prepared on areas equipped for irrigation, actually irrigated areas, irrigated harvested crop areas, with special attention to irrigated cereals, and irrigated fodder and pasture, as well as water requirement ratios or irrigation efficiencies. The **AQUASTAT database** provides policy- and decisions-makers as well as the scientific community with a complete dataset containing reliable data, calculated in a uniform way, and comparable with each other at country level.

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¹ The online version of this document is available at:
http://www.fao.org/nr/water/aquastat/water_use_agr/index.stm

² The authors would like to thank Jippe Hoogeveen who provided the modeled data for **Irrigation water requirement** (section 3)

³ Senior Officer (Water Resources Management) and AQUASTAT Programme Coordinator, Land and Water Division, Food and Agriculture Organization of the United Nations (FAO)

⁴ Consultant for the Food and Agriculture Organization of the United Nations

1. Introduction

The AQUASTAT database reports water statistics at country level with a special emphasis on irrigation and agricultural water. Continuous data collection processes populate and update the database, while careful and meticulous data analyses ensure its reliable data quality and accuracy. Despite constant efforts, data gaps exist and AQUASTAT undertakes some limited modelling to fill those for an improved usability, in particular for data relating to agricultural water, its focus. This review contributes to these three tasks: updating, quality checking and gap filling.

A selection of terms commonly used in this review is marked by an italic clickable link when they first appear. Clicking on them will direct to their definition in **Annex 1**. These definitions and many more are also available in the **AQUASTAT online glossary**.

Agriculture, and especially irrigated agriculture, is the sector with by far the largest **consumptive water use** and **water withdrawal**. To estimate the pressure of irrigation on the available water resources, an assessment has to be made both of **irrigation water requirement** and of **irrigation water withdrawal**.

Irrigation water requirement depends on the **crop water requirement** and the water naturally available to the crops (**effective precipitation**, **soil moisture**, etc.). While part can be estimated based on climatic conditions, part results from physiological processes at plant level (crop coefficient⁵) for which actual figures are not available, calling for modelling. In this review, the model's inputs are AQUASTAT data related to the corresponding irrigated crops: areas of harvested irrigated crops, **cropping patterns** and **cropping intensity**, converted into **irrigated crop calendars**.

Irrigation water withdrawal (or water withdrawal for irrigation) largely exceeds irrigation water requirement due to significant losses in distribution and application. Although available for some countries, figures of irrigation water withdrawal are easily confused with **agricultural water withdrawal**. Moreover, in the absence of direct measurement and due to the complexity of assessment methods, they are not always reliable. These difficulties explain that such figures are not always available at country level.

Nonetheless, a review of these variables at country level is necessary to improve the overall quality of global water resources monitoring. The main objective of this review is thus to update the AQUASTAT database with modelled irrigation water requirement, to supplement national data with estimates of irrigation water withdrawal and to check data accuracy and quality thanks to **water requirement ratios** comparing the two variables. In doing so, the database will provide policy- and decisions-makers as well as the scientific community with a complete dataset containing reliable data, calculated in a uniform way, and comparable with each other at country level.

The first review took place around 2000 within the framework of the preparation of FAO's global perspective study **World agriculture: towards 2015/2030: an FAO perspective** (FAO, 2003) for 90 developing countries and countries in transition. The spatial coverage of the data of the present updated review consists of 165 countries⁶ (out of the total of 198 countries in 2012⁷) and 2 territories, corresponding to those practicing irrigation and for which data on irrigated areas and on irrigated crops are available (see section 5 '**Discussion**' for the list of countries not included in this study). Among those 167 countries and territories, 41 are high income countries and 1 high

⁵ The crop coefficients for the different crops and growing stages are presented in **Annex 2**.

⁶ Although in July 2011 Sudan became two countries, Sudan and South Sudan, in this review the two countries are still grouped together due to the lack of disaggregated data.

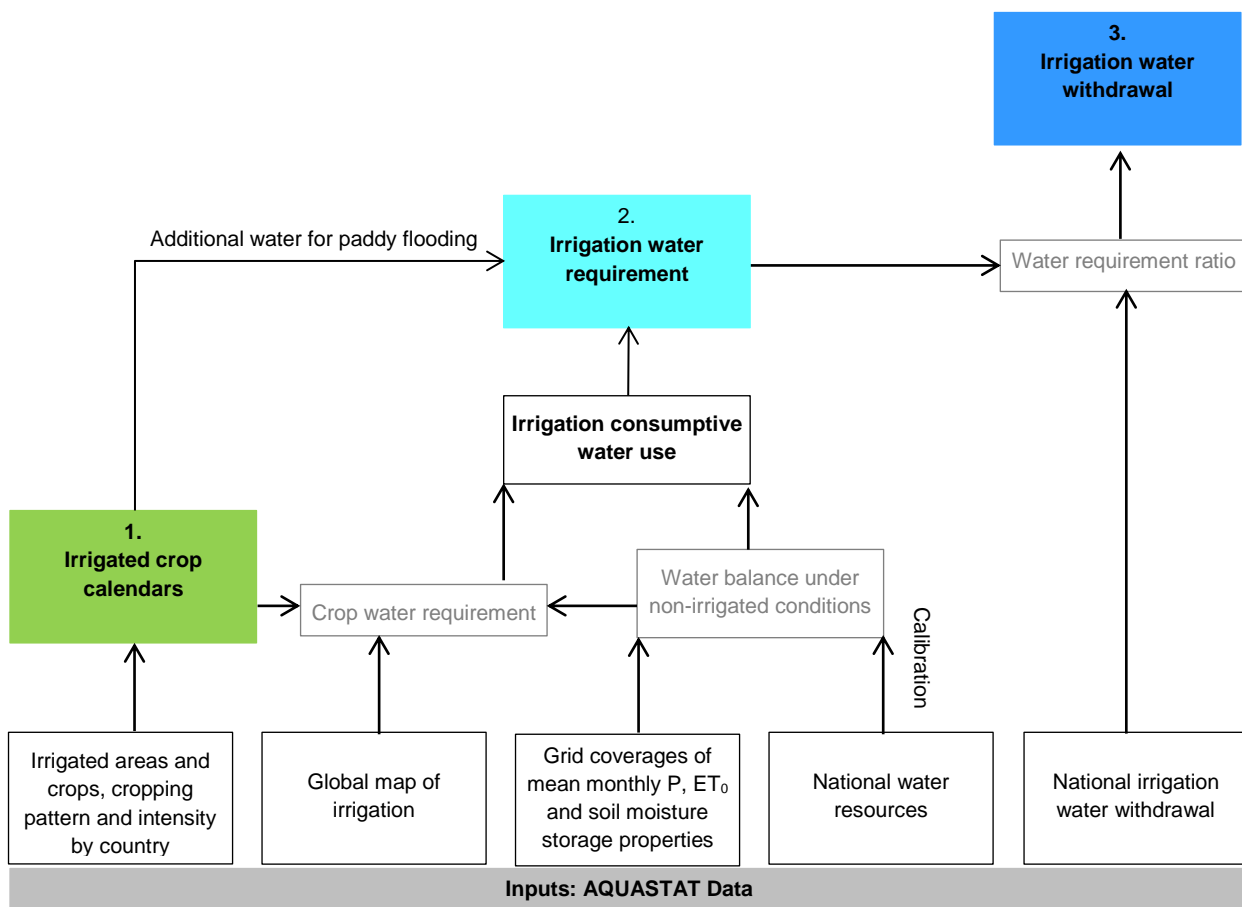
⁷ **Annex 3** lists alphabetically the countries included in this review.

income territory, 89 are middle income countries and 1 middle income territory, and 35 are low income countries.

The review consists in a 3-step methodology (summarized in Figure 1 below):

- Preparation of **irrigated crop calendars** by country (section 2)
 - Irrigated crop calendars by country
 - Regional summary of the irrigated crop calendars
- Calculation of **irrigation water requirement** (section 3), calculated by the model by comparing:
 - The **water balance under non-irrigated conditions**, corresponding to the **actual evapotranspiration** under non-irrigated conditions and calculated using available climatic datasets; and
 - The crop water requirement based on the irrigated crop calendars and the global map of irrigation areas.
- Estimation of **irrigation water withdrawal** (section 4) for countries with unavailable national statistics using a water requirement ratio
 - Estimation of irrigation water withdrawal by country
 - Corrections of irrigation water requirement and irrigation water withdrawal
 - Pressure on water resources due to irrigation: regional summary of the water requirement ratio

FIGURE 1
Review of irrigation water requirement and irrigation water withdrawal



2. Irrigated crop calendars

AQUASTAT data of harvested irrigated area by crop at the national level—for **harvested crops irrigated by full control irrigation** only (AHI_{full})—are converted into an irrigated crop calendar, which details monthly occupation rates of the **area equipped for full control irrigation actually irrigated** (AAI_{full}) for each crop. The ratio between the harvested irrigated crop area and the actually irrigated area is called ‘cropping intensity’:

$$\text{Cropping Intensity} = 100 \times AHI_{full} / AAI_{full}$$

When no data relating to irrigated harvested crop areas is available in AQUASTAT for a country, the irrigated crops database produced in the framework of the FAO perspective studies **World agriculture: towards 2030/2050** (FAO, 2006) and/or ‘World agriculture: towards 2050/2080’ (FAO, 2011a) is used.

Crop calendars are prepared for a specific year for which data are available. As much as possible AHI_{full} and AAI_{full} are selected for the same year indicated at the top of the crop calendar (for example 2008 for Bangladesh’s calendar in Table 1 below). Otherwise a note following the AAI_{full} figure indicates its corresponding year. This is also the case for the **area equipped for full control irrigation** (AEI_{full}) and the **total area equipped for irrigation** (AEI_{tot}), which are also shown in the table below as well as the percentage of the full control equipped area that is actually irrigated in the given year.

TABLE 1
Example of an irrigated crop calendar: Bangladesh

BANGLADESH		2008											
Irrigated cropping calendar		Crop area as percentage of the full control actually irrigated area by month											
Irrigated crops	Irrigated area 1000 ha	J	F	M	A	M	J	J	A	S	O	N	D
Wheat	313	6	6	6	6								6
Rice one (Aman)	927							18	18	18	18	18	
Rice two (Boro)	3 414	68	68	68	68								68
Maize	90	2	2	2	2								2
Other cereals	26	1	1	1	1								1
Vegetables	236	5	5	5	5								5
Sesame	30	1	1	1	1								1
Potatoes	283	5	5	5	5								5
Tea	40	1	1	1	1	1	1	1	1	1	1	1	1
Pulses	156	3	3	3	3								3
Sugarcane	43	1	1	1	1	1	1	1	1	1	1	1	1
Cotton	7	0.1	0.1	0.1	0.1	0.1						0.1	0.1
Tobacco	18	0.4	0.4	0.4	0.4								0.4
Other temporary crops	414	8	8	8	8								8
Harvested irrigated crop area [AHI_{full}]	5 977	100	100	100	100	2	2	20	20	20	20	20	100
Area equipped for full control irrigation actually irrigated [AAI_{full}]	5 050												
Cropping intensity (%) = $100 \times [AHI_{full}] / [AAI_{full}]$	118												
Area equipped for full control irrigation [AEI_{full}]	5 050												
% of full control equipped actually irrigated = $100 \times [AAI_{full}] / [AEI_{full}]$	100												
Total area equipped for irrigation [AEI_{tot}]	5 050												

Different cropping cycles of a same crop appear on different lines of the calendar. For example, in Bangladesh rice is cultivated from July to November (Rice one) and from December to April (Rice two). Crops are classified and ordered according to the **World programme for the census of agriculture 2010** (FAO, 2005b). In particular, this means that distinction is made between temporary and permanent fodder crops, as well as between temporary and permanent meadows and pastures. While temporary fodder crops and temporary meadows and pastures are included in the **FAOSTAT** definition of arable land (FAO, 2012b), in its definition of permanent crops only permanent fodder crops are included but not permanent meadows and pasture. Thus in the AQUASTAT definition of cultivated land—being the sum of FAOSTAT’s arable land and

permanent crops—permanent meadows and pastures are not included. In a very few cases with **permanent pastures irrigated**, this might lead to the irrigated area being larger than the cultivated area.

For three large countries where irrigation is relatively intensive (China, India, United States of America), irrigated crop calendars have been prepared by sub-national zones (north, south, west, east) to more closely reflect the climate variations. On the contrary, the nine small islands from the Caribbean Lesser Antilles (CARL) have been combined into a single crop calendar due to limited irrigated areas and limited available data for each of them separately. These geographical divisions or groupings are detailed in the respective crop calendars.

Irrigated crop calendars are thus available below, as well as a **regional summary** (section 2.2) of the irrigated crop calendars.

2.1. Irrigated crop calendars by country

The resulting irrigated crop calendars for the countries are available in Annex (in a separate PDF) along with their respective narratives. The countries have been listed alphabetically for the world. Please note that updates of these irrigated crop calendars will be put **online** as they become available.

2.2. Regional summary of the irrigated crop calendars

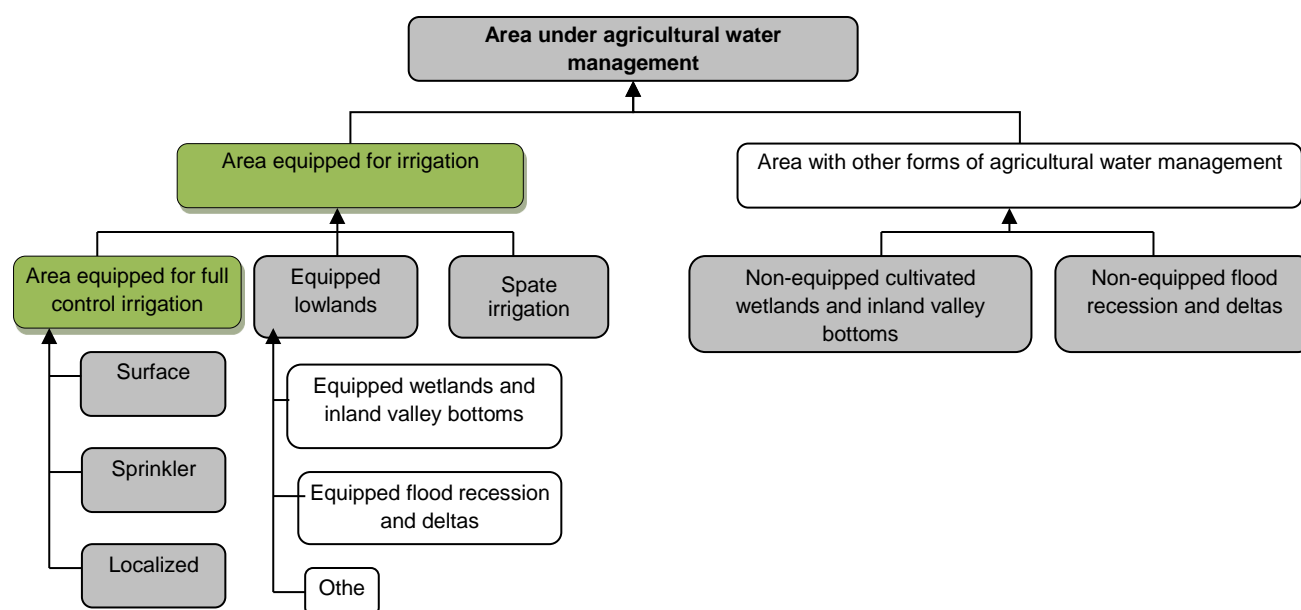
Data obtained in the irrigated crop calendars of individual countries is compiled and analyzed by continent, by (sub-)region and by income-based grouping: high, middle and low income. Special attention is given to the 61 low income food deficit countries (LIFDC)—of which 37 are in Africa—and the 40 least developed countries (LDC)—of which 30 are in Africa—since water, and in particular agricultural water, is a significant developing incentive for food security and rural development. **Annex 3** lists alphabetically the countries included in this review for the world, by continent, by region and sub-region, by income-based grouping as well as the LIFDCs and LDCs, as per October 2012. It also provides the definitions of high, middle and low income, as well as LIFDC and LDC.

First, the regional analysis examines regional specificities with regards to AHI_{full} , cropping intensity, AAI_{full} , AEI_{full} and AEI_{tot} (**Table 2a**). **Table 2b** gives the percentage of the world total for AHI_{full} , AAI_{full} , AEI_{full} and AEI_{tot} in each country grouping. Then, regional features of irrigated harvested crops—in hectares (**Table 3a**) or in percentage (**Table 3b**, **Table 3c**)—and irrigated harvested cereals in particular (**Table 3d** and **Table 3e**), are detailed.

2.2.1. Areas equipped for irrigation, areas actually irrigated and cropping intensity

AQUASTAT makes the following distinction (Figure 2) with regards to agricultural water management, where 'Area equipped for irrigation' is equal to AEI_{tot} in this review and 'Area equipped for full control irrigation' equal to AEI_{full} (green boxes).

FIGURE 2
AQUASTAT classification of areas under agricultural water management



Note: the boxes in white refer to variables that are not available in the AQUASTAT database

Africa is the only continent where the area equipped for full control irrigation (AEI_{full}) is significantly lower than the total equipped area for irrigation (AEI_{tot}). AEI_{full} accounts for 93 percent of AEI_{tot} , whereas it is 99 percent in Asia and Europe and more or less 100 percent in the Americas and Oceania (Table 2a). This is due to significant areas of equipped lowlands in Sub-Saharan Africa and spate irrigation mainly in Northern Africa and the Sudano-Sahelian sub-region. However, because they rely on floodwater, they cannot completely uncouple irrigated crops from climatic conditions like full control irrigation does. Asia with 71 percent of the AEI_{tot} and AEI_{full} worldwide represents 78 percent (Table 2b) of the global AAI_{full} thanks to its high cropping intensity, but also to the largest part of AEI_{full} that is actually irrigated (AAI_{full}). In Europe the percentage of AEI_{full} actually irrigated is more limited (65 percent). European irrigation is indeed strongly dependent on precipitation and, in a lesser extent, on mobile irrigation equipment, the intensive use of which—by applying water to different plots with the same mobile equipment—in fact expands areas considered equipped for full control irrigation. In addition, the climatic conditions allowing various cropping cycles in a year in large parts of Asia, Africa and Americas, make a significantly larger cropping intensity possible in these regions than in parts of Europe and Oceania, where irrigated crop growth in the winter season is little or non-existent.

The combination of high cropping intensity and high rates of AAI_{full}/AEI_{full} makes that Asia and Africa benefit the most of irrigation. In fact, it is worth mentioning that LIFDCs take full advantage of irrigation with their cropping intensity close to the world average and with a very high level of areas equipped for irrigation that are actually irrigated. Similarly, the LDCs have a cropping intensity larger than high income countries, despite their lower portion of areas equipped for full control irrigation relative to their total area equipped for irrigation (AEI_{full}/AEI_{tot}), which is explained by the fact that the majority of LDCs are located in Sub-Saharan Africa, where most of the equipped lowlands can be found.

2.2.2. Irrigated harvested crops

On average, cereals are the main irrigated crops (61 percent) (Table 3a and Table 3b) and 87 percent of the irrigated cereals is grown in Asia (Table 3c). Almost half of the world's irrigated cereals is rice (Table 3d and Table 3e), which is thus the main irrigated crop worldwide (29 percent of irrigated crops). However, while rice is the main irrigated cereal in Asia, rice and wheat

are the main irrigated cereals in Africa, maize dominates in Americas and Europe, and wheat in Oceania. These ascendancies nearly reflect the continental respective traditional food preferences, except for wheat, the preferred cereal in Europe and in a lesser degree in Americas, which is mostly grown in winter under rainfed conditions. At continental level, Oceania—limited to Australia and New Zealand in this study—is the only single exception to the irrigated cereals' large domination, with irrigated fodder and pastures representing almost half of the irrigated crops (48 percent). At a smaller scale, irrigated fodder and pastures in the Eastern Europe and Russian Federation region also largely prevails (51 percent) over irrigated cereals (17 percent).

The diversification of irrigated crops increases in countries with a higher income (**Table 3b**): the part of cereals in irrigated crops varies a lot between high income countries (38 percent), middle income countries (64 percent), and to low income countries (75 percent). With 76 percent of the irrigated areas of the LDCs dedicated to cereals, irrigation there focuses on provision of staple food. In high income countries vegetables, fruits, oilseed crops, and fodder and pasture diversify the irrigated crops with their respective proportion being significantly larger than in other income-based groups and even the world's averages. This diversification by irrigation, and the relatively diversified average diet it mirrors, is however coupled with a lower physical productivity of irrigation water, in term of final product destined for human consumption, due to large volume of irrigation water dedicated to fodder and pasture and required to produce meat. On the other hand, diversification of local diets from irrigation in low income countries and LDCs is not only limited by the large portion of cereals but also by the allocation of irrigated areas to export crops, such as beverage crops (cocoa, coffee, tea). This is also the case in LIFDCs where irrigated export crops, such as sugar crops (sugarcane and sugar beet) and fibre crops (including cotton), almost match the world's averages despite their larger portion of irrigated cereals and their need of locally consumed crops—their irrigated vegetables, fruits and oil crops fail to reach the world's averages. These latter three crop groups represent 30 percent of the irrigated crop areas in high income countries, against 9 percent in LIFDCs. In spite of their relatively high cropping intensity and level of areas equipped actually irrigated as shown in **Table 2a**, irrigation could play a greater role in the fight to achieve food security of these LIFDCs, and in particular through diversification of crops with larger areas dedicated to these three crop groups (vegetables, fruits and oil crops).

Based on the above irrigated crop calendars, the irrigation water requirement corresponding to these irrigated crops (2nd step) is calculated.

3. Irrigation water requirement

Precipitation, and in particular its effective portion, provides part of the water crops need to satisfy their transpiration requirements. The soil, acting as a buffer, stores part of the precipitation water and returns it to the crops in times of deficit. In humid climates, this mechanism is sufficient to ensure satisfactory growth in rainfed agriculture. In arid climates or during extended dry seasons, irrigation is necessary to compensate for the **evapotranspiration** (crop transpiration and soil evaporation) deficit due to insufficient or erratic precipitation. **Irrigation consumptive water use** is defined as the volume of water needed to compensate for the deficit between **potential evapotranspiration** on the one side and effective precipitation over the crop growing period and change in soil moisture content on the other side. It varies considerably with climatic conditions, seasons, crops and soil types. For a given month, the crop water balance can be expressed as follows:

$$ICU = ET_c - P - \Delta S$$

with:

- ICU = irrigation consumptive water use needed to satisfy crop water demand (mm)
- ET_c = potential crop evapotranspiration (mm)
- P = effective precipitation (mm)
- ΔS = change in soil moisture (mm)

In this study, the irrigation consumptive water use is computed for each country on the basis of the irrigated crop calendar for a specific year, as the difference between the crop water requirement—i.e. the potential evapotranspiration of AH_{full} —and the water balance under natural conditions—i.e. actual evapotranspiration (ET_a) under non-irrigated conditions. In the specific case of paddy rice, additional water is needed for flooding to facilitate land preparation and for plant protection. This additional amount is calculated by multiplying the harvested area under irrigated rice by a water layer of 20 centimetres. In that case, the irrigation water requirement is the sum of rainfall deficit and the water needed to flood paddy fields. Otherwise, it is equal to the irrigation consumptive water use.

The irrigation water requirement computed in this study is available by country under the variable 'Irrigation water requirement' [code 4260] in the **AQUASTAT database**. It also appears by country in **Table 4** and by region in **Table 5**, comparing irrigation water withdrawal and irrigation water requirement.

Calculation methods of the two components of the irrigation water requirement equation are detailed below.

3.1. Water balance under non-irrigated (or natural) conditions

Renewable water resources corresponds to the sum of internal renewable water resources—surface water and groundwater resources produced internally—and external renewable water resources—surface water and groundwater resources entering and bordering the countries minus those leaving the country if secured by treaties or agreements for a downstream country. The internal component originates from the part of endogenous precipitation flowing into rivers and lakes or infiltrating into aquifers after evapotranspiration of natural ecosystems, including grass and trees. Thus the annual water balance in natural conditions, i.e. without irrigation—also understood as the maximum theoretical yearly amount of water actually available for a given area—, can be calculated as the sum of the annual precipitation and the balance of external renewable water resources minus evapotranspiration (excluding evapotranspiration caused by groundwater and surface water flows towards open water bodies and wetlands). One of the activities undertaken by AQUASTAT is to compile information on **renewable water resources** by country and based on this make its best estimates of the main elements of the water balance for each country.

The global water balance has spatially distributed input layers—derived as much as possible from the public domain—and consisting of datasets for precipitation, **reference evapotranspiration**, and soil moisture storage properties:

Map	Resolution	Source
Global maps of monthly precipitation	10 min	New, Hulme and Jones (2000)
Global maps of wet days per month	10 min	New, Hulme and Jones (2000)
Global maps of coefficient of variation of precipitation per month	10 min	New, Hulme and Jones (2000)
Global maps of monthly reference evapotranspiration (ET_0)	10 min	Calculated according to FAO (1998) with input data from New, Hulme and Jones (2000)
Maximum soil moisture storage capacity	5 min	Derived from the Harmonized World Soil Database (FAO, 2009a)
Maximum deep percolation flux	5 min	Derived from BGR and UNESCO (2008)
Crop coefficient (K_C)	5 min	Derived from FAO's Global Major Agricultural Systems Map (FAO, 2010)
Global Map of Irrigation Areas	5 min	Siebert <i>et al</i> (2007)
Global map of lakes and wetlands	5 min	Derived from Lehner and Döll (2004)

The computation of the water balance is carried out on a spatial resolution of 5 arc degree grid-cells and in daily time steps. The results of the water balance calculations consist of monthly values by grid-cell for generated long-term average precipitation, actual evapotranspiration, incremental evapotranspiration caused by irrigated agriculture, surface runoff, groundwater recharge and water stored as soil moisture. Summarized annual water balances can be calculated for any desired spatial domain (for example countries or river basins) and include, apart from the above mentioned variables, incremental evapotranspiration over open water and incremental evapotranspiration over wetlands.

For each grid cell, potential crop evapotranspiration (ET_c) is calculated on a daily basis according to the methodology described in FAO Irrigation and Drainage paper 56 (FAO, 1998):

$$ET_{c(t)} = K_c \times ET_{0(t)}$$

with:

- t = time step (days)
- $ET_{c(t)}$ = potential crop evapotranspiration on t (mm)
- $ET_{0(t)}$ = reference evapotranspiration on t (mm)
- K_c = crop or land use factor (-)

The crop or land use factor K_c varies during the growing season depending on the growing stage. However, for rainfed conditions it was decided not to apply differentiated K_c factors, since no distinction was made between the different crops grown on rainfed agricultural land. Actual evapotranspiration (ET_a) under non-irrigated conditions is assumed to be equal to the potential crop evapotranspiration (ET_c), in those periods of the year when precipitation exceeds potential evapotranspiration or when there is enough water stored in the soil to allow maximum evapotranspiration. In drier periods of the year, when the available soil moisture is reduced below a certain level, lack of water reduces actual evapotranspiration to an extent depending on the available soil moisture.

Evaporation and evapotranspiration in open water areas and over swamps and wetlands are assumed to be 10 percent higher than reference evapotranspiration throughout the whole calculation period.

For each grid cell, the available soil moisture is calculated per day by adding in- and outgoing fluxes to the available soil moisture of the day before. Runoff occurs when the balance of the in- and outgoing fluxes exceed the maximum soil moisture storage capacity, and thus is calculated as the part of the precipitation that does not evaporate and cannot be stored in the soil. Runoff is always positive except for areas identified as open water or wetland, where actual evapotranspiration can exceed precipitation. Groundwater recharge is assumed to occur only above a certain level when there is enough water available in the soil to percolate.

The model is calibrated by comparing calculated values for water resources per country (i.e. the difference between precipitation and evapotranspiration) with data on internal renewable water resources for each country obtained from **AQUASTAT country surveys** and presented in the **country water resources sheets**. Where differences between calculated values and AQUASTAT country statistics were considered too big, correction factors have been applied to soil moisture storage capacity parameters and maximum recharge fluxes.

The model was validated by comparing the discharges of major rivers given in the **Global river discharge database** (SAGE, 2012) with the calculated runoff for the drainage basins of these rivers.

This calibrated and validated spatial water balance is used for the computation of the crop water requirement (below) and the irrigation water requirements.

3.2. Crop water requirement

The calibrated water balance under natural conditions, the **Global map of irrigation areas** (version 4.0.1; FAO, 2010, Siebert et al., 2007 and 2010) and the irrigated crop calendars are used as inputs for the computation of the crop water requirement, that is the potential evapotranspiration of irrigated crops. Like the computation of the water balance under natural conditions, the calculation of the potential crop evapotranspiration is carried out on a spatial resolution of 5 arc degree grid-cells and in daily time steps and can be presented in statistical tables or maps at different levels of spatial aggregation.

The evapotranspiration of a crop under irrigation (ET_c in mm) is obtained by multiplying the reference evapotranspiration (ET_0) with a crop and growing stage specific coefficient ($ET_c = K_c \times ET_0$). This coefficient has been derived for four different growing stages: the initial phase (just after sowing), the development phase, the mid-phase and the late phase (when the crop is ripening to be harvested) (FAO, 1998). In general, these coefficients are low during the initial phase, after which they increase during the development phase to high values in the mid-phase and again lower in the late phase. It is assumed that the initial phase, the development phase and the late phase each take one month for each crop, while the duration of the mid-phase varies according to the type of crop. For example, the growing season for wheat in Bangladesh, displayed in the **example of irrigated crop calendar** (Table 1), starts in December and ends in April, as follows: initial phase: December ($K_c = 0.4$), development phase: January ($K_c = 0.8$), mid-phase: February - March ($K_c = 1.15$), and late phase: April ($K_c = 0.3$). The crop coefficients for the different crops and growing stages are presented in **Annex 2**. It is assumed that there is always enough water available to assure that crops under irrigation never suffer water stress.

The rate of evapotranspiration coming from the irrigated area per month and per grid cell is calculated by multiplying the area equipped for irrigation with cropping intensity and crop evapotranspiration for each crop.

$$ET_{c(t)} = IA \times \sum_c (CI_c \times K_c \times ET_{0(t)})$$

with:

- t = time step (days)
- $ET_{c(t)}$ = evapotranspiration of an irrigated cell on t (mm)
- IA = area actually irrigated as percentage of cell area for the given grid cell (ha)
- C = crop under irrigation
- \sum_c = sum of the different crops
- CI_c = cropping intensity for crop c (-)
- K_c = crop coefficient, varying for each crop and each growth stage (-)
- ET_0 = reference evapotranspiration (mm)

The difference between the calculated evapotranspiration of the irrigated area, ET_c , and **actual evapotranspiration under non-irrigated conditions** (section 3.1), ET_a , is equal to the incremental evapotranspiration due to irrigation, also called the irrigation consumptive water use (ICU):

$$ICU_{(t)} = ET_{c(t)} - ET_{a(t)}$$

The amount of irrigation consumptive water use is computed for each country and for a specific year. In addition, in the case of flood paddy fields, an additional amount of water (20 cm) for land preparation and flooding for plant protection is added to this rainfall deficit for the calculation of the irrigation water requirement.

$$IWR = (ICU_{(yr)} \times A_{cell} + 0.2 \times A_{paddy(yr)}) \times 10$$

with:

IWR	= total irrigation water requirements per year (m ³)
ICU _(yr)	= irrigation consumptive water use per year (mm)
A _{cell}	= area of the grid cell (ha)
A _{paddy(yr)}	= area under paddy irrigation per year (ha)

This extra water for paddy fields will be mostly returned to rivers or underlying aquifers and thus is not part of the irrigation consumptive water use. The element of irrigation water requirement dedicated to salt leaching is not estimated and thus not included in estimations proposed in this study due to lacking data regarding salinization which is highly contextual. The calculated irrigation water requirement corresponds to net irrigation water requirement, which does not include water lost in delivery (conveyance, distribution, application).

Resulting irrigation water requirements, after **corrections** (section 4.2) when necessary, are available by country under the variable 'Irrigation water requirement' [code 4260] in the **AQUASTAT database**. Based on these irrigation water requirements, irrigation water withdrawals (3rd step) are estimated for countries where this data is unavailable. Estimations of both irrigation water requirement and irrigation water withdrawal are compared in synthesizing **Table 4** by country or **Table 5** by region.

4. Irrigation water withdrawal

Assessing the impact of irrigation on water resources requires an estimate of the water effectively withdrawn for irrigation, i.e. the volume of water extracted from rivers, lakes and aquifers for irrigation purposes. Irrigation water withdrawal normally far exceeds the net irrigation water requirement because of water lost in its distribution from its source to the crops.

For 118 out of the 165 countries and territories information on water withdrawal is available from national sources (i.e. not estimated). In order to fill the data gaps regarding the 47 countries for which this information is not available (or only estimated), a ratio of the estimated irrigation water requirement to the actual irrigation water withdrawal is calculated for countries for which such data is available:

$$WR \text{ Ratio} = IWR / IWW$$

with:

WR Ratio	= water requirement ratio (irrigation efficiency) (-)
IWR	= irrigation water requirement per year (m ³)
IWW	= irrigation water withdrawal per year (m ³)

This ratio is often referred to as '**water use efficiency**' (FAO, 2012c) in agriculture or 'irrigation efficiency'. However, the use of the expression is subject of debate (Perry and Kite, 2003). The word 'efficiency' implies that that water is being wasted when the efficiency is low. This is not necessarily so. The recoverable fraction of the non-consumed water can be used further downstream in the irrigation scheme, it can flow back to the river or it can contribute to the recharge of aquifers. It is for this reason that in this study the term 'water requirement ratio' is employed when referring to the ratio between irrigation water requirement and the amount of water withdrawn for irrigation.

The average of the water requirement ratio calculated at sub-regional or regional level enables, in combination with the irrigation water requirement calculated in the previous step, the estimation of

irrigation water withdrawal (below) for countries with missing data. In addition, it also permits to cross-check data and thus their **correction** (section 4.2).

4.1. Estimation of irrigation water withdrawal

Data on country agricultural water withdrawal (AQUASTAT variable code 4250) and water withdrawal for irrigation (AQUASTAT variable code 4475) have been collected through the AQUASTAT country surveys (FAO, 1995; 1997a; 1997b; 1999; 2000; 2005a; 2009b; 2012a). In addition, updating was carried out especially for this exercise and in some cases more recent national statistics were obtained. For improved accuracy, water withdrawal for irrigation was preferred when available over agricultural water withdrawal [code 4250], which also includes water withdrawal for livestock and aquaculture. However, because irrigation is the most significant agricultural user of water, in the absence of specific data for irrigation water withdrawal, the agricultural water withdrawal is assumed to refer only to irrigation. In addition, the water withdrawal data referring to the crop calendar's year (or the closest year) was selected when available; thus the latest values are not always the ones used for calculation.

After selection of the most appropriate year for the water withdrawal data, water requirement ratios at country level have been calculated, by comparing them with the calculated figures on irrigation water requirement.

To assign a ratio to countries for which agricultural or irrigation water withdrawal information was unavailable or estimated, a regional rather than national approach was used in an effort to reduce the large uncertainties on the value at country level. Thus correction ratios have been calculated at sub-regional or regional level when at least two coherent country ratios were available. These exclude ratios either below 15 percent or above 85 percent considered inconsistent for being too low or too high. These were then also replaced by these correction ratios:

$$CR_r = IWR_r / IWW_r$$

with:

r = region

CR_r = correction ratio for the region

IWR_r = total irrigation water requirement for the countries with coherent ratios only in the region

IWW_r total irrigation water withdrawal for the countries with coherent ratios only in the region

These sub-regional or, when not available, regional corrections ratios have been assigned to countries with previously estimated or unavailable water withdrawals. They have been used to make a new estimation of water withdrawal for irrigated agriculture per country by dividing the irrigation water requirement of the country by its assigned correction ratio. These new estimations refer to the year of their respective crop calendar. They are indicated as modelled data (with the symbol 'L') in the **AQUASTAT database** and in italic in **Table 4**. The total actual renewable water resources for each country are also presented in **Table 4** and are used in the calculation of the pressure on water resources due to irrigation (irrigation water withdrawal as a percentage of total renewable water resources). Regional data and analysis are available in the **regional summary** (section 4.3. below).

In addition to the above estimations of water withdrawal for irrigation in order to fill the corresponding variable [code 4475] in the AQUASTAT database, the water requirement ratios also identify incoherent pairs of irrigation water requirement and irrigation water withdrawal and therefore give the opportunity to apply some corrections.

4.2. Corrections of irrigation water requirement and withdrawal

The water requirement ratio identifies incoherent pairs of data on irrigation water requirement and irrigation water withdrawal, and has been fixed in this review at either below 15 percent or above 85 percent. In these cases, either the values of irrigation water requirement or the values of irrigation water withdrawal are corrected based on expert judgement.

Corrections of irrigation water requirement—based on the corresponding correction ratios and their respective water withdrawal (as explained above)—apply in the following three situations:

- *For countries with high inter-annual variability of precipitation (Australia, Middle East countries, Tunisia), and high (> 85 percent) or low (< 15 percent) individual country ratios:* The use of the long-term national average precipitation for the calculation of the irrigation water requirement results most of the time in distorted calculated ratios for a particular year: high ratio for a wet year or low ratio for a dry year. As a case in point, precipitation in Australia was predominantly larger than average in 2010 (ABS, 2011) resulting in an individual country average above 100 percent. In these cases, the individual country ratio was replaced by the correction ratio for its sub-region (or region when not available).
- *For countries with moderate climatic conditions and individual country ratios over 85 percent (such as several European countries) or below 15 percent:* Again, the long-term national average precipitation used in the model for the calculation of the irrigation water requirement explains the ratio's bias. For countries with moderate climatic conditions AAI_{full} varies a lot from one year to the other depending on the early spring precipitation. When the irrigation water withdrawal and irrigation water requirement used for the calculation of the water requirement ratio do not refer to the same year, the distortion can be important. Another misrepresentation in such countries comes from the actual amount of water applied which varies according to the spring and summer rainfall. When summer rainfall is higher than the long-term average, irrigation is supplemental only so that the water requirement ratio obtained is extremely high. On the contrary, when rainfall is lower than the long-term average, a higher volume of irrigation water is required to compensate for the missing precipitation, so that the water requirement ratio obtained is extremely low. In European countries, for which both elements of the water requirement ratio refer to the same year, the actual volume of irrigation water applied explains any distortion. This puts a limitation of the model used for **irrigation water requirement** (section 3) calculations in evidence. In these cases, the individual country ratio was replaced by the correction ratio for its sub-region (or region when not available).
- *For countries with very limited (< 1 000 ha) AAI_{full} and AHI_{full} :* Their calculated irrigation water requirement was nil, either because the unit used (km^3 , that is $10^9 m^3$) is too large for such limited irrigation or due to lack of geo-referenced data. This represents another limitation of the model used for the calculation of the irrigation water requirement. Their individual country ratio was replaced by the average ratio for its sub-region (or region when not available).

In addition, a correction of irrigation water withdrawal is also applied to some African countries:

- *Where the portion of AEI_{full} represents less than 50 percent of the AEI_{tot} :* Africa, as mentioned in the **regional summary of irrigated crop calendars** (section 2.2), is indeed the only continent where such small proportions exist (**Table 2a**). Areas of equipped lowlands and spate irrigation outside of Africa exist only in a very limited number of countries (Cuba, Kazakhstan, Yemen, Georgia, Mongolia, Myanmar, Malaysia, Pakistan and Albania) and always representing only a small proportion of the total areas equipped for irrigation. In those African countries where AEI_{full} is less or close to 50 percent of AEI_{tot} , the irrigation water withdrawal figure was corrected relatively to AEI_{full} . This is based on the fact that often the data obtained for water withdrawal for

irrigation include not only AEI_{full} but also equipped lowlands and sometimes even spate irrigation.

The resulting irrigation water requirement and irrigation water withdrawal for 167 countries are displayed in **Table 4** together with their corresponding water requirement ratio. In addition, total actual renewable freshwater resources for each country are also presented and used in the calculation of the pressure on freshwater resources due to irrigation (water withdrawal for irrigation as a percentage of total actual renewable freshwater resources). The direct use of **non-conventional water** was not considered in this estimate of water pressure, but is done in the **MDG water indicator**. Regional data and analysis are available in the 'Pressure on water resources due to irrigation' section (below).

4.3. Pressure on water resources due to irrigation: regional summary of water requirement ratio

Water requirement ratios obtained for individual countries (**Table 4**) are compiled and analyzed by continent and by income-based grouping (high, middle and low income, as defined as of October 2012). Also, like in the regional summary of irrigated crop calendars, special attention is given to LIFDCs and LDCs (**Table 5**).

On average, for the 167 countries, it is estimated that the water requirement ratio is around 56 percent, varying from 23 percent in areas of abundant water resources (Central America) to 72 percent in Northern Africa where water scarcity calls for higher water requirement ratios. In addition to geographical disparity based on water availability, water requirement ratios also may depend on financial resources availability as the income-based grouping evidences with increasing ratios for low, middle and high income countries: 48, 56 and 61 percent respectively. The LDCs display an even lower water requirement ratio with only 50 percent. The lack of financial resources may impede the appropriate operation and maintenance of irrigation systems and the development of smallholder/small-scale irrigation, as well as the development of pressurized irrigation systems—more expensive than surface irrigation systems but with higher irrigation efficiency at field scale. Financial resources also make possible the capacity building of irrigators and water officials and the monitoring of water resources among other. The higher water requirement ratios of the high income countries counterbalances both their lower cropping intensity and lower portion of areas equipped actually irrigated (explained in the **regional summary of irrigated crop calendars**, section 2.2). At country level, variations are even higher with water requirement ratios varying from 18 percent to 85 percent. In addition, relations to both water availability and income disappear, with a number of water-stressed or high income countries having relatively low water requirement ratios and some water abundant or low income countries having relatively high water requirement ratios (see also the **discussion** in section 5. about the limitations of this review).

Irrigation water withdrawal was estimated to account for only 5 percent of total renewable water resources for the 167 countries studied (**Table 5**). However, there are wide variations between regions, with the Northern Africa region using 77 percent of its water resources in irrigation and the Middle East 40 percent (and the Arabian Peninsula, one of its sub-regions, uses 472 percent of its resources), while Latin America barely uses 2 percent and Europe 1 percent. Ten countries (mostly from the Arabian Peninsula, but also from Northern Africa or Central Asia) used volumes of water for irrigation which are several times larger than their annual renewable water resources in their respective reference year. Despite the distortion of these ratios by the use of significant volume of secondary freshwater (water previously withdrawn and returned to rivers and groundwater) and non-conventional sources of water—direct use of treated or untreated wastewater, agricultural drainage water and even desalinated water for agriculture—as well as fossil groundwater in some cases, the situation remains critical in these countries. An additional 22 countries used more than 20 percent of their water resources, a threshold that could be used to indicate impending water scarcity. For other countries, relatively low national figures may give an overly optimistic impression of the level of water stress: China, for instance, is facing severe water shortage in the north while the south still has abundant water resources. Overexploitation

of renewable groundwater also occurs at the local level in several countries of the Near East, Northern Africa, South and East Asia, Central America and in the Caribbean, even if at the national level the water balance may still be positive.

5. Discussion: limitations of the study

The geographical coverage of the **irrigated crop calendars** (section 2) their corresponding **irrigation water requirement** (section 3) calculations and estimation of **irrigation water withdrawal** (section 4) detailed in the previous pages, consists of 167 countries (including two territories) where most irrigation is practiced worldwide (**Annex 3**). The 32 remaining countries (as well as all other territories), are excluded due to the lack of data available on areas equipped for irrigation and irrigated crops either:

- Countries where irrigation is assumed to be inexistent (because of climatic conditions or limited areas): Faroe Islands, Iceland, Holy See, Liechtenstein, Luxembourg, Monaco, San Marino; or
- Countries where irrigation may be practiced but where not sufficient data is available for the analysis: Andorra, Bahamas, Bosnia and Herzegovina, Comoros, Cook Islands, Croatia, Dominica, Equatorial Guinea, Fiji, Kiribati, Maldives, Marshall Islands, Micronesia (Federated States of), Nauru, Niue, Palau, Papua New Guinea, Samoa, Sao Tome and Principe, Singapore, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu.

For countries included in this study, some limitations exist in the way crop calendars are prepared, irrigation water requirement modelled and water requirement ratios estimated (some already mentioned earlier in this review):

- In the absence of national data for irrigated harvested crops, some crop calendars are based on 'World agriculture: towards 2050/2080' (FAO, 2011a) or **World agriculture: towards 2030/2050** (FAO, 2006), which are estimations only.
- Exact location of the different types of irrigated crops in the country is unknown (and thus the exact climate conditions under which they are cultivated). However because the areas equipped for irrigation are geo-referenced in the **Global map of irrigation areas** (FAO, 2010), their location can be equally distributed among those, reducing thus the uncertainty associated with their climatic conditions, but not where what crop is grown.
- Data on AAI_{full} are easily confused with data on AEI_{full} or are often unavailable. In such cases, AAI_{full} is assumed similar to AEI_{full} . In countries with a large part of mobile irrigation equipment (towable system, traveller spray, etc.), such as in high income countries, AAI_{full} becomes technically AEI_{full} .
- Despite selection of data in such a way that as much as possible similar years for both the crop calendar (and therefore the irrigation water requirement calculations) and the irrigation water withdrawal are used, out of 118 countries for which water withdrawal data are not estimated, only 52 refer to the same year. For the other countries, accuracy is limited by potential discrepancies between years.
- Although water withdrawal for irrigation was preferred when available over agricultural water withdrawal—which also includes water withdrawal for livestock and aquaculture—, in the absence of specific data for irrigation water withdrawal, the agricultural water withdrawal is assumed to refer only to irrigation.
- As previously mentioned in the **corrections** (section 4.2) applied, the irrigation water requirement is distorted by the use of long-term national average precipitation—in particular for countries with moderate climatic conditions or high inter-annual variability for precipitation. Although actual precipitation data could be used when available, the averages were still preferred for later comparison with the total actual renewable water resources which are also long-term national averages. However, this means that for such countries, individual country ratios might misrepresent the reality if the precipitation for the corresponding year is quite different from the long-term average, even though the countries may fall into the 15-85 percent range considered as coherent.

- Distortion arises also from the assumption that optimal plant growth and thus complete satisfaction of the crop water demand always occurs—again, in particular for countries with moderate climatic conditions or high inter-annual variability for precipitation. This also means that for such countries, individual country ratios might misrepresent the reality if the irrigation water differs widely from the irrigation water requirements, even though the countries may fall into the 15-85 percent range considered as coherent.
- Another limitation of the analysis derives from the use of (long-term average) annual renewable water resources which does not account for monthly variations, especially in monsoon climate, and thus the actual availability of water.
- Finally, and in addition to the above limitations, individual country ratios that are not corrected directly reflect the data gathered (and often provided by the respective governments). Even though differences between neighbouring countries with similar context might sometimes seem difficult to explain. However we deliberately choose to keep as much as possible calculations based on 'actual' data (i.e. data obtained from national references and statistics), rather than correcting them by sub-regional averages. We seek to improve the coherency of country ratio as soon as more accurate data are available.

Despite a similar exercise undertaken almost 10 years ago, some improvements in accuracy taken on in this review impede to compare their respective results:

- The irrigated crop calendars are established for AEI_{full} , as opposed to AEI_{tot} in the previous exercise, which includes equipped lowlands and spate irrigation.
- The irrigated crop calendars are established for actual figures of AAI, as opposed to the assumption that AAI is 85 percent of AEI in the previous exercise.
- The irrigated crop calendars are established for the exact year of the irrigated crops data, while it was assigned to the year 2000 for all countries in the previous exercise.
- The water requirement ratios are calculated with water withdrawal data referring to the closest year available (to the crop calendar and thus irrigation water requirement), instead of extrapolated water withdrawals relative to the change in area under irrigation as calculated from FAOSTAT (FAO, 2012b) figures of 'total area equipped for irrigation' in the previous exercise. This prevents from any distortion introduced by FAOSTAT yearly figures, which in some cases may be different from the AQUASTAT data.

6. Conclusions

The modelling approach described in this review combines data from the AQUASTAT database, such as harvested irrigated areas and crops, cropping patterns and intensity, as well as different elements of the climate in order to assess the amount of water diverted and required for irrigation. The development of 'irrigated crop calendars' for each country, based on FAO's knowledge of the countries' agriculture is probably one of the most sophisticated ways to ensure reliable assessment of irrigation water requirements.

The robustness of this model is now well recognized and it has been used for a number of significant FAO exercises, such as the **World agriculture: towards 2015/2030; an FAO perspective** (FAO, 2003), the **World agriculture: towards 2030/2050** (FAO, 2006), the 'World agriculture: towards 2050/2080' (FAO, 2011a), and more recently the **State of the world's land and water resources for food and agriculture** or SOLAW (FAO, 2011b). The accuracy of the approach has also been validated by national statistics that became available in the meantime. This review however has the additional benefits of updated data as well as a handmade meticulous selection and correction of individual data, based on expert judgment.

Worldwide, over 307 million hectares are currently equipped for irrigation, of which 304 million hectares are equipped for full control irrigation and 261 million hectares are equipped for full control and actually irrigated. From these actually irrigated areas and thanks to the higher cropping intensity (CI) permitted by irrigation, over 346 million hectares of irrigated crops are

harvested (meaning a global CI of 133 percent), the total irrigation water requirements of which account for 1 500 km³. To meet these requirements, 2 673 km³ are withdrawn (from primary and secondary renewable water resources, fossil groundwater and non-conventional sources of water), resulting in a water requirement ratio of 56 percent. However, both the methodology's improvement (see last bullet points of the **Discussion** in section 5) and the geographical coverage expansion since the previous modelling exercise (from 90 to 167 countries) prevent from attributing the progress of this ratio (which was 38 percent in 2000, the previous exercise) to refined irrigation or water management.

Despite the fact that this water requirement ratio is used in this review as a tool for estimation of irrigation water withdrawal rather than as a result as such, it could represent the weakness of this analysis at country level, both because of the scarce information available and for conceptual reasons (Perry and Kite, 2003). Conceptually, used at such scale water requirement ratio cannot differentiate between consumptive and non-consumptive flows, productive and unproductive use, and recoverable or unrecoverable flows (Perry et al., 2009). In particular it cannot accommodate recoverable return flows and the unproductive consumptive flows which return to the rivers or the aquifers—either from where it originates or another. In large irrigation schemes or areas, it is therefore certain that the amount of water 'lost' in conveyance or in drainage from irrigated fields is reused downstream and that the irrigation scheme ratio or basin ratio can therefore be much higher than field ratio. The problem is particularly relevant in cascade irrigation of paddy rice in areas like South Eastern Asia or with significant use of agricultural drainage water like in Egypt. This study cannot distinguish between basin, scheme and field water requirement ratios by lack of detailed information on the type of irrigation schemes and of geo-referenced water withdrawal data. Another drawback originating from this ratio is the difficulty to account for withdrawal of secondary freshwater, in particular when agricultural drainage water is discharged directly in canals and thus usually not metered. Besides, information regarding the irrigated crops' yield is lacking to account for **water productivity**. Also water requirement ratio does not consider at all the benefits associated with water (Gleick et al, 2011) such as better water quality, healthier ecosystems or regular agricultural production. Nonetheless, the regional analysis performed in this review tends to erase countries' specificities reflected in the ratio and allows for a meaningful analysis.

Finally, the AQUASTAT team would always give preference to reliable and coherent national statistics over any of the modelled or estimated data obtained in this review. As soon as such data become available, results of this review will be replaced in the database. In addition, estimated and modelled data are proposed to supplement the information already in the database, and will never be used for further estimation or modelling.

7. References

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8. Tables

TABLE 2A

Summary table of areas equipped for irrigation and cropping intensity per region

	AHI _{full} (1 000 ha)	Cropping intensity (%)	AAI _{full} (1 000 ha)	AAI _{full} /AEI _{full} (%)	AEI _{full} (1 000 ha)	AEI _{full} /AEI _{tot} (%)	AEI _{tot} (1 000 ha)
Africa	1 4446	138	10 489	84	12 494	93	13 457
<i>Northern Africa</i>	8 698	145	6 003	96	6 231	98	6 340
<i>Sub-Saharan Africa</i>	5 748	128	4 485	72	6 263	88	7 117
Central Africa	58	132	44	36	121	95	128
Eastern Africa	769	130	592	99	601	97	621
Gulf of Guinea	372	113	330	89	372	65	576
Indian Ocean Islands	1 102	193	571	52	1 107	100	1 107
Southern Africa	2 076	112	1 849	94	1 963	95	2 063
Sudano-Sahelian	1 370	125	1 099	52	2 098	80	2 620
Americas	43 901	107	41 014	84	48 802	100	48 883
<i>Northern America</i>	29 843	105	28 438	84	33 874	100	33 874
<i>Central America and Caribbean</i>	1 323	117	1 135	59	1 927	96	2 009
Central America	713	115	620	91	680	100	680
Caribbean: Greater and Lesser Antilles	609	118	515	41	1 247	94	1 329
<i>Southern America</i>	12 735	111	11 442	88	13 001	100	13 001
Andean	3 421	106	3 230	75	4 320	100	4 320
Guyana	230	129	179	89	201	100	201
Brazil	5 329	120	4 454	97	4 601	100	4 601
Southern America	3 743	105	3 573	92	3 873	100	3 873
Asia	270 570	141	192 419	89	216 833	99	218 766
<i>Middle East</i>	20 343	117	17 381	75	23 260	99	23 530
Near East	8 002	109	7 351	71	10 366	100	10 379
Arabian Peninsula	2 055	105	1 948	78	2 496	92	2 722
Caucus	1 693	102	1 658	79	2 101	99	2 132
Iran	8 593	134	6 423	77	8 297	100	8 297
<i>Central Asia</i>	10 823	103	10 465	85	12 360	93	13 227
<i>Southern and Eastern Asia</i>	239 405	145	164 573	91	181 213	100	182 009
South Asia	101 989	121	84 607	93	90 732	99	91 452
East Asia	101 174	172	58 759	87	67 757	100	67 784
Mainland Southeast Asia	19 647	160	12 316	90	13 747	100	13 774
Maritime Southeast Asia	16 596	187	8 891	99	8 977	100	8 999
Europe	14 958	100	14 960	65	23 024	99	23 176
<i>Western and Central Europe</i>	10 732	100	10 734	66	16 157	99	16 309
Central Europe	505	100	505	39	1 289	100	1 289
Mediterranean Europe	7 678	100	7 678	76	10 100	99	10 252
Northern Europe	377	100	378	49	778	100	778
Western Europe	2 173	100	2 173	54	3 990	100	3 990
<i>Eastern Europe and Russian Federation</i>	4 226	100	4 226	62	6 867	100	6 867
Eastern Europe	796	100	796	32	2 521	100	2 521
Russian Federation	3 430	100	3 430	79	4 346	100	4 346
Oceania	2 350	100	2 350	74	3 166	100	3 166
<i>Australia and new Zealand</i>	2 350	100	2 350	74	3 166	100	3 166
<i>Pacific Islands</i>	-	-	-	-	-	-	-
WORLD	346 214	133	261 226	86	304 313	99	307 441
High income countries	42 701	105	40 798	79	51 586	100	51 586
Middle income countries	284 563	139	205 134	87	235 187	99	237 771
Low income countries	18 950	124	15 294	87	17 540	97	18 084
Low Income Food Deficit Countries (LIFDC)	120 748	130	93 145	88	105 785	99	106 922
Least Developed Countries (LDC)	17 610	128	13 720	81	16 844	94	17 864

Note:

AHI = Harvested irrigated crop area

AAI = Actually irrigated area

AEI = Area equipped for irrigation

TABLE 2B

Summary table of areas equipped for irrigation (in percentage) per region

	AHI _{full} (%)	AAI _{full} (%)	AEI _{full} (%)	AEI _{tot} (%)
Africa	4.17	4.02	4.11	4.38
<i>Northern Africa</i>	2.51	2.30	2.05	2.06
<i>Sub-Saharan Africa</i>	1.66	1.72	2.06	2.31
Central Africa	0.02	0.02	0.04	0.04
Eastern Africa	0.22	0.23	0.20	0.20
Gulf of Guinea	0.11	0.13	0.12	0.19
Indian Ocean Islands	0.32	0.22	0.36	0.36
Southern Africa	0.60	0.71	0.65	0.67
Sudano-Sahelian	0.40	0.42	0.69	0.85
Americas	12.68	15.70	16.04	15.90
<i>Northern America</i>	8.62	10.89	11.13	11.02
<i>Central America and Caribbean</i>	0.38	0.43	0.63	0.65
Central America	0.21	0.24	0.22	0.22
Caribbean: Greater and Lesser Antilles	0.18	0.20	0.41	0.43
<i>Southern America</i>	3.68	4.38	4.27	4.23
Andean	0.99	1.24	1.42	1.40
Guyana	0.07	0.07	0.07	0.07
Brazil	1.54	1.70	1.51	1.50
Southern America	1.08	1.37	1.27	1.26
Asia	78.15	73.66	71.25	71.16
<i>Middle East</i>	5.88	6.65	7.64	7.65
Near East	2.31	2.81	3.41	3.38
Arabian Peninsula	0.59	0.75	0.82	0.89
Caucusus	0.49	0.63	0.69	0.69
Iran	2.48	2.46	2.73	2.70
<i>Central Asia</i>	3.13	4.01	4.06	4.30
<i>Southern and Eastern Asia</i>	69.15	63.00	59.55	59.20
South Asia	29.46	32.39	29.81	29.75
East Asia	29.22	22.49	22.27	22.05
Mainland Southeast Asia	5.67	4.71	4.52	4.48
Maritime Southeast Asia	4.79	3.40	2.95	2.93
Europe	4.32	5.73	7.57	7.54
<i>Western and Central Europe</i>	3.10	4.11	5.31	5.30
Central Europe	0.15	0.19	0.42	0.42
Mediterranean Europe	2.22	2.94	3.32	3.33
Northern Europe	0.11	0.14	0.26	0.25
Western Europe	0.63	0.83	1.31	1.30
<i>Eastern Europe and Russian Federation</i>	1.22	1.62	2.26	2.23
Eastern Europe	0.23	0.30	0.83	0.82
Russian Federation	0.99	1.31	1.43	1.41
Oceania	0.68	0.90	1.04	1.03
<i>Australia and new Zealand</i>	0.68	0.90	1.04	1.03
<i>Pacific Islands</i>	-	-	-	-
WORLD	100.00	100.00	100.00	100.00
High income countries	12.33	15.62	16.95	16.78
Middle income countries	82.19	78.53	77.28	77.34
Low income countries	5.47	5.85	5.76	5.88
Low Income Food Deficit Countries (LIFDC)	34.88	35.66	34.76	34.78
Least Developed Countries (LDC)	5.09	5.25	5.54	5.81

Note:

AHI = Harvested irrigated crop area
 AAI = Actually irrigated area
 AEI = Area equipped for irrigation

TABLE 3A

Summary of areas of irrigated harvested crops by region (in 1 000 hectares)

AQUASTAT - http://www.fao.org/nr/water/aquastat/water_use_agr/index.stm

	CEREALS	ROOTS	VEGETABLES	FRUITS	PULSES	SUGAR CROPS	OIL CROPS	BEVERAGE CROPS	FIBER CROPS	FODDER & PASTURES	OTHERS	IRRIGATED CROPS
Africa	6 262.1	408.2	1 794.0	1 388.3	367.5	747.6	643.0	65.9	671.0	2 014.3	83.9	14 446.0
<i>Northern Africa</i>	3 546.2	239.2	1 143.8	967.7	211.2	298.1	502.0	0.0	304.2	1 454.0	32.1	8 698.4
<i>Sub-Saharan Africa</i>	2 715.9	169.1	650.2	420.6	156.3	449.5	141.0	65.9	366.8	560.3	51.9	5 747.6
Central Africa	27.6	1.3	16.3	5.4	1.1	5.0	0.0	0.0	0.0	0.0	1.7	58.4
Eastern Africa	327.5	52.2	181.8	48.9	8.7	37.4	6.0	21.1	82.2	0.0	3.5	769.1
Gulf of Guinea	101.2	28.6	168.5	21.6	0.0	41.9	1.0	0.0	8.0	0.0	1.0	372.0
Indian Ocean Islands	1 062.4	0.0	1.0	0.04	0.003	36.5	0.1	0.0	1.2	0.0	0.5	1 101.8
Southern Africa	487.1	51.0	155.2	331.7	146.5	230.0	66.8	40.8	103.1	418.4	45.2	2 075.9
Sudano-Sahelian	710.0	35.9	127.5	12.9	0.0	98.6	67.1	4.0	172.4	141.9	0.1	1 370.3
Americas	16 189.5	776.4	2 901.6	4 544.3	1 182.6	3 656.9	4 356.0	431.2	1 721.2	7 903.8	225.9	43 889.6
<i>Northern America</i>	11 748.3	511.4	2 034.8	2 715.7	519.9	678.2	3 689.8	0.0	1 382.1	6 545.9	17.4	29 843.4
<i>Central America and Caribbean</i>	491.1	9.5	72.1	205.3	51.2	423.0	1.2	35.7	5.5	13.8	14.3	1 322.7
Central America	210.5	4.0	25.0	133.8	21.0	270.2	0.0	35.5	4.9	8.4	0.0	713.2
Caribbean: Greater and Lesser Antilles	280.6	5.5	47.1	71.5	30.2	152.7	1.2	0.2	0.6	5.5	14.3	609.5
<i>Southern America</i>	3 950.2	255.6	794.7	1 623.2	611.5	2 555.7	665.1	395.5	333.7	1 344.1	194.3	12 723.5
Andean	1 090.9	179.7	210.3	466.8	77.7	484.7	26.1	133.3	109.7	525.3	116.8	3 421.3
Brazil	1 706.9	23.0	151.8	213.5	315.9	1,705.2	624.2	262.2	207.0	55.0	64.0	5 328.7
Guyana	177.5	0.0	4.0	4.0	0.0	44.6	0.0	0.0	0.0	0.0	0.0	230.1
Southern America	974.9	52.8	428.5	938.9	217.9	321.1	14.7	0.0	17.0	763.8	13.5	3 743.4
Asia	184 431.4	3 101.8	14 402.3	10 823.6	5 616.6	7 415.1	18 911.3	555.1	12 017.8	11 065.6	2 229.7	270 570.3
<i>Middle East</i>	8 952.2	599.8	1 818.5	2 558.5	483.9	562.0	1 685.8	193.0	1 183.0	1 965.7	340.5	20 342.9
Near East	3 112.6	232.7	956.4	782.8	292.7	342.5	679.6	2.7	944.4	579.4	76.5	8 002.2
Arabian Peninsula	807.7	32.6	188.3	322.3	26.8	0.04	201.5	118.8	17.2	330.2	9.7	2 055.4
Caucasus	886.2	99.1	110.7	183.1	4.6	3.2	22.4	6.8	78.2	177.9	120.6	1 692.8
Iran (Islamic Republic of)	4 145.7	235.4	563.0	1 270.3	159.7	216.3	782.2	64.7	143.2	878.2	133.7	8 592.5
<i>Central Asia</i>	5 397.0	226.7	495.6	616.0	52.5	39.2	122.7	0.0	2 507.8	1 224.4	140.7	10 822.6
<i>Southern and Eastern Asia</i>	170 082.1	2 275.3	12 088.1	7 649.2	5 080.2	6 813.9	17 102.9	362.2	8 327.0	7 875.5	1 748.5	239 404.8
East Asia	69 371.5	795.0	9 648.5	3 550.0	304.0	756.0	12 327.0	0.0	2 456.0	1 558.0	408.0	101 174.0
South Asia	69 647.7	961.1	1 958.0	2 862.4	4 556.2	5 458.7	3 643.9	40.0	5 702.8	6 317.5	840.3	101 988.7
Mainland Southeast Asia	16 076.6	273.5	166.4	1 198.5	220.0	438.8	515.6	322.2	168.2	0.0	266.9	19 646.5
Maritime Southeast Asia	14 986.3	245.7	315.3	38.3	0.0	160.5	616.3	0.0	0.0	0.0	233.3	16 595.6
Europe	4 636.1	781.0	1 276.7	2 353.8	392.8	483.4	1 369.3	15.9	212.2	3 367.7	69.3	14 958.2
<i>Western and Central Europe</i>	3 911.1	414.3	987.3	2 030.2	220.0	342.4	1 323.1	15.9	212.2	1 206.5	69.2	10 732.3
Western Europe	994.3	219.9	249.4	222.5	80.6	99.1	65.0	0.0	0.0	242.0	0.0	2 172.8
Central Europe	105.5	35.2	85.7	87.9	18.4	20.0	67.4	0.1	1.4	75.3	8.1	505.0
Mediterranean Europe	2 684.0	117.3	637.7	1 714.9	94.2	174.0	1 173.3	15.9	210.8	794.2	61.1	7 677.6
Northern Europe	127.2	41.8	14.5	5.0	26.8	49.2	17.4	0.0	0.0	95.0	0.0	376.9
<i>Eastern Europe and Russian Federation</i>	725.0	366.7	289.4	323.5	172.8	141.0	46.2	0.0	0.0	2 161.2	0.1	4 225.9
Eastern Europe	128.0	66.7	81.4	83.5	54.8	24.0	46.2	0.0	0.0	311.2	0.1	795.9
Russian Federation	597.0	300.0	208.0	240.0	118.0	117.0	0.0	0.0	0.0	1 850.0	0.0	3 430.0
Oceania	318.2	0.0	131.4	340.4	0.0	212.6	60.0	16.3	153.2	1 117.6	0.0	2 349.7
<i>Australia and New Zealand</i>	318.2	0.0	131.4	340.4	0.0	212.6	60.0	16.3	153.2	1 117.6	0.0	2 349.7
<i>Pacific Islands</i>	-	-	-	-	-	-	-	-	-	-	-	-
WORLD	211 837.4	5 067.4	20 506.0	19 450.3	7 559.5	12 515.6	25 339.7	1 084.4	14 775.5	25 469.0	2 608.9	346 213.8
High income countries	16 407.2	974.7	3 354.1	4 295.0	432.1	969.1	5 251.5	35.0	1 908.6	9 004.6	69.3	42 701.1
Middle income countries	181 241.0	3 536.8	16 316.7	14 706.8	6 600.2	11 207.7	19 535.9	949.3	12 320.0	16 098.5	2 047.2	284 559.5
Low income countries	14 189.2	556.0	835.2	448.4	527.3	338.9	552.3	100.2	546.9	365.9	492.3	18 953.1
Low Income Food Deficit Countries (LIFDC)	85 707.0	1 574.7	3 985.6	3 659.8	3 931.0	4 983.9	4 110.7	227.7	5 275.6	6 238.3	1 053.4	120 747.7
Least Developed Countries (LDC)	13 445.6	397.2	813.9	401.8	442.7	391.9	453.1	215.9	429.1	270.7	448.6	17 710.4

TABLE 3B

Summary of areas of irrigated harvested crops (in percentage of the total irrigated crops over the region)

	CEREALS	ROOTS	VEGETABLES	FRUITS	PULSES	SUGAR CROPS	OIL CROPS	BEVERAGE CROPS	FIBER CROPS	FODDER & PASTURES	OTHERS	IRRIGATED CROPS
Africa	43.35	2.83	12.42	9.61	2.54	5.18	4.45	0.46	4.65	13.94	0.58	100.00
<i>Northern Africa</i>	40.77	2.75	13.15	11.12	2.43	3.43	5.77	0.00	3.50	16.72	0.37	100.00
<i>Sub-Saharan Africa</i>	47.25	2.94	11.31	7.32	2.72	7.82	2.45	1.15	6.38	9.75	0.90	100.00
Central Africa	47.26	2.24	27.87	9.29	1.96	8.56	0.00	0.00	0.00	0.00	2.83	100.00
Eastern Africa	42.58	6.79	23.63	6.35	1.13	4.87	0.78	2.74	10.68	0.00	0.45	100.00
Gulf of Guinea	27.22	7.69	45.31	5.81	0.00	11.28	0.27	0.00	2.15	0.00	0.27	100.00
Indian Ocean Islands	96.42	0.00	0.09	0.00	0.00	3.32	0.01	0.00	0.11	0.00	0.04	100.00
Southern Africa	23.47	2.46	7.48	15.98	7.06	11.08	3.22	1.97	4.97	20.16	2.18	100.00
Sudano-Sahelian	51.82	2.62	9.30	0.94	0.00	7.19	4.90	0.29	12.58	10.36	0.01	100.00
Americas	36.88	1.77	6.61	10.35	2.69	8.33	9.92	0.98	3.92	18.00	0.51	100.00
<i>Northern America</i>	39.37	1.71	6.82	9.10	1.74	2.27	12.36	0.00	4.63	21.93	0.06	100.00
<i>Central America and Caribbean</i>	37.13	0.72	5.45	15.52	3.87	31.98	0.09	2.70	0.41	1.05	1.08	100.00
Central America	29.51	0.56	3.51	18.76	2.94	37.89	0.00	4.97	0.68	1.17	0.00	100.00
Caribbean: Greater and Lesser Antilles	46.03	0.90	7.73	11.74	4.96	25.06	0.20	0.03	0.10	0.90	2.35	100.00
<i>Southern America</i>	31.02	2.01	6.24	12.75	4.80	20.07	5.22	3.11	2.62	10.56	1.53	100.00
Andean	31.89	5.25	6.15	13.64	2.27	14.17	0.76	3.90	3.21	15.35	3.41	100.00
Brazil	32.03	0.43	2.85	4.01	5.93	32.00	11.71	4.92	3.88	1.03	1.20	100.00
Guyana	73.61	0.00	1.66	1.66	0.00	18.49	0.00	0.00	0.00	0.00	0.00	100.00
Southern America	26.04	1.41	11.45	25.08	5.82	8.58	0.39	0.00	0.45	20.40	0.36	100.00
Asia	68.16	1.15	5.32	4.00	2.08	2.74	6.99	0.21	4.44	4.09	0.82	100.00
<i>Middle East</i>	44.01	2.95	8.94	12.58	2.38	2.76	8.29	0.95	5.82	9.66	1.67	100.00
Near East	38.90	2.91	11.95	9.78	3.66	4.28	8.49	0.03	11.80	7.24	0.96	100.00
Arabian Peninsula	39.30	1.59	9.16	15.68	1.31	0.00	9.81	5.78	0.84	16.07	0.47	100.00
Caucasus	52.35	5.85	6.54	10.82	0.27	0.19	1.33	0.40	4.62	10.51	7.13	100.00
Iran (Islamic Republic of)	48.25	2.74	6.55	14.78	1.86	2.52	9.10	0.75	1.67	10.22	1.56	100.00
<i>Central Asia</i>	49.87	2.09	4.58	5.69	0.48	0.36	1.13	0.00	23.17	11.31	1.30	100.00
<i>Southern and Eastern Asia</i>	71.04	0.95	5.05	3.20	2.12	2.85	7.14	0.15	3.48	3.29	0.73	100.00
East Asia	68.57	0.79	9.54	3.51	0.30	0.75	12.18	0.00	2.43	1.54	0.40	100.00
South Asia	68.29	0.94	1.92	2.81	4.47	5.35	3.57	0.04	5.59	6.19	0.82	100.00
Mainland Southeast Asia	81.83	1.39	0.85	6.10	1.12	2.23	2.62	1.64	0.86	0.00	1.36	100.00
Maritime Southeast Asia	90.30	1.48	1.90	0.23	0.00	0.97	3.71	0.00	0.00	0.00	1.41	100.00
Europe	30.99	5.22	8.54	15.74	2.63	3.23	9.15	0.11	1.42	22.51	0.46	100.00
<i>Western and Central Europe</i>	36.44	3.86	9.20	18.92	2.05	3.19	12.33	0.15	1.98	11.24	0.64	100.00
Western Europe	45.76	10.12	11.48	10.24	3.71	4.56	2.99	0.00	0.00	11.14	0.00	100.00
Central Europe	20.90	6.97	16.98	17.40	3.65	3.97	13.36	0.02	0.27	14.90	1.60	100.00
Mediterranean Europe	34.96	1.53	8.31	22.34	1.23	2.27	15.28	0.21	2.75	10.34	0.80	100.00
Northern Europe	33.76	11.09	3.86	1.33	7.10	13.06	4.60	0.00	0.00	25.20	0.00	100.00
<i>Eastern Europe and Russian Federation</i>	17.16	8.68	6.85	7.66	4.09	3.34	1.09	0.00	0.00	51.14	0.00	100.00
Eastern Europe	16.09	8.38	10.22	10.50	6.89	3.02	5.81	0.00	0.00	39.10	0.01	100.00
Russian Federation	17.41	8.75	6.06	7.00	3.44	3.41	0.00	0.00	0.00	53.94	0.00	100.00
Oceania	13.54	0.00	5.59	14.49	0.00	9.05	2.55	0.69	6.52	47.56	0.00	100.00
<i>Australia and New Zealand</i>	13.54	0.00	5.59	14.49	0.00	9.05	2.55	0.69	6.52	47.56	0.00	100.00
<i>Pacific Islands</i>	-	-	-	-	-	-	-	-	-	-	-	-
WORLD	61.18	1.46	5.92	5.62	2.18	3.61	7.32	0.31	4.27	7.36	0.75	100.00
High income countries	38.41	2.28	7.85	10.06	1.01	2.27	12.30	0.08	4.47	21.08	0.16	100.00
Middle income countries	63.69	1.24	5.73	5.17	2.32	3.94	6.87	0.33	4.33	5.66	0.72	100.00
Low income countries	74.86	2.93	4.41	2.37	2.78	1.79	2.91	0.53	2.89	1.93	2.60	100.00
Low Income Food Deficit Countries (LIFDC)	70.98	1.30	3.30	3.03	3.26	4.13	3.40	0.19	4.37	5.17	0.87	100.00
Least Developed Countries (LDC)	75.92	2.24	4.60	2.27	2.50	2.21	2.56	1.22	2.42	1.53	2.53	100.00

TABLE 3C

Summary of irrigated harvested crops (in percentage of the specific irrigated crop by region)

	CEREALS	ROOTS	VEGETABLES	FRUITS	PULSES	SUGAR CROPS	OIL CROPS	BEVERAGE CROPS	FIBER CROPS	FODDER & PASTURES	OTHERS	IRRIGATED CROPS
Africa	2.96	8.06	8.75	7.14	4.86	5.97	2.54	6.07	4.54	7.91	3.22	4.17
<i>Northern Africa</i>	1.67	4.72	5.58	4.98	2.79	2.38	1.98	0.00	2.06	5.71	1.23	2.51
<i>Sub-Saharan Africa</i>	1.28	3.34	3.17	2.16	2.07	3.59	0.56	6.07	2.48	2.20	1.99	1.66
Central Africa	0.01	0.03	0.08	0.03	0.02	0.04	0.00	0.00	0.00	0.00	0.06	0.02
Eastern Africa	0.15	1.03	0.89	0.25	0.11	0.30	0.02	1.94	0.56	0.00	0.13	0.22
Gulf of Guinea	0.05	0.56	0.82	0.11	0.00	0.34	0.00	0.00	0.05	0.00	0.04	0.11
Indian Ocean Islands	0.50	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.01	0.00	0.02	0.32
Southern Africa	0.23	1.01	0.76	1.71	1.94	1.84	0.26	3.77	0.70	1.64	1.73	0.60
Sudano-Sahelian	0.34	0.71	0.62	0.07	0.00	0.79	0.26	0.37	1.17	0.56	0.00	0.40
Americas	7.64	15.32	14.15	23.36	15.64	29.22	17.19	39.76	11.65	31.03	8.66	12.68
<i>Northern America</i>	5.55	10.09	9.92	13.96	6.88	5.42	14.56	0.00	9.35	25.70	0.67	8.62
<i>Central America and Caribbean</i>	0.23	0.19	0.35	1.06	0.68	3.38	0.00	3.29	0.04	0.05	0.55	0.38
Central America	0.10	0.08	0.12	0.69	0.28	2.16	0.00	3.27	0.03	0.03	0.00	0.21
Caribbean: Greater and Lesser Antilles	0.13	0.11	0.23	0.37	0.40	1.22	0.00	0.02	0.00	0.02	0.55	0.18
<i>Southern America</i>	1.86	5.04	3.88	8.35	8.09	20.42	2.62	36.47	2.26	5.28	7.45	3.68
Andean	0.51	3.55	1.03	2.40	1.03	3.87	0.10	12.30	0.74	2.06	4.48	0.99
Brazil	0.81	0.45	0.74	1.10	4.18	13.62	2.46	24.18	1.40	0.22	2.45	1.54
Guyana	0.08	0.00	0.02	0.02	0.00	0.36	0.00	0.00	0.00	0.00	0.00	0.07
Southern America	0.46	1.04	2.09	4.83	2.88	2.57	0.06	0.00	0.12	3.00	0.52	1.08
Asia	87.06	61.21	70.23	55.65	74.30	59.25	74.63	51.19	81.34	43.45	85.47	78.15
<i>Middle East</i>	4.23	11.84	8.87	13.15	6.40	4.49	6.65	17.80	8.01	7.72	13.05	5.88
Near East	1.47	4.59	4.66	4.02	3.87	2.74	2.68	0.25	6.39	2.27	2.93	2.31
Arabian Peninsula	0.38	0.64	0.92	1.66	0.35	0.00	0.80	10.95	0.12	1.30	0.37	0.59
Caucasus	0.42	1.95	0.54	0.94	0.06	0.03	0.09	0.62	0.53	0.70	4.62	0.49
Iran (Islamic Republic of)	1.96	4.65	2.75	6.53	2.11	1.73	3.09	5.97	0.97	3.45	5.13	2.48
<i>Central Asia</i>	2.55	4.47	2.42	3.17	0.69	0.31	0.48	0.00	16.97	4.81	5.39	3.13
<i>Southern and Eastern Asia</i>	80.29	44.90	58.95	39.33	67.20	54.44	67.49	33.40	56.36	30.92	67.02	69.15
East Asia	32.75	15.69	47.05	18.25	4.02	6.04	48.65	0.00	16.62	6.12	15.64	29.22
South Asia	32.88	18.97	9.55	14.72	60.27	43.62	14.38	3.69	38.60	24.80	32.21	29.46
Mainland Southeast Asia	7.59	5.40	0.81	6.16	2.91	3.51	2.03	29.71	1.14	0.00	10.23	5.67
Maritime Southeast Asia	7.07	4.85	1.54	0.20	0.00	1.28	2.43	0.00	0.00	0.00	8.94	4.79
Europe	2.19	15.41	6.23	12.10	5.20	3.86	5.40	1.47	1.44	13.22	2.66	4.32
<i>Western and Central Europe</i>	1.85	8.18	4.81	10.44	2.91	2.74	5.22	1.47	1.44	4.74	2.65	3.10
Western Europe	0.47	4.34	1.22	1.14	1.07	0.79	0.26	0.00	0.00	0.95	0.00	0.63
Central Europe	0.05	0.69	0.42	0.45	0.24	0.16	0.27	0.01	0.01	0.30	0.31	0.15
Mediterranean Europe	1.27	2.32	3.11	8.82	1.25	1.39	4.63	1.46	1.43	3.12	2.34	
Northern Europe	0.06	0.82	0.07	0.03	0.35	0.39	0.07	0.00	0.00	0.37	0.00	0.11
<i>Eastern Europe and Russian Federation</i>	0.34	7.24	1.41	1.66	2.29	1.13	0.18	0.00	0.00	8.49	0.00	1.22
Eastern Europe	0.06	1.32	0.40	0.43	0.73	0.19	0.18	0.00	0.00	1.22	0.00	0.23
Russian Federation	0.28	5.92	1.01	1.23	1.56	0.93	0.00	0.00	0.00	7.26	0.00	0.99
Oceania	0.15	0.00	0.64	1.75	0.00	1.70	0.24	1.50	1.04	4.39	0.00	0.68
<i>Australia and New Zealand</i>	0.15	0.00	0.64	1.75	0.00	1.70	0.24	1.50	1.04	4.39	0.00	0.68
<i>Pacific Islands</i>	-	-	-	-	-	-	-	-	-	-	-	-
WORLD	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
High income countries	7.75	19.23	16.35	22.08	5.72	7.74	20.72	3.23	12.92	35.35	2.66	12.33
Middle income countries	85.56	69.79	79.55	75.61	87.31	89.55	77.10	87.54	83.38	63.21	78.47	82.19
Low income countries	6.70	10.97	4.07	2.31	6.97	2.71	2.18	9.24	3.70	1.44	18.87	5.47
Low Income Food Deficit Countries (LIFDC)	40.46	31.08	19.43	18.82	52.00	39.82	16.22	21.00	35.71	24.49	40.38	34.88
Least Developed Countries (LDC)	6.35	7.84	3.97	2.07	5.86	3.13	1.79	19.91	2.90	1.06	17.19	5.12

TABLE 3D

Summary of irrigated harvested cereals by region (in 1 000 hectares and in percentage of the specific irrigated cereals)

	WHEAT	WHEAT (%)	RICE	RICE (%)	MAIZE	MAIZE (%)	MILLET	MILLET (%)	BARLEY	BARLEY (%)	SORGHUM	SORGHUM (%)	OTHER CEREALS	OTHER CEREALS (%)	IRRIGATED CEREALS	IRRIGATED CEREALS (%)
Africa	2 020.6	2.88	2 242.2	2.23	1 251.7	4.13	3.0	0.17	206.8	5.96	347.9	12.60	190.0	6.28	6 262.1	2.96
<i>Northern Africa</i>	<i>1 590.2</i>	<i>2.27</i>	<i>658.0</i>	<i>0.66</i>	<i>887.8</i>	<i>2.93</i>	<i>0.0</i>	<i>0.00</i>	<i>201.0</i>	<i>5.79</i>	<i>156.2</i>	<i>5.66</i>	<i>53.1</i>	<i>1.76</i>	<i>3 546.2</i>	<i>1.67</i>
<i>Sub-Saharan Africa</i>	<i>430.4</i>	<i>0.61</i>	<i>1 584.2</i>	<i>1.58</i>	<i>363.9</i>	<i>1.20</i>	<i>3.0</i>	<i>0.17</i>	<i>5.8</i>	<i>0.17</i>	<i>191.7</i>	<i>6.94</i>	<i>136.9</i>	<i>4.53</i>	<i>2 715.9</i>	<i>1.28</i>
Central Africa	0.0	0.00	15.4	0.02	12.3	0.04	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	27.6	0.01
Eastern Africa	23.2	0.03	130.0	0.13	148.3	0.49	0.0	0.00	5.8	0.17	0.0	0.00	20.3	0.67	327.5	0.15
Gulf of Guinea	19.0	0.03	63.2	0.06	19.0	0.06	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	101.2	0.05
Indian Ocean Islands	0.0	0.00	1 062.4	1.06	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	1 062.4	0.50
Southern Africa	279.3	0.40	18.5	0.02	158.8	0.52	0.0	0.00	0.0	0.00	0.0	0.00	30.6	1.01	487.1	0.23
Sudano-Sahelian	109.0	0.16	294.6	0.29	25.6	0.08	3.0	0.17	0.0	0.00	191.7	6.94	86.1	2.85	710.0	0.34
Americas	2 456.7	3.50	3 883.2	3.87	7 778.5	25.66	0.0	0.00	558.3	16.08	1 258.0	45.56	254.9	8.43	16 189.5	7.64
<i>Northern America</i>	<i>2 329.5</i>	<i>3.32</i>	<i>1 150.7</i>	<i>1.15</i>	<i>6 397.4</i>	<i>21.10</i>	<i>0.0</i>	<i>0.00</i>	<i>535.9</i>	<i>15.43</i>	<i>1 137.2</i>	<i>41.19</i>	<i>197.7</i>	<i>6.53</i>	<i>11 748.3</i>	<i>5.55</i>
<i>Central America and Caribbean</i>	<i>0.0</i>	<i>0.00</i>	<i>344.0</i>	<i>0.34</i>	<i>144.8</i>	<i>0.48</i>	<i>0.0</i>	<i>0.00</i>	<i>0.0</i>	<i>0.00</i>	<i>0.0</i>	<i>0.00</i>	<i>2.2</i>	<i>0.07</i>	<i>491.1</i>	<i>0.23</i>
Central America	0.0	0.00	97.0	0.10	113.4	0.37	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	210.5	0.10
Caribbean: Greater and Lesser Antilles	0.0	0.00	247.0	0.25	31.4	0.10	0.0	0.00	0.0	0.00	0.0	0.00	2.2	0.07	280.6	0.13
<i>Southern America</i>	<i>127.2</i>	<i>0.18</i>	<i>2 388.5</i>	<i>2.38</i>	<i>1 236.3</i>	<i>4.08</i>	<i>0.0</i>	<i>0.00</i>	<i>22.4</i>	<i>0.64</i>	<i>120.7</i>	<i>4.37</i>	<i>55.0</i>	<i>1.82</i>	<i>3 950.2</i>	<i>1.86</i>
Andean	0.0	0.00	656.5	0.65	374.4	1.23	0.0	0.00	20.7	0.59	12.7	0.46	26.6	0.88	1 090.9	0.51
Brazil	19.0	0.03	1 128.9	1.13	559.0	1.84	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	1 706.9	0.81
Guyana	0.0	0.00	177.5	0.18	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	177.5	0.08
Southern America	108.2	0.15	425.6	0.42	302.9	1.00	0.0	0.00	1.7	0.05	108.0	3.91	28.4	0.94	974.9	0.46
Asia	64 791.2	92.37	93 617.5	93.31	18 773.7	61.93	1 791.5	99.83	2 190.6	63.09	1 155.2	41.84	2 111.6	69.80	184 431.4	87.06
<i>Middle East</i>	<i>5 681.7</i>	<i>8.10</i>	<i>747.1</i>	<i>0.74</i>	<i>723.3</i>	<i>2.39</i>	<i>7.9</i>	<i>0.44</i>	<i>1 266.7</i>	<i>36.48</i>	<i>189.0</i>	<i>6.84</i>	<i>336.7</i>	<i>11.13</i>	<i>8 952.2</i>	<i>4.23</i>
Near East	1 853.2	2.64	119.0	0.12	661.6	2.18	0.0	0.00	453.7	13.07	0.0	0.00	25.2	0.83	3 112.6	1.47
Arabian Peninsula	532.5	0.76	0.0	0.00	19.2	0.06	7.9	0.44	35.5	1.02	189.0	6.84	23.6	0.78	807.7	0.38
Caucasus	661.9	0.94	0.0	0.00	42.5	0.14	0.0	0.00	170.0	4.89	0.0	0.00	11.9	0.39	886.2	0.42
Iran (Islamic Republic of)	2 634.1	3.76	628.1	0.63	0.0	0.00	0.0	0.00	607.5	17.50	0.0	0.00	276.0	9.12	4 145.7	1.96
<i>Central Asia</i>	<i>4 263.4</i>	<i>6.08</i>	<i>384.1</i>	<i>0.38</i>	<i>379.6</i>	<i>1.25</i>	<i>0.0</i>	<i>0.00</i>	<i>361.0</i>	<i>10.40</i>	<i>0.0</i>	<i>0.00</i>	<i>8.8</i>	<i>0.29</i>	<i>5 397.0</i>	<i>2.55</i>
<i>Southern and Eastern Asia</i>	<i>54 846.1</i>	<i>78.19</i>	<i>92 486.3</i>	<i>92.18</i>	<i>17 670.8</i>	<i>58.29</i>	<i>1 783.5</i>	<i>99.39</i>	<i>563.0</i>	<i>16.22</i>	<i>966.3</i>	<i>35.00</i>	<i>1 766.1</i>	<i>58.38</i>	<i>170 082.1</i>	<i>80.29</i>
East Asia	22 508.5	32.09	32 170.0	32.06	12 954.0	42.73	0.0	0.00	0.0	0.00	0.0	0.00	1 739.0	57.49	69 371.5	32.75
South Asia	32 260.6	45.99	30 990.7	30.89	3 056.5	10.08	1 783.5	99.39	563.0	16.22	966.3	35.00	27.1	0.90	69 647.7	32.88
Mainland Southeast Asia	77.0	0.11	15 712.1	15.66	287.5	0.95	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	16 076.6	7.59
Maritime Southeast Asia	0.0	0.00	13 613.6	13.57	1 372.7	4.53	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	14 986.3	7.07
Europe	705.6	1.01	567.0	0.57	2 460.1	8.12	0.0	0.00	516.3	14.87	0.0	0.00	387.2	12.80	4 636.1	2.19
<i>Western and Central Europe</i>	<i>481.6</i>	<i>0.69</i>	<i>407.0</i>	<i>0.41</i>	<i>2 305.1</i>	<i>7.60</i>	<i>0.0</i>	<i>0.00</i>	<i>421.3</i>	<i>12.13</i>	<i>0.0</i>	<i>0.00</i>	<i>296.1</i>	<i>9.79</i>	<i>3 911.1</i>	<i>1.85</i>
Western Europe	30.2	0.04	0.0	0.00	841.8	2.78	0.0	0.00	20.6	0.59	0.0	0.00	101.7	3.36	994.3	0.47
Central Europe	0.0	0.00	4.2	0.00	91.0	0.30	0.0	0.00	0.0	0.00	0.0	0.00	10.3	0.34	105.5	0.05
Mediterranean Europe	417.5	0.60	402.8	0.40	1 372.3	4.53	0.0	0.00	330.8	9.53	0.0	0.00	160.7	5.31	2 684.0	1.27
Northern Europe	33.9	0.05	0.0	0.00	0.0	0.00	0.0	0.00	69.9	2.01	0.0	0.00	23.5	0.78	127.2	0.06
<i>Eastern Europe and Russian Federation</i>	<i>224.0</i>	<i>0.32</i>	<i>160.0</i>	<i>0.16</i>	<i>155.0</i>	<i>0.51</i>	<i>0.0</i>	<i>0.00</i>	<i>95.0</i>	<i>2.74</i>	<i>0.0</i>	<i>0.00</i>	<i>91.0</i>	<i>3.01</i>	<i>725.0</i>	<i>0.34</i>
Eastern Europe	0.0	0.00	21.0	0.02	100.0	0.33	0.0	0.00	0.0	0.00	0.0	0.00	7.0	0.23	128.0	0.06
Russian Federation	224.0	0.32	139.0	0.14	55.0	0.18	0.0	0.00	95.0	2.74	0.0	0.00	84.0	2.78	597.0	0.28
Oceania	167.6	0.24	18.9	0.02	50.4	0.17	0.0	0.00	0.0	0.00	0.0	0.00	81.3	2.69	318.2	0.15
<i>Australia and New Zealand</i>	<i>167.6</i>	<i>0.24</i>	<i>18.9</i>	<i>0.02</i>	<i>50.4</i>	<i>0.17</i>	<i>0.0</i>	<i>0.00</i>	<i>0.0</i>	<i>0.00</i>	<i>0.0</i>	<i>0.00</i>	<i>81.3</i>	<i>2.69</i>	<i>318.2</i>	<i>0.15</i>
<i>Pacific Islands</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WORLD	70 141.7	100.00	100 328.8	100.00	30 314.3	100.00	1 794.5	100.00	3 472.0	100.00	2 761.1	100.00	3 025.0	100.00	211 837.4	100.00
High income countries	3 001.0	4.28	4 169.9	4.16	7 298.5	24.08	0.0	0.00	786.5	22.65	565.3	20.47	586.1	19.37	16 407.2	7.74
Middle income countries	64 109.7	91.40	86 814.6	86.53	21 852.6	72.09	1 791.5	99.83	2 459.1	70.83	2 182.1	79.03	2 031.5	67.16	181 241.0	85.55
Low income countries	3 031.0	4.32	9 344.3	9.31	1 163.3	3.84	3.0	0.17	226.4	6.52	13.7	0.50	407.5	13.47	14 189.2	6.70
Low Income Food Deficit Countries (LIFDC)	31 100.2	44.34	45 436.9	45.29	5 012.3	16.53	1 316.9	73.39	1 230.2	35.43	1 103.7	39.98	506.8	16.75	85 707.0	40.46
Least Developed Countries (LDC)	2 524.2	3.60	9 309.0	9.28	1 101.1	3.63	10.9	0.61	133.0	3.83	234.6	8.50	132.7	4.39	13 445.6	6.35

TABLE 3E
Summary of irrigated harvested cereals (in percentage of total irrigated cereals by region)

AQUASTAT - http://www.fao.org/nr/water/aquastat/water_use_agr/index.stm

	WHEAT	RICE	MAIZE	MILLET	BARLEY	SORGHUM	OTHER CEREALS	IRRIGATED CEREALS
Africa	32.27	35.81	19.99	0.05	3.30	5.55	3.03	100
<i>Northern Africa</i>	44.84	18.56	25.03	0.00	5.67	4.40	1.50	100
<i>Sub-Saharan Africa</i>	15.85	58.33	13.40	0.11	0.21	7.06	5.04	100
Central Africa	0.00	55.62	44.38	0.00	0.00	0.00	0.00	100
Eastern Africa	7.07	39.70	45.27	0.00	1.77	0.00	6.19	100
Gulf of Guinea	18.77	62.47	18.77	0.00	0.00	0.00	0.00	100
Indian Ocean Islands	0.00	100.00	0.00	0.00	0.00	0.00	0.00	100
Southern Africa	57.34	3.80	32.59	0.00	0.00	0.00	6.27	100
Sudano-Sahelian	15.35	41.50	3.61	0.42	0.00	27.00	12.13	100
Americas	15.17	24.01	48.03	0.00	3.45	7.77	1.57	100
<i>Northern America</i>	19.83	9.79	54.45	0.00	4.56	9.68	1.68	100
<i>Central America and Caribbean</i>	0.00	70.05	29.49	0.00	0.00	0.01	0.45	100
Central America	0.00	46.10	53.88	0.00	0.00	0.02	0.00	100
Caribbean: Greater and Lesser Antilles	0.00	88.02	11.19	0.00	0.00	0.00	0.78	100
<i>Southern America</i>	3.22	60.52	31.26	0.00	0.57	3.05	1.39	100
Andean	0.00	60.18	34.32	0.00	1.89	1.17	2.44	100
Brazil	1.11	66.14	32.75	0.00	1.11	0.00	0.00	100
Guyana	0.00	100.00	0.00	0.00	0.00	0.00	0.00	100
Southern America	11.10	43.65	31.07	0.00	0.18	11.08	2.92	100
Asia	35.13	50.76	10.18	0.97	1.19	0.63	1.14	100
<i>Middle East</i>	63.47	8.35	8.08	0.09	14.15	2.11	3.76	100
Near East	59.54	3.82	21.25	0.00	14.58	0.00	0.81	100
Arabian Peninsula	65.92	0.00	2.38	0.98	4.40	23.40	2.92	100
Caucasus	74.69	0.00	4.79	0.00	19.18	0.00	1.34	100
Iran (Islamic Republic of)	63.54	15.15	0.00	0.00	14.65	0.00	6.66	100
<i>Central Asia</i>	79.00	7.12	7.03	0.00	6.69	0.00	0.16	100
<i>Southern and Eastern Asia</i>	32.25	54.38	10.39	1.05	0.33	0.57	1.04	100
East Asia	32.45	46.37	18.67	0.00	0.00	0.00	2.51	100
South Asia	46.32	44.50	4.39	2.56	0.81	1.39	0.04	100
Mainland Southeast Asia	0.48	97.73	1.79	0.00	0.00	0.00	0.00	100
Maritime Southeast Asia	0.00	90.84	9.16	0.00	0.00	0.00	0.00	100
Europe	15.22	12.23	53.06	0.00	11.14	0.00	8.35	100
<i>Western and Central Europe</i>	12.31	10.41	58.94	0.00	10.77	0.00	7.57	100
Western Europe	3.04	0.00	84.66	0.00	2.07	0.00	10.22	100
Central Europe	0.00	3.99	86.23	0.00	0.00	0.00	9.78	100
Mediterranean Europe	15.55	15.01	51.13	0.00	12.33	0.00	5.99	100
Northern Europe	26.63	0.00	0.00	0.00	54.90	0.00	18.47	100
<i>Eastern Europe and Russian Federation</i>	30.89	22.07	21.38	0.00	13.10	0.00	12.56	100
Eastern Europe	0.00	16.40	78.10	0.00	0.00	0.00	5.50	100
Russian Federation	37.52	23.28	9.21	0.00	15.91	0.00	14.07	100
Oceania	52.67	5.95	15.84	0.00	0.00	0.00	25.55	100
<i>Australia and New Zealand</i>	52.67	5.95	15.84	0.00	0.00	0.00	25.55	100
<i>Pacific Islands</i>								-
WORLD	33.11	47.36	14.31	0.85	1.64	1.30	1.43	100
High income countries	18.29	25.44	44.47	0.00	4.79	3.44	3.57	100
Middle income countries	35.37	47.90	12.06	0.99	1.36	1.20	1.12	100
Low income countries	21.36	65.86	8.20	0.02	1.60	0.10	2.87	100
Low Income Food Deficit Countries (LIFDC)	36.29	53.01	5.85	1.54	1.44	1.29	0.59	100
Least Developed Countries (LDC)	18.77	69.23	8.19	0.08	0.99	1.74	0.99	100

TABLE 4
Water requirement ratio and comparison with water resources by country (165 countries and 2 territories in this review) *

Country	Total actual renewable freshwater resources (km ³ /yr)*°	Year	Irrigation water requirement (km ³ /yr)	Water requirement ratio (%)	Irrigation water withdrawal (km ³ /yr)	Pressure on freshwater resources due to irrigation (%)
Afghanistan	65.000	2002	10.901	55	20.000	30.77
Albania	41.700	2000	0.322	62	0.518	1.24
Algeria	11.670	2001	2.511	72	3.502	30.01
Angola	148.000	2005	0.040	27	0.147	0.10
Antigua and Barbuda	0.052	1997	0.000	25	0.001	2.52
Argentina	814.000	2011	12.229	44	27.930	3.43
Armenia	7.769	2006	0.624	34	1.859	23.93
Australia	492.000	2006	3.892	59	6.596	1.34
Austria	77.700	2007	0.060	60	0.100	0.13
Azerbaijan	34.680	2003	3.620	39	9.330	26.90
Bahrain	0.116	2001	0.040	25	0.159	137.24
Bangladesh	1 227.000	2008	24.562	78	31.500	2.57
Barbados	0.080	1989	0.014	25	0.055	68.44
Belarus	58.000	2003	0.043	38	0.114	0.20
Belgium	18.300	2007	0.022	60	0.037	0.20
Belize	18.550	1997	0.024	23	0.102	0.55
Benin	26.390	2008	0.011	24	0.045	0.17
Bhutan	78.000	2007	0.104	33	0.318	0.41
Bolivia (Plurinational State of)	622.500	1999	0.688	39	1.777	0.29
Botswana	12.240	2002	0.010	34	0.029	0.24
Brazil	8 233.000	2006	15.296	48	31.700	0.39
Brunei Darussalam	8.500	1995	0.003	51	0.005	0.06
Bulgaria	21.300	2007	0.217	31	0.710	3.33
Burkina Faso	12.500	2001	0.129	31	0.421	3.37
Burundi	12.540	2000	0.028	44	0.065	0.52
Cambodia	476.100	2006	0.919	48	1.928	0.40
Cameroon	285.500	2000	0.201	27	0.737	0.26
Canada	2 902.000	2010	2.544	54	4.749	0.16
Cape Verde	0.300	1997	0.008	31	0.025	8.32
Central African Republic	144.400	1987	0.000	27	0.000	0.00
Chad	43.000	2002	0.206	31	0.672	1.56
Chile	922.000	2007	5.038	22	22.886	2.48
China	2 840.000	2006	256.872	72	358.000	12.61
Colombia	2 132.000	2011	2.273	39	5.867	0.28
Congo	832.000	1993	0.001	27	0.004	0.00
Costa Rica	112.400	1997	0.579	18	3.200	2.85
Côte d'Ivoire	81.140	1994	0.143	24	0.595	0.73
Cuba	38.120	1997	0.685	28	2.476	6.50
Cyprus	0.780	2007	0.092	62	0.148	18.97
Czech Republic	13.150	2007	0.003	32	0.009	0.07
Democratic People's Republic of Korea	77.150	1995	3.016	70	4.308	5.58
Democratic Republic of the Congo	1 283.000	1995	0.020	27	0.072	0.01
Denmark	6.000	2007	0.051	60	0.085	1.42
Djibouti	0.300	1999	0.001	31	0.003	0.83
Dominican Republic	21.000	2009	1.136	29	3.949	18.80
Ecuador	424.400	2000	3.129	39	8.077	1.90
Egypt	57.300	2002	45.111	76	59.000	102.97
El Salvador	25.230	1997	0.274	23	1.176	4.66
Eritrea	6.300	1993	0.043	41	0.104	1.66
Estonia	12.810	2010	0.000	70	0.000	0.00
Ethiopia	122.000	2001	1.475	28	5.204	4.27
Finland	110.000	2010	0.028	70	0.040	0.04
France	211.000	2007	2.351	60	3.923	1.86
Gabon	164.000	1987	0.011	27	0.040	0.02
Gambia	8.000	1999	0.012	31	0.039	0.49
Georgia	63.330	2007	0.248	29	0.867	1.37

Country	Total actual renewable freshwater resources (km ³ /yr) ^a	Year	Irrigation water requirement (km ³ /yr)	Water requirement ratio (%)	Irrigation water withdrawal (km ³ /yr)	Pressure on freshwater resources due to irrigation (%)
Germany	154.000	2006	0.048	60	0.080	0.05
Ghana	53.200	2000	0.162	25	0.652	1.23
Greece	74.250	2007	5.441	64	8.458	11.39
Grenada	-	1997	0.001	25	0.002	-
Guatemala	111.300	2003	0.439	23	1.886	1.69
Guinea	226.000	2001	0.070	24	0.293	0.13
Guinea-Bissau	31.000	1996	0.026	18	0.144	0.46
Guyana	241.000	1991	0.528	39	1.362	0.57
Haiti	14.030	1991	0.348	29	1.209	8.62
Honduras	95.930	2007	0.298	23	1.280	1.33
Hungary	104.000	2007	0.025	63	0.040	0.04
India	1 911.000	2006	370.843	54	688.000	36.00
Indonesia	2 019.000	2005	47.417	51	92.760	4.59
Iran (Islamic Republic of)	137.500	2006	49.185	57	86.000	62.55
Iraq	75.610	1990	15.023	29	52.000	68.77
Ireland	52.000	1998	0.002	60	0.003	0.01
Israel	1.780	2004	0.556	49	1.129	63.43
Italy	191.300	2007	8.022	62	12.895	6.74
Jamaica	9.404	2009	0.129	29	0.448	4.77
Japan	430.000	2006	38.321	70	54.731	12.73
Jordan	0.937	2004	0.301	49	0.611	65.23
Kazakhstan	109.600	2010	6.448	46	14.002	12.78
Kenya	30.700	2003	0.486	22	2.165	7.05
Kuwait	0.020	2006	0.119	24	0.492	2459.50
Kyrgyzstan	48.950	2005	2.918	39	7.447	15.21
Lao People's Democratic Republic	333.500	2005	1.521	48	3.193	0.96
Latvia	35.450	2007	0.036	70	0.051	0.14
Lebanon	4.503	1998	0.529	68	0.780	17.32
Lesotho	5.230	1999	0.001	27	0.004	0.07
Liberia	232.000	1987	0.003	24	0.012	0.01
Libya	0.700	2000	1.833	51	3.584	512.00
Lithuania	24.900	2007	0.001	70	0.002	0.01
Madagascar	337.000	2000	4.398	27	16.120	4.78
Malawi	17.280	2002	0.310	27	1.164	6.74
Malaysia	580.000	1994	1.271	51	2.505	0.43
Mali	100.000	2000	1.469	25	5.900	5.90
Malta	0.051	2007	0.012	63	0.019	37.62
Mauritania	11.400	2004	0.375	31	1.223	10.73
Mauritius	2.751	2002	0.132	27	0.491	17.85
Mexico	457.200	2009	26.034	44	58.782	12.86
Mongolia	34.800	1994	0.108	48	0.227	0.65
Montenegro	-	2010	0.001	32	0.002	-
Morocco	29.000	2004	5.823	53	11.010	37.97
Mozambique	217.100	2001	0.183	27	0.689	0.32
Myanmar	1 168.000	2004	12.381	42	29.570	2.53
Namibia	17.720	2002	0.032	22	0.144	0.81
Nepal	210.200	2002	5.428	58	9.320	4.43
Netherlands	91.000	2007	0.043	60	0.071	0.08
New Zealand	327.000	2007	1.492	59	2.529	0.77
Nicaragua	196.600	2001	0.512	34	1.489	0.76
Niger	33.650	2005	0.201	31	0.657	1.95
Nigeria	286.200	2004	1.695	24	7.047	2.46
Norway	382.000	2007	0.068	60	0.113	0.03
Occupied Palestinian Territory	0.837	2003	0.093	49	0.189	22.58
Oman	1.400	2004	0.721	62	1.168	83.43
Pakistan	246.800	2008	126.891	74	172.400	69.85
Panama	148.000	1997	0.160	23	0.687	0.46
Paraguay	336.000	2012	0.959	51	1.897	0.56
Peru	1 913.000	1998	5.663	35	16.350	0.85

Country	Total actual renewable freshwater resources (km ³ /yr) ^{†°}	Year	Irrigation water requirement (km ³ /yr)	Water requirement ratio (%)	Irrigation water withdrawal (km ³ /yr)	Pressure on freshwater resources due to irrigation (%)
Philippines	479.000	2006	33.280	51	65.590	13.69
Poland	61.600	2007	0.031	32	0.098	0.16
Portugal	68.700	2007	2.016	31	6.567	9.56
Puerto Rico	7.100	2005	0.048	65	0.074	1.04
Qatar	0.058	2001	0.076	29	0.262	451.72
Republic of Korea	69.700	2002	3.932	27	14.487	20.78
Republic of Moldova	11.650	2007	0.025	70	0.036	0.31
Romania	211.900	2007	0.379	53	0.718	0.34
Russian Federation	4 508.000	2008	9.227	70	13.200	0.29
Rwanda	9.500	2000	0.026	25	0.102	1.07
Saint Kitts and Nevis	0.024	1997	0.000	25	0.000	0.76
Saint Lucia	-	2007	0.008	25	0.030	-
Saint Vincent and the Grenadines	-	1990	0.003	25	0.010	-
Saudi Arabia	2.400	2000	11.599	56	20.830	867.92
Senegal	38.800	2002	0.949	46	2.065	5.32
Serbia	162.200	2011	0.021	32	0.066	0.04
Seychelles	-	2003	0.000	27	0.001	-
Sierra Leone	160.000	1992	0.011	24	0.046	0.03
Slovakia	50.100	2007	0.003	32	0.009	0.02
Slovenia	31.870	2010	0.001	32	0.002	0.01
Somalia	14.700	2003	0.263	32	0.820	5.58
South Africa	50.000	2000	2.138	27	7.836	15.67
Spain	111.500	2009	14.058	72	19.560	17.54
Sri Lanka	52.800	2006	3.819	34	11.310	21.42
Sudan and South Sudan	64.500	2000	8.015	31	26.153	40.55
Suriname	122.000	1998	0.167	39	0.431	0.35
Swaziland	4.510	2000	0.313	32	0.993	22.02
Sweden	174.000	2007	0.041	60	0.069	0.04
Switzerland	53.500	2007	0.041	60	0.068	0.13
Syrian Arab Republic	16.800	2004	7.123	49	14.670	87.32
Tajikistan	15.980	2009	4.281	41	10.441	65.34
Thailand	438.600	2007	34.191	66	51.790	11.81
The former Yugoslav Republic of Macedonia	6.400	2004	0.078	62	0.126	1.97
Timor-Leste	8.215	2002	0.192	18	1.071	13.04
Togo	14.700	1996	0.007	46	0.014	0.10
Trinidad and Tobago	3.840	1997	0.009	25	0.036	0.94
Tunisia	4.595	2001	1.552	72	2.165	47.12
Turkey	213.600	2006	25.139	85	29.600	13.86
Turkmenistan	24.720	2006	13.558	51	26.364	106.65
Uganda	66.000	2010	0.063	52	0.120	0.18
Ukraine	139.600	2010	0.826	70	1.186	0.85
United Arab Emirates	0.150	2003	1.815	55	3.312	2208.00
United Kingdom	147.000	2007	0.035	60	0.059	0.04
United Republic of Tanzania	96.270	2002	0.973	22	4.425	4.60
United States of America	3 069.000	2007	108.528	61	177.403	5.78
Uruguay	139.000	1998	1.077	34	3.170	2.28
Uzbekistan	50.410	2005	22.515	45	50.400	99.98
Venezuela (Bolivarian Republic of)	1 233.000	2008	6.472	39	16.707	1.35
Viet Nam	884.100	2005	29.238	38	77.750	8.79
Yemen	2.100	2004	1.773	55	3.235	154.05
Zambia	105.200	2002	0.306	27	1.150	1.09
Zimbabwe	20.000	1999	0.836	25	3.318	16.59
TOTAL (165 countries and 2 territories)	52 579.472	-	1 500.464	56	2 672.640	5.07

* Not included: Andorra, Bahamas, Bosnia and Herzegovina, Comoros, Cook Islands, Croatia, Dominica, Equatorial Guinea, Faroe Islands, Fiji, Holy See, Iceland, Kiribati, Liechtenstein, Luxembourg, Maldives, Marshall Islands, Micronesia (Federated States of), Monaco, Nauru, Niue, Palau, Papua New Guinea, Samoa, San Marino, Sao Tome and Principe, Singapore, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu

† km³ = 10⁹ m³

° Total long-term average annual actual renewable freshwater resources

TABLE 5
Summary results of water requirement ratio and comparison with water resources

	Total actual renewable water resources (km ³ /yr) ^{†°}	Irrigation water requirement (km ³ /yr)	Water requirement ratio (%)	Irrigation water withdrawal (km ³ /yr)	Pressure on freshwater resources due to irrigation (%)
Africa	5 530.286	82.611	48	171.222	3.1
<i>Northern Africa</i>	103.265	56.830	72	79.261	76.8
<i>Sub-Saharan Africa</i>	5 427.021	25.781	28	91.961	1.7
Central Africa	2 856.900	0.273	27	1.000	0.0
Eastern Africa	337.010	3.051	25	12.081	3.6
Gulf of Guinea	1 110.630	2.128	24	8.849	0.8
Indian Ocean Islands	339.751	4.530	27	16.612	4.9
Southern Africa	449.280	4.128	27	15.332	3.4
Sudano-Sahelian	333.450	11.671	31	38.082	11.4
Americas	24 361.760	195.291	49	397.200	1.6
<i>Northern America</i>	6 428.200	137.106	57	240.934	3.7
<i>Central America and Caribbean</i>	801.660	4.666	26	18.112	2.3
Central America	708.010	2.285	23	9.820	1.4
Caribbean: Greater and Lesser Antilles	93.650	2.381	29	8.291	8.9
<i>Southern America</i>	17 131.900	53.519	39	138.154	0.8
Andean	6 324.900	18.225	37	48.777	0.8
Guyana	363.000	0.695	39	1.793	0.5
Brazil	8 233.000	15.296	48	31.700	0.4
Southern America	2 211.000	19.303	35	55.883	2.5
Asia	14 450.715	1 173.514	58	2 025.911	14.0
<i>Middle East</i>	563.590	118.584	52	226.493	40.2
Near East	314.067	48.764	49	98.979	31.5
Arabian Peninsula	6.244	16.143	55	29.458	471.8
Caucasus	105.779	4.492	37	12.056	11.4
Iran	137.500	49.185	57	86.000	62.5
<i>Central Asia</i>	314.660	60.621	47	128.654	40.9
<i>Southern and Eastern Asia</i>	13 572.465	994.309	60	1 670.764	12.3
South Asia	3 725.800	531.646	58	912.848	24.5
East Asia	3 451.650	302.249	70	431.753	12.5
Mainland Southeast Asia	3 300.300	78.250	48	164.231	5.0
Maritime Southeast Asia	3 094.715	82.163	51	161.932	5.2
Europe	7 417.711	43.671	63	69.181	0.9
<i>Western and Central Europe</i>	2 627.301	33.513	61	54.592	2.1
Central Europe	656.120	0.681	41	1.654	0.3
Mediterranean Europe	494.681	30.042	62	48.290	9.8
Northern Europe	672.000	0.188	61	0.307	0.0
Western Europe	804.500	2.602	60	4.342	0.5
<i>Eastern Europe and Russian Federation</i>	4 790.410	10.158	70	14.589	0.3
Eastern Europe	282.410	0.931	67	1.389	0.5
Russian Federation	4 508.000	9.227	70	13.200	0.3
Oceania	819.000	5.384	59	9.125	1.1
<i>Australia and new Zealand</i>	819.000	5.384	59	9.125	1.1
<i>Pacific Islands</i>	-	-	-	-	-
WORLD (165 countries and 2 territories)	52 579.472	1 500.464	56	2 672.640	5.1
High income countries	9 511.779	206.196	61	340.471	3.6
Middle income countries	36 489.853	1 217.890	56	2 172.602	6.0
Low income countries	6 577.840	76.377	48	159.559	2.4
Low Income Food Deficit Countries (LIFDC)	12 647.955	625.383	52	1 199.992	9.5
Least Developed Countries (LDC)	7 168.905	77.742	50	154.796	2.2

† km³ = 10⁹ m³

° Total long-term average annual actual renewable freshwater resources

9. Annexes

ANNEX 1

Glossary

Actual evapotranspiration:

The crop actual evapotranspiration (ETa) represents the actual rate of water uptake by the plant, which is determined by the level of available water in the soil and combines simultaneously both evaporative losses from the soil surface and transpiration from the plant surface. Under non-irrigated conditions is assumed to be equal to the potential crop evapotranspiration (ETc), in those periods of the year when precipitation exceeds potential evapotranspiration or when there is enough water stored in the soil to allow maximum evapotranspiration and thus to fulfill the crop water requirement. In drier periods of the year, when the available soil moisture is reduced below a certain level, lack of water reduces actual evapotranspiration to an extent depending on the available soil moisture. For open water or wetland, actual evapotranspiration can exceed precipitation.

It is also sometimes referred to as the water balance under natural conditions (non-irrigated conditions).

Agricultural water withdrawal:

Annual quantity of self-supplied water withdrawn for irrigation, livestock and aquaculture purposes. It includes water from primary renewable and secondary freshwater resources, as well as water from over-abstraction of renewable groundwater or withdrawal of fossil groundwater, direct use of agricultural drainage water and (treated) wastewater, and desalinated water. Water for the dairy and meat industries and industrial processing of harvested agricultural products is included under industrial water withdrawal.

AAI_{full}—Part of area equipped for full control irrigation actually irrigated:

Portion of the area equipped for full control irrigation that is actually irrigated, in a given year. It refers to physical areas. Irrigated land that is cultivated more than once a year is counted only once.

AAI_{tot}—Part of area equipped for irrigation actually irrigated:

Portion of the area equipped for irrigation that is actually irrigated, in a given year. It refers to physical areas. Irrigated land that is cultivated more than once a year is counted only once.

AEI_{full}—Area equipped for full control irrigation:

The sum of surface irrigation, sprinkler irrigation and localized irrigation.

AEI_{tot}—Total area equipped for irrigation:

Area equipped to provide water (via irrigation) to crops. It includes areas equipped for full/partial control irrigation, equipped lowland areas, and areas equipped for spate irrigation.

AHI_{full}—Harvested irrigated crop area under full control irrigation:

Total harvested irrigated crop area. It refers to the crops grown under full control irrigation. Areas under double irrigated cropping (same area cultivated and irrigated twice a year) are counted twice. Therefore the total area may be larger than the full/partial control equipped area under, which gives an indication of the cropping intensity. The total is only given if information on all irrigated crops in the country is available.

Consumptive water use:

The part of water withdrawn from its source for use in a specific sector (e.g., for agricultural, industrial or municipal purposes) that will not become available for reuse because of evaporation,

transpiration, incorporation into products, drainage directly to the sea or evaporation areas, or removal in other ways from freshwater resources. It is opposed to non-consumptive water use. More information can be found on http://www.fao.org/nr/water/aquastat/water_use/index.stm.

Crop water requirement:

The total water needed for evapotranspiration and cell construction, from planting to harvest for a given crop in a specific climate regime, when adequate soil water is maintained by rainfall and/or irrigation so that it does not limit plant growth and crop yield. It also corresponds to the amount of water enabling the actual evapotranspiration of a crop to be equal to its potential evapotranspiration.

Cropping intensity:

The fraction of the cultivated area that is harvested. The cropping intensity may exceed 100 percent where more than one crop cycle is permitted each year on the same area. In AQUASTAT, the cropping intensity has been calculated on irrigated crops only, and becomes practically the ratio of the harvested irrigated areas over the area equipped for full control irrigation actually irrigated. Irrigation, by decoupling the crop production from the natural precipitation, increases cropping intensity in countries where temperatures are not a limiting factor.

Cropping pattern:

Plan and/or schedule that determines the agronomic practices of a specific crop: to what extent it is grown, and in what seasons during the year.

Effective precipitation:

Useful or utilizable precipitation. Precipitation is not necessarily useful or desirable at the time, rate or amount in which it is received. Some of it may be unavoidably wasted while some may even be destructive. The useful portion of precipitation is stored and supplied to the user; the unwanted part needs to be conveyed or removed speedily, but varies depending on users. From an agricultural production perspective, the effective precipitation is that portion of total annual precipitation which is useful directly and/or indirectly for crop production at the site where it falls, but without pumping. It therefore includes water intercepted by living or dry vegetation, that is lost by evaporation from the soil surface, the precipitation lost by evapotranspiration during growth, that fraction which contributes to leaching, percolation or facilitates other cultural operations either before or after sowing without any harm to yield and quality of the principal crops. Consequently ineffective rainfall is that portion which is lost by surface runoff, unnecessary deep percolation losses, the moisture remaining in the soil after the harvest of the crop and which is not useful for next season's crop.

Evaporation:

Evaporation is the process whereby liquid water is converted to water vapour (vaporization) and removed from the evaporating surface (vapour removal). Water evaporates from a variety of surfaces, such as lakes, rivers, pavements, soils and wet vegetation.

Evapotranspiration:

This term represents the combination of evaporative losses from the soil surface and transpiration from the plant surface. These two phenomenon occur simultaneously and there is no easy way of distinguishing between them.

Irrigated crop calendar:

In AQUASTAT, crop calendars have been prepared for irrigated crops only at country level on the area equipped for full control irrigation actually irrigated. Crop areas indicated are harvested irrigated areas, which can be larger than the area equipped for full control irrigation actually irrigated when the cropping intensity is over 100 percent, that is when climate conditions enable more than one crop cycle per year on the same area.

Irrigation consumptive water use:

The quantity of water exclusive of precipitation and soil moisture required to ensure that the crop receives its full crop water requirement. It varies considerably with climatic conditions, seasons, crops and soil types:

$$ICU = K_c \times ET_0 - P - \Delta S$$

with:

ICU = irrigation consumptive water use;

K_c = coefficient varying with crop type and growth stage;

ET_0 = reference evapotranspiration, depending on climatic factors;

P = effective precipitation;

ΔS = change in soil moisture from previous period.

It is also the part of the crop consumptive water use originating from irrigation water. It consists in the portion of irrigation water requirement that is required to meet the full crop water requirement, while its remaining components (paddy flooding and salt leaching) are non-consumptive water use (returning to the system).

Irrigation efficiency:

The ratio or percentage of the irrigation water requirements of crops on an irrigated farm, field or project to the water diverted from the source of supply. Also called 'Overall irrigation efficiency'.

Irrigation water requirement:

The quantity of water exclusive of precipitation and soil moisture (i.e. quantity of irrigation water) required for normal crop production. It consists of water to ensure that the crop receives its full crop water requirement (i.e. irrigation consumptive water use, as well as extra water for flooding of paddy fields to facilitate land preparation and protect the plant and for leaching salt when necessary to allow for plant growth). It is usually expressed in water depth (millimetres) or water volume (m^3) and may be stated in monthly, seasonal or annual terms, or for a crop period. It corresponds to net irrigation water requirement. More information can be found on http://www.fao.org/nr/water/aquastat/water_use/index.stm.

Irrigation water withdrawal or Water withdrawal for irrigation:

Annual quantity of water withdrawn for irrigation purposes. In the AQUASTAT database water withdrawal for irrigation is part of agricultural water withdrawal, together with water withdrawal for livestock (watering and cleaning) and water withdrawal for aquaculture. It includes renewable freshwater resources as well as over-abstraction of renewable groundwater or withdrawal of fossil groundwater, use of agricultural drainage water, (treated) wastewater and desalinated water. The amount of water withdrawn for irrigation by far exceeds the consumptive use of irrigation because of water lost in its distribution from its source to the crops. The term "water requirement ratio" (sometimes also called "irrigation efficiency") is used to indicate the ratio between the net irrigation water requirements or crop water requirements, which is the volume of water needed to compensate for the deficit between potential evapotranspiration and effective precipitation over the growing period of the crop, and the amount of water withdrawn for irrigation including the losses. In the specific case of paddy rice irrigation, additional water is needed for flooding to facilitate land preparation and for plant protection. In that case, irrigation water requirements are the sum of rainfall deficit and the water needed to flood paddy fields. At scheme level, water requirement ratio values can vary from less than 20 percent to more than 85 percent.

Non-conventional water:

Water that can be available for use without increasing the load on primary renewable freshwater resources. It includes: 1) desalinated sea or brackish water; 2) direct use of (treated) wastewater; 3) direct use of agricultural drainage water. Treatment requirements vary by country.

Permanent pasture irrigated:

The land used permanently (five years or more) to grow herbaceous forage crops and actually irrigated in a given year. Permanent meadows and pasture do not fall under permanent crops ([4102]) and therefore, do not fall under cultivated area ([4103]) either, since it is a separate category in FAOSTAT.

Potential evapotranspiration:

Maximum quantity of water capable of being lost, as water vapour, in a given climate, by a continuous stretch of vegetation covering the whole ground and well supplied with water. It thus includes evaporation from the soil and transpiration from the vegetation from a specific region at a given time interval.

Reference crop evapotranspiration:

The crop evapotranspiration under standard conditions, denoted as ET_c , is the evapotranspiration from disease-free, well-fertilized crops, grown in large fields, under optimum soil water conditions, and achieving full production under the given climatic conditions.

Soil moisture:

The percentage of water in the soil (by weight). It is normally taken as the water amount in the soil between wilting point and field capacity (WMO, 1990).

Water balance under the natural conditions:

The maximum theoretical yearly amount of water actually available for a given area without irrigation. It can also be defined as the sum of the annual endogenous precipitation and the balance of external renewable water resources minus evapotranspiration.

Water productivity:

Water productivity is the ratio of the net benefits from crop, forestry, fishery, livestock and mixed agricultural systems to the amount of water used to produce those benefits. In its broadest sense, it reflects the objectives of producing more food, income, livelihood and ecological benefits at less social and environmental cost per unit of water consumed. In the agricultural context, Physical water productivity is defined as the ratio of agricultural output to the amount of water consumed – “more crop per drop” ($\text{kg of product} / \text{m}^3$), and Economic water productivity is defined as the monetary value generated from each unit of water consumed ($\text{€} / \text{m}^3$). Economic water productivity has been used to relate water use in agriculture to nutrition, jobs, welfare and the environment.

Water requirement ratio:

Ratio between irrigation water requirement and the amount of water withdrawn for irrigation:

$$\text{WR Ratio} = \text{IWR} / \text{IWW}$$

with:

WR Ratio = water requirement ratio;

IWR = net irrigation water requirement;

IWW = irrigation water withdrawal.

This ratio is often referred to as “irrigation efficiency”. However, the use of the expression is subject of debate. The word “efficiency” implies that that water is being wasted when the efficiency is low. This is not necessarily so. The recoverable fraction of the non-consumed water can be used further downstream in the irrigation scheme, it can flow back to the river or it can contribute to the recharge of aquifers.

Water use efficiency:

Water use efficiency (WUE) is the ratio between effective water use and actual water withdrawal. In irrigation, WUE represents the ratio between estimated irrigation water requirements (through evapotranspiration) and actual water withdrawal. It is dimensionless and can be calculated at any scale (plant, field, irrigation schemes, basin, country, etc.). At country level, it is similar to the water requirement ratio calculated in the AQUASTAT irrigation water use exercise.

Efficient use of water in agriculture can be pursued by reducing water losses in transmission and distribution, increasing crop productivity or diverting water towards higher value crops (intrasectoral allocation). But just because an agricultural use of water becomes more efficient does not mean that water is 'saved'. In the quest for greater 'efficiency', it is important to take a broad view (e.g. at basin level), recognizing the contribution that so-called 'losses' can make to the productivity of other users and in other parts of the water cycle.

Water withdrawal:

Water that has been removed from its source for a specific use, which includes water from primary and secondary freshwater resources and non-conventional water (direct use of agricultural drainage water, direct use of (treated) wastewater, desalinated water).

ANNEX 2

Crop coefficients for different growing stages

	Growing stage			
	Initial	Development	Mid	Late
Bananas	1.00	1.00	1.00	1.00
Barley	0.30	0.73	1.15	0.25
Cassava	0.60	0.85	1.10	0.90
Citrus	0.75	0.75	0.75	0.75
Coconut	1.00	1.00	1.00	1.00
Cocoa	1.00	1.00	1.00	1.00
Coffee	1.00	1.00	1.00	1.00
Cotton	0.35	0.78	1.20	0.60
Fibres	0.35	0.68	1.00	0.60
Fodder	0.40	0.70	1.00	0.90
Fruit	0.75	0.75	0.75	0.75
Groundnut	0.40	0.78	1.15	0.60
Maize	0.30	0.75	1.20	0.60
Millet	0.30	0.65	1.00	0.30
Oil crops	0.35	0.75	1.15	0.35
Other cereals	1.00	1.00	1.00	1.00
Other root crops	1.00	1.00	1.00	1.00
Palm	1.00	1.00	1.00	1.00
Plantain	1.00	1.00	1.00	1.00
Potatoes	0.50	0.83	1.15	0.75
Pulses	0.40	0.78	1.15	0.55
Rapeseed	0.35	0.73	1.10	0.35
Rice	1.20	1.15	1.10	0.80
Rubber	1.00	1.00	1.00	1.00
Sesame	0.35	0.73	1.10	0.25
Sorghum	0.30	0.70	1.10	0.55
Soybean	0.40	0.78	1.15	0.50
Sugar beet	0.35	0.78	1.20	0.70
Sugarcane	1.00	1.00	1.00	1.00
Sweet potatoes	1.00	1.00	1.00	1.00
Sunflower	0.35	0.73	1.10	0.35
Tea	1.05	1.05	1.05	1.05
Tobacco	0.50	0.85	1.20	0.80
Vegetables	0.60	0.85	1.10	0.90
Wheat	0.40	0.78	1.15	0.30

ANNEX 3

Country groupings used in this review

Geographical grouping⁸

Continent	Region	Sub-region	Countries and territories included in the review
Africa			Algeria, Angola, Benin, Botswana Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Congo, Côte d'Ivoire, Djibouti, Democratic Republic of the Congo, Egypt, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan and South Sudan ⁹ , Swaziland, Togo, Tunisia, Uganda, United Republic of Tanzania, Zambia, Zimbabwe
	Northern Africa		Algeria, Egypt, Libya, Morocco, Tunisia
	Sub-Saharan Africa		Angola, Benin, Botswana Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Congo, Côte d'Ivoire, Djibouti, Democratic Republic of the Congo, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan and South Sudan, Swaziland, Togo, Uganda, United Republic of Tanzania, Zambia, Zimbabwe
		Central Africa	Angola, Cameroon, Central African Republic, Congo, Democratic Republic of the Congo, Gabon
		Eastern Africa	Burundi, Ethiopia, Kenya, Rwanda, Uganda, United Republic of Tanzania
		Gulf of Guinea	Benin, Côte d'Ivoire, Ghana, Guinea, Guinea-Bissau, Liberia, Nigeria, Sierra Leone, Togo
		Indian Ocean Islands	Madagascar, Mauritius, Seychelles
		Southern Africa	Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia, Zimbabwe
		Soudano-Sahelian	Burkina Faso, Cape Verde, Chad, Djibouti, Eritrea, Gambia, Mali, Mauritania, Niger, Senegal, Somalia, Sudan and South Sudan

⁸ Not included:

- Africa: Comoros, Equatorial Guinea, Sao Tome and Principe
- Americas: Bahamas, Dominica
- Asia: Maldives, Papua New Guinea, Singapore
- Europe: Andorra, Bosnia and Herzegovina, Croatia, Faroe Islands, Iceland, Holy See, Liechtenstein, Luxembourg, Monaco, San Marino,
- Oceania: Cook Islands, Fiji, Kiribati, Marshall Islands, Micronesia (Federated States of), Nauru, Niue, Palau, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu

⁹ Although in July 2011 Sudan became two countries, Sudan and South Sudan, in this review the two countries are still grouped together due to the lack of disaggregated data.

Americas		Antigua and Barbuda, Argentina, Barbados, Belize, Bolivia (Plurinational State of), Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, United States of America, Uruguay, Venezuela (Bolivarian Republic of)
	Central America and Caribbean	Antigua and Barbuda, Barbados, Belize, Costa Rica, Cuba, Dominican Republic, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Nicaragua, Panama, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago
	Central America	Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama
	Caribbean: Greater and Lesser Antilles	Antigua and Barbuda, Barbados, Cuba, Dominican Republic, Grenada, Haiti, Jamaica, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago
	Northern America	Canada, Mexico, United States of America
	Southern America	Argentina, Brazil, Bolivia (Plurinational State of), Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela (Bolivarian Republic of)
	Andean	Bolivia (Plurinational State of), Colombia, Ecuador, Peru, Venezuela (Bolivarian Republic of)
	Brazil	Brazil
	Guyana	Guyana, Suriname
	Southern America	Argentina, Chile, Paraguay, Uruguay
Asia		Afghanistan, Armenia, Azerbaijan, Bahrain, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Democratic People's Republic of Korea, Georgia, India, Indonesia, Iran (Islamic Republic of), Iraq, Israel, Japan, Jordan, Kazakhstan, Kuwait, Kyrgyzstan, Lao People's Democratic Republic, Lebanon, Malaysia, Mongolia, Myanmar, Nepal, Occupied Palestinian Territory, Oman, Pakistan, Philippines, Qatar, Republic of Korea, Saudi Arabia, Sri Lanka, Syrian Arab Republic, Tajikistan, Thailand, Timor-Leste, Turkey, Turkmenistan, United Arab Emirates, Uzbekistan, Viet Nam, Yemen
	Central Asia	Afghanistan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan
	Middle East	Armenia, Azerbaijan, Bahrain, Georgia, Iran (Islamic Republic of), Iraq, Israel, Jordan, Kuwait, Lebanon, Occupied Palestinian Territory, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, Turkey, United Arab Emirates, Yemen
	Arabian Peninsula	Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, Yemen
	Caucasus	Armenia, Azerbaijan, Georgia
	Iran	Iran (Islamic Republic of)
	Near East	Iraq, Israel, Jordan, Lebanon, Occupied Palestinian Territory, Syrian Arab Republic, Turkey

Southern and Eastern Asia		Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Democratic People's Republic of Korea, India, Indonesia, Japan, Lao People's Democratic Republic, Malaysia, Mongolia, Myanmar, Nepal, Pakistan, Philippines, Republic of Korea, Sri Lanka, Thailand, Timor-Leste, Viet Nam
	East Asia	China, Democratic People's Republic of Korea, Japan, Mongolia, Republic of Korea
	South Asia	Bangladesh, Bhutan, India, Nepal, Pakistan, Sri Lanka
	Mainland Southeast Asia	Cambodia, Lao People's Democratic Republic, Myanmar, Thailand, Viet Nam
	Maritime Southeast Asia	Brunei Darussalam, Indonesia, Malaysia, Philippines, Timor-Leste
Europe		Albania, Austria, Belarus, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Montenegro, Netherlands, Norway, Poland, Portugal, Republic of Moldova, Romania, Russian Federation, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, The former Yugoslav Republic of Macedonia, United Kingdom, Ukraine
	Eastern Europe and Russian Federation	Belarus, Estonia, Latvia, Lithuania, Republic of Moldova, Russian Federation, Ukraine
	Eastern Europe	Belarus, Estonia, Latvia, Lithuania, Republic of Moldova, Ukraine
	Russian Federation	Russian Federation
	Western and Central Europe	Albania, Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Malta, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, The former Yugoslav Republic of Macedonia, United Kingdom
	Central Europe	Bulgaria, Czech Republic, Hungary, Montenegro, Poland, Romania, Serbia, Slovakia, Slovenia
	Mediterranean Europe	Albania, Cyprus, Greece, Italy, Malta, Portugal, Spain, The former Yugoslav Republic of Macedonia
	Northern Europe	Denmark, Finland, Norway, Sweden
	Western Europe	Austria, Belgium, France, Germany, Ireland, Netherlands, Switzerland, United Kingdom
Oceania		Australia, New Zealand
	Australia and New Zealand	Australia, New Zealand
	Pacific Islands	-
WORLD (167 countries and territories included in this review)		
Afghanistan, Albania, Algeria, Angola, Antigua and Barbuda, Argentina, Armenia, Austria, Azerbaijan, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Belize, Benin, Bhutan, Bolivia (Plurinational State of), Botswana, Brazil, Brunei Darussalam, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Cape Verde, Central African Republic, Chad, Chile, China, Colombia, Congo, Costa Rica, Côte d'Ivoire, Cuba, Cyprus, Czech Republic, Djibouti, Democratic People's Republic of Korea, Democratic Republic of the Congo, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Eritrea, Estonia, Ethiopia, Finland, France, Gabon, Gambia, Georgia, Germany, Ghana, Greece, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hungary, India, Indonesia, Iran (Islamic Republic of), Iraq, Ireland, Italy, Israel, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kuwait, Kyrgyzstan, Lao People's Democratic Republic, Latvia, Lebanon, Lesotho, Liberia, Libya, Lithuania, Madagascar, Malaysia, Malawi, Mali, Malta, Mauritania, Mauritius, Mexico, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, Netherlands, Nicaragua, Niger, Nigeria, Norway, Occupied Palestinian Territory, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Puerto Rico, Qatar, Republic of Korea, Republic of Moldova, Romania, Russian Federation, Rwanda, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Saudi Arabia, Senegal, Serbia, Seychelles, Sierra Leone, Slovakia, Slovenia, Somalia, South Africa, Spain, Sri Lanka, Sudan and South Sudan, Suriname, Swaziland, Sweden, Switzerland, Syrian Arab Republic, Tajikistan, Thailand, The former Yugoslav Republic of Macedonia, Timor-Leste, Trinidad and Tobago, Togo, Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, United Arab Emirates, United Kingdom, United Republic of Tanzania, United States of America, Uruguay, Uzbekistan, Venezuela (Bolivarian Republic of), Viet Nam, Yemen, Zambia, Zimbabwe		

Country groupings based on income (as of October 2012)¹⁰

Category	Countries
High Income Countries:	
Economies are divided according to 2011 GNI per capita, calculated using the World Bank Atlas method. The groups are: low income, \$1,025 or less; middle income, \$1,026 - \$12,475; and high income, \$12,476 or more (WB, 2012).	
	Australia, Austria, Bahrain, Barbados, Belgium, Brunei Darussalam, Canada, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Japan, Kuwait, Malta, Netherlands, New Zealand, Norway, Oman, Poland, Portugal, Puerto Rico (USA), Qatar, Republic of Korea, Saint Kitts and Nevis, Saudi Arabia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Trinidad and Tobago, United Arab Emirates, United Kingdom, United States of America
Middle Income Countries	
	Albania, Algeria, Angola, Antigua and Barbuda, Argentina, Armenia, Azerbaijan, Belarus, Belize, Bhutan, Bolivia (Plurinational State of), Botswana, Brazil, Bulgaria, Cameroon, Cape Verde, Chile, China, Colombia, Congo, Costa Rica, Côte d'Ivoire, Cuba, Djibouti, Dominican Republic, Ecuador, Egypt, El Salvador, Gabon, Georgia, Ghana, Grenada, Guatemala, Guyana, Honduras, India, Indonesia, Iran (Islamic Republic of), Iraq, Jamaica, Jordan, Kazakhstan, Lao People's Democratic Republic, Latvia, Lebanon, Lesotho, Libya, Lithuania, Malaysia, Mauritius, Mexico, Mongolia, Montenegro, Morocco, Namibia, Nicaragua, Nigeria, Occupied Palestinian Territory, Pakistan, Panama, Paraguay, Peru, Philippines, Republic of Moldova, Romania, Russian Federation, Saint Lucia, Saint Vincent and the Grenadines, Senegal, Serbia, Seychelles, South Africa, Sri Lanka, Sudan and South Sudan, Suriname, Swaziland, Syrian Arab Republic, Thailand, The former Yugoslav Republic of Macedonia, Timor-Leste, Tunisia, Turkey, Turkmenistan, Ukraine, Uruguay, Uzbekistan, Venezuela (Bolivarian Republic of), Viet Nam, Yemen, Zambia
Low Income Countries	
	Afghanistan, Bangladesh, Benin, Burkina Faso, Burundi, Cambodia, Central African Republic, Chad, Democratic People's Republic of Korea, Democratic Republic of the Congo, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Haiti, Kenya, Kyrgyzstan, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Rwanda, Sierra Leone, Somalia, Tajikistan, Togo, Uganda, United Republic of Tanzania, Zimbabwe

¹⁰ Not included:

- High Income Countries: Andorra, Bahamas, Croatia, Equatorial Guinea, Faroe Islands, Iceland, Holy See, Liechtenstein, Luxembourg, Monaco, San Marino, Singapore
- Middle Income Countries: Bosnia and Herzegovina, Cook Islands, Dominica, Fiji, Kiribati, Maldives, Marshall Islands, Micronesia (Federated States of), Nauru, Niue, Palau, Papua New Guinea, Samoa, Sao Tome and Principe, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu
- Low Income Countries: Comoros
- LIFDC: Comoros, Kiribati, Papua New Guinea, Sao Tome and Principe, Solomon Islands
- LDC: Comoros, Equatorial Guinea, Kiribati, Samoa, Sao Tome and Principe, Solomon Islands, Tokelau, Tuvalu, Vanuatu

Low Income Countries Food Deficit (LIFDC):

The classification of a country as low-income food-deficit used is traditionally determined by four criteria:

A per capita gross national income (GNI);

The net food import position (i.e. gross imports less gross exports) of a country averaged over the preceding three years for which statistics are available;

The self-exclusion criterion is applied when countries that meet the above two criteria specifically request FAO to be excluded from the LIFDC category;

A "persistence of position" factor in order to avoid countries changing their LIFDC status too frequently - typically due to short-term, exogenous shocks. This factor would postpone the "exit" of a LIFDC from the list, until the change in its status is verified for three consecutive years (FAO, 2012d).

Afghanistan, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Cambodia, Cameroon, Central African Republic, Chad, Congo, Côte d'Ivoire, Democratic People's Republic of Korea, Democratic Republic of the Congo, Djibouti, Egypt, Eritrea, Ethiopia, Gambia, Georgia, Ghana, Guinea, Guinea-Bissau, Haiti, Honduras, India, Indonesia, Iraq, Kenya, Kyrgyzstan, Lao People's Democratic Republic, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mongolia, Mozambique, Nepal, Nicaragua, Niger, Nigeria, Philippines, Republic of Moldova, Rwanda, Senegal, Sierra Leone, Somalia, Sri Lanka, Sudan and South Sudan, Syrian Arab Republic, Tajikistan, Timor-Leste, Togo, Uganda, United Republic of Tanzania, Uzbekistan, Yemen, Zambia, Zimbabwe

Least Developed Countries (LDC):

The least developed country (LDC) category comprises low-income developing countries which face severe structural impediments to growth. Indicators of such impediments are the high vulnerability of the countries' economies and their low level of human capital, which are evaluated through three indices:

The gross national income (GNI) per capita;

A human assets index (HAI): based on: (a) nutrition: percentage of population undernourished; (b) health: mortality rate for children aged five years or under; (c) education: the gross secondary school enrolment ratio; and (d) adult literacy rate;

An economic vulnerability index (EVI) based on indicators of: (a) population size; (b) remoteness; (c) merchandise export concentration; (d) share of agriculture, forestry and fisheries in gross domestic product; (e) share of population living in low elevated coastal zones; (f) instability of exports of goods and services; (g) victims of natural disasters; and (h) instability of agricultural production (UN, 2008 & UN-OHRLLS, 2012)

Afghanistan, Angola, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Cambodia, Central African Republic, Chad, Democratic Republic of the Congo, Djibouti, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Haiti, Lao People's Democratic Republic, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Rwanda, Senegal, Sierra Leone, Somalia, Sudan and South Sudan, Timor-Leste, Togo, Uganda, United Republic of Tanzania, Yemen, Zambia

ANNEX 4 - Irrigated crop calendars used in this review

AFGHANISTAN

Irrigated crop calendar

2011

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	1 303	69	69	69	69	69						69	69
Rice	208						11	11	11	11	11		
Barley	116	6	6	6	6	6							6
Maize	183						10	10	10	10	10		
Vegetables	69						4	4	4	4	4		
Fruit	137	7	7	7	7	7	7	7	7	7	7	7	7
Grapes	61	3	3	3	3	3	3	3	3	3	3	3	3
Sunflower°	10						1	1	1	1	1		
Sesame	10						1	1	1	1	1		
Potatoes°	15	1	1	1	1	1							
Pulses°	27						1	1	1	1	1		
Sugar beets°	2						0.1	0.1	0.1	0.1	0.1		
Sugarcane°	2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Cotton	33					2	2	2	2	2	2	2	
Harvested irrigated crop area [AHI_{full}]	2 176	86	86	86	86	88	39	39	39	39	39	81	85
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1 896	* * These areas refer to the year 2002 ° These areas originate from AT2050/2080											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	115												
Area equipped for full control irrigation [AEI_{full}]	3 208												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	59												
Total area equipped for irrigation [AEI_{tot}]	3 208												

* These areas refer to the year 2002

° These areas originate from AT2050/2080

Narrative Afghanistan

AEI_{full} in 2002 is 3 208 480 (FAO, 2012). AAI_{full} is 1 896 000 for the cropping year 2010-2011 according to the 2011 Statistical Yearbook (CSO, 2012). AHI_{full} is estimated at 2 328 000 ha in 2006 by AT 2050/2080 (FAO, 2011). A partial AHI_{full} for 2011 (2 120 000 ha) is available from the 2011 Statistical Yearbook (CSO, 2012). It was completed with the areas of additional crops originating from AT 2050/2080, and resulting in a total AHI_{full} of 2 176 000 ha and a cropping intensity of 115 percent. Irrigation is practiced all year round. Temporary crops are mostly irrigated from June (or April for cotton) to October, except some cereals and fodder which are cultivated from November or January to May.

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ALBANIA

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	3	3	3	3	3	3						3	3
Maize	29				28	28	28	28	28				
Other cereals	4				4	4	4	4	4				
Vegetables	20				19	19	19	19	19				
Fruit	8	8	8	8	8	8	8	8	8	8	8	8	8
Rapeseed	9				9	9	9	9	9				
Potatoes	3				3	3	3	3	3				
Pulses	13				13	13	13	13	13				
Fodder temporary	14	14	14	14	14							14	14
Harvested irrigated crop area [AHI_{full}]	103	25	25	25	100	86	83	83	83	8	8	25	25
Area equipped for full control irrigation actually irrigated [AAI_{full}]	103	* This area refers to the year 2000											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	188												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	54												
Total area equipped for irrigation [AEI_{tot}]	340												

* This area refers to the year 2000

Narrative Albania

According to the AQUASTAT database, AEI_{tot} is equal to 340 000 ha in 2000 (FAO, 2012). However, irrigation systems deteriorated in the 1990s to a historic low of 148 000 ha equipped in 1994 with only 80 000 ha actually irrigated. Rehabilitation is currently undertaken. Siebert *et al.* (2010) consider that AEI_{full} is 188 450 ha and AAI_{full} is 102 670 ha in 2006. This last figure is also confirmed by national data (MAFCD, 2010). The crop calendar is adapted from AT 2030/2050 (FAO, 2006). The main irrigated crops are cereals (mainly maize), vegetables, temporary fodder and pulses. Irrigation is necessary in the drier plain areas, mostly in summer for temporary crops (from April to August, the driest months), except for winter wheat and fodder (from November to April-May).

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ALGERIA

Irrigated crop calendar

2001

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	89	20	20	20	20	20						20	20
Vegetables	99					22	22	22	22	22			
Fruit	111	24	24	24	24	24	24	24	24	24	24	24	24
Citrus	46	10	10	10	10	10	10	10	10	10	10	10	10
Oil crops	15					3	3	3	3	3			
Potatoes	79					17	17	17	17	17			
Tobacco	5					1	1	1	1	1			
Fodder permanent	9	2	2	2	2	2	2	2	2	2	2	2	2
Harvested irrigated crop area [AHI_{full}]	453	56	56	56	56	100	80	80	80	80	37	56	56
Area equipped for full control irrigation actually irrigated [AAI_{full}]	453												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	513												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	88												
Total area equipped for irrigation [AEI_{tot}]	569												

Narrative

The partial values on the harvested irrigated crops (191 000 ha) used in the AQUASTAT country profile (FAO, 2012) refer to 1986, while AEI_{tot} (569 400 ha) and AEI_{full} (513 400 ha) refer to 2001 (FAO, 2012). AAI_{tot} is 453 300 ha and AAI_{full} is assumed similar and consistent with Siebert *et al.*'s (2010) figure (455 534 ha). AHI_{full} is assumed to be similar to AAI_{full}. The main irrigated crops are fruit (25 percent), vegetables (22 percent), wheat (20 percent) and potatoes (18 percent). Some citrus, olive trees, fodder (assumed to be permanent based on 1986 data) and tobacco are also irrigated. Except winter wheat grown from November to May, all other temporary crops are irrigated from May to September.

References

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ANGOLA

Irrigated crop calendar

2005

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Maize	4.7						41	41	41	41	41		
Vegetables	2.7	23	23	23	23								23
Potatoes	0.2	2	2	2	2								2
Sweet potatoes	0.8	7	7	7	7								7
Cassava	0.3	3	3	3	3								3
Pulses	1.1	10	10	10	10								10
Other temporary crops	1.7	14	14	14	14								14
Harvested irrigated crop area [AHI_{full}]	11.5	59	59	59	59	0	41	41	41	41	41	0	59
Area equipped for full control irrigation actually irrigated [AAI_{full}]	11.5												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	85.5												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	13												
Total area equipped for irrigation [AEI_{tot}]	85.5												

Narrative

AEI_{full} is 85 529 ha during the 2004-2005 cropping season. AHI_{full} is however only 11 522 ha, which is a significant decrease compared to 1996 data (35 000 ha) and estimation from AT 2050/2080 (41 000 ha in 2006; FAO, 2011). This data is nonetheless considered the more accurate. AAI_{full} is assumed to be equal to AHI_{full}. There is also a change regarding the irrigated crops as maize and vegetables are dominating. Some roots (potatoes, sweet potatoes, and cassava) and leguminous crops are also irrigated. The cropping seasons are based on AT 2050/2080 (FAO, 2011). Except maize irrigated from June to November, temporary crops are irrigated from December to April.

References

FAO. 2011. World agriculture: towards 2050/2080. FAO, Global Perspective Studies Unit. Rome. (Internal document).

ARGENTINA

Irrigated crop calendar

2008

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	60						3	3	3	3	3	3	3
Rice	164	8	8	8								8	8
Maize	198	9	9	9								9	9
Sorghum	108	5	5	5								5	5
Vegetables	312	14	14	14								14	14
Fruit	537	25	25	25	25	25	25	25	25	25	25	25	25
Citrus	22	1	1	1	1	1	1	1	1	1	1	1	1
Oil crops	9	0.4	0.4	0.4								0.4	0.4
Potatoes	29	1	1	1								1	1
Pulses	208	10	10	10								10	10
Sugarcane	246	11	11	11	11	11	11	11	11	11	11	11	11
Cotton	17	1	1	1	1						1	1	1
Tobacco	10	0.5	0.5	0.5								0.5	0.5
Fodder temporary	380						18	18	18	18	18		
Harvested irrigated crop area [AHI_{full}]	2 300	86	86	86	38	37	58	58	58	58	58	89	89
Area equipped for full control irrigation actually irrigated [AAI_{full}]	2 162	* * * These figures refer to the year 2011											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	106												
Area equipped for full control irrigation [AEI_{full}]	2 357												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	92												
Total area equipped for irrigation [AEI_{tot}]	2 357												

Narrative Argentina

AEI_{tot} and AEI_{full} are 2 357 000 ha and AAI_{full} is 2 162 100 ha in 2011 (FAO, 2012). AHI_{full} is 2 300 000 ha in 2008 according to the 2008 Agricultural Census (INDEC, 2009), but limited details about the existing crops are available. Therefore the crops' areas mentioned in the crop calendar are based on AT 2050/2080 (FAO, 2011), but adjusted with the census' data. The crop calendar for temporary fodder was assumed to be very similar to winter wheat as it is generally the case in neighbouring countries. The resulting cropping intensity is 106 percent. Temporary crops are irrigated from November till March, during the dry summer period, except wheat which is irrigated from June to December and temporary fodder from June to October.

References

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- FAO.** 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

ARMENIA

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat winter	18	10	10	10	10						10	10	10
Wheat spring	18					10	10	10	10	10			
Barley winter	3	2	2	2	2							2	2
Barley spring	3					2	2	2	2	2			
Maize	3					2	2	2	2	2			
Vegetables	23					13	13	13	13	13			
Fruit	35	20	20	20	20	20	20	20	20	20	20	20	20
Vineyards	16	9	9	9	9	9	9	9	9	9	9	9	9
Rapeseed	6					3	3	3	3	3			
Potatoes	24					14	14	14	14	14			
Pulses	2					1	1	1	1	1			
Fodder temporary	26	15	15	15	15							15	15
Harvested irrigated crop area [AHI_{full}]	176	55	55	55	55	74	74	74	74	74	39	55	55
Area equipped for full control irrigation actually irrigated [AAI_{full}]	176												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	274												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	64												
Total area equipped for irrigation [AEI_{tot}]	274												

Narrative

According to the AQUASTAT database AEI_{full} is similar to AEI_{tot} and equals to 273 500 ha in 2006, of which only 176 000 ha were actually irrigated (FAO, 2012). Based on different reports of the Ministry of Agriculture, AHI_{full} is also estimated at 176 000 ha. More than 80 percent of the total crop production in this country is produced under irrigation and the main irrigated crops are wheat, fruit, temporary fodder, vegetables and potatoes. Some vineyards, rapeseed and pulses are also irrigated. Temporary crops are irrigated in summer from May to September, except winter varieties of wheat and barley, as well as temporary fodder, which are cultivated from November to April.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

AUSTRALIA

Irrigated crop calendar

2010

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	139					8	8	8	8	8	8	8	
Rice	19	1	1	1	1								1
Maize	50	3	3	3	3								3
Barley and other cereals	58	3	3	3	3								3
Vegetables	104	6	6	6	6								6
Fruit	134	7	7	7	7	7	7	7	7	7	7	7	7
Grapes	163	9	9	9	9	9	9	9	9	9	9	9	9
Soybeans	30	2	2	2	2								2
Rapeseed	30	2	2	2	2								2
Sugarcane	213	12	12	12	12	12	12	12	12	12	12	12	12
Fodder temporary	192					10	10	10	10	10	10		
Cotton	153	8	8	8	8	8	8						8
Flowers	13	1	1	1	1	1	1	1	1	1	1	1	1
Pasture permanent	542	29	29	29	29	29	29	29	29	29	29	29	29
Harvested irrigated crop area [AHI_{full}]	1 841	82	82	82	82	84	84	76	76	76	76	65	82
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1 841	* This area refers to the year 2006											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	2 546												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	72												
Total area equipped for irrigation [AEI_{tot}]	2 546												

Narrative Australia

AEI_{full} for 2006 (2 545 000 ha), the historic largest irrigated area in Australia, is also AEI_{tot} (ABS, 2011). This area is considered fully operative, as AHI_{full} in 2006 equals to AEI_{full} . However, during the period 2007-2010 the irrigated area has been significantly reduced due to the lack of available water (drought period). The AHI_{full} for the cropping year 2009-2010 is 1 840 610 ha slightly recovering from the historic low of 2008-2009 with 1.760 million ha (ABS, 2011). AAI_{full} is assumed to equal to AHI_{full} . Permanent pastures and temporary fodder are the main irrigated crop (41 percent of AHI_{full}). Most temporary crops are irrigated during summer (from December to April or to June for cotton), except fodder and winter wheat. The area cropped with rice is highly dependent on the water availability and is thus the first crop affected in drought period, explaining the huge difference with pre-2006 years (for example 51 000 ha in 2006).

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AUSTRIA

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Maize	7.4				17	17	17	17	17				
Other cereals	8.5				20	20	20	20	20				
Vegetables	2.2				5	5	5	5	5				
Fruit	4.7	11	11	11	11	11	11	11	11	11	11	11	11
Oil crops	4.2				10	10	10	10	10				
Potatoes	3.2				7	7	7	7	7				
Pulses	6.5				15	15	15	15	15				
Sugar beet	6.7			15	15	15	15	15	15				
Harvested irrigated crop area [AHI_{full}]	43.3	11	11	26	100	100	100	100	100	11	11	11	11
Area equipped for full control irrigation actually irrigated [AAI_{full}]	43.4												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	116.1												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	37												
Total area equipped for irrigation [AEI_{tot}]	116.1												

Narrative

AEI_{tot} and AEI_{full} are 116 070 ha and AAI_{full} is 43 440 ha in 2007 (Eurostat, 2012). The crop calendar is adapted from AT 2030/2050 (FAO, 2006). The main irrigated crops are cereals (37 percent, mostly maize), sugar beet (16 percent) and pulses (15 percent). Vegetables (including potatoes), fruits and oils crops are also irrigated. Except fruit trees, which are irrigated in summer and frost protected by water in winter/spring, all are temporary crops irrigated in summer from March (sugar beet) or April to August.

References

Eurostat. 2012. EUROSTAT irrigation data. Available at <http://epp.eurostat.ec.europa.eu/>, accessed in June 2012.

FAO. 2006. *World agriculture: towards 2030/2050*. Interim report. FAO, Global Perspective Studies Unit. Rome, Italy. Available at http://www.fao.org/fileadmin/user_upload/esag/docs/Interim_report_AT2050web.pdf, accessed in November 2012.

AZERBAIJAN

Irrigated crop calendar

2004

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	611	45	45	45	45						45	45	45
Barley	159	12	12	12							12	12	12
Maize	33					2	2	2	2	2			
Other cereals	12					1	1	1	1	1			
Vegetables	77					6	6	6	6	6			
Fruit	98	7	7	7	7	7	7	7	7	7	7	7	7
Sunflower	11					1	1	1	1	1			
Potatoes	66					5	5	5	5	5			
Tea	4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Sugar beet	3					0.2	0.2	0.2	0.2	0.2			
Fodder temporary	118	9	9	9	9						9	9	9
Cotton	78				6	6	6	6	6	6	6		
Tobacco	3					0.2	0.2	0.2	0.2	0.2			
Other temporary crops	118					9	9	9	9	9			
Harvested irrigated crop area [AHI_{full}]	1391	73	73	73	67	37	37	37	37	37	79	73	73
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1 356	* * These areas refer to the year 2003											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	103												
Area equipped for full control irrigation [AEI_{full}]	1 426												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	95												
Total area equipped for irrigation [AEI_{tot}]	1 426												

Narrative Azerbaijan

AEI_{full} is 1 426 000 ha in 2003 (Heydar Aliyev Foundation, 2008), of which 1 356 400 ha are actually irrigated in 2004 (State Statistical Committee, 2012). AHI_{full} is 1 391 000 ha in 2004, resulting in a cropping intensity of 103 percent. The main irrigated areas consist of cereals (mainly wheat), vegetables, fruit and cotton. Some potatoes, sunflower, tea, sugar beets, tobacco and other temporary crops are also irrigated. Temporary crops are irrigated from May to September (only cotton lasts from April until October), except some cereals and temporary fodder which are cultivated in winter from October to April.

References

Heydar Aliyev Foundation. 2008. Azerbaijan. Available at <http://www.azerbaijan.az/>, accessed in June 2012.

State Statistical Committee of the Republic of Azerbaijan. 2012. Irrigated lands. Available at <http://www.azstat.org/statinfo/agriculture/en/index.shtml>, accessed in June 2012.

BAHRAIN

Irrigated crop calendar

2000

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Vegetables	1.015				25	25	25	25	25				
Fruit (dates)	2.210	55	55	55	55	55	55	55	55	55	55	55	55
Fodder temporary	0.790	20	20	20	20							20	20
Harvested irrigated crop area [AHI_{full}]	4.015	75	75	75	100	80	80	80	80	55	55	75	75
Area equipped for full control irrigation actually irrigated [AAI_{full}]	4.015												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	4.015												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	4.015												

Narrative

AEI_{full} equals AEI_{tot} in 2000 (4 015 ha) according to the AQUASTAT database (FAO, 2012), while AAI_{full} is considered similar to AEI_{full} by Siebert *et al.* (2010). AHI_{full} is 4 015 ha (FAO, 2012) resulting in a cropping intensity of 100 percent. The main irrigated crops are fruit (dates), vegetables (mainly tomatoes) and temporary fodder (mainly alfalfa). Irrigation is practiced all year round.

References

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Siebert, S., Burke, J., Faures, J. M., Frenken, K., Hoogeveen, J., Döll, P., and Portmann, F. T. 2010. Ground water use for irrigation - a global inventory. Hydrol. Earth Syst. Sci., 14, 1863–1880. Available at <http://www.fao.org/docrep/013/al816e/al816e00.pdf>, accessed in June 2012.

BANGLADESH

Irrigated crop calendar

2008

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	313	6	6	6	6								6
Rice one (Aman)	927							18	18	18	18	18	
Rice two (Boro)	3 414	68	68	68	68								68
Maize	90	2	2	2	2								2
Other cereals	26	1	1	1	1								1
Vegetables	236	5	5	5	5								5
Sesame	30	1	1	1	1								1
Potatoes	263	5	5	5	5								5
Tea	40	1	1	1	1	1	1	1	1	1	1	1	1
Pulses	156	3	3	3	3								3
Sugarcane	43	1	1	1	1	1	1	1	1	1	1	1	1
Cotton	7	0.1	0.1	0.1	0.1	0.1						0.1	0.1
Tobacco	18	0.4	0.4	0.4	0.4								0.4
Other temporary crops	414	8	8	8	8								8
Harvested irrigated crop area [AHI_{full}]	5 977	100	100	100	100	2	2	20	20	20	20	20	100
Area equipped for full control irrigation actually irrigated [AAI_{full}]	5 050												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	118												
Area equipped for full control irrigation [AEI_{full}]	5 050												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	5 050												

Narrative

The crop calendar indicates an AHI_{full} of 5 977 000 ha (2008) and a cropping intensity of 118 percent. Based on a report of the Ministry of Agriculture (MOA, 2008), AAI_{full} is considered to be equal to AEI_{full} (5 050 000 ha). The main irrigated crop is rice (86 percent) followed by cereals (7 percent) and potatoes (4 percent). Some vegetables, pulses, sugarcane, tea, sesame, cotton, tobacco and other temporary crops are also irrigated. Temporary crops are mostly irrigated from December to April/May, during the dry season (December to February) and pre-monsoon season (March to May). There is double cropping of rice with *Boro* rice on 3 414 000 ha from December to April and *Aman* rice on 927 000 from July to November.

References

Ministry of Agriculture [MOA]. 2008. *Handbook of agriculture statistics 2008*. Dhaka, Bangladesh.

Prepared in November 2012

BELARUS

Irrigated crop calendar

2011

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Vegetables	3.0				10	10	10	10	10				
Fruit	2.3	7	7	7	7	7	7	7	7	7	7	7	7
Potatoes	2.9				10	10	10	10	10				
Pulses	2.3				8	8	8	8	8				
Pasture permanent	20.1	66	66	66	66	66	66	66	66	66	66	66	66
Harvested irrigated crop area [AHI_{full}]	30.6	73	73	73	100	100	100	100	100	73	73	73	73
Area equipped for full control irrigation actually irrigated [AAI_{full}]	30.6	* This area refers to the year 2003											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	115.0												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	27												
Total area equipped for irrigation [AEI_{tot}]	115.0												

Narrative

AEI_{tot} reached its maximum in the 1980s at 163 000 ha and then declined to 149 000 ha in 1990, 131 000 ha in 1993 (FAO, 2012) and 115 000 ha in 2003 as reported in the Global Map of Irrigation Areas (Siebert *et al.*, 2005) and considered still valid (Siebert *et al.*, 2010). AEI_{full} is considered equal to AEI_{tot}, based on previous data set. AAI_{full} is 30 600 ha in 2011 (NSC, 2011), and AHI_{full} is assumed similar. The main irrigated crop is by far permanent pasture followed by vegetables. Temporary crops are irrigated in summer from April to August.

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BELGIUM

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Barley	1.5				27	27	27	27	27				
Fruit	1.2	22	22	22	22	22	22	22	22	22	22	22	22
Potatoes	2.3				41	41	41	41	41				
Sugar beet	0.6			11	11	11	11	11	11				
Harvested irrigated crop area [AHI_{full}]	5.7	22	22	32	100	100	100	100	100	22	22	22	22
Area equipped for full control irrigation actually irrigated [AAI_{full}]	5.7												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	23.4												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	24												
Total area equipped for irrigation [AEI_{tot}]	23.4												

Narrative

AEI_{tot} and AEI_{full} are 23 350 ha, and AAI_{tot} and AAI_{full} are 5 680 ha in 2007 (Eurostat, 2012). The crop calendar was defined in comparison with the neighbouring countries and Eurostat (European Commission, 2010). It is assumed that AHI_{full} is equal to AAI_{full}. The crops mentioned in the crop calendar are potatoes (41 percent), barley (27 percent), vegetables (22 percent) and sugar beet (11 percent). Irrigation mostly occurs in summer, from March (sugar beet) or April to August for temporary crops. Fruit trees are considered irrigated the whole year: for frost protection in winter/spring and for water deficit in summer.

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BELIZE

Irrigated crop calendar

1997

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice	0.9				30	30	30	30	30				
Fruit	0.6	20	20	20	20	20	20	20	20	20	20	20	20
Sugarcane	1.5	50	50	50	50	50	50	50	50	50	50	50	50
Harvested irrigated crop area [AHI_{full}]	3.0	70	70	70	100	100	100	100	100	70	70	70	70
Area equipped for full control irrigation actually irrigated [AAI_{full}]	3.0												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	3.0												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	3.0												

Narrative

Irrigation is marginal because of the climatic and social conditions. AEI_{tot} is 3 000 ha and is equal to AEI_{full} as reported by the AQUASTAT database (FAO, 2012). These figures refer to 1997 but there is no information suggesting any change. It is estimated that AHI_{full} and AAI_{full} are similar to AEI_{full}. Sugarcane, rice and fruits (banana, citrus and papaya) are the main irrigated crops. Rice is irrigated from April to August, during the rainy season.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

BENIN

Irrigated crop calendar

2008

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	5.9						35	35	35	35	35		
Rice two	5.0	29	29	29	29	29							
Vegetables	2.7						16	16	16	16	16		
Roots	4.6						27	27	27	27	27		
Sugarcane	3.5	20	20	20	20	20	20	20	20	20	20	20	20
Harvested irrigated crop area [AHI_{full}]	21.8	50	50	50	50	50	98	98	98	98	98	20	20
Area equipped for full control irrigation actually irrigated [AAI_{full}]	17.2												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	127												
Area equipped for full control irrigation [AEI_{full}]	23.0												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	75												
Total area equipped for irrigation [AEI_{tot}]	23.0												

Narrative

AEI_{tot} and AEI_{full} are 23 037 ha in 2008 and AAI_{full} is 17 199 ha for the same year. AHI_{full} is 21 798 ha in 2008 (FAO, 2010), resulting in a cropping intensity of 127 percent. The main irrigated crops are cereals (assumed to be double cropping of rice based on the previous exercise undertaken in 2000) and roots. Some vegetables and industrial crops (assumed to be sugarcane also based on the previous exercise) are also irrigated. The cropping seasons are based on AT 2050/2080 (FAO, 2011). Temporary crops are irrigated mostly from June to October, except for the rice second cropping.

References

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BHUTAN

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	27.4						99	99	99	99	99		
Rice two	3.0	11	11	11								11	11
Potatoes	0.5	2	2	2								2	2
Harvested irrigated crop area [AHI_{full}]	30.9	13	13	13	0	0	99	99	99	99	99	13	13
Area equipped for full control irrigation actually irrigated [AAI_{full}]	27.7												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	112												
Area equipped for full control irrigation [AEI_{full}]	27.7												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	27.7												

Narrative

The new figure for AEI_{tot} and AEI_{full} (27 685 ha) is based on a national project report (MOA, 1995). It is considered that AEI_{full} and AAI_{full} and are equal in 2007 as confirmed through country feedback. AHI_{full} is estimated at 30 900 ha to account for the double cropping of paddy, which is limited to the lowest altitudes where the temperatures during the winter allow its cultivation. The resulting cropping intensity is 112 percent. The main irrigated crops are rice (98 percent) and potatoes (2 percent). The main irrigation period is from June to October, during the monsoon season.

References

Ministry of Agriculture [MOA]. 1995. *Land Use planning Project*. Bhutan.

BOLIVIA (PLURINATIONAL STATE OF)

Irrigated crop calendar

1999

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice	23	18	18	18	18								18
Barley	6	4	4	4	4								4
Vegetables	18	14	14	14	14								14
Fruit	4	3	3	3	3	3	3	3	3	3	3	3	3
Citrus	7	5	5	5	5	5	5	5	5	5	5	5	5
Potatoes	7	5	5	5	5								5
Sweet potatoes	2	1	1	1	1								1
Sugarcane	37	29	29	29	29	29	29	29	29	29	29	29	29
Fodder temporary	1	1	1	1	1								1
Cotton	25	20	20	20	20	20	20						20
Harvested irrigated crop area [AHI_{full}]	128	100	100	100	100	56	56	37	37	37	37	37	100
Area equipped for full control irrigation actually irrigated [AAI_{full}]	128												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	128												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	128												

Narrative

AEI_{tot}, AEI_{full}, AAI_{tot}, and AAI_{full} are identical and equal to 128 200 ha in 1999 (FAO, 2012). Note that the AEI_{full} and AAI_{full} figures chosen by Siebert *et al.* (2010) are similar (128 000 ha). AHI_{full} is considered equal to AAI_{full}. The main irrigated crops besides sugarcane are mostly commercial crops for exports such as cotton, rice and vegetables in the plains, potatoes, sweet potatoes, cereals (barley) and fodder (assumed to be temporary) in the Altiplano area, and fruits (citrus) and vegetables in the valleys. Temporary crops are cultivated and irrigated from December to April or (June for cotton), during the rainy season.

References

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Siebert, S., Burke, J., Faures, J. M., Frenken, K., Hoogeveen, J., Döll, P., and Portmann, F. T. 2010. Ground water use for irrigation - a global inventory. Hydrol. Earth Syst. Sci., 14, 1863–1880. Available at <http://www.fao.org/docrep/013/al816e/al816e00.pdf>, accessed in June 2012.

BOTSWANA

Irrigated crop calendar

2002

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Maize	0.35	29	29	29	29	29							
Vegetables	0.30	24	24	24	24								24
Fruit (Citrus etc)	0.32	26	26	26	26	26	26	26	26	26	26	26	26
Fodder temporary	0.22					18	18	18	18	18			
Cotton	0.10	8	8	8	8	8						8	8
Harvested irrigated crop area [AHI_{full}]	1.29	87	87	87	87	81	44	44	44	44	26	34	59
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1.23												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	105												
Area equipped for full control irrigation [AEI_{full}]	1												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	85												
Total area equipped for irrigation [AEI_{tot}]	1.44												

Narrative

AEI_{tot} and AEI_{full} equal to 1 439 ha in 2002 (FAO, 2012). A partial AHI_{full} is given in the AQUASTAT database for 2002 (consisting of 321 ha of citrus and 299 ha of vegetables). AHI_{full} (1 290 ha) was calculated by adding the 1991 additional areas for maize, cotton and temporary fodder, resulting in a cropping intensity of 105 percent. The cropping seasons originate from the previous exercise undertaken in 2000 for maize and cotton, and neighbouring countries for fodder. Temporary crops are mostly irrigated from November or January to April or May, except temporary fodder cultivated from May to September.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>.

BRAZIL

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat*	19	0.4	0.4	0.4								0.4	0.4
Maize	559				13	13	13	13	13				
Rice	1 129	25	25	25	25	25							
Vegetables	152	3	3	3								3	3
Fruit*	29	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Bananas*	27	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Citrus	158	4	4	4	4	4	4	4	4	4	4	4	4
Soybeans	624								14	14	14	14	14
Potatoes*	23	0.5	0.5	0.5								0.5	0.5
Coffee	262	6	6	6	6	6	6	6	6	6	6	6	6
Pulses	316	7	7	7								7	7
Sugarcane	1 705	38	38	38	38	38	38	38	38	38	38	38	38
Pasture permanent*	55	1	1	1	1	1	1	1	1	1	1	1	1
Tobacco *	64	1	1	1								1	1
Cotton*	207						5	5	5	5	5	5	5
Harvested irrigated crop area [AHI_{full}]	5 329	88	88	88	88	88	67	67	81	69	69	82	82
Area equipped for full control irrigation actually irrigated [AAI_{full}]	4 454	* These areas originate from AT2050/2080											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	120												
Area equipped for full control irrigation [AEI_{full}]	4 601												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	97												
Total area equipped for irrigation [AEI_{tot}]	4 601												

* These areas originate from AT2050/2080

Narrative Brazil

AEI_{full} is 4 601 290 ha in 2006 as reported by the 2009 Report on State of Water Resources of Brazil (ANA, 2009). AAI_{full} is 4 454 000 ha for the same year, according to the 2006 agricultural census. A partial AHI_{full} for the ten main irrigated crops in 2006 is 4 904 677 ha, according to the 2006 Agricultural Census (GSO, 2010). For other minor crops cited in AT 2050/2080 (FAO, 2011) their specific area is added, resulting in an AHI_{full} of 5 329 000 ha and a cropping intensity of 120 percent. The range of crops grown under irrigation is highly diversified. The main irrigated crop is sugarcane, followed by rice, soybeans, cereals (mainly maize), pulses, coffee, cotton, fruit (citrus), bananas, vegetables, potatoes, tobacco and pastures. Pastures are considered to be permanent pastures due to indication in the 2009 State of Water Resources that they are irrigated but not included in arable land. Basic commodities are complemented, whenever markets permits, by high-value commercial crops with off-season fruits and vegetables for example intended in particular for exports. Temporary crops are mostly cultivated and irrigated from November to March.

References

Agencia Nacional de Aguas [ANA]. 2009. Conjuntura dos recursos hídricos no Brasil 2009. Brasília: ANA 2009. Brasília: ANA 2009, Available at <http://arquivos.ana.gov.br/institucional/sge/CEDOC/Catalogo/2009/ConjunturaDosRecursosHidricosNoBrasil.pdf>, accessed in June 2012.

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BRUNEI DARUSSALAM

Irrigated crop calendar

1995

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	0.48	76	76								76	76	76
Rice two	0.37					59	59	59	59	59			
Fruits	0.15	24	24	24	24	24	24	24	24	24	24	24	24
Harvested irrigated crop area [AHI_{full}]	1.00	100	100	24	24	83	83	83	83	83	100	100	100
Area equipped for full control irrigation actually irrigated [AAI_{full}]	0.63												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	159												
Area equipped for full control irrigation [AEI_{full}]	1.00												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	63												
Total area equipped for irrigation [AEI_{tot}]	1.00												

Narrative

AEI_{tot} and AEI_{full} are equal to 1 000 ha in 1995 (FAO, 2012). Based on qualitative information of the country profile, AAI_{full} is estimated at 630 ha and AHI_{full} at 1 000 ha, resulting in a cropping intensity of 159 percent. AHI_{full} consists mainly of rice. The 15 percent of continuously irrigated area has been considered to be cultivated under fruit trees. Irrigation is practiced all year round.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

BULGARIA

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Maize	17.0				23	23	23	23	23				
Rice	4.2				6	6	6	6	6				
Vegetables	20.2				28	28	28	28	28				
Fruit	4.9	7	7	7	7	7	7	7	7	7	7	7	7
Rapeseed	2.2				3	3	3	3	3				
Sunflower	4.9				7	7	7	7	7				
Potatoes	3.7				5	5	5	5	5				
Pulses	4.3				6	6	6	6	6				
Fodder temporary	2.7				4	4	4	4	4				
Cotton	1.4				2	2	2	2	2	2	2		
Tobacco	7.0				10	10	10	10	10				
Harvested irrigated crop area [AHI_{full}]	72.6	7	7	7	100	100	100	100	100	9	9	7	7
Area equipped for full control irrigation actually irrigated [AAI_{full}]	72.6												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	104.6												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	69												
Total area equipped for irrigation [AEI_{tot}]	104.6												

Narrative

AEI_{tot} and AEI_{full} are 104 600 ha and and AAI_{full} is 72 640 ha in 2007 (Eurostat, 2012). The crop calendar is adapted from AT 2030/2050 (FAO, 2006). The main irrigated crops are cereals (mainly maize), vegetables and tobacco. Except fruit trees, all irrigated crops are temporary crops and are grown in summer from April to August or October (for cotton).

References

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BURKINA FASO

Irrigated crop calendar

2001

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	4.7	35	35	35								35	35
Rice two	4.7						35	35	35	35	35		
Maize and other cereals	0.7	5	5	5								5	5
Vegetables	4.0	30	30	30								30	30
Potatoes	0.1	0.5	0.5	0.5								0.5	0.5
Sugarcane	3.9	29	29	29	29	29	29	29	29	29	29	29	29
Tobacco	0.1	1	1	1								1	1
Harvested irrigated crop area [AHI_{full}]	18.2	100	100	100	29	29	64	64	64	64	64	100	100
Area equipped for full control irrigation actually irrigated [AAI_{full}]	13.5												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	135												
Area equipped for full control irrigation [AEI_{full}]	18.6												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	73												
Total area equipped for irrigation [AEI_{tot}]	25.0												

Narrative

AEI_{tot} is 25 000 ha in 2001 while AEI_{full} is 18 600 ha (DGHA, 2002). The crop pattern comes from the Ministry of Agriculture (MARA/DSAP, 1997). It is incomplete and refers to 1996/1997. AHI_{full} was raised to 18 230 ha using additional crops from the 2002 AQUASTAT country profile. AAI_{full} was then calculated scaling down AHI_{full} by the area of one crop of rice (due to the rice double cropping), that is 13 500 ha. As a result the cropping intensity is 135 percent. The main irrigated crops are rice (51 percent, double cropping), vegetables (22 percent, beans, tomatoes, onions) and sugar cane (21 percent). Some fruits, maize and other cereals such as cowpea, and tobacco are also irrigated. Temporary crops are irrigated from December to April, except for the second cropping of rice.

References

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MARA/DSAP. 1997. *Résultats de l'Enquête Maraîchère: Campagne Agricole Année 1996/1997*. Ministère de l'Agriculture et des Ressources Animales, Direction des Statistiques Agro-Pastorales, 1992.

BURUNDI

Irrigated crop calendar

2000

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	2.1		47	47	47	47	47						
Rice two	2.1	47								47	47	47	47
Vegetables one	0.4		9	9	9	9	9						
Vegetables two	0.4	9								9	9	9	9
Coffee	0.5	11	11	11	11	11	11	11	11	11	11	11	11
Sugarcane	1.5	33	33	33	33	33	33	33	33	33	33	33	33
Harvested irrigated crop area [AHI_{full}]	7.0	100	100	100	100	100	100	44	44	100	100	100	100
Area equipped for full control irrigation actually irrigated [AAI_{full}]	4.5												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	156												
Area equipped for full control irrigation [AEI_{full}]	7.0												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	64												
Total area equipped for irrigation [AEI_{tot}]	21.4												

Narrative

The AQUASTAT database reports a figure of 21 430 ha for AEI_{tot} as the sum of AEI_{full} (6 960 ha) and the equipped lowlands area (14 470 ha). AHI_{full} equals to 6 960 ha as reported in the AQUASTAT country profile (FAO, 2012). AAI_{full} was then calculated scaling down AHI_{full} by the area of one crop of rice and of one crop of vegetables (due to double cropping), that is 4 460 ha. As a result the cropping intensity is 156 percent. The main irrigated crops are rice (double cropping), vegetables (double cropping), sugarcane and coffee. Irrigation is practiced all year round with thanks to multiple cropping of temporary crops.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>.

CAMBODIA

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	306					96	96	96	96	96			
Rice two	67	21	21								21	21	21
Citrus	1	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Sugarcane	10	3	3	3	3	3	3	3	3	3	3	3	3
Harvested irrigated crop area [AHI_{full}]	385	25	25	4	4	100	100	100	100	100	25	25	25
Area equipped for full control irrigation actually irrigated [AAI_{full}]	317												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	121												
Area equipped for full control irrigation [AEI_{full}]	354												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	90												
Total area equipped for irrigation [AEI_{tot}]	354												

Narrative

AEI_{full} is similar to AEI_{tot} and equal to 353 566 ha, while AAI_{full} is 317 225 ha in 2006 (FAO, 2012). Except for a very small area of sugarcane and citrus, AHI_{full} consists of rice. The cropping intensity is 121 percent. Irrigated is practiced all year round but with a peak from May to September, during the wet season.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

CAMEROON

Irrigated crop calendar

2000

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	5.0					22	22	22	22	22			
Rice two	5.0	22	22	22	22								22
Maize	7.5					34	34	34	34	34			
Vegetables	11.2	50	50	50	50								50
Bananas	5.4	24	24	24	24	24	24	24	24	24	24	24	24
Harvested irrigated crop area [AHI_{full}]	34.1	96	96	96	96	80	80	80	80	80	24	24	96
Area equipped for full control irrigation actually irrigated [AAI_{full}]	22.5												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	152												
Area equipped for full control irrigation [AEI_{full}]	22.5												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	25.7												

Narrative

The AQUASTAT database provides AEI_{tot} (25 650 ha) and AEI_{full} (22 450 ha) in 2000 (FAO, 2012). AAI_{full} is assumed to be equal to AEI_{full}. AHI_{tot} is 44 540 ha in 2000 (FAO, 2012), but it is considered overestimated due to the abandoned areas in the Société d'Expansion et de Modernisation de la Riziculture de Yagoua (SEMRY); thus this area has been reduced based on qualitative and quantitative information (FAO, 2011; Ministère de l'Agriculture, 2000), resulting in AHI_{full} equal to 34 000 ha and a cropping intensity of 152 percent. In addition to rice (double cropping), the main irrigated crops are maize, vegetables, fruits and banana. Irrigation is practiced almost the whole year, either from May to September or from December to April.

References

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FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

Ministère de l'Agriculture. 2000. *Annuaire des statistiques du secteur agricole 1999/2000*. Éd. DEPA Cellule des enquêtes et statistiques.

CANADA

Irrigated crop calendar

2010

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	70				9	9	9	9	9				
Barley	36				5	5	5	5	5				
Maize	287				37	37	37	37	37				
Vegetables	36				5	5	5	5	5				
Fruit	32	4	4	4	4	4	4	4	4	4	4	4	4
Oil crops	8				1	1	1	1	1				
Soybeans	128				17	17	17	17	17				
Potatoes	71				9	9	9	9	9				
Pulses	16				2	2	2	2	2				
Sugar beet	6				1	1	1	1	1				
Fodder temporary	79				10	10	10	10	10				
Harvested irrigated crop area [AHI_{full}]	770	4	4	4	100	100	100	100	100	4	4	4	4
Area equipped for full control irrigation actually irrigated [AAI_{full}]	770												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	770												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	770												

Narrative

Over 90 percent of the irrigated area is located in the provinces of Alberta, British Columbia, Saskatchewan and Ontario. For the whole country AHI_{full} is equal to 770 150 ha in 2010 (Statistics Canada, 2012). AEI_{full} and AAI_{full} are assumed similar to AHI_{full}. The main irrigated crops are cereals (mainly maize), soybeans, temporary fodder (it is assumed that it is temporary fodder and improved pastures) and potatoes. Some vegetables, fruits, pulses, sugar beet and oil crops are also irrigated. Irrigation is practiced only during the summer, from April to September.

References

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CAPE VERDE

Irrigated crop calendar

2004

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Vegetables	0.88				48	48	48	48	48				
Potatoes and other tubers	0.21	12	12	12								12	12
Sugarcane	1.00	55	55	55	55	55	55	55	55	55	55	55	55
Harvested irrigated crop area [AHI_{full}]	2.09	66	66	66	103	103	103	103	103	55	55	66	66
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1.82	* * * These areas refer to the year 1997											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	114												
Area equipped for full control irrigation [AEI_{full}]	2.78												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	66												
Total area equipped for irrigation [AEI_{tot}]	2.78												

Narrative

Agriculture is mostly rainfed. AEI_{tot} and AEI_{full} are 2 780 ha in 1997 while AAI_{tot} and AAI_{full} are 1 821 ha (FAO, 2012). AHI_{full} is 2 085 ha in 2004 (FAO, 2012). The crop calendar mentions sugarcane (48 percent), vegetables (42 percent) and potatoes and other tubers (10 percent). In addition, flowers might still exist over a limited area. Irrigation is practiced all year round.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>.

CENTRAL AFRICAN REPUBLIC

Irrigated crop calendar

1987

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	0.03					43	43	43	43	43			
Rice two	0.03	43	43	43								43	43
Vegetables	0.03					43	43	43	43	43			
Harvested irrigated crop area [AHI_{full}]	0.09	43	43	43	0	87	87	87	87	87	0	43	43
Area equipped for full control irrigation actually irrigated [AAI_{full}]	0.07												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	130												
Area equipped for full control irrigation [AEI_{full}]	0.14												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	51												
Total area equipped for irrigation [AEI_{tot}]	0.14												

Narrative

No recent figure is available. The only figures available refer to 1987: AEI_{tot} and AEI_{full} are 135 ha (Boulvert, 1987), of which only 69 ha are actually irrigated. AHI_{full} is assumed higher than AAI_{full} due to double cropping of rice. In addition to rice, vegetables are also cultivated. This results in a cropping intensity of 130 percent. Irrigation is mostly practiced from May to September.

References

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CHAD

Irrigated crop calendar

2002

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	2.0	8	8	8	8	8							
Rice one	0.5	2	2	2	2								2
Rice two	9.5						36	36	36	36	36		
Maize	6.0						23	23	23	23	23		
Millet	3.0						11	11	11	11	11		
Vegetables	2.1	8	8	8	8								8
Sugarcane	3.8	14	14	14	14	14	14	14	14	14	14	14	14
Harvested irrigated crop area [AHI_{full}]	26.8	32	32	32	32	22	85	85	85	85	85	14	24
Area equipped for full control irrigation actually irrigated [AAI_{full}]	26.2												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	102												
Area equipped for full control irrigation [AEI_{full}]	30.3												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	87												
Total area equipped for irrigation [AEI_{tot}]	30.3												

Narrative

AEI_{tot} and AEI_{full} equal to 30 273 ha while AAI_{full} and AAI_{tot} are 26 200 ha in 2002 (FAO, 2012). AHI_{full} is 26 800 ha for the same year (AQUASTAT country profile), resulting in a cropping intensity of 102 percent. The cropping seasons are adapted from AT 2050/2080 (FAO, 2011). The main irrigated crops are rice (37 percent, limited area under double cropping), maize (22 percent) and sugarcane (14 percent). Some millet, wheat and vegetables are also irrigated. Cereals are irrigated from June to October, corresponding to the raining season, except wheat and a very limited second cropping of rice (from December or January to April or May). However, vegetables are cropped and irrigated during winter, from December to April.

References

- FAO. 2011. *World agriculture: towards 2050/2080*. FAO, Global Perspective Studies Unit. Rome. (Internal document).
- FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

CHILE

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	48						4	4	4	4	4	4	4
Rice	22	2	2	2								2	2
Maize	101	9	9	9								9	9
Barley	2						0.2	0.2	0.2	0.2	0.2	0.2	
Other cereals	8	1	1	1								1	1
Vegetables	104	9	9	9								9	9
Fruit	246	23	23	23	23	23	23	23	23	23	23	23	23
Grapes	104	10	10	10	10	10	10	10	10	10	10	10	10
Citrus	17	2	2	2	2	2	2	2	2	2	2	2	2
Oil crops	6	0.5	0.5	0.5								0.5	0.5
Potatoes	22	2	2	2								2	2
Pulses	10	1	1	1								1	1
Sugar beet	19	2	2	2							2	2	2
Fodder temporary	283						26	26	26	26	26	26	
Tobacco	3	0.3	0.3	0.3								0.3	0.3
Pasture permanent	100	9	9	9	9	9	9	9	9	9	9	9	9
Harvested irrigated crop area [AHI_{full}]	1 094	70	70	70	43	43	73	73	73	73	75	100	74
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1 094												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	1 199												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	91												
Total area equipped for irrigation [AEI_{tot}]	1 199												

Narrative Chile

AEI_{tot} and AEI_{full} are 1 198 600 ha in 1991 (IICA, 2010) and are considered still valid in recent reports. AAI_{full} is 1 093 813 ha in 2007 according to the 2007 Census of Agriculture (INE, 2009). It is assumed that AHI_{full} equals AAI_{full} , as no double cropping is permitted by the crop calendar, thus resulting in a cropping intensity of 100 percent. The main irrigated crops are fruit (including grapes and citrus), temporary fodder, cereals (mainly maize and wheat, but also rice and barley), vegetables, potatoes and permanent pastures. Some sugar beet, pulses, tobacco and oil industrial crops are also irrigated. Temporary crops are irrigated mostly in summer, from November to March, except some cereals and temporary fodder, which are irrigated from June to December and November respectively.

References

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CHINA - NORTHEAST

(Beijing & Tianjin, Gansu, Hebei, Heilongjiang, Henan, Inner Mongolia, Jilin, Liaoning, Ningxia, Shaanxi, Shandong, Shanghai, Shanxi)

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	15 595	56	56	56	56						56	56	56
Rice (Keng)	5 048					18	18	18	18	18			
Maize	10 489					38	38	38	38	38			
Other cereals	649					2	2	2	2	2			
Vegetables one	4 020						15	15	15	15			
Vegetables two	300		1	1	1	1							
Fruit	1 440	5	5	5	5	5	5	5	5	5	5	5	5
Citrus	220	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Soybeans	1 548					6	6	6	6	6			
Groundnuts	1 002					4	4	4	4	4			
Rapeseed	2 880	10	10	10	10						10	10	10
Oil crops	109					0.4	0.4	0.4	0.4	0.4			
Sunflower	151					0.5	0.5	0.5	0.5	0.5			
Sesame	122					0.4	0.4	0.4	0.4	0.4			
Potatoes and other roots	291					1.1	1.1	1.1	1.1	1.1			
Pulses	89					0.3	0.3	0.3	0.3	0.3			
Sugarcane	240	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Sugar beet	93					0.3	0.3	0.3	0.3	0.3	0.3		
Cotton	1 335					5	5	5	5	5	5	5	
Tobacco	192				0.7	0.7	0.7	0.7	0.7				
Pasture permanent	574	2	2	2	2	2	2	2	2	2	2	2	2
Harvested irrigated crop area [AHI_{full}]	46 387	76	77	77	77	86	100	100	100	99	81	80	76
Area equipped for full control irrigation actually irrigated [AAI_{full}]	27 710												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	167												
Area equipped for full control irrigation [AEI_{full}]	33 299												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	83												
Total area equipped for irrigation [AEI_{tot}]													

CHINA - SOUTHEAST

(Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Yunnan, Zhejiang)

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	4 472	23	23	23	23	23							
Rice one (Hsien)	12 910						66	66	66	66	66		
Rice two	8 250	42	42	42								42	42
Maize	1 554	8	8	8								8	8
Other cereals	541	3	3	3								3	3
Vegetables one	50	0.3	0.3	0.3	0.3								
Vegetables two	800					4	4	4	4				
Vegetables three	2 750									14	14	14	14
Fruit	1 200	6	6	6	6	6	6	6	6	6	6	6	6
Citrus	184	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Soybeans	1 290				7	7	7	7	7				
Groundnut	835				4	4	4	4	4				
Rapeseed	2 400	12	12	12								12	12
Sunflower	126				0.6	0.6	0.6	0.6	0.6				
Sesame	102				0.5	0.5	0.5	0.5	0.5				
Oil crops	91	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Potatoes and other roots	243				1	1	1	1	1				
Pulses	74				0.4	0.4	0.4	0.4	0.4				
Sugarcane	200	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sugar beet	77				0.4	0.4	0.4	0.4	0.4				
Cotton	635				3	3	3	3	3	3	3		
Tobacco	160				0.8	0.8	0.8	0.8	0.8				
Pasture permanent	478	2	2	2	2	2	2	2	2	2	2	2	2
Harvested irrigated crop area [AHI_{full}]	39 422	100	100	100	52	56	100	100	100	95	95	91	91
Area equipped for full control irrigation actually irrigated [AAI_{full}]	19 477												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	202												
Area equipped for full control irrigation [AEI_{full}]	22 252												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	88												
Total area equipped for irrigation [AEI_{tot}]													

CHINA - WEST

(Chongqing, Qinghai, Sichuan, Tibet, Xinjiang)

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	2 232	33	33	33	33						33	33	33
Rice (Hsien)	2 839					42	42	42	42	42			
Maize	906					14	14	14	14	14			
Other cereals	162					2	2	2	2	2			
Vegetables	1 080					16	16	16	16	16			
Fruits	360	5	5	5	5	5	5	5	5	5	5	5	5
Citrus	55	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Soybeans	387					6	6	6	6	6			
Groundnut	251					4	4	4	4	4			
Rapeseed	720	11	11	11	11						11	11	11
Sunflower	38					0.6	0.6	0.6	0.6	0.6			
Sesame	31					0.5	0.5	0.5	0.5	0.5			
Oil crops	27					0.4	0.4	0.4	0.4	0.4			
Potatoes and other roots	73					1.1	1.1	1.1	1.1	1.1			
Pulses	22					0.3	0.3	0.3	0.3	0.3			
Sugar beet	23					0.3	0.3	0.3	0.3	0.3	0.3		
Sugarcane	60	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Pasture permanent	144	2	2	2	2	2	2	2	2	2	2	2	2
Cotton	219					3	3	3	3	3	3	3	
Tobacco	48				0.7	0.7	0.7	0.7	0.7				
Harvested irrigated crop area [AHI_{full}]	9 677	53	53	53	54	100	100	100	100	100	57	57	53
Area equipped for full control irrigation actually irrigated [AAI_{full}]	6 706												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	144												
Area equipped for full control irrigation [AEI_{full}]	7 008												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	96												
Total area equipped for irrigation [AEI_{tot}]													

CHINA - TOTAL	2006 1000 ha
Harvested irrigated crop area [AH_{full}]	95 486
Area equipped for full control irrigation actually irrigated [AAI_{full}]	53 892
Cropping intensity (%) = $100 \times [AH_{full}]/[AAI_{full}]$	177
Area equipped for full control irrigation [AEI_{full}]	62 559
% of full control equipped actually irrigated = $100 \times [AAI_{full}]/[AEI_{full}]$	86

Narrative China

The area under agricultural water management is described by region: northeast (arid), southeast (semi arid) and west (humid). The information derives from the Ministry of Water Resources census (MWR, 2007/2006/2005). AEI_{full} and AAI_{full} for China are respectively 62 559 130 ha and 53 892 399 ha, of which 63 percent in the north and 37 percent in the south. AH_{full} derives from AT 2050/2080 (FAO, 2011). The cropping intensity is 202 percent in the southeast where rice is by far the most important irrigated crop and the monsoon climate enables growing vegetables during the whole year. In the northeast, the cropping intensity is 167 percent while it is 144 percent in the west, resulting in a national intensity of 177 percent.

References

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COLOMBIA
Irrigated crop calendar
2011

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	125			32	32	32	32	32					
Rice two	120								31	31	31	31	31
Maize and other cereals one	2			0.5	0.5	0.5	0.5	0.5					
Maize and other cereals two	33								8	8	8	8	8
Vegetables one	8			2	2	2	2	2					
Vegetables two	18								5	5	5	5	5
Fruit	14	4	4	4	4	4	4	4	4	4	4	4	4
Plantains	2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Potatoes	9								2	2	2	2	2
Coffee	9	2	2	2	2	2	2	2	2	2	2	2	2
Cocoa	12	3	3	3	3	3	3	3	3	3	3	3	3
Sugarcane	168	43	43	43	43	43	43	43	43	43	43	43	43
Cotton	1	0.3	0.3						0.3	0.3	0.3	0.3	0.3
Tobacco	2								0.6	0.6	0.6	0.6	0.6
Harvested irrigated crop area [AHI_{full}]	524	52	52	86	86	86	86	86	99	99	99	99	99
Area equipped for full control irrigation actually irrigated [AAI_{full}]	394												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	133												
Area equipped for full control irrigation [AEI_{full}]	1 087												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	36												
Total area equipped for irrigation [AEI_{tot}]	1 087												

Narrative Colombia

AEI_{tot} and AEI_{full} are 900 000 ha in 1998. The 2008 national agricultural census on the irrigation systems was based on the number of farms instead of their areas (DANE, 2008). But an AEI_{tot} of 1 086 800 ha in 2011 is indicated in the National Plan for Development 2010-2014 (DNP, 2011). In addition, the 2011 National Survey provides harvested irrigated areas (DANE, 2011). AHI_{full} in 2011 is 524 000 ha. AAI_{full} has been calculated by deducting from AHI_{full} the area of one crop of rice, one of other cereals and one of vegetables due to double cropping, resulting in an AAI_{full} of 394 000 ha and a cropping intensity of 133 percent. Except for the most humid areas, precipitation is characterized by a strong seasonality. Irrigation is then necessary for temporary and permanent crops. The main irrigated crops are cereals (rice and maize), sugarcane, vegetables, cocoa and coffee. Some fruits, plantains, potatoes, cotton and tobacco are also irrigated. Irrigation occurs all year round but with a peak in the second semester of the year during the dry season.

References

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CONGO

Irrigated crop calendar

1993

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Vegetables one	0.2	100	100	100								100	100
Vegetables two	0.2					100	100	100	100	100			
Harvested irrigated crop area [AHI_{full}]	0.4	100	100	100	0	100	100	100	100	100	0	100	100
Area equipped for full control irrigation actually irrigated [AAI_{full}]	0.2												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	200												
Area equipped for full control irrigation [AEI_{full}]	0.2												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	2.0												

Narrative

AEI_{tot} is 2 000 ha in 1993 while AEI_{full} is 217 ha (FAO, 2012). Because AAI_{tot} equals to AEI_{full}, it is believed that AAI_{full} also equals to AEI_{full}. AHI_{full} has been recalculated to reflect the double cropping, that is 434 ha; and thus resulting in a cropping intensity of 200 percent. The main irrigated crops are vegetables (cabbage, chive, eggplant, tomato, lettuce, cucumber, and carrot) rather than sugarcane as indicated in AT 2050/2080 (FAO, 2011) and in the previous exercise undertaken in 2000. It is indeed assumed that sugarcane is actually on equipped lowlands and therefore is not included here. Irrigation is practiced all year round.

References

- FAO. 2011. *World agriculture: towards 2050/2080*. FAO, Global Perspective Studies Unit. Rome. (Internal document).
- FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

CÔTE D'IVOIRE

Irrigated crop calendar

2008

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice	3.6						11	11	11	11	11		
Vegetables	3.6	11	11	11	11								11
Bananas	13.3	41	41	41	41	41	41	41	41	41	41	41	41
Sugarcane	12.0	37	37	37	37	37	37	37	37	37	37	37	37
Harvested irrigated crop area [AHI_{full}]	32.5	89	89	89	89	78	89	89	89	89	89	78	89
Area equipped for full control irrigation actually irrigated [AAI_{full}]	32.5	* This area refers to the year 1994											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	47.8												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	68												
Total area equipped for irrigation [AEI_{tot}]	72.8												

Narrative

The 1994 data seems to be still the most representative. AEI_{tot} is 72 750 ha while AEI_{full} is 47 750 ha. AAI_{tot} is 66 930 ha in 1994. Figures from 2008 suggest that AEI_{full} is still valid but 14 950 ha have been abandoned, resulting in an AAI_{full} equal to 32 500 ha (Sirte Water Conference, 2008). AHI_{full} is assumed equal to AAI_{full}. The same document indicates that the main irrigated crops are sugar cane and bananas accounting for two third of the AAI_{full}. Some rice and vegetables are also irrigated. Cropping seasons are based on AT 2050/2080 (FAO, 2011) and neighbouring countries. Temporary crops are irrigated either from June to October (rice) or from December to April (vegetables).

References

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Sirte Water Conference. 2008. *Rapport national d'investissement – Côte d'Ivoire*.

COSTA RICA

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	27				26	26	26	26	26				
Rice two	20	19								19	19	19	19
Vegetables °	3	3								3	3	3	3
Bananas°	5	5	5	5	5	5	5	5	5	5	5	5	5
Plantains°	1	1	1	1	1	1	1	1	1	1	1	1	1
Citrus	11	10	10	10	10	10	10	10	10	10	10	10	10
Pulses°	4				4	4	4	4	4				
Sugarcane	40	39	39	39	39	39	39	39	39	39	39	39	39
Coffee°	13	13	13	13	13	13	13	13	13	13	13	13	13
Harvested irrigated crop area [AHI_{full}]	124	90	68	68	98	98	98	98	98	90	90	90	90
Area equipped for full control irrigation actually irrigated [AAI_{full}]	103	* * * These areas refer to the year 1997 ° These areas originate from AT2050/2080											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	120												
Area equipped for full control irrigation [AEI_{full}]	103												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	103												

* These areas refer to the year 1997

° These areas originate from AT2050/2080

Narrative Costa Rica

The AQUASTAT database reports that AEI_{full} , AAI_{tot} and AAI_{full} are equal to AEI_{tot} (103 100 ha) in 1997 (FAO, 2012). The National Plan of Integrated Water Resources Management (MINAET, 2008) mentions that AAI_{tot} and AAI_{full} are 101 500 ha in 2006. AHI_{full} is 160 100 in 1999 but without details of its composition. A partial AHI_{full} is 135 800 ha in 1997, which was considered still valid in 2006 and completed by including some additional crops, the areas of which originate from AT 2050/2080 (FAO, 2011) for 2006, and by replacing the harvested irrigated areas of bananas of 1997, which is considered too high, by the AT 2050/2080 estimation. As a result, AHI_{full} is 124 000 ha and the cropping intensity is 120 percent. The main irrigated crops are rice (double cropping), sugarcane, bananas, fruit (citrus). Some coffee, pulses, vegetables and plantains are also irrigated. Temporary crops are irrigated either from April to August, or from September to January, each season enjoying one of the peaks of rainfall in June and September.

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CUBA

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice	33						18	18	18	18	18		
Maize	10						6	6	6	6	6		
Vegetables	2						1	1	1	1	1		
Fruit	15	8	8	8	8	8	8	8	8	8	8	8	8
Citrus	13	7	7	7	7	7	7	7	7	7	7	7	7
Sugarcane	102	56	56	56	56	56	56	56	56	56	56	56	56
Tobacco	6						3	3	3	3	3		
Harvested irrigated crop area [AHI_{full}]	181	72	72	72	72	72	100	100	100	100	100	72	72
Area equipped for full control irrigation actually irrigated [AAI_{full}]	181	* This area refers to the year 1997											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	789												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	23												
Total area equipped for irrigation [AEI_{tot}]	870												

Narrative

AEI_{tot} is 870 317 ha, AEI_{full} is 788 800 ha and AAI_{tot} is 737 900 ha in 1997 (FAO, 2012), while Siebert *et al.* (2010) reports a decline of AAI_{full} from 822 225 ha in 1997 to 180 900 ha in 2007 based on figures from the Oficina Nacional de Estadísticas (ONE, 2007). AHI_{full} has therefore been reduced from 736 000 ha in 2006 as estimated in AT 2050/2080 down to 180 900 ha in order to obtain a cropping intensity of 100 percent in the absence of double cropping (FAO, 2011). Sugarcane is by far the major irrigated crop (an important export product for this country). Some rice, fruits (including citrus), maize, tobacco and vegetables are also irrigated. Temporary crops are irrigated during the rainy period, from June to October.

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CYPRUS

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Barley and other cereals	2.7				9	9	9	9	9				
Vegetables	5.9				19	19	19	19	19				
Fruit	14.7	47	47	47	47	47	47	47	47	47	47	47	47
Roots and tubers	7.0				22	22	22	22	22				
Pulses	1.0				3	3	3	3	3				
Harvested irrigated crop area [AHI_{full}]	31.3	47	47	47	100	100	100	100	100	47	47	47	47
Area equipped for full control irrigation actually irrigated [AAI_{full}]	31.3												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	45.8												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	68												
Total area equipped for irrigation [AEI_{tot}]	45.8												

Narrative

AEI_{tot} and AEI_{full} are 45 790 ha, and AAI_{tot} and AAI_{full} are 31 260 ha in 2007 (Eurostat, 2012). AHI_{full} is considered equal to AAI_{full}. The main irrigated crops are fruit (47 percent), roots and tubers (23 percent) and vegetables (19 percent), as well as pulses. Except fruit trees, which are irrigated the whole year (for water deficit in summer and frost protection in winter/spring), all crops are temporary and irrigated in summer from April to August.

References

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CZECH REPUBLIC

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Vegetables	3.3				16	16	16	16	16				
Fruit	9.3	47	47	47	47	47	47	47	47	47	47	47	47
Potatoes	2.8				14	14	14	14	14				
Sugar beet	4.5			23	23	23	23	23	23				
Harvested irrigated crop area [AHI_{full}]	19.9	47	47	70	100	100	100	100	100	47	47	47	47
Area equipped for full control irrigation actually irrigated [AAI_{full}]	19.9												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	38.5												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	52												
Total area equipped for irrigation [AEI_{tot}]	38.5												

Narrative

AEI_{tot} and AEI_{full} are 38 530 ha and AAI_{full} is 19 910 ha in 2007 (Eurostat, 2012). The crop calendar is adapted from AT 2030/2050 (FAO, 2006). AHI_{full} is considered equal to AAI_{full}. The main irrigated crops are fruit, sugar beet and vegetables (including potatoes). Except fruits, which are irrigated the whole year (for water deficit in summer and frost protection in winter/spring), all crops are temporary and irrigated in summer from March (sugar beet) or April to August.

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DEMOCRATIC REPUBLIC OF THE CONGO

Irrigated crop calendar

2000

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	1.2	17	17	17	17								17
Rice two	1.2					17	17	17	17	17			
Vegetables	0.5					7	7	7	7	7			
Sugarcane	5.0	74	74	74	74	74	74	74	74	74	74	74	74
Harvested irrigated crop area [AHI_{full}]	7.8	90	90	90	90	98	98	98	98	98	74	74	90
Area equipped for full control irrigation actually irrigated [AAI_{full}]	6.8	* This area refers to the year 1995											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	115												
Area equipped for full control irrigation [AEI_{full}]	10.0												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	68												
Total area equipped for irrigation [AEI_{tot}]	10.5												

Narrative

No recent data are available for area equipped for irrigation and crop production. AEI_{tot} (10 500 ha) and AEI_{full} (10 000 ha) refer both to 1995. However, updated value of AAI_{tot} (8 000 ha in 1995) and AAI_{full} for the year 2000 are 7 300 ha and 6 800 ha respectively. The most important agricultural system in this country is rainfed (tubers, maize, rice, fruit and palm). AHI_{full} in 1995 was 13 500 ha, consisting of 11 200 ha of sugarcane and 2 300 ha of rice. AT 2050/2080 estimates that AHI_{full} in 2006 is 21 000 ha (FAO, 2011), however this is not consistent with a decreasing AAI_{full}. AHI_{full} for 2000 is therefore assumed to be 8 000 ha as estimated in AT 2030/2050 (FAO, 2006), resulting in a cropping intensity of 115 percent. Based on qualitative information presented in the AQUASTAT country profile (FAO, 2012), it is assumed that sugarcane, rice (double cropping) and vegetables correspond to, respectively, 5 000 ha, 2 300 ha and 500 ha. Irrigation is practiced all year round with an intensity peak due to vegetables' watering from May to September.

References

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DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA

Irrigated crop calendar

1995

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	74					5	5	5	5	5			
Rice	470					35	35	35	35	35			
Maize and other cereals	331					25	25	25	25	25			
Vegetables	147					11	11	11	11	11			
Fruit	39	3	3	3	3	3	3	3	3	3	3	3	3
Soybeans	94					7	7	7	7	7			
Potatoes	86					6	6	6	6	6			
Sweet potatoes	19					1	1	1	1	1			
Pulses	84					6	6	6	6	6			
Tobacco	7					1	1	1	1	1			
Harvested irrigated crop area [AHI_{full}]	1 351	3	3	3	3	100	100	100	100	100	3	3	3
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1 351												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	1 460												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	93												
Total area equipped for irrigation [AEI_{tot}]	1 460												

Narrative

AEI_{tot} and AEI_{full} are similar and equal to 1 460 000 ha in 1995 (FAO, 2012). The previous exercise undertaken in 2000 suggested that the only period under cultivation was from May to September, during the raining season, except for fruits. AHI_{full} is estimated at 1 351 000 ha in 2006 by AT 2050/2080 (FAO, 2011). It is assumed that AAI_{full} is equal to AHI_{full} which corresponds to 93 percent of AEI_{full}. The main irrigated crops are rice, other cereals (mostly maize and wheat), vegetables, soybeans, potatoes and sweet potatoes as well as pulses. Some fruits and tobacco are also irrigated.

References

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DENMARK

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	34				13	13	13	13	13				
Barley	41				16	16	16	16	16				
Other cereals	7				3	3	3	3	3				
Vegetables	6				2	2	2	2	2				
Rapeseed	5				2	2	2	2	2				
Potatoes	25				10	10	10	10	10				
Pulses	24				9	9	9	9	9				
Sugar beet	37				14	14	14	14	14				
Fodder temporary	75				29	29	29	29	29				
Harvested irrigated crop area [AHI_{full}]	253	0	0	0	100	100	100	100	100	0	0	0	0
Area equipped for full control irrigation actually irrigated [AAI_{full}]	254												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	435												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	58												
Total area equipped for irrigation [AEI_{tot}]	435												

Narrative

AEI_{tot} and AEI_{full} are 435 400 ha and AAI_{full} is 254 100 ha in 2007 (Eurostat, 2012). The crop calendar is adapted from AT 2030/2050 (FAO, 2006). AHI_{full} is considered equal to AAI_{full}. Irrigation takes place only between April and August. The main irrigated crops are cereals (32 percent), temporary fodder (30 percent), sugar beet (15 percent), as well as vegetables (mostly potatoes) and pulses.

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DJIBOUTI

Irrigated crop calendar

1999

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Vegetable one	0.338	87	87	87								87	87
Vegetable two	0.194				50	50	50	50	50				
Fruit (lemon, mango, date)	0.050	13	13	13	13	13	13	13	13	13	13	13	13
Harvested irrigated crop area [AHI_{full}]	0.582	100	100	100	63	63	63	63	63	13	13	100	100
Area equipped for full control irrigation actually irrigated [AAI_{full}]	0.388												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	150												
Area equipped for full control irrigation [AEI_{full}]	1.012												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	38												
Total area equipped for irrigation [AEI_{tot}]	1.012												

Narrative

Agriculture is limited because of few arable lands available, dry climate and poor water quality. AEI_{tot} and AEI_{full} equal to 1 012 ha in 1999 while AAI_{tot} and AAI_{full} are 388 ha (FAO, 2012). AHI_{full} is 582 ha according the AQUASTAT country profile, consisting of 388 ha in winter (cool season) and half of it in summer. 1989 data was used for the fruit areas, and other crops' areas have been calculated based on it and AHI_{full}. The main irrigated crops are vegetables and fruit. Irrigation starts only from mid-November during the cool season and ends mid-May. The main irrigated crops are vegetables (tomatoes). In summer, only pumpkins as well as fruit and palm trees are irrigated.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

DOMINICAN REPUBLIC
Irrigated crop calendar

2004

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	80			37	37	37	37	37					
Rice two	80								37	37	37	37	37
Maize	8			4	4	4	4	4					
Other cereals	2			1	1	1	1	1					
Vegetables	36			16	16	16	16	16					
Fruit	8	4	4	4	4	4	4	4	4	4	4	4	4
Plantains	24	4	4	4	4	4	4	4	4	4	4	4	4
Groundnut	1			1	1	1	1	1					
Potatoes	5			3	3	3	3	3					
Sugarcane	12	6	6	6	6	6	6	6	6	6	6	6	6
Other temporary crops	27			13	13	13	13	13					
Pasture temporary	4	2	2	2								2	2
Other permanent crops	9	4	4	4	4	4	4	4	4	4	4	4	4
Harvested irrigated crop area [AHI_{full}]	296	19	19	93	91	91	91	91	54	54	54	56	56
Area equipped for full control irrigation actually irrigated [AAI_{full}]	216	* These areas refer to the year 2009											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	137												
Area equipped for full control irrigation [AEI_{full}]	306												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	71												
Total area equipped for irrigation [AEI_{tot}]	306												

Narrative Dominican Republic

AEI_{full} is equal to 306 505 ha in 2009. The previous figure of 269 700 ha in 1999 seems to include only public irrigation schemes (FAO, 2012). AHI_{full} is 296 189 ha in 2004 (INDRHI, 2010). Since double cropping of rice is considered, the AAI_{full} of 216 189 ha is calculated by deducting from AHI_{full} of 296 189 ha the area of one crop of rice, 80 000 ha, resulting in a cropping intensity of 137 percent. Rice has become the main irrigated crop (double cropping) and has overtaken sugarcane, previously the first irrigated crop in the country. Vegetables (including potatoes and other roots and tubers), fruits, and cereals (maize and sorghum), groundnuts, pasture (assumed to be temporary and thus irrigated during the dry season) and other crops (both temporary and permanent) are also irrigated. Temporary crops, except pastures, are irrigated from March to July, while the rainy season lasts from May to October.

References

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ECUADOR

Irrigated crop calendar

2000

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	108					17	17	17	17	17			
Rice two	46	17	17								17	17	17
Maize	61					10	10	10	10	10			
Vegetables	81					13	13	13	13	13			
Fruit	42	7	7	7	7	7	7	7	7	7	7	7	7
Bananas	148	24	24	24	24	24	24	24	24	24	24	24	24
Citrus	8	1	1	1	1	1	1	1	1	1	1	1	1
Potatoes	13					2	2	2	2	2			
Coffee	9	1	1	1	1	1	1	1	1	1	1	1	1
Cocoa	33	5	5	5	5	5	5	5	5	5	5	5	5
Pulses	10					2	2	2	2	2			
Sugarcane	91	15	15	15	15	15	15	15	15	15	15	15	15
Other permanent crops	16	3	3	3	3	3	3	3	3	3	3	3	3
Harvested irrigated crop area [AHI_{full}]	666	74	74	56	56	100	100	100	100	100	74	74	74
Area equipped for full control irrigation actually irrigated [AAI_{full}]	620												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	107												
Area equipped for full control irrigation [AEI_{full}]	853												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	73												
Total area equipped for irrigation [AEI_{tot}]	853												

Narrative Ecuador

The AQUASTAT database shows that AEI_{tot} is identical to AEI_{full} (863 400 ha) in 1997 (FAO, 2012). Based on the 2000 Agricultural National Census (INEC, 2008) AEI_{full} was fixed at 853 330 ha, AAI_{full} at 619 900 ha and AHI_{full} at 666 320 ha, resulting in a cropping intensity of 107 percent. The major part of the country is characterized by a humid tropical climate with an abundant availability of water resources. The major irrigated crops are rice (double cropping) and bananas, followed by sugarcane and vegetables. Some maize, other fruits (including citrus), cocoa, potatoes, pulses, coffee and other permanent crops are also irrigated. Annual crops are generally irrigated from May to September.

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EGYPT

Irrigated crop calendar

2002

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	1 029	30	30	30	30	30						30	30
Rice	650						19	19	19	19	19		
Maize	828						24	24	24	24	24		
Barley	96	3	3	3	3							3	3
Sorghum	156						5	5	5	5	5		
Vegetables one	346			10	10	10	10						
Vegetables two	346							10	10	10	10		
Fruit	205	6	6	6	6	6	6	6	6	6	6	6	6
Bananas	24	1	1	1	1	1	1	1	1	1	1	1	1
Citrus	145	4	4	4	4	4	4	4	4	4	4	4	4
Grapes	64	2	2	2	2	2	2	2	2	2	2	2	2
Soybeans	6					0.2	0.2	0.2	0.2	0.2			
Groundnut	59					2	2	2	2	2			
Sesame	30					1	1	1	1	1			
Sunflower	15					0.5	0.5	0.5	0.5	0.5			
Olives	50	1	1	1	1	1	1	1	1	1	1	1	1
Potatoes and other tubers	94		3	3	3	3	3						
Pulses	164					5	5	5	5	5			
Sugarcane	136	4	4	4	4	4	4	4	4	4	4	4	4
Sugar beets	65					2	2	2	2	2	2		
Fodder temporary	1 196	35	35	35								35	35
Cotton	297	9						9	9	9	9	9	9
Flowers	26	1	1	1	1	1	1	1	1	1	1	1	1
Harvested irrigated crop area [AHI_{full}]	6 027	95	90	100	65	72	90	95	95	95	87	95	95
Area equipped for full control irrigation actually irrigated [AAI_{full}]	3 422												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	176												
Area equipped for full control irrigation [AEI_{full}]	3 422												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	3 422												

Narrative Egypt

AEI_{tot} , AAI_{tot} and AEI_{full} are equal to 3 422 178 ha in 2002 (FAO, 2012). It is assumed that AAI_{full} is similar due to the desert climate predominating over the country, resulting in the cropland being fully irrigated. AHI_{full} in 2002 is 6 027 115 ha (FAO, 2012). The cropping intensity is then 176 percent. The main irrigated crops are cereals (46 percent, mainly wheat, maize, rice, sorghum and barley), temporary fodder (20 percent), vegetables (11 percent, double cropping) and fruit (8 percent, including citrus bananas and grapes). Some cotton, pulses, sugarcane, potatoes, sugar beets, groundnut, olives trees, sesame and flowers are also cropped under irrigation. There are three growing seasons in Egypt: winter—from November to May; summer—from April/May to October; and "Nili"—from July/August to October. The main winter crops are wheat and temporary fodder, including clover or berseem. Minor winter crops are, amongst others, pulses, barley and sugar beet. The main summer crops are maize, rice and cotton; the latter being the most important Egyptian export crop.

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EL SALVADOR

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice	2				5	5	5	5	5				
Sugarcane	17	51	51	51	51	51	51	51	51	51	51	51	51
Coffee	6	18	18	18	18	18	18	18	18	18	18	18	18
Pasture permanent	8	25	25	25	25	25	25	25	25	25	25	25	25
Harvested irrigated crop area [AHI_{full}]	33	94	94	94	100	100	100	100	100	94	94	94	94
Area equipped for full control irrigation actually irrigated [AAI_{full}]	33	* * These figures refer to the year 1997											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	45												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	74												
Total area equipped for irrigation [AEI_{tot}]	45												

Narrative

Siebert *et al.* (2010) reports that AEI_{full} and AAI_{full} are equal to 45 000 ha in 2009, consistent with AQUASTAT figures for 1997 (44 990 ha; FAO, 2012). AHI_{full} is 33 250 ha in 2007 according to the 2007 Agricultural Census (Ministerio de Economía, 2009), including 24 960 ha of crops and 8 290 of permanent pasture. AAI_{full} is assumed to be equal to AHI_{full}. The crop areas have been calculated based on AT 2050/2080. The main irrigated crops are for export, such as sugarcane and coffee. Some rice and permanent pastures are also irrigated. Rice is cultivated and irrigated from April to August, during the rainy season.

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ERITREA

Irrigated crop calendar

1993

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Sorghum and other cereals	1.68							41	41	41	41	41	
Vegetables	1.22	30	30	30	30								30
Fruit	0.58	14	14	14	14	14	14	14	14	14	14	14	14
Potatoes	0.63	15	15	15	15								15
Cotton	1.86					45	45	45	45	45	45	45	
Harvested irrigated crop area [AHI_{full}]	5.97	59	59	59	59	60	60	100	100	100	100	100	59
Area equipped for full control irrigation actually irrigated [AAI_{full}]	4.10												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	146												
Area equipped for full control irrigation [AEI_{full}]	4.10												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	21.59												

Narrative

The war and the severe droughts contributed to weaken the agricultural sector. The data available in AQUASTAT refer to 1993; AEI_{tot} is 21 590 ha while AEI_{full} 4 100 ha (FAO, 2012). Based on the information provided by the Ministry of Agriculture (NAP, 2002), the crop calendar from the previous exercise undertaken in 2000 is considered still valid. AAI_{full} is assumed to be equal to AEI_{full}. AHI_{full} in 1993 was 5 969 ha (FAO, 2012) consisting of cotton and other temporary crops (AQUASTAT country profile) that were assumed to be cereals, vegetables, potatoes and fruits. The cropping intensity is therefore 145 percent. The irrigated crops are cereals (46 percent, mainly sorghum), vegetables (24 percent), potatoes (15 percent) and fruit (14 percent).

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ESTONIA

Irrigated crop calendar

2010

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Vegetables	0.166				51	51	51	51	51				
Fruit	0.071	22	22	22	22	22	22	22	22	22	22	22	22
Potatoes	0.025				8	8	8	8	8				
Other temporary crops	0.063				19	19	19	19	19				
Pasture permanent	0.001	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Harvested irrigated crop area [AHI_{full}]	0.326	22	22	22	100	100	100	100	100	22	22	22	22
Area equipped for full control irrigation actually irrigated [AAI_{full}]	0.326												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	0.458												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	71												
Total area equipped for irrigation [AEI_{tot}]	0.458												

Narrative

AEI_{tot} and AEI_{full} are 458 ha in 2010, while AAI_{tot} and AAI_{full} average 352 ha over the previous three years according to the 2010 Agricultural Census (Estonia Statistics, 2011). The areas equipped and actually irrigated declined in the last decades, being over 3 600 ha and 1 622 ha respectively in 1995 (FAO, 2012). AHI_{full} is 326 ha in 2010. This figure is also used for AAI_{full} in 2010 for a more accurate calendar. The main irrigated crops are vegetables, potatoes and other temporary crops which are grown in summer from April to August; a very limited area of permanent pasture is also irrigated. Fruit plantations are assumed to be irrigated the whole year (for frost protection in winter/spring and water deficit in summer).

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ETHIOPIA

Irrigated crop calendar

2001

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	23	8	8	8	8	8						8	8
Maize	87						30	30	30	30	30		
Barley	6	2	2	2	2	2						2	2
Sorghum and other cereals	20						7	7	7	7	7		
Vegetables	107	37	37	37								37	37
Bananas	6	2	2	2	2	2	2	2	2	2	2	2	2
Citrus	6	2	2	2	2	2	2	2	2	2	2	2	2
Fruit	4	1	1	1	1	1	1	1	1	1	1	1	1
Groundnut	6	2	2	2								2	2
Potatoes and other tubers	52	18	18	18								18	18
Pulses	9	3	3	3								3	3
Sugarcane	27	9	9	9	9	9	9	9	9	9	9	9	9
Cotton	58				20	20	20	20	20	20	20		
Harvested irrigated crop area [AHI_{full}]	411	85	85	85	45	45	72	72	72	72	72	85	85
Area equipped for full control irrigation actually irrigated [AAI_{full}]	290												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	142												
Area equipped for full control irrigation [AEI_{full}]	290												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	290												

Narrative Ethiopia

AEI_{full} is 289 600 ha (FAO, 2012a and 2012b) in 2001. However, there is a significant variability according to the sources in regards with AAI_{full} . While AAI_{full} is 170 000 ha in FAOSTAT for 2009 (FAO, 2012b) and 121 000 ha in 2003, it is 289 600 ha in AQUASTAT for 2001 (that is equal to AEI_{full}) (FAO, 2012a). Similarly AHI_{full} is 286 000 ha for 2000 in AT 2030/2050 (FAO, 2006), 357 000 ha for 2006 from AT 2050/2080 (FAO, 2011), and 410 600 ha in AQUASTAT for 2002 (FAO, 2012a). Finally the crop calendar is based on the information available in AQUASTAT, resulting in a cropping intensity of 142 percent. The main irrigated crops are cereals (mainly maize), vegetables, cotton, roots and tubers, and sugarcane. Irrigation is practiced all year round with temporary crops being irrigated mostly in winter (from November to March or May), except some cereals (maize and sorghum) and cotton.

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FINLAND

Irrigated crop calendar

2010

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Cereals	2.0				13	13	13	13	13				
Vegetables	3.8				25	25	25	25	25				
Fruit	3.2	21	21	21	21	21	21	21	21	21	21	21	21
Potatoes	4.7				31	31	31	31	31				
Sugar beet	1.4				9	9	9	9	9				
Harvested irrigated crop area [AHI_{full}]	15.0	21	21	21	100	100	100	100	100	21	21	21	21
Area equipped for full control irrigation actually irrigated [AAI_{full}]	15.0												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	68.6												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	22												
Total area equipped for irrigation [AEI_{tot}]	68.6												

Narrative

AEI_{tot} and AEI_{full} are 68 580 ha in 2010, while AAI_{full} is 15 020 ha according to the 2010 Agricultural Census (Matilda, 2012). AHI_{full} is estimated equal to AAI_{full}, but there might be some double cropping not accounted for. Irrigation is used only between April and August. However, frost protection also occurs in winter/spring for permanent crops. The main irrigated crops are potatoes, vegetables and fruits (berries and apples).

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FRANCE

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	30	2	2	2	2	2						2	2
Maize	756				50	50	50	50	50				
Other cereals	60				4	4	4	4	4				
Vegetables	166				11	11	11	11	11				
Fruit	136	9	9	9	9	9	9	9	9	9	9	9	9
Soybeans	30				2	2	2	2	2				
Sunflower	15				1	1	1	1	1				
Potatoes	60				4	4	4	4	4				
Pulses	60				4	4	4	4	4				
Sugar beet	30			2	2	2	2	2	2				
Fodder temporary	136	9	9	9	9							9	9
Fodder permanent	30	2	2	2	2	2	2	2	2	2	2	2	2
Harvested irrigated crop area [AHI_{full}]	1 512	22	22	24	100	91	89	89	89	11	11	22	22
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1 512												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	2 670												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	57												
Total area equipped for irrigation [AEI_{tot}]	2 670												

Narrative France

AEI_{tot} and AEI_{full} are 2 670 000 ha (FAO, 2012) and AAI_{full} is 1 512 000 ha in 2007 (Eurostat, 2012). The crop calendar is based on the 2000 agricultural census (Ministère de l'Agriculture, 2010). AHI_{full} is estimated equal to AAI_{full} . The main irrigated crops are cereals (56 percent, mainly maize), vegetables (11 percent), fodder (11 percent, temporary and permanent), and fruits. Potatoes, pulses, sugar beet, soybean and sunflower are also sometimes irrigated. Temporary crops are irrigated from March (sugar beet) or April to August, except winter wheat and temporary fodder which are irrigated from November to April/May. Fruit trees are irrigated for water deficit in summer and for frost protection in winter/spring.

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GABON

Irrigated crop calendar

1987

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	1.5	48	48	48	48								48
Rice two	1.5					48	48	48	48	48			
Vegetables	1.5	46	46	46	46								46
Harvested irrigated crop area [AHI_{full}]	4.5	94	94	94	94	48	48	48	48	48	0	0	94
Area equipped for full control irrigation actually irrigated [AAI_{full}]	3.2												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	141												
Area equipped for full control irrigation [AEI_{full}]	3.2												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	4.5												

Narrative

AHI_{full} (15 000 ha) from AT 2030/2050 (FAO, 2006) was considered too high compared to the AEI_{full} of 3 150 ha (1987). It is believed that the most representative data are those provided by the AQUASTAT database for the year 1987 (FAO, 2012). AAI_{full} was assumed to be equal to AEI_{full}, while AHI_{full} was 4 450 ha in 1987 (equal to AEI_{tot}) consisting only of rice. However, based on the previous exercise undertaken in 2000, the harvested irrigated area of rice was reduced to 3 000 ha (double cropping) to allow for vegetables (1 450 ha) consistently with the AQUASTAT country profile. The resulting cropping intensity is 141 percent. Vegetables are irrigated from December to April, similarly to Cameroon.

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GAMBIA

Irrigated crop calendar

1999

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	1.0	100	100	100								100	100
Rice two	1.0						100	100	100	100	100		
Harvested irrigated crop area [AHI_{full}]	2.0	100	100	100	0	0	100	100	100	100	100	100	100
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1.0												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	200												
Area equipped for full control irrigation [AEI_{full}]	2.1												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	47												
Total area equipped for irrigation [AEI_{tot}]	2.1												

Narrative

AEI_{tot} and AEI_{full} equal to 2 149 ha in 1999 (FAO, 2012). AHI_{full} is estimated at 2 000 ha in AT 2050/2080 (FAO, 2011). Due to double cropping of rice, AAI_{full} is calculated such as it amounts to half of AHI_{full}, that is 1 000 ha. The AQUASTAT country profile also indicates that some irrigated horticulture exists although without indicating its area. The resulting cropping intensity is 200 percent.

References

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GEORGIA

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	16	13	13	13	13						13	13	13
Barley	5	4	4	4	4							4	4
Maize	6					5	5	5	5	5			
Vegetables	10					8	8	8	8	8			
Fruits	31	24	24	24	24	24	24	24	24	24	24	24	24
Citrus	4	3	3	3	3	3	3	3	3	3	3	3	3
Sunflower	5					4	4	4	4	4			
Potatoes	9					7	7	7	7	7			
Tea	3	2	2	2	2	2	2	2	2	2	2	2	2
Pulses	3					2	2	2	2	2			
Fodder temporary	34	27	27	27	27							27	27
Harvested irrigated crop area [AHI_{full}]	126	73	73	73	73	56	56	56	56	56	42	73	73
Area equipped for full control irrigation actually irrigated [AAI_{full}]	126												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	401												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	31												
Total area equipped for irrigation [AEI_{tot}]	433												

Narrative Georgia

AEI_{tot} covers 432 790 ha (2006), of which 401 290 ha correspond to AEI_{full} and 31 500 ha to equipped wetland and inland valley bottoms (Ministry of Environment and Natural Resources Protection, 2006). AAI_{full} is estimated at 126 060 ha (Siebert *et al.*, 2010), while AHI_{full} is reported similar by the Ministry of Environment and Natural Resources Protection, resulting in a cropping intensity of 100 percent. The crop calendar is adapted from AT 2030/2050 (FAO, 2006). The main irrigated crops are fruits (including citrus), temporary fodder, cereals (mostly wheat, but also maize and barley). Some vegetables, potatoes, sunflower, pulses and tea are also irrigated. Temporary crops are mostly irrigated from May to September, except for some cereals and temporary fodder which are cultivated from October or November to April.

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GERMANY

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Barley	19				8	8	8	8	8				
Maize	41				18	18	18	18	18				
Other cereals	30				13	13	13	13	13				
Vegetables	11				5	5	5	5	5				
Fruit	38	16	16	16	16	16	16	16	16	16	16	16	16
Rapeseed	13				5	5	5	5	5				
Sunflower	2				1	1	1	1	1				
Potatoes	23				10	10	10	10	10				
Pulses	14				6	6	6	6	6				
Sugar beet	36				15	15	15	15	15	15			
Pasture permanent	9	4	4	4	4	4	4	4	4	4	4	4	4
Harvested irrigated crop area [AHI_{full}]	235	20	20	20	100	100	100	100	100	35	20	20	20
Area equipped for full control irrigation actually irrigated [AAI_{full}]	235												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	516												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	45												
Total area equipped for irrigation [AEI_{tot}]	516												

Narrative Germany

AEI_{tot} and AEI_{full} are 515 730 ha and AAI_{full} is 234 595 ha in 2006. Both are estimation from the Global Map of Irrigation Areas (Siebert *et al.*, 2010). The crop calendar is adapted from AT 2030/2050 (FAO, 2006). AHI_{full} is estimated to be equal to AAI_{full} . The main irrigated crops are cereals (38 percent), fruit (16 percent) and sugar beet (15 percent). Potatoes, pulses, rapeseed, vegetables, permanent pastures (grasslands are considered permanent pastures) and sunflowers are also sometimes irrigated. Except permanent crops which are irrigated almost the whole year, in particular fruit trees (for water deficit in summer and frost protection in winter/spring), the rest of the irrigated crops are temporary and grown in summer only, from April to August or September (for sugar beet).

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GHANA

Irrigated crop calendar

2010

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	10.0						33	33	33	33	33		
Rice two	10.0	33	33	33	33	33							
Vegetables one	20.2	67	67	67	67	67							
Vegetables two	20.2						67	67	67	67	67		
Harvested irrigated crop area [AHI_{full}]	60.4	100	100	100	100	100	100	100	100	100	100	0	0
Area equipped for full control irrigation actually irrigated [AAI_{full}]	30.3	* This area refers to the year 2000											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	200												
Area equipped for full control irrigation [AEI_{full}]	30.9												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	98												
Total area equipped for irrigation [AEI_{tot}]	30.9												

Narrative

AEI_{tot} and AEI_{full} are 30 900 ha in 2000 while AAI_{tot} and AAI_{full} are 27 910 ha (FAO, 2012). The Ministry of Agriculture website indicates an area under irrigation (AAI_{full}) of 30 269 ha in 2010. Estimations of AHI_{full} vary greatly according to the sources and years: 13 000 ha in 1998 (AT 2015/2030; FAO, 2003), 33 500 ha in 2000 (AT 2030/2050; FAO, 2006) and 28 000 ha in 2006 (AT 2050/2080; FAO, 2011). In addition, a partial AHI_{full} for rice of 5 238 ha for 2002 is given in AQUASTAT, corresponding to public irrigation schemes only. Thus AHI_{full} is then calculated such as the cropping intensity is 200 percent to reflect the double cropping of both rice and vegetables, that is 60 500 ha. The cropping seasons are based on AT 2050/2080 (FAO, 2011). The main irrigated crops are vegetables and rice. Due to double cropping for both crops, irrigation is practiced all year round.

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GREECE
Irrigated crop calendar
2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	31	2	2	2	2	2						2	2
Rice	22				2	2	2	2	2				
Maize	193				15	15	15	15	15				
Other cereals	31				2	2	2	2	2				
Vegetables	96				7	7	7	7	7				
Fruit	140	11	11	11	11	11	11	11	11	11	11	11	11
Citrus	49	4	4	4	4	4	4	4	4	4	4	4	4
Olives	367	29	29	29	29	29	29	29	29	29	29	29	29
Potatoes	19				1	1	1	1	1				
Pulses	19				1	1	1	1	1				
Sugar beet	34			3	3	3	3	3	3				
Fodder temporary	33	3	3	3	3							3	3
Fodder permanent	62	5	5	5	5	5	5	5	5	5	5	5	5
Cotton	161				13	13	13	13	13	13	13		
Tobacco	24				2	2	2	2	2				
Harvested irrigated crop area [AHI_{full}]	1 280	53	53	56	100	97	95	95	95	61	61	53	53
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1 280												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	1 555												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	82												
Total area equipped for irrigation [AEI_{tot}]	1 555												

Narrative Greece

AEI_{tot} and AEI_{full} are 1 555 000 ha, and AAI_{tot} and AAI_{full} are 1 280 000 ha in 2007 (Eurostat, 2012). The crop calendar is adapted from AT 2030/2050 (FAO, 2006). AHI_{full} is estimated to be equal to AAI_{full} . The main irrigated crops are olives (29 percent), cereals (22 percent, mainly maize but also wheat and rice) and cotton (13 percent). Fruits, vegetables, fodder (temporary and permanent), citrus, sugar beet, pulses and tobacco are also irrigated. Temporary crops are mostly summer crops, irrigated from March (sugar beet) or April to August or October (cotton), except winter wheat and permanent fodder from November to April/May. Permanent crops are irrigated for water deficit in summer and for frost protection in winter/spring.

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GUATEMALA

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice	0.2				0.1	0.1	0.1	0.1	0.1				
Maize one	35				11	11	11	11	11				
Maize two	35	11								11	11	11	11
Vegetables one	3				1	1	1	1	1				
Vegetables two	5	2								2	2	2	2
Fruits	13	4	4	4	4	4	4	4	4	4	4	4	4
Bananas and plantains	44	14	14	14	14	14	14	14	14	14	14	14	14
Citrus	12	4	4	4	4	4	4	4	4	4	4	4	4
Palm (African)	17	5	5	5	5	5	5	5	5	5	5	5	5
Potatoes	3				1	1	1	1	1				
Coffee	16	5	5	5	5	5	5	5	5	5	5	5	5
Sugarcane	163	52	52	52	52	52	52	52	52	52	52	52	52
Cotton	4	1	1	1						1	1	1	1
Harvested irrigated crop area [AHI_{full}]	352	99	87	87	99	99	99	99	99	99	99	99	99
Area equipped for full control irrigation actually irrigated [AAI_{full}]	312	* * * These figures refer to the year 2003											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	113												
Area equipped for full control irrigation [AEI_{full}]	312												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	312												

Narrative Guatemala

AEI_{tot} , AEI_{full} , AAI_{tot} and AAI_{full} all are 129 800 ha in 1997 (FAO, 2012). However, AAI_{full} is 312 140 ha in 2003 (INE, 2005) and AHI_{full} is 386 000 ha in 2007 (INE, 2008), representing a huge increase compared to the 1997 data. It is assumed that AEI_{full} is equal to AAI_{full} . AHI_{full} was considered too high (monthly use exceeding 100 percent) and thus has been reduced to 352 000 ha. The resulting cropping intensity is 113 percent. The main irrigated crops are sugarcane, maize, bananas and plantains, African palm, coffee and fruits (mangoes, papaya, and pineapple). Some citrus, vegetables (tomatoes, beans, broccoli, etc.), potatoes, cotton and rice are also irrigated. Irrigation is required for around six months in the Altiplano and the Atlantic Coast regions, except for crops with high water requirements such as vegetables.

References

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GUINEA

Irrigated crop calendar

2001

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice	13.7						67	67	67	67	67		
Vegetables	3.7						18	18	18	18	18		
Bananas	1.0	5	5	5	5	5	5	5	5	5	5	5	5
Oil palm	1.0	5	5	5	5	5	5	5	5	5	5	5	5
Rubber	1.0	5	5	5	5	5	5	5	5	5	5	5	5
Harvested irrigated crop area [AHI_{full}]	20.4	15	15	15	15	15	100	100	100	100	100	15	15
Area equipped for full control irrigation actually irrigated [AAI_{full}]	20.4												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	20.4												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	94.9												

Narrative

AEI_{full} and AAI_{full} are similar and equal to 20 386 ha in 2001 while AEI_{tot} and AAI_{tot} are 94 914 ha for the same year (FAO, 2012). AHI_{full} is equal to AAI_{full} resulting in a cropping intensity of 100 percent. The main irrigated crops are rice and vegetables, but banana, rubber and oil palm are also irrigated. Irrigation of temporary crops is practiced during the dry season only from June to October.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

GUINEA-BISSAU

Irrigated crop calendar

1996

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice	0.7						8	8	8	8	8		
Vegetables	0.5						6	6	6	6	6		
Fruit (citrus, bananas, mangoes, etc)	7.4	86	86	86	86	86	86	86	86	86	86	86	86
Harvested irrigated crop area [AHI_{full}]	8.6	86	86	86	86	86	100	100	100	100	100	86	86
Area equipped for full control irrigation actually irrigated [AAI_{full}]	8.6												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	8.6												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	22.6												

Narrative

AEI_{full} and AHI_{full} are 8 562 ha in 1996 while AEI_{tot} and AAI_{tot} are 22 558 ha for the same year (FAO, 2012). AAI_{full} is defined equal to AHI_{full} in order to have a cropping intensity of 100 percent. The fruit production (bananas, mangoes, pineapple) is the main irrigated crop while rice and vegetables are irrigated. Irrigation is practiced during the dry season only from June to October.

References

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GUYANA

Irrigated crop calendar

2010

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	51				40	40	40	40	40				
Rice two	80	63								63	63	63	63
Vegetables °	4				3	3	3	3	3				
Citrus °	2	2	2	2	2	2	2	2	2	2	2	2	2
Sugarcane	42	33	33	33	33	33	33	33	33	33	33	33	33
Harvested irrigated crop area [AHI_{full}]	179	97	34	34	78	78	78	78	78	97	97	97	97
Area equipped for full control irrigation actually irrigated [AAI_{full}]	128	* ° These areas originate from AT2050/2080											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	140												
Area equipped for full control irrigation [AEI_{full}]	150												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	85												
Total area equipped for irrigation [AEI_{tot}]	150												

* These figures refer to the year 1991

° These areas originate from AT2050/2080

Narrative

Figures regarding equipped and irrigated areas are very consistent from one source to another. AEI_{full} is estimated at 150 000 ha, considering the 1991 AQUASTAT value is still valid (FAO, 2012). AHI_{full} is 179 000 ha in 2010 when completing national data (BoS, 2012) with a limited area of additional crops from AT 2050/2080 (citrus and vegetables, FAO, 2011). AAI_{full} has been estimated at 85 percent of AEI_{full}, that is 127 500 ha. Thus the cropping intensity equals to 140 percent. The main irrigated crops are rice (double cropping) and sugarcane, as well as vegetables and citrus. Irrigation is practiced all year round.

References

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HAITI

Irrigated crop calendar

2009

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	29			44	44	44	44	44					
Rice two	15								23	23	23	23	23
Maize	13			20	20	20	20	20					
Vegetables	6			9	9	9	9	9					
Citrus	5	7	7	7	7	7	7	7	7	7	7	7	7
Pulses	3			5	5	5	5	5					
Sugarcane	9	14	14	14	14	14	14	14	14	14	14	14	14
Cotton	1	1	1						1	1	1	1	1
Harvested irrigated crop area [AHI_{full}]	80	22	22	98	98	98	98	98	45	45	45	45	45
Area equipped for full control irrigation actually irrigated [AAI_{full}]	65	* These areas refer to the year 1991											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	122												
Area equipped for full control irrigation [AEI_{full}]	92												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	71												
Total area equipped for irrigation [AEI_{tot}]	92												

Narrative

Siebert *et al.* (2010) considers that AEI_{full} and AAI_{full} reported by AQUASTAT for 1991 (FAO, 2012) are still valid in 2009 (respectively, 91 500 and 65 420 ha), although it is not anymore due to damages by the 2010 earthquake. The estimated value of AHI_{full} of 96 000 ha used in AT 2050/2080 (FAO, 2011) has been considered too high considering the economic conditions and has been reduced to 80 000 ha, resulting in a cropping intensity of 122 percent. The main irrigated crops are rice (double cropping), maize, sugarcane, vegetables, but some citrus, pulses and cotton are also irrigated. Annual crops are irrigated from March to July, except the second crop of rice (August to December) and cotton (August to February).

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HONDURAS

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice	3				5	5	5	5	5				
Maize one	21				34	34	34	34	34				
Maize two	11	17								17	17	17	17
Vegetables	5				8	8	8	8	8				
Bananas	9	15	15	15	15	15	15	15	15	15	15	15	15
Plantains	5	8	8	8	8	8	8	8	8	8	8	8	8
Citrus	6	10	10	10	10	10	10	10	10	10	10	10	10
Sugarcane	12	20	20	20	20	20	20	20	20	20	20	20	20
Cotton	1	2	2	2						2	2	2	2
Harvested irrigated crop area [AHI_{full}]	72	71	54	54	99	99	99	99	99	71	71	71	71
Area equipped for full control irrigation actually irrigated [AAI_{full}]	61	* These areas refer to the year 2007											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	118												
Area equipped for full control irrigation [AEI_{full}]	88												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	69												
Total area equipped for irrigation [AEI_{tot}]	88												

Narrative

AEI_{tot} and AEI_{full} are 87 850 ha in 2007 (SAG, 2012). Siebert *et al.* (2010) reports that AAI_{full} is 61 000 ha in 2006. AHI_{full}, derived from AT 2050/2080 (FAO, 2011), is equal to 72 000 ha resulting in a cropping intensity of 118 percent. The main crops are maize (double cropping), sugarcane and bananas (including plantains). Some citrus, vegetables, rice and cotton are also irrigated. Irrigation is practiced all year round.

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HUNGARY

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Maize	14.2				16	16	16	16	16				
Vegetables	26.3				30	30	30	30	30				
Fruit	21.5	24	24	24	24	24	24	24	24	24	24	24	24
Rapeseed	2.0				2	2	2	2	2				
Sunflower	2.3				3	3	3	3	3				
Potatoes	9.3				11	11	11	11	11				
Pulses	8.0				9	9	9	9	9				
Sugar beet	2.9			3	3	3	3	3	3				
Pasture permanent	1.1	1	1	1	1	1	1	1	1	1	1	1	1
Harvested irrigated crop area [AHI_{full}]	87.6	26	26	29	100	100	100	100	100	26	26	26	26
Area equipped for full control irrigation actually irrigated [AAI_{full}]	87.6												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	140.9												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	62												
Total area equipped for irrigation [AEI_{tot}]	140.9												

Narrative

AEI_{tot} and AEI_{full} are 140 900 ha and AAI_{full} is 87 620 ha in 2007 (Eurostat, 2012). The crop calendar is adapted from AT 2030/2050 (FAO, 2006). AHI_{full} is estimated to be equal to AAI_{full}. The main irrigated crops are vegetables, fruit and maize. Some potatoes, pulses, sugar beet, sunflower, rapeseed and permanent pasture are also irrigated. All temporary crops are summer crops, irrigated from March (sugar beet) or April to August. Permanent crops are irrigated almost the whole year (for water deficit in summer and frost protection in winter/spring).

References

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INDIA - EAST

(Arunachal Pradesh, Assam, Bihar, Orissa, West Bengal, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura)

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	4 314	46	46	46								46	46
Rice one	3 203	34	34	34								34	34
Rice two	3 203						34	34	34	34	34		
Maize	144						2	2	2	2	2		
Millet	131						1	1	1	1	1		
Sorghum	71						0.8	0.8	0.8	0.8	0.8		
Barley	48						0.5	0.5	0.5	0.5	0.5		
Vegetables	213	2	2	2								2	2
Fruit	329	4	4	4	4	4	4	4	4	4	4	4	4
Soybeans	154						2	2	2	2	2		
Groundnuts	86						1	1	1	1	1		
Rapeseed	60	0.6	0.6	0.6								0.6	0.6
Sesame	27						0.3	0.3	0.3	0.3	0.3		
Oil crops	24						0.3	0.3	0.3	0.3	0.3		
Potatoes and sweet potatoes	86						1	1	1	1	1		
Pulses	238	3	3	3								3	3
Fodder temporary	608	7	7	7								7	7
Fibre crops	14						0.1	0.1	0.1	0.1	0.1		
Tobacco	35						0.4	0.4	0.4	0.4	0.4		
Harvested irrigated crop area [AHI_{full}]	12 988	96	96	96	4	4	47	47	47	47	47	96	96
Area equipped for full control irrigation actually irrigated [AAI_{full}]	9 349												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	139												
Area equipped for full control irrigation [AEI_{full}]	9 945												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	94												
Total area equipped for irrigation [AEI_{tot}]													

INDIA - NORTH

(Haryana, Himachal Pradesh, Jammu & Kashmir, Punjab, Uttar Pradesh, Chandigarh, Delhi, Uttaranchal)

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	7 670	38	38	38								38	38
Rice one	3 546	18	18	18								18	18
Rice two	3 546						18	18	18	18	18		
Maize	432						2	2	2	2	2		
Millet	392						2	2	2	2	2		
Sorghum	214						1	1	1	1	1		
Barley	144						0.7	0.7	0.7	0.7	0.7		
Vegetables	465	2	2	2								2	2
Fruit	721	4	4	4	4	4	4	4	4	4	4	4	4
Soybeans	337						2	2	2	2	2		
Rapeseed	163	0.8	0.8	0.8								0.8	0.8
Sesame	58						0.3	0.3	0.3	0.3	0.3		
Oil crops	52						0.3	0.3	0.3	0.3	0.3		
Potatoes and sweet potatoes	189						1	1	1	1	1		
Pulses	1 255	6	6	6								6	6
Sugarcane	2 103	10	10	10	10	10	10	10	10	10	10	10	10
Fodder temporary	1 330						7	7	7	7	7		
Cotton	1 189				6	6	6	6	6	6	6		
Fibre crops	31				0.2	0.2	0.2	0.2	0.2	0.2	0.2		
Tobacco	77						0.4	0.4	0.4	0.4	0.4		
Harvested irrigated crop area [AHI_{full}]	23 914	79	79	79	20	20	54	54	54	54	54	79	79
Area equipped for full control irrigation actually irrigated [AAI_{full}]	20 046												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	119												
Area equipped for full control irrigation [AEI_{full}]	21 325												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	94												
Total area equipped for irrigation [AEI_{tot}]													

INDIA - SOUTH

(Andra Pradesh, Karnataka, Kerala, Tamil Nadu, Pondicherry)

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	240	2	2	2	2								2
Rice one	6 321	56	56	56	56								56
Rice two	1 000							9	9	9	9	9	
Barley	106							1	1	1	1	1	
Maize	317							3	3	3	3	3	
Millet	287	3	3	3	3								3
Sorghum	157	1	1	1	1								1
Vegetables	239	2	2	2								2	2
Fruit	371	3	3	3	3	3	3	3	3	3	3	3	3
Soybeans	174							2	2	2	2	2	
Oil crops	27							0.2	0.2	0.2	0.2	0.2	
Sesame	30							0.3	0.3	0.3	0.3	0.3	
Groundnuts	719							6	6	6	6	6	
Potatoes and sweet potatoes	97							1	1	1	1	1	
Pulses	136	1	1								1	1	1
Sugarcane	1 031	9	9	9	9	9	9	9	9	9	9	9	9
Fodder temporary	684	6	6	6	6								6
Cotton	317	3						3	3	3	3	3	3
Fibre crops	16							0.1	0.1	0.1	0.1	0.1	
Tobacco	39							0.3	0.3	0.3	0.3	0.3	
Harvested irrigated crop area [AHI_{full}]	12 308	87	84	83	80	12	12	38	38	38	39	41	87
Area equipped for full control irrigation actually irrigated [AAI_{full}]	11 308												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	109												
Area equipped for full control irrigation [AEI_{full}]	14 320												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	79												
Total area equipped for irrigation [AEI_{tot}]													

INDIA - WEST

(Gujarat, Madhya Pradesh, Maharashtra, Rajasthan, Goa, Daman & Diu, D & N Haveli, Chhattisgarh)

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	11 744	66	66	66	66	66	66						66
Rice	2 059							11	11	11	11	11	
Barley	183							1	1	1	1	1	
Maize	547							3	3	3	3	3	
Millet	496							3	3	3	3	3	
Sorghum	271							2	2	2	2	2	
Vegetables	412	2	2	2								2	2
Fruit	639	4	4	4	4	4	4	4	4	4	4	4	4
Soybeans	299							2	2	2	2	2	
Groundnuts	268							1	1	1	1	1	
Rapeseed	320	2	2								2	2	2
Sesame	51							0.3	0.3	0.3	0.3	0.3	
Oil crops	47							0.3	0.3	0.3	0.3	0.3	
Potatoes and sweet potatoes	167							1	1	1	1	1	
Pulses	1 764	10	10	10								10	10
Sugarcane	990	6	6	6	6	6	6	6	6	6	6	6	6
Fodder temporary	1 178	7	7	7	7								7
Cotton	1 136					6	6	6	6	6	6	6	
Fibre crops	27							0.2	0.2	0.2	0.2	0.2	
Tobacco	68							0.4	0.4	0.4	0.4	0.4	
Harvested irrigated crop area [AHI_{full}]	22 666	95	95	93	81	81	81	40	40	40	42	54	95
Area equipped for full control irrigation actually irrigated [AAI_{full}]	17 912												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	127												
Area equipped for full control irrigation [AEI_{full}]	19 055												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	94												
Total area equipped for irrigation [AEI_{tot}]													

INDIA - TOTAL	2006 1000 ha
Harvested irrigated crop area [AHI_{full}]	71 876
Area equipped for full control irrigation actually irrigated [AAI_{full}]	58 614
Cropping intensity (%) = $100 \times [AHI_{full}]/[AAI_{full}]$	123
Area equipped for full control irrigation [AEI_{full}]	64 646
% of full control equipped actually irrigated = $100 \times [AAI_{full}]/[AEI_{full}]$	91

Narrative India

The AQUASTAT database reports that AEI_{full} is 64 646 000 ha and 66 334 000 ha, respectively, in 2005 and 2008, and AHI_{full} 76 820 000 ha and 87 259 000 ha, respectively, in 2004 and 2008 (FAO, 2012). AAI_{full} was calculated as 94 percent of AEI_{full} as found in previous reports for that year (MOA, 2009; MWR, 2007). Four crop calendars have been adapted from AT 2050/2080 (FAO, 2011). The resulting cropping intensity for the whole country equals to 123 percent. Rice is the main irrigated crop in the East (49 percent of regional AHI_{full}) and the South (59 percent). Wheat is the main irrigated crop in the West (52 percent) and in the North (both 32 percent).

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INDONESIA

Irrigated crop calendar

2005

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	4 067	61	61	61									61
Rice two	3 869				58	58	58	58					
Rice three	2 797								42	42	42	42	
Maize	1 269							19	19	19	19	19	
Vegetables	244							4	4	4	4	4	
Soybeans	280							4	4	4	4	4	
Groundnuts	324							5	5	5	5	5	
Potatoes	65							1	1	1	1	1	
Sweet potatoes	178							3	3	3	3	3	
Sugarcane	95	1	1	1	1	1	1	1	1	1	1	1	1
Tobacco	198							3	3	3	3	3	
Harvested irrigated crop area [AHI_{full}]	13 388	62	62	62	59	59	59	97	81	81	81	81	62
Area equipped for full control irrigation actually irrigated [AAI_{full}]	6 722												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	199												
Area equipped for full control irrigation [AEI_{full}]	6 722												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	6 722												

Narrative

Based on the AQUASTAT questionnaire, AEI_{tot} and AEI_{full} are 6 722 000 ha in 2005, all of which is considered actually irrigated (FAO, 2012). The cropping intensity is very high (199 percent) due to the possibility to grow rice three times in a year. The main irrigated crop is thus rice. Some maize, groundnuts, soybeans, vegetable, tobacco, sweet potatoes, sugarcane and potatoes are also irrigated.

References

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IRAN (ISLAMIC REPUBLIC OF)

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	2 634	41	41	41	41						41	41	41
Rice	628					10	10	10	10	10			
Barley	607	9	9	9	9							9	9
Maize and other cereals	276					4	4	4	4	4			
Vegetables	563					9	9	9	9	9			
Fruit	1 054	16	16	16	16	16	16	16	16	16	16	16	16
Bananas	3	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Citrus	213	3	3	3	3	3	3	3	3	3	3	3	3
Soybeans	57					1	1	1	1	1			
Groundnuts	648					10	10	10	10	10			
Sunflowers	78					1	1	1	1	1			
Sweet potatoes	187					3	3	3	3	3			
Other roots and tubers	49					1	1	1	1	1			
Tea	3	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Pulses	160					2	2	2	2	2			
Sugarcane	63	1	1	1	1	1	1	1	1	1	1	1	1
Sugar beet	153				2	2	2	2	2	2			
Fodder temporary	878	14	14	14	14							14	14
Cotton	143				2	2	2	2	2	2	2		
Flowers	62	1	1	1	1	1	1	1	1	1	1	1	1
Tobacco	10					0.2	0.2	0.2	0.2	0.2			
Other temporary crops	124					2	2	2	2	2			
Harvested irrigated crop area [AHI_{full}]	8 593	86	86	86	91	70	70	70	70	70	65	86	86
Area equipped for full control irrigation actually irrigated [AAI_{full}]	6 423												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	134												
Area equipped for full control irrigation [AEI_{full}]	8 297												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	77												
Total area equipped for irrigation [AEI_{tot}]	8 297												

Narrative Iran (Islamic Republic of)

AEI_{tot} and AEI_{full} are 8 297 031 ha and AAI_{full} is 6 423 342 ha in 2006 (Statistical Centre of Iran, 2006). AHI_{full} of 8 592 554 ha in 2003 (MOA, 2005) is considered still valid in 2006, resulting in a cropping intensity of 134 percent. By far the most important harvested irrigated crop is wheat, followed by other cereals (rice, barley and maize), temporary fodder and fruit (including citrus and bananas). Some groundnuts, vegetables, sweet potatoes and other roots, pulses, sugar beets, cotton, flowers, sunflower, sugarcane, soybeans, tobacco and tea, as well as other non-defined temporary crops are also irrigated. Temporary crops are mostly irrigated from May to September, except some cereals and temporary fodder which are cultivated from October or November to April.

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IRAQ

Irrigated crop calendar

2010

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	960	61	61	61	61						61	61	61
Rice	48					3	3	3	3	3			
Barley	362	23	23	23	23							23	23
Maize	113					7	7	7	7	7			
Other cereals	20					1	1	1	1	1			
Vegetables	261					17	17	17	17	17			
Fruit°	190	12	12	12	12	12	12	12	12	12	12	12	12
Citrus°	32	2	2	2	2	2	2	2	2	2	2	2	2
Oil crops (sunflower & sesame)	19					1	1	1	1	1			
Potatoes	13					1	1	1	1	1			
Pulses	12					1	1	1	1	1			
Cotton	21				1	1	1	1	1	1	1		
Harvested irrigated crop area [AHI_{full}]	2 050	99	99	99	100	47	47	47	47	47	77	99	99
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1 564	* * These areas refer to the year 1990 ° These areas originate from AT2050/2080											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	131												
Area equipped for full control irrigation [AEI_{full}]	3 525												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	44												
Total area equipped for irrigation [AEI_{tot}]	3 525												

*

* These areas refer to the year 1990

° These areas originate from AT2050/2080

Narrative Iraq

AEI_{tot} and AEI_{full} equal to 3 525 000 ha in 1990 (FAO, 2003) of which it is likely that a significant amount has been abandoned due to waterlogging, salinity and conflicts (FAO, 2012). In this country, irrigation started when Sumerians built a canal to irrigate wheat and barley in Mesopotamia. These two crops are still the main irrigated ones. A partial AHI_{full} is 1 828 000 ha in 2010 according the Annual Abstract of Statistics 2010-2011 (COS, 2011). AHI_{full} was completed by adding the missing crops' areas (fruits including citrus) from AT 2050/2080 (FAO, 2011). As a result, AHI_{full} is estimated at 2 050 000 ha in 2010. Wheat and barley, the two main irrigated crops, are grown in winter, that is outside the common irrigation period. Thus AAI_{full} was calculated to be 1 564 000 ha, which is the total area of winter crops (wheat and barley), permanent crops (fruits and citrus) and cotton which are cultivated simultaneously. The resulting cropping intensity is 131 percent. Some vegetables, maize, rice and other cereals, oil crops (sesame and sunflower), potatoes and pulses are grown and irrigated during summer, between May and September.

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IRELAND

Irrigated crop calendar

1998

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Vegetables	0.5				45	45	45	45	45				
Strawberry	0.1				9	9	9	9	9				
Potatoes	0.5				45	45	45	45	45				
Harvested irrigated crop area [AHI_{full}]	1.1	0	0	0	100	100	100	100	100	0	0	0	0
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1.1												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	1.1												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	1.1												

Narrative

Irrigation is practised on a very limited area. Statistics regarding areas and crops are not even recorded in Eurostat. However, in 1998 AEI_{tot}, AEI_{full} and AAI_{full} were 1 100 ha (Baldock et al. 2000). AHI_{full} is assumed to be equal to AAI_{full} and is divided mainly between potatoes and vegetables with only a small area of strawberries. The crop calendar is adapted from neighbouring countries. All crops are irrigated in summer only, thus from April to August.

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ISRAEL

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	9	5	5	5	5						5	5	5
Other cereals	5					3	3	3	3	3			
Vegetables	54					30	30	30	30	30			
Fruit	54	29	29	29	29	29	29	29	29	29	29	29	29
Citrus	16	9	9	9	9	9	9	9	9	9	9	9	9
Sunflower	4					2	2	2	2	2			
Pulses	8					4	4	4	4	4			
Potatoes	18					10	10	10	10	10			
Cotton	14				7	7	7	7	7	7	7		
Flowers	3	2	2	2	2	2	2	2	2	2	2	2	2
Harvested irrigated crop area [AHI_{full}]	184	45	45	45	52	96	96	96	96	96	52	45	45
Area equipped for full control irrigation actually irrigated [AAI_{full}]	182	* * These areas refer to the year 2004											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	101												
Area equipped for full control irrigation [AEI_{full}]	225												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	81												
Total area equipped for irrigation [AEI_{tot}]	225												

Narrative Israel

In 2004, AEI_{tot} and AEI_{full} are equal to 225 000 ha, of which 75 percent equipped with localized irrigation (mostly drip irrigation) (FAO, 2012; MARD, 2006). AAI_{full} is estimated at 182 000 ha (Siebert *et al.*, 2010). AHI_{full} reaches 183 600 ha in 2006 (CBS, 2009) which is close to the figure referring to 2000 in the AQUASTAT database (182 000 ha). The cropping intensity is 101 percent. The main irrigated crops are vegetables (including potatoes) and permanent crops (fruit and citrus). Some cereals, cotton, sunflower and flowers are also irrigated. Temporary crops are irrigated from May to September, except cotton (from April to October) and wheat (October to April).

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ITALY

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	118	4	4	4	4	4						4	4
Rice	241				9	9	9	9	9				
Maize	736				28	28	28	28	28				
Vegetables	226				8	8	8	8	8				
Fruit	384	14	14	14	14	14	14	14	14	14	14	14	14
Citrus	123	5	5	5	5	5	5	5	5	5	5	5	5
Grapes	197	7	7	7	7	7	7	7	7	7	7	7	7
Soybeans	85				3	3	3	3	3				
Sunflower	20				1	1	1	1	1				
Olives	120	5	5	5	5	5	5	5	5	5	5	5	5
Potatoes	31				1	1	1	1	1				
Sugar beet	96			4	4	4	4	4	4				
Fodder temporary	100	4	4	4	4							4	4
Fodder permanent	189	7	7	7	7	7	7	7	7	7	7	7	7
Harvested irrigated crop area [AHI_{full}]	2 666	46	46	50	100	96	92	92	92	38	38	46	46
Area equipped for full control irrigation actually irrigated [AAI_{full}]	2 666												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	3 951												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	67												
Total area equipped for irrigation [AEI_{tot}]	3 951												

Narrative Italy

AEI_{tot} and AEI_{full} are 3 951 000 and AAI_{full} is 2 666 000 ha (Eurostat, 2012). AHI_{full} is assumed equal to AAI_{full} resulting in a cropping intensity of 100 percent. The main irrigated crops are cereals (41 percent, mainly maize), fruit (26 percent, including grapes and citrus) and fodder (11 percent, temporary and permanent). Some vegetables, olives, sugar beet, soybeans, potatoes and sunflower are also irrigated. Temporary crops are mostly summer crops irrigated from March (sugar beet) or April to August, except winter wheat and fodder (from November to April or May). Permanent crops are irrigated almost the whole year (for water deficit in summer and frost protection in winter/spring).

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JAMAICA

Irrigated crop calendar

2009

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Vegetables	1.3			5	5	5	5	5					
Bananas	2.2	9	9	9	9	9	9	9	9	9	9	9	9
Citrus	0.6	2	2	2	2	2	2	2	2	2	2	2	2
Coffee	0.2	1	1	1	1	1	1	1	1	1	1	1	1
Sugarcane	19.5	77	77	77	77	77	77	77	77	77	77	77	77
Fodder temporary	1.5	6	6								6	6	6
Harvested irrigated crop area [AHI_{full}]	25.2	95	95	94	94	94	94	94	89	89	95	95	95
Area equipped for full control irrigation actually irrigated [AAI_{full}]	25.2												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	25.2												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	25.2												

Narrative

Siebert *et al.* (2010) considers that AAI_{full} of 25 220 ha reported in AQUASTAT for 1997, and similar to AEI_{full}, is still valid in 2009. AHI_{full} in AT 2050/2080 is estimated at 31 000 ha (FAO, 2011) and a partial AHI_{full} was 24 665 ha in 1997 in AQUASTAT (FAO, 2012). The 1997 figures have been rounded to the upper unit in order to obtain an AHI_{full} equal to AEI_{full}, resulting in a cropping intensity of 100 percent. As presented in the AQUASTAT country profile, agriculture has always played a significant role in the island's economy, and the need to improve irrigation practices has long been recognized (FAO, 2012) in particular during the main dry season lasting from December to April. Fruit and sugarcane are the main irrigated crops. Vegetables, coffee and temporary fodder are also irrigated.

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JAPAN

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	127	5	5	5	5						5	5	5
Rice one	1 000					38	38	38	38	38			
Rice two	691	27	27	27								27	27
Other cereals	56					2	2	2	2	2			
Vegetables	269					10	10	10	10	10			
Soybeans	71					3	3	3	3	3			
Potatoes	46					2	2	2	2	2			
Pulses	35					1	1	1	1	1			
Sugarcane	16	1	1	1	1	1	1	1	1	1	1	1	1
Sugar beet	47					2	2	2	2	2	2		
Cotton	267					10	10	10	10	10	10	10	
Pasture permanent	332	13	13	13	13	13	13	13	13	13	13	13	13
Harvested irrigated crop area [AHI_{full}]	2 957	45	45	45	18	82	82	82	82	82	30	55	45
Area equipped for full control irrigation actually irrigated [AAI_{full}]	2 600												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	114												
Area equipped for full control irrigation [AEI_{full}]	2 800												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	93												
Total area equipped for irrigation [AEI_{tot}]													

Narrative Japan

AEI_{full} was 3 128 079 ha in 1993, consisting of 2 781 411 ha of irrigated paddy fields and 346 668 ha of irrigated upland fields. Siebert *et al.* (2010) estimated AEI_{full} at 2 800 000 ha and AAI_{full} at 2 600 000 ha. AHI_{full}, 2 957 000 ha, is taken from AT 2030/2050 (FAO, 2006), resulting in a cropping intensity of 114 percent. The main irrigated crops are rice, permanent pastures, vegetables, cotton and other cereals. Some soybean, sugar beets, potatoes, pulses and sugarcane are also irrigated. Temporary crops are mostly irrigated from May to September (or November for cotton only), except wheat which is grown from October to April and the second rice crop which is grown from November to March.

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JORDAN

Irrigated crop calendar

2004

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	2	2	2	2	2						2	2	2
Barley	1	1	1	1							1	1	1
Vegetables one	12	17	17	17	17								
Vegetables two	12					17	17	17	17				
Vegetables three	12									17	17	17	17
Fruit	20	26	26	26	26	26	26	26	26	26	26	26	26
Bananas	2	3	3	3	3	3	3	3	3	3	3	3	3
Citrus	7	9	9	9	9	9	9	9	9	9	9	9	9
Olives	27	36	36	36	36	36	36	36	36	36	36	36	36
Potatoes	3					5	5	5	5	5			
Pulses	1					1	1	1	1	1			
Harvested irrigated crop area [AHI_{full}]	99	93	93	93	92	96	96	96	96	96	93	93	93
Area equipped for full control irrigation actually irrigated [AAI_{full}]	75												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	132												
Area equipped for full control irrigation [AEI_{full}]	79												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	95												
Total area equipped for irrigation [AEI_{tot}]	79												

Narrative

AEI_{tot} and AEI_{full} are 78 860 ha in 2004 (FAO, 2012) and AHI_{full} is 99 030 ha in the same year (MOA, 2004). Agriculture is mostly rainfed. The irrigated areas are allocated to olives, fruit, vegetables (three cycles per year) and cereals. Some pulses are also irrigated. AAI_{full} has been calculated by deducting two seasons of vegetables from AHI_{full}, which results in 75 000 ha. This gives a cropping intensity of 132 percent.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

Ministry of Agriculture [MOA]. 2004. *Data and Information on Agricultural Developments, Achievements and Planning*. Agriculture annual report. Directorate of Information and Computer, Jordan.

KAZAKHSTAN

Irrigated crop calendar

2010

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	208	18	18	18	18	18						18	18
Rice	94						8	8	8	8	8		
Barley	92						8	8	8	8	8		
Maize	96						8	8	8	8	8		
Vegetables	183						15	15	15	15	15		
Fruit	54	5	5	5	5	5	5	5	5	5	5	5	5
Oil crops	40	3	3	3	3	3	3	3	3	3	3	3	3
Potatoes	60	5	5	5	5	5							
Sugar beets	9						1	1	1	1	1		
Fodder permanent	26	2	2	2	2	2	2	2	2	2	2	2	2
Cotton	134					11	11	11	11	11	11	11	
Tobacco	2						0.1	0.1	0.1	0.1	0.1		
Other temporary crops	5						0.4	0.4	0.4	0.4	0.4		
Pasture permanent	181	15	15	15	15	15	15	15	15	15	15	15	15
Harvested irrigated crop area [AHI_{full}]	1 182	48	48	48	48	59	77	77	77	77	77	54	43
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1 182												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	1 200												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	99												
Total area equipped for irrigation [AEI_{tot}]	2 066												

Narrative

AEI_{tot} is 2 065 900 ha and AEI_{full} is 1 199 600 ha in 2010 (FAO, 2012). The difference is due to spate irrigation. AAI_{full} is equal to 1 182 100 ha in 2010. AHI_{full} is similar to AAI_{full}. The main irrigated crops are wheat, vegetables, permanent pastures and cotton. Some other cereals (maize, rice and barley), potatoes, fruits, oil crops, permanent fodder, sugar beets, tobacco, and other temporary crops are also irrigated. Temporary crops are mostly irrigated from June to October (or from May to November for cotton), except wheat and potatoes which are cultivated and irrigated from November and January, respectively, to May.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

KENYA

Irrigated crop calendar

2003

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice	18				19	19	19	19	19				
Maize	4				4	4	4	4	4				
Vegetables	31	32	32								32	32	32
Citrus	6	6	6	6	6	6	6	6	6	6	6	6	6
Pineapple	6	6	6	6	6	6	6	6	6	6	6	6	6
Banana	1	1	1	1	1	1	1	1	1	1	1	1	1
Sugarcane	6	6	6	6	6	6	6	6	6	6	6	6	6
Coffee	15	15	15	15	15	15	15	15	15	15	15	15	15
Tea	6	6	6	6	6	6	6	6	6	6	6	6	6
Flowers	3	3	3	3	3	3	3	3	3	3	3	3	3
Cotton	4	4	4	4						4	4	4	4
Harvested irrigated crop area [AHI_{full}]	100	80	80	48	67	67	67	67	67	48	80	80	80
Area equipped for full control irrigation actually irrigated [AAI_{full}]	97												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	103												
Area equipped for full control irrigation [AEI_{full}]	103												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	94												
Total area equipped for irrigation [AEI_{tot}]	103												

Narrative Kenya

AEI_{tot} and AEI_{full} equal to 103 200 ha in 2003 while AAI_{tot} and AAI_{full} are 97 200 ha (FAO, 2012). AHI_{full} is assumed to be at least equal to AAI_{full} as it was the case for the 1992 dataset. In addition, a partial AHI_{tot} in country profile for 2003 is 37 496 ha for temporary crops only. AHI_{full} 's estimation in AT 2050/2080 (75 000 ha; FAO, 2011) is considered to be low. Thus AHI_{full} is estimated at 100 000 ha using 1990 and 2003 available figures in AQUASTAT as well as AT 2050/2080. The main irrigated crops are vegetables, rice and coffee. Some citrus, pineapple, sugarcane, tea, cotton, maize, flowers and bananas are also irrigated. Temporary crops are irrigated mostly from April to August during the long raining season.

References

- FAO.** 2011. *World agriculture: towards 2050/2080*. FAO, Global Perspective Studies Unit. Rome. (Internal document).
- FAO.** 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

KUWAIT

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat and other cereals	2	22	22	22	22	22	22						22
Vegetables	4							57	57	57	57	57	
Fruit	2	24	24	24	24	24	24	24	24	24	24	24	24
Potatoes	1							11	11	11	11	11	
Harvested irrigated crop area [AHI_{full}]	8	46	46	46	46	46	46	92	92	92	92	92	46
Area equipped for full control irrigation actually irrigated [AAI_{full}]	7	* This area refers to the year 2003											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	114												
Area equipped for full control irrigation [AEI_{full}]	9												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	82												
Total area equipped for irrigation [AEI_{tot}]	9												

Narrative

The AQUASTAT database reports a value for AEI_{tot} and AEI_{full} of 8 600 ha in 2007 (Arab Organization for Agricultural Development, 2008). AHI_{full} comes from FAOSTAT (FAO, 2012a) considering 'harvested crop area' to be 'harvested irrigated crop area' because all crops are irrigated in Kuwait. It is equal to 8 050 ha in 2006. AAI_{full} is 7 050 ha in 2003 (FAO, 2012b), resulting in a cropping intensity of 114 percent. The main irrigated crops are vegetables, potatoes, cereals and fruits. Irrigation is practiced all year round.

References

Arab Organization for Agricultural Development. 2008. *Arab Agriculture Statistics Yearbook, 2007*. Volume 28.

FAO. 2012a. FAOSTAT online database. <http://faostat.fao.org/>

FAO. 2012b. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

KYRGYZSTAN

Irrigated crop calendar

2005

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	361	35	35	35	35	35						35	35
Rice	5				0.5	0.5	0.5	0.5	0.5				
Barley	87	8	8	8	8							8	8
Maize	62				6	6	6	6	6				
Other cereals	2				0.2	0.2	0.2	0.2	0.2				
Vegetables	41				4	4	4	4	4				
Sunflower	59				6	6	6	6	6				
Potatoes	76	7	7	7	7	7							
Pulses	21				2	2	2	2	2				
Sugar beets	15			1	1	1	1	1	1				
Fodder temporary	36	4	4	4	4	4						4	4
Fodder permanent	73	7	7	7	7	7	7	7	7	7	7	7	7
Cotton	46				4	4	4	4	4	4	4		
Tobacco	6				0.5	0.5	0.5	0.5	0.5				
Other temporary crops	28				3	3	3	3	3				
Pasture permanent	107	10	10	10	10	10	10	10	10	10	10	10	10
Harvested irrigated crop area [AHI_{full}]	1 021	72	72	74	100	92	45	45	45	22	22	65	65
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1 021												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	1 021												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	1 021												

Narrative Kyrgyzstan

AEI_{tot} , AEI_{full} and AAI_{full} are equal to 1 021 400 ha in 2005 (FAO, 2012). AHI_{full} is equal to AAI_{full} (FAO, 2012), resulting in a cropping intensity of 100 percent. The main irrigated crops are cereals (mainly wheat, but also maize, barley and rice), fodder (permanent and temporary) and permanent pastures. Some vegetables, potatoes, sunflower, cotton, pulses, sugar beets, tobacco and other temporary crops are also irrigated. Temporary crops are mostly irrigated from April to August (or October for cotton), except wheat, potatoes and temporary fodder which are cultivated and irrigated from November (or January) to May.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

LAO PEOPLE'S DEMOCRATIC REPUBLIC

Irrigated crop calendar

2005

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	244					90	90	90	90	90			
Rice two	67	25	25								25	25	25
Vegetables	33	12	12								12	12	12
Citrus	15	6	6	6	6	6	6	6	6	6	6	6	6
Sugarcane	5	2	2	2	2	2	2	2	2	2	2	2	2
Cotton	8	3	3	3						3	3	3	3
Harvested irrigated crop area [AHI_{full}]	372	47	47	10	7	98	98	98	98	100	47	47	47
Area equipped for full control irrigation actually irrigated [AAI_{full}]	271												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	137												
Area equipped for full control irrigation [AEI_{full}]	310												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	87												
Total area equipped for irrigation [AEI_{tot}]	310												

Narrative

AEI_{full} and AEI_{tot} are equal to 310 000 ha and AAI_{full} is equal to 270 742 ha in 2005 (FAO, 2012). AHI_{full} is 371 700 ha for the same year (FAO, 2012), resulting in a cropping intensity of 137 percent. The main irrigated crops are rice (84 percent) and vegetables (9 percent). Some citrus, cotton and sugarcane are also irrigated. Irrigation is practiced all year round.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

LATVIA

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Vegetables	0.31				50	50	50	50	50				
Potatoes	0.31				50	50	50	50	50				
Harvested irrigated crop area [AHI_{full}]	0.62	0	0	0	100	100	100	100	100	0	0	0	0
Area equipped for full control irrigation actually irrigated [AAI_{full}]	0.62												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	0.83												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	75												
Total area equipped for irrigation [AEI_{tot}]	0.83												

Narrative

AEI_{tot} and AEI_{full} are 830 ha and AAI_{full} is 620 ha in 2007 (Eurostat, 2012). Based on the neighbouring countries, a cropping intensity of 100 percent was considered. AHI_{full} was split equally into potatoes and vegetables, which are irrigated only in summer from April to August.

References

Eurostat. 2012. EUROSTAT irrigation data. Available at <http://epp.eurostat.ec.europa.eu/>, accessed in June 2012.

LEBANON

Irrigated crop calendar

2003

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	17	19	19	19	19						19	19	19
Barley	5	6	6	6	6							6	6
Maize	3					4	4	4	4	4			
Vegetables one	4		5	5	5	5							
Vegetables two	14						16	16	16	16			
Fruit	5	5	5	5	5	5	5	5	5	5	5	5	5
Bananas	3	3	3	3	3	3	3	3	3	3	3	3	3
Citrus	16	18	18	18	18	18	18	18	18	18	18	18	18
Groundnuts	1					1	1	1	1	1			
Potatoes	19					21	21	21	21	21			
Pulses	4					5	5	5	5	5			
Fodder temporary	3	4	4	4	4							4	4
Tobacco	9					10	10	10	10	10			
Flowers	1	1	1	1	1	1	1	1	1	1	1	1	1
Harvested irrigated crop area [AHI_{full}]	105	56	60	60	60	73	84	84	84	84	46	56	56
Area equipped for full control irrigation actually irrigated [AAI_{full}]	90	* * * These areas refer to the year 1998											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	117												
Area equipped for full control irrigation [AEI_{full}]	104												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	87												
Total area equipped for irrigation [AEI_{tot}]	104												

Narrative Lebanon

AEI_{full} is 104 009 ha and AAI_{full} is 90 000 ha in 1998 (MOA, 2002). AHI_{full} is 105 300 ha in 2003 (MOA, 2003) resulting in a cropping intensity of 117 percent. The main irrigated crops are cereals (24 percent, mainly wheat), fruit (23 percent, mainly citrus) and vegetables (17 percent, double cropping). Some potatoes, tobacco, pulses, temporary fodder, groundnuts and flowers are also irrigated. Temporary crops with single cropping are mostly irrigated from May to September, except some cereals and temporary fodder which are cultivated from October or November to April.

References

Ministry of Agriculture [MOA]. 2002. *L'Atlas Agricole du Liban*. Ministry of Agriculture and FAO, Beirut, Lebanon. Available at http://www.agriculture.gov.lb/ATLAS_%20AGRICOLE/atlas.html, accessed in June 2012.

Ministry of Agriculture [MOA]. 2003. *L'Agriculture au Liban*. Ministère de l'Agriculture - Direction des Etudes et de Coordination.

LESOTHO

Irrigated crop calendar

1999

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Vegetables	0.07			100	100	100	100	100	100				
Harvested irrigated crop area [AHI_{full}]	0.07	0	0	100	100	100	100	100	100	0	0	0	0
Area equipped for full control irrigation actually irrigated [AAI_{full}]	0.07												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	2.64												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	3												
Total area equipped for irrigation [AEI_{tot}]	2.64												

Narrative

AEI_{tot} and AEI_{full} equal to 2 637 ha in 1999 while AAI_{tot} and AAI_{full} are only 67 ha (FAO, 2012). Besides it was decided to define AHI_{full} equal to AAI_{full} since it was already the case for earlier data (1995) and allocate all irrigated areas to vegetables (cabbage, carrots, spinach and a variety of other crops) similarly to 1995. Vegetables produced under irrigation remains very seasonal, during the dry season from March to August.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

LIBERIA

Irrigated crop calendar

1987

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Vegetables	0.1	100	100	100	100							100	100
Harvested irrigated crop area [AHI_{full}]	0.1	100	100	100	100	0	0	0	0	0	0	100	100
Area equipped for full control irrigation actually irrigated [AAI_{full}]	0.1												
Cropping intensity (%) = $100 \times [AHI_{full}]/[AAI_{full}]$	100												
Area equipped for full control irrigation [AEI_{full}]	0.1												
% of full control equipped actually irrigated = $100 \times [AAI_{full}]/[AEI_{full}]$	100												
Total area equipped for irrigation [AEI_{tot}]	2.1												

Narrative

AEI_{tot} is 2 100 ha but AEI_{full} is marginal (100 ha). These data refer to 1987 but there is no new information to update them (FAO, 2012). AHI_{full} is estimated at 3 000 ha in AT 2050/2080 (FAO, 2011). However, because of significant rainfall (2 391 mm/year), the irrigation infrastructure is very limited and almost not used. It was decided thus to set AAI_{full} and AHI_{full} also at 100 ha and allocate it to vegetables, as rice is mostly grown in swamps. Irrigation occurs from November to April, during the dry season.

References

- FAO. 2011. *World agriculture: towards 2050/2080*. FAO, Global Perspective Studies Unit. Rome. (Internal document).
- FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

LIBYA

Irrigated crop calendar

2000

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	70	22	22	22	22	22						22	22
Barley and other cereals	50	16	16	16	16							16	16
Vegetables one	30					9	9	9					
Vegetables two	30								9	9	9		
Fruit	10	3	3	3	3	3	3	3	3	3	3	3	3
Citrus	10	3	3	3	3	3	3	3	3	3	3	3	3
Groundnut	10			3	3	3	3	3					
Olives	105	33	33	33	33	33	33	33	33	33	33	33	33
Potatoes and other tubers	10			3	3	3	3	3					
Pulses	10			3	3	3	3	3					
Fodder temporary	70	22	22								22	22	22
Tobacco	1			0.3	0.3	0.3	0.3	0.3					
Harvested irrigated crop area [AHI_{full}]	406	100	100	87	87	81	59	59	49	49	71	100	100
Area equipped for full control irrigation actually irrigated [AAI_{full}]	316												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	128												
Area equipped for full control irrigation [AEI_{full}]	470												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	67												
Total area equipped for irrigation [AEI_{tot}]	470												

Narrative Libya

AEI_{tot} and AEI_{full} equal to 470 000 ha in 2000 (FAO, 2012). The same source provides AAI_{tot} and AAI_{full} for the same year (316 000 ha) and AHI_{full} (441 000ha). However to avoid monthly use higher than 100 percent, AHI_{full} was scale down to 406 000 ha. The cropping intensity is then 128 percent. The main irrigated crops are cereals (mainly wheat and barley), olives, temporary fodder (mainly berseem clover), vegetables and fruit. Some groundnut, potatoes, pulses and tobacco are also irrigated. Temporary crops are mostly irrigated during an early summer (from March to July), except cereals and fodder which cultivated and irrigated in winter, from October to April.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

LITHUANIA

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Vegetables	0.4				40	40	40	40	40				
Potatoes	0.4				40	40	40	40	40				
Pasture permanent	0.2	20	20	20	20	20	20	20	20	20	20	20	20
Harvested irrigated crop area [AHI_{full}]	1.0	20	20	20	100	100	100	100	100	20	20	20	20
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1.0												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	1.3												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	75												
Total area equipped for irrigation [AEI_{tot}]	1.3												

Narrative

AEI_{tot} and AEI_{full} are 1 340 ha in 2007 (Eurostat, 2012). AAI_{full} is 1 000 ha (Eurostat, 2012) and AHI_{full} is estimated equal to AAI_{full}. The main irrigated crops are potatoes and vegetables, which are irrigated only in summer from April to August. Some permanent pasture is also irrigated.

References

Eurostat. 2012. EUROSTAT irrigation data. Available at <http://epp.eurostat.ec.europa.eu/>, accessed in June 2012.

MADAGASCAR

Irrigated crop calendar

2000

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	531	97	97	97								97	97
Rice two	531				97	97	97	97	97				
Sugarcane	17	3	3	3	3	3	3	3	3	3	3	3	3
Cotton	1	0.2	0.2	0.2						0.2	0.2	0.2	0.2
Harvested irrigated crop area [AHI_{full}]	1 081	100	100	100	100	100	100	100	100	3	3	100	100
Area equipped for full control irrigation actually irrigated [AAI_{full}]	550												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	196												
Area equipped for full control irrigation [AEI_{full}]	1 086												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	50.6												
Total area equipped for irrigation [AEI_{tot}]	1 086												

Narrative

AEI_{tot} and AEI_{full} are identical and equal to 1 086 000 ha in 2000 (FAO, 2012). The AQUASTAT database also gives AHI_{full} (1 081 000 ha) for the same year. AAI_{full} is calculated based on AHI_{full} reduced by the area of one crop of rice, that is 550 000 ha. Rice is by far the main irrigated crop and two crops are cultivated each year. Sugarcane and in a lesser extent cotton are also irrigated. Irrigation is practiced all year round.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

MALAWI

Irrigated crop calendar

2002

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	3.2	6	6	6								6	6
Rice two	3.2				6	6	6	6	6				
Maize	2.0	4	4	4								4	4
Vegetables	2.0				4	4	4	4	4				
Sugarcane	21.7	40	40	40	40	40	40	40	40	40	40	40	40
Tea	21.0	39	39	39	39	39	39	39	39	39	39	39	39
Coffee	5.5	10	10	10	10	10	10	10	10	10	10	10	10
Harvested irrigated crop area [AHI_{full}]	58.5	99	99	99	99	99	99	99	99	89	89	99	99
Area equipped for full control irrigation actually irrigated [AAI_{full}]	54.1												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	108												
Area equipped for full control irrigation [AEI_{full}]	56.4												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	96												
Total area equipped for irrigation [AEI_{tot}]	56.4												

Narrative

AEI_{tot} and AEI_{full} equal to 56 390 ha in 2002 (FAO, 2012). More recent report suggests AEI_{full} is 73 500 ha in 2006. AHI_{full} is 56 515 ha in 2000-2002 in the AQUASTAT country profile, but without any figure for maize, thus the 1992 figure was added, resulting in a AHI_{full} of 58 515 ha. AAI_{full} is estimated at 54 000 ha applying the ratio between AEI_{full} and AAI_{full} from the 1992 dataset. As a result, the cropping intensity is 108 percent. The main irrigated crops are sugarcane, tea, rice (double cropping), coffee, vegetables and maize. Irrigation is practiced all year round with a peak due to vegetables' irrigation from April to August.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

MALAYSIA

Irrigated crop calendar

1996

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	217	83	83								83	83	83
Rice two	217					83	83	83	83	83			
Vegetables	32					12	12	12	12	12			
Tobacco	11					4	4	4	4	4			
Harvested irrigated crop area [AHI_{full}]	477	83	83	0	0	100	100	100	100	100	83	83	83
Area equipped for full control irrigation actually irrigated [AAI_{full}]	260	* These areas refer to the year 1994											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	183												
Area equipped for full control irrigation [AEI_{full}]	341												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	76												
Total area equipped for irrigation [AEI_{tot}]	363												

Narrative

In 1994, AEI_{tot} is 362 687 ha, of which 340 717 ha is AEI_{full} and 21 970 ha equipped lowlands (FAO, 2012). AHI_{full} is 477 000 ha in 1996 (FAO, 2012), a value still valid in 2006 being close the 462 000 ha estimated by AT 2050/2080 (FAO, 2011). Rice is the main irrigated crop (over 90 percent, double cropping), but some vegetables and tobacco are also irrigated. AAI_{full} is calculated by deducting the area of one crop from AHI_{full}, thus giving 260 200 ha. This results in a cropping intensity of 183 percent. Irrigation is mostly practiced from May to September during the drier season, except for the double cropping of rice.

References

- FAO. 2011. *World agriculture: towards 2050/2080*. FAO, Global Perspective Studies Unit. Rome. (Internal document).
 FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

MALTA

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Vegetables	1.28				46	46	46	46	46				
Fruit	0.37	13	13	13	13	13	13	13	13	13	13	13	13
Potatoes	0.86				30	30	30	30	30				
Pulses	0.31				11	11	11	11	11				
Harvested irrigated crop area [AHI_{full}]	2.81	13	13	13	100	100	100	100	100	13	13	13	13
Area equipped for full control irrigation actually irrigated [AAI_{full}]	2.81												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	3.20												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	88												
Total area equipped for irrigation [AEI_{tot}]	3.20												

Narrative

AEI_{tot} and AEI_{full} are 3 200 ha, and AAI_{tot} and AAI_{full} are 2 810 ha in 2007 (Eurostat, 2012). The crop calendar is adapted from AT 2030/2050 (FAO, 2006). AHI_{full} is assumed to be equal to AAI_{full}. The main irrigated crops are vegetables (46 percent) and potatoes (30 percent), but some fruits and pulses are also irrigated. Irrigation of temporary crops occurs only in summer from April to August, while fruit trees are irrigated for water deficit in summer and frost protection in winter/spring.

References

Eurostat. 2012. EUROSTAT irrigation data. Available at <http://epp.eurostat.ec.europa.eu/>, accessed in June 2012.

MALI

Irrigated crop calendar

2000

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	3.5	4	4	4	4	4						4	4
Rice one	81.5	84	84	84								84	84
Rice two	63.0						65	65	65	65	65		
Other cereals	7.4						8	8	8	8	8		
Vegetables	3.7						4	4	4	4	4		
Potatoes	1.4	1	1	1								1	1
Sugarcane	7.1	7	7	7	7	7	7	7	7	7	7	7	7
Tea	4.0	4	4	4	4	4	4	4	4	4	4	4	4
Harvested irrigated crop area [AHI_{full}]	171.6	100	100	100	15	15	87	87	87	87	87	100	100
Area equipped for full control irrigation actually irrigated [AAI_{full}]	97.5												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	176												
Area equipped for full control irrigation [AEI_{full}]	97.5												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	235.8												

Narrative

AEI_{tot} is 235 791 ha in 2000 while AEI_{full} is 97 499 ha for the same year and AAI_{tot} is 175 800 ha in 2000 (FAO, 2012). It is assumed that AAI_{full} equals to AEI_{full}. AHI_{full} is 171 600 ha in 1997-2000, resulting in a cropping intensity of 176 percent. The main irrigated crops are rice (84 percent, double cropping), other cereals (6 percent including wheat, maize, sorghum), sugarcane (4 percent), vegetables (including potatoes) and tea. During winter or dry season, almost all full control irrigated area is cultivated with rice, but in summer, some of these are used for vegetables.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

MAURITANIA

Irrigated crop calendar

2004

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	16.9	74	74	74								74	74
Rice two	16.9						74	74	74	74	74		
Other cereals	1.2						5	5	5	5	5		
Vegetables	0.2						1	1	1	1	1		
Fruit (Dates)	4.8	21	21	21	21	21	21	21	21	21	21	21	21
Harvested irrigated crop area [AHI_{full}]	40.0	95	95	95	21	21	101	101	101	101	101	95	95
Area equipped for full control irrigation actually irrigated [AAI_{full}]	22.8												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	175												
Area equipped for full control irrigation [AEI_{full}]	45.0												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	51												
Total area equipped for irrigation [AEI_{tot}]	45.0												

Narrative

AEI_{tot} and AEI_{full} equal to 45 012 ha in 2004 while AAI_{tot} and AAI_{full} is 22 840 ha for the same year (FAO, 2012). For coherency of cropping intensity, the area of harvested irrigated crops has been calculated such as it equals AAI_{full} plus 244 ha of vegetables intercropped with palm trees in oases, plus the area of one crop of rice, that is 39 964 ha. The harvest irrigated area of rice decreased in the more recent years with 17 390 ha in 2008 from the irrigated schemes of the Senegal River only (DPCSE, 2008). But no data is available that year for irrigation in oases. Therefore 2004 data is used in the crop calendar. The main irrigated crops are rice (74 percent, double cropping), fruit (21 percent, mainly dates in oases with intercropped with temporary crops, mainly vegetables) and cereals (maize, sorghum).

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

Direction des Politiques, de la Coopération, du Suivi et de l'Evaluation [DPCSE]. 2008. Résultats définitifs de la campagne agricole 2007/2008.

MAURITIUS

Irrigated crop calendar

2002

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Maize	0.04					0.2	0.2	0.2	0.2	0.2			
Vegetables	0.76	4	4	4	4							4	4
Citrus	0.04	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Groundnut	0.12	1	1	1	1							1	1
Sugarcane	19.49	94	94	94	94	94	94	94	94	94	94	94	94
Tobacco	0.34	2	2	2	2	2						2	2
Flowers	0.14	1	1	1	1							1	1
Harvested irrigated crop area [AHI_{full}]	20.92	100	100	100	100	96	94	94	94	94	94	100	100
Area equipped for full control irrigation actually irrigated [AAI_{full}]	20.80												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	101												
Area equipped for full control irrigation [AEI_{full}]	21.22												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	98												
Total area equipped for irrigation [AEI_{tot}]	21.22												

Narrative

AEI_{tot} and AEI_{full} are identical and equal to 21 220 ha in 2002 (FAO, 2012a). The AQUASTAT database also gives AAI_{tot} and AAI_{full} (20 800 ha) and AHI_{full} (20 920 ha) for that year, resulting in a cropping intensity of just over 100 percent. Sugarcane is clearly the main irrigated crop. Some vegetables (tomatoes, eggplants, green peppers, and beans), tobacco, flowers, groundnuts, citrus and maize are also irrigated. Cropping seasons have been defined based on the FAO crop calendar tool (FAO, 2012b). Temporary crops are mostly irrigated from November to April, except Maize from May to September.

References

FAO. 2012a. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

FAO. 2012b. Crop calendar tool. Available at <http://www.fao.org/agriculture/seed/cropcalendar/welcome.do;jsessionid=9DC07CAED4773F60E555828B0AD05940>, accessed in July 2012.

MEXICO

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	597	11	11	11	11	11						11	11
Rice	66						1	1	1	1	1		
Maize	1 349						25	25	25	25	25		
Barley	195						4	4	4	4	4		
Sorghum	718						13	13	13	13	13		
Other cereals	55						1	1	1	1	1		
Vegetables	404						7	7	7	7	7		
Fruit	551	10	10	10	10	10	10	10	10	10	10	10	10
Bananas	56	1	1	1	1	1	1	1	1	1	1	1	1
Citrus	478	9	9	9	9	9	9	9	9	9	9	9	9
Soybeans	71						1	1	1	1	1		
Potatoes	53						1	1	1	1	1		
Pulses	330						6	6	6	6	6		
Sugarcane	333	6	6	6	6	6	6	6	6	6	6	6	6
Fodder temporary	416	8	8	8	8							8	8
Tobacco	8						0.1	0.1	0.1	0.1	0.1		
Cotton	118						2	2	2	2	2	2	2
Harvested irrigated crop area [AHI_{full}]	5 798	45	45	45	45	37	88	88	88	88	88	47	47
Area equipped for full control irrigation actually irrigated [AAI_{full}]	5 439	* * These areas refer to the year 2009											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	107												
Area equipped for full control irrigation [AEI_{full}]	6 460												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	84												
Total area equipped for irrigation [AEI_{tot}]	6 460												

Narrative Mexico

AEI_{tot} increased from 1 000 000 ha in the 1920s to 3 000 000 ha in 1961 and 6 460 000 in 2009 (CNA, 2011). AEI_{full} is assumed to be equal to AEI_{tot} and both AAI_{tot} and AAI_{full} are 5 439 600 ha in 2007 (CNA, 2011). AHI_{full} in AT 2050/2080 (FAO, 2011) is estimated at 5 798 000 ha, resulting in a cropping intensity of 107 percent. The main irrigated crops are cereals (mainly maize and sorghum), fruit (including citrus and bananas), temporary fodder, pulses and sugarcane. Some cotton, soybean, potatoes and tobacco are also irrigated. Temporary crops are irrigated from June to October, except cotton (to December), wheat and fodder (from November to April or May).

References

- Comisión Nacional del Agua [CNA].** 2011. Estadísticas del agua en México, edición 2011. Available at <http://www.conagua.gob.mx/CONAGUA07/Publicaciones/Publicaciones/SGP-1-11-EAM2011.pdf>, accessed in June 2012.
- FAO.** 2011. *World agriculture: towards 2050/2080*. FAO, Global Perspective Studies Unit. Rome. (Internal document).

MONGOLIA

Irrigated crop calendar

1993

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	9					24	24	24	24	24			
Vegetables	4					10	10	10	10	10			
Fruit	1	3	3	3	3	3	3	3	3	3	3	3	3
Potatoes	4					11	11	11	11	11			
Fodder temporary	18					51	51	51	51	51			
Harvested irrigated crop area [AHI_{full}]	35	3	3	3	3	100	100	100	100	100	3	3	3
Area equipped for full control irrigation actually irrigated [AAI_{full}]	35	* This area refers to the year 1994											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	57												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	61												
Total area equipped for irrigation [AEI_{tot}]	84												

Narrative

The AEI_{tot} of 84 300 ha, available in the AQUASTAT database, refers to 1994 while AEI_{full} of 57 300 ha and AAI_{full} of 35 000 ha refer to 1993 (FAO, 2012). The severe climatic conditions limit rainfed agriculture and the growing period to 80-100 days in the north and 120-140 days in the south. Based on qualitative information of the AQUASTAT country profile, a cropping intensity of 100 percent is assumed. The main irrigated crops are temporary fodder, wheat, vegetables, potatoes and fruits. Irrigation of temporary crops occurs from May to September.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

MONTENEGRO

Irrigated crop calendar

2010

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Temporary crops	0.009			0	0	0	0	0	0	0	0		
Fruit	0.102	4	4	4	4	4	4	4	4	4	4	4	4
Grapes	2.301	95	95	95	95	95	95	95	95	95	95	95	95
Harvested irrigated crop area [AHI_{full}]	2.412	100	100	100	100	100	100	100	100	100	100	100	100
Area equipped for full control irrigation actually irrigated [AAI_{full}]	2.412												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	2.412												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	2.412												

Narrative

AEI_{tot}, AEI_{full} and AHI_{full} are 2 412 ha in 2010 (SOM, 2012). AAI_{full} is considered equal to AHI_{full} for a cropping intensity of 100 percent. The largely dominant irrigated crop is vineyard, grown and irrigated partly throughout the year (for water deficit in summer and frost protection in winter/spring). Some orchards are also irrigated, as well as cereals and vegetables in a very limited area.

References

Statistical Office of Montenegro [SOM]. 2012. Statistical Yearbook of Montenegro 2011. Available at <http://www.monstat.org/userfiles/file/publikacije/godisnjak%202011/6.KLIMA.pdf>, accessed in June 2012.

MOROCCO

Irrigated crop calendar

2004

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	353	24	24	24	24						24	24	24
Rice	8			1	1	1	1	1					
Maize	60			4	4	4	4	4					
Barley	93	6	6	6							6	6	6
Vegetables	202					14	14	14	14	14			
Fruit	129	9	9	9	9	9	9	9	9	9	9	9	9
Citrus	74	5	5	5	5	5	5	5	5	5	5	5	5
Sunflower	12			1	1	1	1	1					
Olive	184	13	13	13	13	13	13	13	13	13	13	13	13
Potatoes	37					3	3	3	3	3			
Pulses	36			2	2	2	2	2					
Sugarcane	22	2	2	2	2	2	2	2	2	2	2	2	2
Sugar beet	72			5	5	5	5	5	5				
Fodder temporary	151	10	10	10							10	10	10
Fodder permanent	7	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Cotton	8			1	1	1	1	1	1	1			
Harvested irrigated crop area [AHI_{full}]	1 445	70	70	84	67	59	59	59	51	46	70	70	70
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1 445												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	1 459												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	99												
Total area equipped for irrigation [AEI_{tot}]	1 485												

Narrative Morocco

AEI_{tot} is 1 484 670 ha in 2004 while AAI_{tot} is 1 448 000 ha and AEI_{full} is 1 459 000 ha for the same year (FAO, 2012). AQUASTAT also gives AHI_{full} (1 445 000 ha) for 2004, so it assumed that AAI_{full} is similar. The cropping intensity is 100 percent. The main irrigated crops are cereals (35 percent, mainly wheat), fruit (27 percent, mainly olives), fodder (temporary and permanent) and vegetables (14 percent). Some sugar beet, pulses, potatoes, sugarcane, sunflower and cotton are also irrigated. Irrigation is practiced all year round. The temporary crops are mostly cultivated and irrigated from March to July, except wheat, barley and temporary fodder.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

MOZAMBIQUE

Irrigated crop calendar

2001

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice	4.1	10	10	10								10	10
Maize*	5.0				12	12	12	12	12				
Vegetables	7.0				18	18	18	18	18				
Citrus	0.4	1	1	1	1	1	1	1	1	1	1	1	1
Sugarcane	23.9	60	60	60	60	60	60	60	60	60	60	60	60
Tobacco	0.4				1	1	1	1	1				
Harvested irrigated crop area [AHI_{full}]	40.8	71	71	71	90	90	90	90	90	60	60	71	71
Area equipped for full control irrigation actually irrigated [AAI_{full}]	40.1	* This data refers to AT 2050/2080											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	102												
Area equipped for full control irrigation [AEI_{full}]	118.1												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	34												
Total area equipped for irrigation [AEI_{tot}]	118.1												

Narrative

AEI_{tot} and AEI_{full} equal to 118 100 ha in 2001 while AAI_{tot} and AAI_{full} are 40 060 ha (FAO, 2012). Partial AHI_{full} from country profile indicates 35 800 ha in 2001, consistent with an AHI_{full} of 41 000 ha in 2006 as AT 2050/2080 suggests (FAO, 2011) adding only 5 000 ha of maize to the 2001 crops available in the country profile. This last data is used, resulting in a cropping intensity of just over 100 percent. The main irrigated crops are sugarcane (61 percent), cereals (22 percent, rice and maize) and vegetables (17 percent, mostly tomatoes and lettuce, which are cultivated with a low intensity of 1.1-1.2 crops/year). Limited superficies of tobacco and citrus are also irrigated but their areas are not known and were not therefore included in the crop calendar. Maize and vegetables are grown and irrigated from April to August, while rice is cropped from November to March.

References

- FAO. 2011. *World agriculture: towards 2050/2080*. FAO, Global Perspective Studies Unit. Rome. (Internal document).
 FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

MYANMAR

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	77	4	4	4								4	4
Rice one	692						33	33	33	33	33		
Rice two	1 226	59	59	59								59	59
Maize	22	1	1	1								1	1
Vegetables	50	2	2	2	2	2							
Fruit	31	1	1	1	1	1	1	1	1	1	1	1	1
Sesame	79	4	4	4								4	4
Other oil crops	200	10	10	10	10	10							
Potatoes and sweet potatoes	6	0.3	0.3	0.3								0.3	0.3
Pulses	220	11	11	11	11	11							
Sugarcane	62	3	3	3	3	3	3	3	3	3	3	3	3
Cotton	108	5	5	5	5	5	5	5					
Tobacco	2	0.1	0.1	0.1	0.1	0.1							
Harvested irrigated crop area [AHI_{full}]	2 775	100	100	100	32	32	43	43	38	38	38	72	72
Area equipped for full control irrigation actually irrigated [AAI_{full}]	2 083	* * These areas refer to the year 2004											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	133												
Area equipped for full control irrigation [AEI_{full}]	2 083												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	2 110												

Narrative

AEI_{tot} is 2 110 000 ha, while AEI_{full} and AAI_{full} are equal to 2 083 000 ha in 2004 (FAO, 2012). AHI_{full} is estimated at 2 775 000 ha in 2006 by AT 2050/2080 (FAO, 2011). The main irrigated crops are rice (69 percent), oil crops (7 percent) and pulses (8 percent). Some other cereals (wheat and maize), cotton, sugarcane, vegetables, fruits, potatoes, and tobacco are also irrigated. The cropping intensity is 133 percent. Temporary crops, except rice, are mostly irrigated from November or January to May during the dry season.

References

- FAO. 2011. *World agriculture: towards 2050/2080*. FAO, Global Perspective Studies Unit. Rome. (Internal document).
 FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

NAMIBIA

Irrigated crop calendar

2002

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	1.4					18	18	18	18	18	18	18	
Maize	2.7	36	36	36	36								36
Vegetables	0.7	9	9	9	9								9
Oil Palm	0.4	5	5	5	5	5	5	5	5	5	5	5	5
Fodder temporary	1.7					22	22	22	22	22			
Cotton	0.7	9	9	9	9						9	9	9
Harvested irrigated crop area [AHI_{full}]	7.6	59	59	59	59	46	46	46	46	46	33	33	59
Area equipped for full control irrigation actually irrigated [AAI_{full}]	7.6												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	7.6												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	7.6												

Narrative

AEI_{tot} and AEI_{full} equal to 7 573 ha in 2002 (FAO, 2012). AAI_{tot}, AAI_{full} and AHI_{full} are not available for that year, but they were assumed equal to AEI_{full} as it was the case for the previous data set in 1991, resulting in a cropping intensity of 100 percent. The crop pattern also refers to 1991. It was therefore decided to scale up the figures proportionally to the newly equipped area. The main irrigated crops are cereals (54 percent, mainly maize and wheat), temporary fodder (20 percent) and cotton.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

NEPAL

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	645	55	55	55	55	55						55	55
Rice one	263								23	23	23	23	23
Rice two	263			23	23	23	23	23					
Maize	580						50	50	50	50	50		
Vegetables	31						3	3	3	3	3		
Rapeseed	36						3	3	3	3	3		
Sugarcane	33	3	3	3	3	3	3	3	3	3	3	3	3
Fodder temporary	58	5	5	5	5	5						5	5
Harvested irrigated crop area [AHI_{full}]	1 909	63	63	86	86	86	81	81	81	81	81	86	86
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1 168	* These areas refer to the year 2002											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	163												
Area equipped for full control irrigation [AEI_{full}]	1 168												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	1 168												

Narrative

AEI_{tot} and AEI_{full} are equal to 1 168 300 ha in 2002 (FAO, 2012), while AHI_{full} is estimated at 1 909 000 ha in 2006 in AT 2050/2080 (FAO, 2011). AAI_{full} is considered equal to AEI_{full} due to the high AHI_{full}, and which is consistent with Siebert *et al.* (2005). The resulting cropping intensity is 163 percent. The main irrigated crops are wheat (34 percent), maize (30 percent) and rice (28 percent). Some temporary fodder, sugarcane, vegetables and oil crops (assumed to be rapeseed) are also irrigated. Temporary crops with a single cropping are irrigated either from May to September (maize, vegetables, rapeseed) or from November to April (wheat, temporary fodder).

References

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Siebert, S., Döll, P., Hoogeveen, J., Faures, J.M., Frenken, K., & Feick, S. 2005. Development and validation of the global map of irrigation areas. *Hydrol. Earth System Sci.* 9 535–47. Available at <ftp://ftp.fao.org/agl/aglw/docs/PaperHess2005.pdf>, accessed in June 2012.

NETHERLANDS

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Maize	31				15	15	15	15	15				
Vegetables	25				13	13	13	13	13				
Fruit	31	15	15	15	15	15	15	15	15	15	15	15	15
Potatoes	55				27	27	27	27	27				
Sugar beet	16			8	8	8	8	8	8				
Pasture permanent	44	22	22	22	22	22	22	22	22	22	22	22	22
Harvested irrigated crop area [AHI_{full}]	202	37	37	45	100	100	100	100	100	37	37	37	37
Area equipped for full control irrigation actually irrigated [AAI_{full}]	202												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	457												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	44												
Total area equipped for irrigation [AEI_{tot}]	457												

Narrative

AEI_{tot} and AEI_{full} are 457 200 ha, and AAI_{tot} and AAI_{full} are 202 300 ha in 2007 (Eurostat, 2012). The crop calendar is adapted from AT 2030/2050 (FAO, 2006). AHI_{full} is assumed to be equal to AAI_{full}. The main irrigated crops are potatoes (27 percent), permanent pasture (22 percent, grasslands are considered permanent pastures), maize (15 percent) and fruit (15 percent). Vegetables and sugar beet are also irrigated. Temporary crops are summer crops only, irrigated from March (sugar beet) or April to August. Permanent crops are assumed to be irrigated almost the whole year (for water deficit in summer and frost protection in winter/spring).

References

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NEW ZEALAND

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	29					6	6	6	6	6	6	6	
Other cereals	23	5	5	5	5								5
Vegetables	27	5	5	5	5								5
Fruit	21	4	4	4	4	4	4	4	4	4	4	4	4
Grapes	22	4	4	4	4	4	4	4	4	4	4	4	4
Fodder temporary	72					14	14	14	14	14	14		
Flowers	3	1	1	1	1	1	1	1	1	1	1	1	1
Pasture permanent	311	61	61	61	61	61	61	61	61	61	61	61	61
Harvested irrigated crop area [AHI_{full}]	509	80	80	80	80	90	90	90	90	90	90	76	80
Area equipped for full control irrigation actually irrigated [AAI_{full}]	509												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	619												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	82												
Total area equipped for irrigation [AEI_{tot}]													

Narrative

The 2007 national census provides an accurate description of the irrigated areas equipped for full control irrigation (619 300 ha) by farm type and crop, while AAI_{tot} is 509 000 ha (SNZ, 2009). It is assumed that both AAI_{full} and AHI_{full} equal to AAI_{tot}. The main irrigated crops are permanent pasture and temporary fodder, cereals (mainly wheat), vegetables, vineyards and fruits. Most temporary crops are irrigated during summer (from December to April or to June for cotton), except fodder and winter wheat.

References

Statistics New Zealand [SNZ]. 2009. 2007 Agricultural Census tables. Available at http://www.stats.govt.nz/methods_and_services/access-data/tables/2007-agricultural-census-tables.aspx, accessed in June 2012.

NICARAGUA

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	12		14	14	14	14	14						
Rice two	12							14	14	14	14	14	
Maize one	4						5	5	5	5	5		
Maize two	4	5	5	5								5	5
Vegetables one	2				3	3	3	3	3				
Vegetables two	2	3	3	3								3	3
Bananas	1	1	1	1	1	1	1	1	1	1	1	1	1
Citrus	9	11	11	11	11	11	11	11	11	11	11	11	11
Pulses	17	21	21	21								21	21
Sugarcane	24	30	30	30	30	30	30	30	30	30	30	30	30
Harvested irrigated crop area [AHI_{full}]	86	71	86	86	59	59	64	64	64	62	62	86	71
Area equipped for full control irrigation actually irrigated [AAI_{full}]	80	* These areas refer to the year 2001											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	108												
Area equipped for full control irrigation [AEI_{full}]	94												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	85												
Total area equipped for irrigation [AEI_{tot}]	94												

Narrative

From 93 000 ha in 1990 (FAO, 2012), AEI_{full} decreased due to lack of maintenance of the pumping systems. However in the last decade, farmers have constructed their own irrigation systems. The 2001 Agrarian Census indicated that AEI_{full} is 94 240 ha (INIDE, 2002). AAI_{full} is estimated at 85 percent of AEI_{full}, or 80 000ha. AHI_{full} from AT 2050/2080 is equal to 86 000 ha (FAO, 2011), resulting in a cropping intensity of 108 percent. The main irrigated crops are rice (double cropping), sugarcane and pulses. Some maize (double cropping), vegetables (double cropping), citrus and bananas are also irrigated. Irrigation is practiced all year round.

References

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NIGER

Irrigated crop calendar

2005

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	0.8	6	6	6	6	6						6	6
Rice one	7.5	59	59	59								59	59
Rice two	6.7						53	53	53	53	53		
Other cereals	2.2	18	18	18								18	18
Vegetables	0.4	3	3	3								3	3
Cotton	1.6	13	13	13	13	13						13	13
Harvested irrigated crop area [AHI_{full}]	19.3	100	100	100	19	19	53	53	53	53	53	100	100
Area equipped for full control irrigation actually irrigated [AAI_{full}]	12.6												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	153												
Area equipped for full control irrigation [AEI_{full}]	13.7												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	92												
Total area equipped for irrigation [AEI_{tot}]	73.7												

Narrative

AEI_{tot} is 73 663 ha in 2005 and AEI_{full} is 13 663 ha for the same year (FAO, 2012). AAI_{tot} is 65 610 ha in 2005, and AAI_{full} is estimated at 12 615 ha—89 percent similarly to AAI_{tot}. AHI_{full} equals to 19 276 ha in 1997 according to the AQUASTAT country profile and estimated still valid in 2005, resulting in a cropping intensity of 153 percent. The irrigated crops are rice (73 percent, double cropping), other cereals (16 percent, such as wheat), cotton (8 percent) and vegetables (3 percent, onion, cabbage, lettuce, pepper, tomato, zucchini, eggplant, carrot and garlic). Tuber (manioc, sweet potato, potatoes) as well as other crops such as tobacco and sugarcane are also irrigated on such a limited area that it was not available to add in the crop calendar. Irrigation is mostly practiced in winter from November to March during the raining season.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

NIGERIA

Irrigated crop calendar

2004

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	19						9	9	9	9	9		
Rice one	7	3	3	3								3	3
Rice two	7						3	3	3	3	3		
Maize	19						9	9	9	9	9		
Vegetables	117	53	53	53	53								53
Potatoes	24	11	11	11	11								11
Sugarcane	25	11	11	11	11	11	11	11	11	11	11	11	11
Cotton	8				4	4	4	4	4	4	4		
Harvested irrigated crop area [AHI_{full}]	226	79	79	79	76	11	32	32	32	32	32	15	79
Area equipped for full control irrigation actually irrigated [AAI_{full}]	219												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	103												
Area equipped for full control irrigation [AEI_{full}]	238												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	92												
Total area equipped for irrigation [AEI_{tot}]	293												

Narrative

The AQUASTAT database gives AEI_{tot} equal to 293 200 ha and AEI_{full} to 238 200 ha in 2004 (FAO, 2012). AAI_{tot} is 218 800 ha in 2004 and AAI_{full} is assumed similar. A partial AHI_{full} is 164 000 ha in 1999, thus AHI_{full} was calculated such as it equals AAI_{full} plus one crop of rice, that is 225 800 ha, resulting in a cropping intensity of 103 percent. More than half of AHI_{full} consists of vegetables. Wheat, maize, sugarcane, rice (double cropping) and potatoes are also significant irrigated crops, while cotton, cowpeas, oil palm, citrus fruits, cocoa, rubber, taro and cashew nuts are much more limited and do not even appear in the crop calendar. Vegetables and potatoes are cropped and irrigated during the dry season from November to April, while wheat and maize enjoy a wet cropping season from June to October.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

NORWAY

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Barley	29				52	52	52	52	52				
Other cereals	14				26	26	26	26	26				
Vegetables	2				3	3	3	3	3				
Fruit	2	3	3	3	3	3	3	3	3	3	3	3	3
Rapeseed	3				6	6	6	6	6				
Potatoes	5				9	9	9	9	9				
Harvested irrigated crop area [AHI_{full}]	55	3	3	3	100	100	100	100	100	3	3	3	3
Area equipped for full control irrigation actually irrigated [AAI_{full}]	55												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	114												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	48												
Total area equipped for irrigation [AEI_{tot}]	114												

Narrative

AEI_{tot} and AEI_{full} are 114 000 ha (FAO, 2012) and AAI_{full} is 55 000 ha in 2007 (Eurostat, 2012). The crop calendar is adapted from AT 2030/2050 (FAO, 2006). AHI_{full} was adjusted to obtain a cropping intensity of 100 percent. Irrigation takes place between April and August, except for 1 800 ha of permanent fruit which are assumed to be irrigated also in winter/spring for frost protection. The main irrigated crops are cereals (79 percent, mainly barley), potatoes (9 percent) and rapeseed (6 percent).

References

Eurostat. 2012. EUROSTAT irrigation data. Available at <http://epp.eurostat.ec.europa.eu/>, accessed in June 2012.

FAO. 2006. *World agriculture: towards 2030/2050*. Interim report. FAO, Global Perspective Studies Unit. Rome, Italy. Available at http://www.fao.org/fileadmin/user_upload/esag/docs/Interim_report_AT2050web.pdf, accessed in November 2012.

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

OCCUPIED PALESTINIAN TERRITORY

Irrigated crop calendar

2003

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Vegetables	15.6				65	65	65	65	65				
Bananas	0.6	2	2	2	2	2	2	2	2	2	2	2	2
Citrus	6.3	26	26	26	26	26	26	26	26	26	26	26	26
Fruit	1.6	7	7	7	7	7	7	7	7	7	7	7	7
Harvested irrigated crop area [AHI_{full}]	24.0	35	35	35	100	100	100	100	100	35	35	35	35
Area equipped for full control irrigation actually irrigated [AAI_{full}]	24.0												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	24.0												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	24.0												

Narrative

AEI_{full} is 24 000 ha in 2003 (FAO, 2012) and it is assumed that AAI_{full} is the same. AHI_{full} of 24 000 ha referring to 1997 (Anonymous, 1997) is considered still valid in 2003, based on AEI_{full} and the crop calendar which does not allow for double cropping. Two-third of AHI_{full} is vegetables, irrigated from May to September during the hot dry summer. The remaining one-third are bananas, citrus and other fruit.

References

Anonymous. 1997. *Irrigated plant production in the West Bank and Gaza Strip*.

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

OMAN

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	0.3	0.5	0.5	0.5							0.5	0.5	0.5
Barley	1.2	2	2	2							2	2	2
Sorghum	2.3				4	4	4	4	4				
Other cereals	3.3				6	6	6	6	6				
Vegetables	5.2				9	9	9	9	9				
Dates	32.8	56	56	56	56	56	56	56	56	56	56	56	56
Bananas	2.4	4	4	4	4	4	4	4	4	4	4	4	4
Citrus	1.2	2	2	2	2	2	2	2	2	2	2	2	2
Coconut	0.4	1	1	1	1	1	1	1	1	1	1	1	1
Potatoes	0.3	0.5	0.5	0.5							0.5	0.5	0.5
Sugarcane	0.04	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Fodder temporary	15.8	27	27	27							27	27	27
Other permanent crops	1.7	3	3	3	3	3	3	3	3	3	3	3	3
Harvested irrigated crop area [AHI_{full}]	67.1	96	96	96	84	84	84	84	84	66	96	96	96
Area equipped for full control irrigation actually irrigated [AAI_{full}]	58.9	* These areas refer to the year 2004											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	114												
Area equipped for full control irrigation [AEI_{full}]	58.9												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	58.9												

Narrative

AEI_{tot} and AEI_{full} are equal to 58 850 ha in 2004 as reported in the agricultural census (MAF, 2005). AAI_{full} is considered to be the same as AEI_{full}. The crop calendar has an AHI_{full} of around 67 000 ha in 2007. This results in a cropping intensity of 114 percent. Dates are by far the main irrigated crop, covering almost 50 percent of the total harvested irrigated area. Some temporary fodder, cereals, vegetables, other fruits (bananas, citrus and coconuts), potatoes, sugarcane and other permanent crops are also irrigated. Irrigation is practiced all year round with temporary crops irrigated either from April to August or from October to March.

References

Ministry of Agriculture and Fisheries [MAF]. 2005. *Agricultural Census*. Ministry of Agriculture and Fisheries, Oman.

PAKISTAN

Irrigated crop calendar

2008

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	7 335	38	38	38	38	38						38	38
Rice	2 515						13	13	13	13	13		
Maize	947						5	5	5	5	5		
Millet	478						2	2	2	2	2		
Sorghum	253						1	1	1	1	1		
Barley	82	0.4	0.4	0.4	0.4							0.4	0.4
Vegetables	353						2	2	2	2	2		
Fruit	560	3	3	3	3	3	3	3	3	3	3	3	3
Bananas	36	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Citrus	199	1	1	1	1	1	1	1	1	1	1	1	1
Sunflower	397						2	2	2	2	2		
Sesame	70						0.4	0.4	0.4	0.4	0.4		
Rapeseed	202	1	1	1								1	1
Groundnuts	9						0.05	0.05	0.05	0.05	0.05		
Potatoes	154						0.8	0.8	0.8	0.8	0.8		
Pulses	1 006						5	5	5	5	5		
Sugarcane	1 241	6	6	6	6	6	6	6	6	6	6	6	6
Fodder temporary	2 460	13	13	13	13							13	13
Cotton	3 054						16	16	16	16	16	16	16
Tobacco	51						0.3	0.3	0.3	0.3	0.3		
Other temporary crops	50						0.3	0.3	0.3	0.3	0.3		
Harvested irrigated crop area [AHI_{full}]	21 452	63	63	63	62	49	59	59	59	59	59	79	79
Area equipped for full control irrigation actually irrigated [AAI_{full}]	19 270												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	111												
Area equipped for full control irrigation [AEI_{full}]	19 270												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	19 990												

Narrative Pakistan

AEI_{tot} is estimated at 19 990 000 ha (including 720 000 ha of spate irrigation) in 2008. AEI_{full} is thus 19 270 000 ha and AAI_{full} is considered to be the same (FAO, 2012). AHI_{full} is 21 452 000 ha in 2008 resulting in a cropping intensity of 111 percent. The main irrigated crops are cereals (54 percent, mainly wheat and rice), cotton (14 percent) and temporary fodder (11 percent). Some pulses, fruits (including bananas and citrus, sunflower, vegetables, rapeseed, potatoes, sesame, tobacco, groundnuts and other temporary crops are also irrigated. Irrigation of temporary crops occurs either from July to October or from November to April or May.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

PANAMA

Irrigated crop calendar

2000

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	5.88				21	21	21	21	21				
Rice two	15.58	57								57	57	57	57
Maize	4.42				16	16	16	16	16				
Sorghum	0.04				0.2	0.2	0.2	0.2	0.2				
Vegetables	4.39				16	16	16	16	16				
Potatoes	0.89				3	3	3	3	3				
Sugarcane	11.99	44	44	44	44	44	44	44	44	44	44	44	44
Harvested irrigated crop area [AHI_{full}]	43.18	100	44	44	100	100	100	100	100	100	100	100	100
Area equipped for full control irrigation actually irrigated [AAI_{full}]	27.48	* * These areas refer to the year 1997											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	157												
Area equipped for full control irrigation [AEI_{full}]	34.60												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	79												
Total area equipped for irrigation [AEI_{tot}]	34.60												

Narrative

AEI_{full} is 34 600 ha in 1997 and AAI_{full} is 27 475 ha in 2000. AHI_{full} is 43 180 ha according to the 2000 Agrarian Census (INEC, 2001), resulting in a cropping intensity of 157 percent. Irrigation started in Panama in 1920 to grow bananas (FAO, 2012), but the main irrigated crops are now rice (double cropping) and sugarcane. Some maize, vegetables, potatoes and sorghum are also irrigated. Temporary crops are irrigated from April to August during most of the rainy season, which starts in May for the rest of the year.

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PARAGUAY

Irrigated crop calendar

2012

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice	80	59	59	59								59	59
Vegetables	2	2	2	2								2	2
Sugarcane	53	39	39	39	39	39	39	39	39	39	39	39	39
Other permanent crops	1	1	1	1	1	1	1	1	1	1	1	1	1
Harvested irrigated crop area [AHI_{full}]	136	100	100	100	40	40	40	40	40	40	40	100	100
Area equipped for full control irrigation actually irrigated [AAI_{full}]	136												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	136												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	136												

Narrative

As described in the AQUASTAT country profile (FAO, 2012), agriculture relies mainly on rainfall. Irrigation is developed only in the eastern region, mostly from surface water. AHI_{full} is estimated at 136 170 ha in 2012, based on figures from the Ministerio de Agricultura y Ganadería (MAG, 2009 & 2011). Because there is no double cropping in Paraguay, AAI_{full} is considered to be equal to AHI_{full}. AEI_{tot} and AEI_{full} are also considered to be equal to AHI_{full}. The main irrigated crops are rice, sugarcane and vegetables. Temporary crops are irrigated from November to March, when punctual water shortages due to irregular rainfall distribution require irrigation.

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PERU

Irrigated crop calendar

1994

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice	86		8	8	8	8	8						
Maize	220		20	20	20	20	20						
Barley	15		1	1	1	1	1						
Other cereals	27		2	2	2	2	2						
Vegetables	62							6	6	6	6	6	
Fruit	86	8	8	8	8	8	8	8	8	8	8	8	8
Bananas	18	2	2	2	2	2	2	2	2	2	2	2	2
Citrus	26	2	2	2	2	2	2	2	2	2	2	2	2
Grapes	10	1	1	1	1	1	1	1	1	1	1	1	1
Potatoes	101							9	9	9	9	9	
Other roots	35							3	3	3	3	3	
Coffee	8	1	1	1	1	1	1	1	1	1	1	1	1
Pulses	64							6	6	6	6	6	
Sugarcane	101	9	9	9	9	9	9	9	9	9	9	9	9
Fodder temporary	161		14	14	14	14	14						
Cotton	84	8	8	8	8	8	8						8
Other temporary crops	21							2	2	2	2	2	
Harvested irrigated crop area [AHI_{full}]	1 124	30	76	76	76	76	76	48	48	48	48	48	30
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1 109	* * These areas refer to the year 1998											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	101												
Area equipped for full control irrigation [AEI_{full}]	1 196												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	93												
Total area equipped for irrigation [AEI_{tot}]	1 196												

Narrative Peru

AQUASTAT indicates that AEI_{tot} and AEI_{full} are 1 196 000 ha in 1998 (FAO, 2012). According to Siebert *et al.* (2005), AAI_{full} is 1 109 000 ha. AHI_{full} is almost 1 124 000 ha in the 1994 agricultural census (INEI, 1996), resulting in a cropping intensity of 101 percent. The agricultural irrigated production consists mainly of cereals (rice, maize and barley), vegetables, potatoes and other roots, fruits (including citrus and grapes), bananas, fodder (considered to be temporary due to the list of plant varieties detailed in the census) and sugarcane. Some pulses, cotton, coffee and other temporary crops are also irrigated. Temporary crops are either irrigated from February to June or from July to November, except cotton (from December to June).

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PHILIPPINES

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	1 118					59	59	59	59	59			
Rice two	1 304	69	69								69	69	69
Maize	97	5	5								5	5	5
Vegetables	38	2	2								2	2	2
Fruit	22	1	1	1	1	1	1	1	1	1	1	1	1
Bananas	14	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Citrus	2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Groundnuts	12	0.7	0.7								0.7	0.7	0.7
Sugarcane	65	3	3	3	3	3	3	3	3	3	3	3	3
Tobacco	24	1	1								1	1	1
Harvested irrigated crop area [AHI_{full}]	2 696	84	84	5	5	65	65	65	65	65	84	84	84
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1 879												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	143												
Area equipped for full control irrigation [AEI_{full}]	1 879												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	1 879												

Narrative

AEI_{tot} and AEI_{full} are equal to 1 879 000 ha (FAO, 2012), all of which is considered to be actually irrigated. AHI_{full} is equal to 2 696 000 ha (FAO, 2012), resulting in a cropping intensity of 143 percent. Rice (double cropping) is the main irrigated crop, covering over 90 percent of AHI_{full}. Some maize, sugarcane, vegetables, tobacco, bananas, fruits (including citrus) and groundnuts are also irrigated. Irrigation is practiced all year round due to the double cropping of rice, but all other temporary crops are irrigated from October to February.

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POLAND

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Maize	4				6	6	6	6	6				
Vegetables	4				6	6	6	6	6				
Fruit	4	5	5	5	5	5	5	5	5	5	5	5	5
Potatoes	14				19	19	19	19	19				
Sugar beet	6			8	8	8	8	8	8				
Fodder permanent	20	28	28	28	28	28	28	28	28	28	28	28	28
Pasture permanent	20	28	28	28	28	28	28	28	28	28	28	28	28
Harvested irrigated crop area [AHI_{full}]	72	61	61	69	100	100	100	100	100	61	61	61	61
Area equipped for full control irrigation actually irrigated [AAI_{full}]	72												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	116												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	62												
Total area equipped for irrigation [AEI_{tot}]	116												

Narrative

AEI_{full} and AAI_{full} are 115 710 ha and 72 060 ha respectively in 2007 (Eurostat, 2012). The crop calendar is adapted from AT 2030/2050 (FAO, 2006). AHI_{full} is assumed to be equal to AAI_{full}, resulting in a cropping intensity of 100 percent. The main irrigated crops are permanent fodder and permanent pasture, as well as potatoes. Some sugar beet, maize, vegetables and fruits are also irrigated. Temporary crops are all summer crops, irrigated from March (sugar beet) or April to August. Permanent crops are assumed to be irrigated almost the whole year for water deficit in summer and frost protection in winter/spring.

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PORTUGAL

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	14	3	3	3	3	3						3	3
Rice	23				6	6	6	6	6				
Maize	94				22	22	22	22	22				
Other cereals	51				12	12	12	12	12				
Vegetables	55				13	13	13	13	13				
Fruit	40	9	9	9	9	9	9	9	9	9	9	9	9
Citrus	17	4	4	4	4	4	4	4	4	4	4	4	4
Sunflower	9				2	2	2	2	2				
Olive trees	38	9	9	9	9	9	9	9	9	9	9	9	9
Potatoes	18				4	4	4	4	4				
Pulses	22				5	5	5	5	5				
Sugar beet	4			1	1	1	1	1	1				
Pasture permanent	37	9	9	9	9	9	9	9	9	9	9	9	9
Harvested irrigated crop area [AHI_{full}]	422	34	34	36	100	100	97	97	97	31	31	34	34
Area equipped for full control irrigation actually irrigated [AAI_{full}]	422												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	584												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	72												
Total area equipped for irrigation [AEI_{tot}]	584												

Narrative Portugal

AEI_{tot} and AEI_{full} are 583 700 ha, and AAI_{tot} and AAI_{full} are 421 500 ha in 2007 (Eurostat, 2012). The crop calendar is adapted from AT 2030/2050 (FAO, 2006). AHI_{full} is assumed to be equal to AAI_{full} , resulting in a cropping intensity of 100 percent. The main irrigated crops are cereals (43 percent, mainly maize), fruit (22 percent, including citrus and olives) and vegetables (13 percent). Some permanent pasture, pulses, potatoes, sunflower and sugar beet are also irrigated. Temporary crops are mostly summer crops, irrigated from March (sugar beet) or April to August, except winter wheat and fodder. Permanent crops are assumed to be irrigated the whole year (for water deficit in summer and frost protection in winter/spring).

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PUERTO RICO (UNITED STATES OF AMERICA)

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice	5			29	29	29	29	29					
Vegetables	1			9	9	9	9	9					
Fruit	2	15	15	15	15	15	15	15	15	15	15	15	15
Sugarcane	7	47	47	47	47	47	47	47	47	47	47	47	47
Harvested irrigated crop area [AHI_{full}]	16	62	62	100	100	100	100	100	62	62	62	62	62
Area equipped for full control irrigation actually irrigated [AAI_{full}]	16	* These areas refer to the year 2005											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	22												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	72												
Total area equipped for irrigation [AEI_{tot}]	22												

Narrative

AEI_{tot} and AEI_{full} are 22 040 ha in 2005 (FAO, 2012). AAI_{full} is 15 776 ha (USDA, 2009) and AHI_{full} is considered to be equal to AAI_{full}, resulting in a cropping intensity of 100 percent. The crop calendar is based on the neighbouring countries. Sugarcane and rice are the main irrigated crops, with also some vegetables and fruits to a lesser extent. Temporary crops are irrigated from March to July.

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QATAR

Irrigated crop calendar

2004

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Barley and wheat	1.0	16	16	16	16							16	16
Other cereals	0.3					5	5	5	5	5			
Vegetables	1.3					21	21	21	21	21			
Fruit	1.7	27	27	27	27	27	27	27	27	27	27	27	27
Fodder temporary	1.1	17	17	17	17							17	17
Fodder permanent	1.5	23	23	23	23	23	23	23	23	23	23	23	23
Harvested irrigated crop area [AHI_{full}]	6.9	84	84	84	84	76	76	76	76	76	50	84	84
Area equipped for full control irrigation actually irrigated [AAI_{full}]	6.3	* These areas refer to the year 2001											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	110												
Area equipped for full control irrigation [AEI_{full}]	12.9												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	49												
Total area equipped for irrigation [AEI_{tot}]	12.9												

Narrative

AEI_{full} is equal to AEI_{tot} and is estimated at 12 935 ha in 2001, of which only 6 322 ha is actually irrigated (DAWR, 2002). The main irrigated crops are fodder (permanent and temporary), fruit, vegetables and cereals. AHI_{full} reaches almost 7 000 ha (DAWR, 2004) resulting in a cropping intensity of 110 percent. Irrigation is practiced all year round, but for temporary crops it occurs either from May to September or from November to April.

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REPUBLIC OF KOREA Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	481					55	55	55	55	55			
Rice two	481	55	55	55								55	55
Maize	5					0.6	0.6	0.6	0.6	0.6			
Vegetables	229					26	26	26	26	26			
Fruit	40	5	5	5	5	5	5	5	5	5	5	5	5
Citrus	11	1	1	1	1	1	1	1	1	1	1	1	1
Soybeans	52					6	6	6	6	6			
Potatoes	19					2	2	2	2	2			
Sweet potatoes	14					2	2	2	2	2			
Fodder temporary	12	1	1	1	1	1						1	1
Tobacco	1					0.1	0.1	0.1	0.1	0.1			
Harvested irrigated crop area [AHI_{full}]	1 345	62	62	62	7	98	97	97	97	97	6	62	62
Area equipped for full control irrigation actually irrigated [AAI_{full}]	880	* These areas refer to the year 2002											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	153												
Area equipped for full control irrigation [AEI_{full}]	880												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	880												

Narrative

According to the 2003 statistical yearbook, AEI_{tot} and AEI_{full} are equal to 880 400 ha in 2002 (MIFAFF, 2003). AHI_{full} of 1 345 000 ha in 2006 comes from AT 2050/2080 (FAO, 2011). The resulting cropping intensity is 153 percent. The main irrigated crop is rice (double cropping) with over 71 percent of AHI_{full}. Some vegetables, soybeans, fruits (including citrus), potatoes and sweet potatoes, temporary fodder, maize and tobacco are also irrigated. Irrigation of temporary crops with single cropping occurs from May to September, except for temporary fodder whose cropping cycle starts in November for seven months.

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REPUBLIC OF MOLDOVA

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Cereals	7.0				22	22	22	22	22				
Vegetables	3.5				11	11	11	11	11				
Potatoes	3.5				11	11	11	11	11				
Sugar beet	2.2			7	7	7	7	7	7				
Fruit	4.8	15	15	15	15	15	15	15	15	15	15	15	15
Pasture permanent	10.9	34	34	34	34	34	34	34	34	34	34	34	34
Harvested irrigated crop area [AHI_{full}]	32.0	49	49	56	100	100	100	100	100	49	49	49	49
Area equipped for full control irrigation actually irrigated [AAI_{full}]	32.0	* This area refers to the year 2011											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	228.3												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	14												
Total area equipped for irrigation [AEI_{tot}]	228.3												

Narrative

AEI_{tot} and AEI_{full} are 228 300 ha in 2011 (NBS, 2012) and AAI_{full} is 32 000 ha in 2007 (WB, 2008). The large drop in equipped area from the early 1990s (AEI_{full} was 312 000 ha in 1992), as well as the significant equipped area unused, is due to the degradation of equipment (in particular pumping stations) and the farming restructuration process (equipment unfit for private farming). It is assumed that AHI_{full} equals to AAI_{full}. The crop calendar is based on the AQUASTAT county profile (FAO, 2012) and the neighbouring countries. The main irrigated crops are permanent pasture (34 percent, grasslands are considered permanent pastures), cereals (22 percent) and fruit (15 percent). Some potatoes, vegetables and sugar beet are also irrigated. Temporary crops are summer crops only, irrigated from March (sugar beet) or April to August. Permanent crops are assumed to be irrigated almost the whole year: for water deficit in summer and frost protection in winter/spring.

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ROMANIA

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Maize	38				22	22	22	22	22				
Vegetables	20				12	12	12	12	12				
Fruit	41	24	24	24	24	24	24	24	24	24	24	24	24
Soybeans	15				9	9	9	9	9				
Rapeseed	5				3	3	3	3	3				
Sunflower	27				16	16	16	16	16				
Potatoes	3				2	2	2	2	2				
Pulses	3				2	2	2	2	2				
Fodder temporary	20	12	12	12	12							12	12
Harvested irrigated crop area [AHI_{full}]	174	35	35	35	100	88	88	88	88	24	24	35	35
Area equipped for full control irrigation actually irrigated [AAI_{full}]	173												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	615												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	28												
Total area equipped for irrigation [AEI_{tot}]	615												

Narrative Romania

Many of the previous infrastructures for irrigation have been abandoned. Eurostat reports an irrigable area of 1 510 830 ha in 2003 (EC, 2010), which is about half of the area developed in former times. AEI_{full} and AAI_{full} are 615 300 ha and 173 400 ha respectively in 2007 (Eurostat, 2012). The crop calendar is adapted from AT 2030/2050 (FAO, 2006). AHI_{full} is assumed to be equal to AAI_{full} , resulting in a cropping intensity of 100 percent. The main irrigated crops are fruit, maize and sunflower. Some vegetables, fodder, soybeans, rapeseed, potatoes and pulses are also irrigated. Except temporary fodder, all temporary crops are summer crops irrigated from April to August. Fruit trees are assumed to be irrigated almost the whole year, that is in summer for water deficit and in winter/spring for frost protection.

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RUSSIAN FEDERATION

Irrigated crop calendar

2008

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	224	7	7	7	7	7						7	7
Rice	139				4	4	4	4	4				
Maize	55				2	2	2	2	2				
Barley	95	3	3	3	3							3	3
Other cereals	84				2	2	2	2	2				
Vegetables	208				6	6	6	6	6				
Fruit	240	7	7	7	7	7	7	7	7	7	7	7	7
Potatoes	300				9	9	9	9	9				
Pulses	118				3	3	3	3	3				
Sugar beet	117			3	3	3	3	3	3				
Fodder temporary	1 200	35	35	35	35							35	35
Pasture permanent	650	19	19	19	19	19	19	19	19	19	19	19	19
Harvested irrigated crop area [AHI_{full}]	3 430	70	70	74	100	62	56	56	56	26	26	70	70
Area equipped for full control irrigation actually irrigated [AAI_{full}]	3 430												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	4 346												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	79												
Total area equipped for irrigation [AEI_{tot}]	4 346												

Narrative Russian Federation

AEI_{tot} covered 6 120 000 ha in 1990 but declined to 5 198 000 ha in 1994, 4 457 100 ha in 2002 and 4 346 000 ha in 2008 (FAO, 2012). The crop calendar is adapted from AT 2030/2050 (FAO, 2006). AHI_{full} is identical to AAI_{full} used in the Global Map of Irrigation Areas, that is 3 430 000 ha (Siebert *et al.*, 2006). Temporary fodder is the main irrigated crop (35 percent) followed by permanent pastures (19 percent) and cereals (17 percent). Some potatoes, fruits, vegetables, pulses and sugar beet are also irrigated. Temporary crops are mostly summer crops, irrigated from March (sugar beet only) or April to August. Only winter wheat, barley and fodder are grown during winter. Similarly to permanent crops, winter crops are irrigated only during dry periods.

References

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RWANDA

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice	2.0		100	100	100	100	100						
Vegetables one	1.0	50										50	50
Vegetables two	1.0							50	50	50	50		
Harvested irrigated crop area [AHI_{full}]	4.0	50	100	100	100	100	100	50	50	50	50	50	50
Area equipped for full control irrigation actually irrigated [AAI_{full}]	2.0	* This area refers to the year 2000											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	200												
Area equipped for full control irrigation [AEI_{full}]	4.6												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	43												
Total area equipped for irrigation [AEI_{tot}]	8.5												

Narrative

AEI_{tot} is 8 500 ha in 2000 and AEI_{full} 3 500 ha in 1996 (FAO, 2012). The 2009 State of Environment announces 4 625 ha of irrigated agriculture in 2007 (REMA, 2009), which is considered to be AEI_{full} based on the previous data. The 2008 National Agricultural Survey indicates that AAI_{tot} is 7 940 ha (NISR, 2010). It is assumed that AAI_{full} is 2 000 ha for coherency on cropping intensity. AHI_{full} and the crop calendar are similar to the previous exercise undertaken in 2000 and AT 2050/2080 (FAO, 2011) with a cropping intensity of 200 percent. Irrigation enables one or two crop of rice per year with vegetables grown during the rest of the year.

References

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SAUDI ARABIA

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	490	41	41	41	41	41	41						41
Barley	22	2	2	2	2	2							2
Sorghum	144							12	12	12	12	12	
Other cereals	18							2	2	2	2	2	
Vegetables	113							9	9	9	9	9	
Fruit	191	16	16	16	16	16	16	16	16	16	16	16	16
Citrus	11	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Sesame	2							0.2	0.2	0.2	0.2	0.2	
Potatoes	15							1	1	1	1	1	
Fodder temporary	207	17	17	17	17	17							17
Harvested irrigated crop area [AHI_{full}]	1 214	77	77	77	77	77	58	41	41	41	41	41	77
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1 191	** This area refers to the year 1999 * * These areas refer to the year 2000											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	102												
Area equipped for full control irrigation [AEI_{full}]	1 731												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	69												
Total area equipped for irrigation [AEI_{tot}]	1 731												

Narrative

AEI_{full} is equal to AEI_{tot} and is 1 731 000 ha in 2000 (FAO, 2012). The AQUASTAT database also provides AAI_{full} of 1 191 000 ha, which refers to the year before. AHI_{full} comes from a joint Ministry of Agriculture and FAO project (MOA, 2007) and is equal to 1 214 000 ha in 2006, resulting in a cropping intensity of 102 percent. The irrigated crops consist mainly of cereals (wheat, sorghum and barley), temporary fodder and fruit (dates). Some vegetables, potatoes, citrus and sesame are also irrigated. Irrigation is practiced all year round. Temporary crops are irrigated either from December to May (or June) for winter cereals and temporary fodder, or from July to November for other crops.

References

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SENEGAL

Irrigated crop calendar

2002

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	43.7	63	63	63								63	63
Rice two	37.0						54	54	54	54	54		
Vegetables	13.6	20	20	20								20	20
Potatoes	1.2	2	2	2	2								2
Sugarcane	10.8	16	16	16	16	16	16	16	16	16	16	16	16
Harvested irrigated crop area [AHI_{full}]	106.2	100	100	100	17	16	69	69	69	69	69	99	100
Area equipped for full control irrigation actually irrigated [AAI_{full}]	69.0												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	154												
Area equipped for full control irrigation [AEI_{full}]	102.2												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	68												
Total area equipped for irrigation [AEI_{tot}]	119.7												

Narrative

AEI_{tot} is 119 680 ha in 2002 while AEI_{full} is 102 180 ha for the same year (FAO, 2012). AAI_{tot} was 69 000 ha in 1997 and considered still valid in 2002. It is assumed that AAI_{full} is similar. Since older figures of AEI_{full} and AHI_{full} are available (1994), AHI_{full} was calculated using the old ratio of 104 percent from AEI_{full}, that is AHI_{full} is 106 240 ha. This results in a cropping intensity of 154 percent. The main irrigated crops are rice (76 percent, double cropping), vegetables (13 percent, potatoes, water melon) and sugarcane (10 percent). Temporary crops are cultivated and irrigated during the raining season, from November to April.

References

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SERBIA

Irrigated crop calendar

2011

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Maize	10				29	29	29	29	29				
Other cereals	8				23	23	23	23	23				
Vegetables	6				18	18	18	18	18				
Fruit	3	7	7	7	7	7	7	7	7	7	7	7	7
Grapes	1	2	2	2	2	2	2	2	2	2	2	2	2
Potatoes	1				3	3	3	3	3				
Sugar beet	2			5	5	5	5	5	5				
Fodder temporary	4				13	13	13	13	13				
Harvested irrigated crop area [AHI_{full}]	34	9	9	14	100	100	100	100	100	9	9	9	9
Area equipped for full control irrigation actually irrigated [AAI_{full}]	34												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	92												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	37												
Total area equipped for irrigation [AEI_{tot}]	92												

Narrative Serbia

AEI_{tot} is 91 959 ha and AAI_{tot} is 34 175 ha in 2011 (SORS, 2012). AEI_{full} and AAI_{full} are considered equal to AEI_{tot} and AAI_{tot} respectively. AHI_{full} is estimated similar to AAI_{full} . In the absence of details regarding the irrigated crops, the crop distribution derives mainly from the total crop distribution in arable lands (FAO, 2009): cereals (52 percent), meadows (14 percent), forage (11 percent, regrouped with meadows into temporary fodder), industrial crops (8 percent divided into potatoes, sugar beet), vegetables (7 percent), orchards (6 percent), grapes (2 percent). Based on neighbouring countries, temporary fodder (13 percent) has been reduced for the benefit of vegetables (18 percent). The crop calendar is similar to neighbouring countries. Temporary irrigation occurs mainly from April to August.

References

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SEYCHELLES

Irrigated crop calendar

2003

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Vegetables	0.208					93	93	93	93	93			
Pulses	0.003					1	1	1	1	1			
Flowers	0.013					6	6	6	6	6			
Harvested irrigated crop area [AHI_{full}]	0.224	0	0	0	0	100	100	100	100	100	0	0	0
Area equipped for full control irrigation actually irrigated [AAI_{full}]	0.224												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	0.260												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	86												
Total area equipped for irrigation [AEI_{tot}]	0.260												

Narrative

AEI_{tot} and AEI_{full} are identical and equal to 260 ha in 2003 (FAO, 2012). The agricultural sector is characterized by small family farms practicing mixed farming. AAI_{tot} and AAI_{full} are 200 ha in 2003. AHI_{full} estimated at 224 ha in 2003. The only significant irrigated crop is vegetables (cabbage, pumpkin, beans, tomatoes, eggplant, cucumber, lettuce, spring onion, cocoyam, capsicum, okra and spices). Pulses and flowers together cover less than 20 ha. Crops such as sweet potatoes, cassava, plantains, sugar cane, bananas and citrus fruits are rainfed but irrigated at the planting stage only. The monsoon from May to October is the main growing and irrigation season.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

SIERRA LEONE

Irrigated crop calendar

1992

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Sugarcane	0.5	50	50	50	50	50	50	50	50	50	50	50	50
Vegetables	0.5	50	50	50	50								50
Harvested irrigated crop area [AHI_{full}]	1.0	100	100	100	100	50	50	50	50	50	50	50	100
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1.0												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	1.0												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	29.4												

Narrative

The irrigated agriculture is poorly developed and no recent data on its extent are available. AEI_{tot} is 29 360 ha in 1992 while AEI_{full} is only 1 000 ha for the same year (FAO, 2012). Rice is likely cultivated in a large area of equipped lowlands. The two crops considered in establishing the crop calendar are sugarcane and vegetables, as suggested by AT 2030/2050 (FAO, 2011) and the previous exercise undertaken in 2000. AAI_{full} and AHI_{full} are considered to be equal to 1 000 ha for a cropping intensity of 100 percent. Temporary crops are irrigated from December to April, during the dry season.

References

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SLOVAKIA

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Maize	7.3				19	19	19	19	19				
Other cereals	2.2				6	6	6	6	6				
Vegetables	4.2				11	11	11	11	11				
Fruit	1.3	3	3	3	3	3	3	3	3	3	3	3	3
Rapeseed	7.0				18	18	18	18	18				
Sunflower	2.0				5	5	5	5	5				
Potatoes	1.2				3	3	3	3	3				
Pulses	2.8				7	7	7	7	7				
Sugar beet	4.9			12	12	12	12	12	12				
Fodder temporary	6.4				16	16	16	16	16				
Harvested irrigated crop area [AHI_{full}]	39.2	3	3	16	100	100	100	100	100	3	3	3	3
Area equipped for full control irrigation actually irrigated [AAI_{full}]	39.1												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	172.0												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	23												
Total area equipped for irrigation [AEI_{tot}]	172.0												

Narrative Slovakia

AEI_{full} and AAI_{full} are 172 000 ha (FAO, 2012) and 39 090 ha respectively in 2007 (Eurostat, 2012). The crop calendar is adapted from AT 2030/2050 (FAO, 2006). AHI_{full} is assumed to be equal to AAI_{full} resulting in a cropping intensity of 100 percent. The main irrigated crops are cereals (mainly maize), rapeseed and temporary fodder. Some sugar beet, vegetables, pulses, sunflower, potatoes and fruits are also irrigated. All, except fruit trees, are summer crops irrigated from March (sugar beet only) or April to August.

References

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SLOVENIA

Irrigated crop calendar

2010

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Maize	0.29				8	8	8	8	8				
Other cereals	0.27				8	8	8	8	8				
Vegetables	0.76				22	22	22	22	22				
Fruit	0.63	18	18	18	18	18	18	18	18	18	18	18	18
Grapes	0.02	1	1	1	1	1	1	1	1	1	1	1	1
Potatoes	0.06				2	2	2	2	2				
Sugar beet	0.13			4	4	4	4	4	4				
Fodder temporary	0.15				4	4	4	4	4				
Pasture permanent	0.02	1	1	1	1	1	1	1	1	1	1	1	1
Flowers	0.08				2	2	2	2	2				
Hop	1.10				32	32	32	32	32				
Harvested irrigated crop area [AHI_{full}]	3.50	19	19	23	100	100	100	100	100	19	19	19	19
Area equipped for full control irrigation actually irrigated [AAI_{full}]	3.50												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	7.60												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	46												
Total area equipped for irrigation [AEI_{tot}]	7.60												

Narrative

AEI_{tot} and AEI_{full} are 7 604 ha and AHI_{full} is 3 501 ha in 2010 (SORS, 2012). AAI_{full} was assumed to be equal to AHI_{full} resulting in a cropping intensity of 100 percent. The main irrigated crops are hop, vegetables, cereals, and fruits. Some temporary fodder, potatoes, sugar beet, flowers, vineyards and permanent pasture are also irrigated. Temporary crops are summer crops irrigated from March (sugar beet only) or April to August. Permanent crops, in particular fruit trees and vineyards, are irrigated almost the whole year: for water deficit in dry periods and frost protection in winter/spring.

References

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SOMALIA

Irrigated crop calendar

2003

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Maize	20				39	39	39	39	39				
Sorghum	14				27	27	27	27	27				
Other cereals	2				3	3	3	3	3				
Vegetables	4	8	8								8	8	8
Fruit	6	13	13	13	13	13	13	13	13	13	13	13	13
Citrus	1	2	2	2	2	2	2	2	2	2	2	2	2
Sugarcane	2	3	3	3	3	3	3	3	3	3	3	3	3
Cotton	2				4	4	4	4	4	4	4		
Harvested irrigated crop area [AHI_{full}]	50	26	26	18	92	92	92	92	92	22	30	26	26
Area equipped for full control irrigation actually irrigated [AAI_{full}]	50												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	50												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	200												

Narrative

AEI_{tot} is 200 000 ha in 2003 while AEI_{full} is 50 000 ha and AAI_{tot} is 65 000 ha for the same year (FAO, 2012). It is assumed that AAI_{full} and AHI_{full} equal to AEI_{full}. The crop calendar is based on information available in AQUASTAT. The main irrigated crops are cereals (70 percent, mainly maize and sorghum), fruit (15 percent, bananas) and vegetables (8 percent), but sugarcane, cotton and citrus are also irrigated. Cereals are irrigated during the main raining season 'Deyr' from April to August, while vegetables enjoy rain from the 'Guy' raining season (lasting only October and November) when cropped and irrigated from October to February. Cotton's cropping season and irrigation lasts over these two wet seasons, from April to October.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

SOUTH AFRICA

Irrigated crop calendar

2000

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	217					14	14	14	14	14	14	14	
Maize	129	9	9	9	9								9
Other cereals	24	2	2	2	2								2
Vegetables	136	9	9	9	9								9
Fruit	238	16	16	16	16	16	16	16	16	16	16	16	16
Bananas	13	1	1	1	1	1	1	1	1	1	1	1	1
Citrus	67	4	4	4	4	4	4	4	4	4	4	4	4
Groundnut	24	2	2	2								2	2
Sunflower	19	1	1	1								1	1
Potatoes and other tubers	49	3	3	3	3								3
Pulses	143	10	10	10	10								10
Sugarcane	90	6	6	6	6	6	6	6	6	6	6	6	6
Fodder temporary	408					27	27	27	27	27			
Tobacco	33	2	2	2	2								2
Cotton	75	5	5	5	5						5	5	5
Harvested irrigated crop area [AHI_{full}]	1 664	69	69	69	67	69	69	69	69	69	47	50	69
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1 498												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	111												
Area equipped for full control irrigation [AEI_{full}]	1 498												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	1 498												

Narrative South Africa

AEI_{tot} and AEI_{full} equal to 1 498 000 ha in 2000 (FAO, 2012), as well as AAI_{tot} and AAI_{full} . AHI_{full} is 1 664 300 ha which gives a cropping intensity of 111 percent. The main irrigated crops are temporary fodder (26 percent), cereals (24 percent, mainly wheat and maize) and fruit (20 percent, including bananas and citrus) but the range of irrigated crops is wide: pulses, sugarcane, cotton, potatoes, tobacco, groundnuts, sunflower among them. Temporary crops are mostly cropped and irrigated in summer from December to April, except for wheat and temporary fodder which are cultivated in winter from May to September or November.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

SPAIN
Irrigated crop calendar
2009

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	248	8	8	8	8	8						8	8
Barley	331	11	11	11	11							11	11
Rice	117				4	4	4	4	4				
Maize	304					10	10	10	10	10			
Other cereals	65				2	2	2	2	2				
Vegetables	219				7	7	7	7	7				
Fruit	241	8	8	8	8	8	8	8	8	8	8	8	8
Citrus	287	9	9	9	9	9	9	9	9	9	9	9	9
Grapes	191	6	6	6	6	6	6	6	6	6	6	6	6
Sunflower	71				2	2	2	2	2				
Olives	453	15	15	15	15	15	15	15	15	15	15	15	15
Potatoes	38				1	1	1	1	1				
Pulses	39				1	1	1	1	1				
Sugar beet	40			1	1	1	1	1	1				
Fodder temporary	89	3	3	3	3							3	3
Fodder permanent	133	4	4	4	4	4	4	4	4	4	4	4	4
Cotton	50				2	2	2	2	2	2	2		
Flowers	16				1	1	1	1	1				
Tobacco	11					0.4	0.4	0.4	0.4	0.4			
Other temporary crops	20				1	1	1	1	1				
Other permanent crop	5	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Pasture permanent	126	4	4	4	4	4	4	4	4	4	4	4	4
Harvested irrigated crop area [AHI_{full}]	3 093	68	68	69	90	86	78	78	78	58	48	68	68
Area equipped for full control irrigation actually irrigated [AAI_{full}]	3 093												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	3 645												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	85												
Total area equipped for irrigation [AEI_{tot}]	3 645												

Narrative Spain

AEI_{tot} and AEI_{full} are 3 645 150 ha and AAI_{full} is 3 093 500 ha in 2009 (INE, 2012). AHI_{full} is equal to AAI_{full} . The crop calendar is based on the 2009 Agricultural Census (INE, 2012). The main irrigated crops are cereals (36 percent), fruit (23 percent, including citrus and grapes), olives (15 percent) and vegetables (7 percent). Some fodder (temporary and permanent), sugar beet, cotton, sunflower, potatoes, pulses, flowers, tobacco and permanent pastures are also irrigated. Temporary crops are either winter crops (irrigated during dry periods from November to April or May) or summer crops (4 to 6 months from March to October). Permanent crops are assumed to be irrigated almost the whole year, either for water deficit in dry periods or for frost protection in winter/spring.

References

Instituto Nacional de Estadísticas [INE]. 2012. 2009 Agricultural Census. Available at <http://www.ine.es/jaxi/menu.do?type=pcaxis&path=%2Ft01/p042/E01&file=inebase&L=0>, accessed in June 2012.

SRI LANKA

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	350	73	73	73								73	73
Rice two	350						73	73	73	73	73		
Maize and other cereals	1						0.2	0.2	0.2	0.2	0.2		
Vegetables	9						2	2	2	2	2		
Fruits	7	2	2	2	2	2	2	2	2	2	2	2	2
Oil crops	4						1	1	1	1	1		
Roots and tubers	4						1	1	1	1	1		
Pulses	1						0.2	0.2	0.2	0.2	0.2		
Sugarcane	17	4	4	4	4	4	4	4	4	4	4	4	4
Harvested irrigated crop area [AHI_{full}]	744	79	79	79	5	5	83	83	83	83	83	79	79
Area equipped for full control irrigation actually irrigated [AAI_{full}]	477												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	156												
Area equipped for full control irrigation [AEI_{full}]	570												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	84												
Total area equipped for irrigation [AEI_{tot}]	570												

Narrative

AEI_{tot} and AEI_{full} are equal to 570 000 ha and AAI_{full} is equal to 476 500 ha in 2006 (FAO, 2012). The AQUASTAT database also provides a figure for AHI_{full} of 744 000 ha in 2006. The cropping intensity is 156 percent. The main irrigated crops are rice (94 percent), sugarcane (2 percent) and vegetables (1 percent). Some fruits, oil crops, roots and tubers, pulses and other cereals are also irrigated. Temporary crop with a single cropping are irrigated from June to October only during the monsoon and thus raining season.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

SUDAN AND SOUTH SUDAN

Irrigated crop calendar

2000

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	103	13	13	13	13	13						13	13
Sorghum	178						22	22	22	22	22		
Maize and other cereals	71						9	9	9	9	9		
Vegetables	97	12	12	12	12								12
Sunflower	21						3	3	3	3	3		
Groundnut	46	6	6	6								6	6
Potatoes	16	2	2	2								2	2
Other roots and tubers	16	2	2	2								2	2
Sugarcane	70	9	9	9	9	9	9	9	9	9	9	9	9
Fodder temporary	142	18	18	18	18							18	18
Cotton	167				21	21	21	21	21	21	21		
Harvested irrigated crop area [AHI_{full}]	927	61	61	61	72	42	63	63	63	63	63	49	61
Area equipped for full control irrigation actually irrigated [AAI_{full}]	800												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	116												
Area equipped for full control irrigation [AEI_{full}]	1 731												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	46												
Total area equipped for irrigation [AEI_{tot}]	1 863												

Narrative Sudan and South Sudan

AEI_{tot} is 1 863 000 ha in 2000 while AEI_{full} is 1 730 970 ha for the same year (FAO, 2012). AAI_{tot} being 800 000 ha in 2000, thus AAI_{full} is assumed to be similar. AHI_{full} in the AQUASTAT profile is 1 150 110 ha in 1989-2000. However, based on qualitative information cotton was the main irrigated crop but its AHI_{full} decreased by 50 percent between 1989 and 2000. AHI_{full} of sorghum and groundnut also occupied a large area in 1989 (355 000 ha and 91 000 ha respectively) (FAO, 2012), but these two crops are not mentioned in the AQUASTAT questionnaire. It was then decided to include them with half of their previous areas. Finally AHI_{full} equals to 927 000 ha, eventuating in a cropping intensity of 116 percent. The main irrigated crops are cereals (38 percent, mainly sorghum and wheat), cotton (18 percent), fodder (15 percent). It is assumed that fodder is temporary as indicated in the AQUASTAT database. Some vegetables, sugarcane, groundnut, sunflower, roots and tubers are also irrigated. Irrigation is practiced mostly during the dry winter, from November to March or April, except for maize, sorghum, sunflower and cotton.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

Note

Although in July 2011 Sudan became two countries, Sudan and South Sudan, in this exercise the two countries are still grouped together due to the lack of disaggregated data.

SURINAME

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice	46					90	90	90	90	90			
Bananas	2	4	4	4	4	4	4	4	4	4	4	4	4
Sugarcane	3	6	6	6	6	6	6	6	6	6	6	6	6
Harvested irrigated crop area [AHI_{full}]	51	10	10	10	10	100	100	100	100	100	10	10	10
Area equipped for full control irrigation actually irrigated [AAI_{full}]	51	* * These areas refer to the year 1998											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	51												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	51												

Narrative

AEI_{tot}, AEI_{full}, AAI_{tot} and AAI_{full} are 51 118 ha in 1998 (FAO, 2012). AHI_{full} is estimated at 49 000 ha in 2006 by AT 2050/2080 (FAO, 2011). However, for coherency on cropping intensity it is scaled up to be equal to AAI_{full}, resulting in a cropping intensity of 100 percent. Irrigation is mainly used to grow rice from May to September. Bananas and sugarcane are also mentioned in the crop calendar.

References

FAO. 2011. *World agriculture: towards 2050/2080*. FAO, Global Perspective Studies Unit. Rome. (Internal document).

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

SWAZILAND

Irrigated crop calendar

2002

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Maize and other cereals	0.6				1	1	1	1	1				
Sugarcane	41.5	93	93	93	93	93	93	93	93	93	93	93	93
Vegetables	0.9				2	2	2	2	2				
Fruit (Citrus, bananas)	2.6	6	6	6	6	6	6	6	6	6	6	6	6
Harvested irrigated crop area [AHI_{full}]	45.5	98	98	98	101	101	101	101	101	98	98	98	98
Area equipped for full control irrigation actually irrigated [AAI_{full}]	44.8	* * These areas refer to the year 2000											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	101												
Area equipped for full control irrigation [AEI_{full}]	49.9												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	90												
Total area equipped for irrigation [AEI_{tot}]	49.9												

Narrative

AEI_{tot} and AEI_{full} equal to 49 850 ha in 2000 while AAI_{tot} and AAI_{full} is 44 840 ha in 2002 (FAO, 2012). AHI_{full} is 45 480 ha in 2002, resulting in a cropping intensity of 101 percent. Sugarcane is by far the main irrigated crops (91 percent), fruits (citrus mainly and bananas), cereals (maize, rice) and vegetables (including potatoes) are also irrigated but over a more limited area. Temporary crops are irrigated only during dry summer, from April to August.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

SWEDEN

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Vegetables	3.1				6	6	6	6	6				
Rapeseed	9.2				17	17	17	17	17				
Potatoes	7.1				13	13	13	13	13				
Pulses	3.3				6	6	6	6	6				
Sugar beet	11.2			21	21	21	21	21	21				
Fodder permanent	20.3	37	37	37	37	37	37	37	37	37	37	37	37
Harvested irrigated crop area [AHI_{full}]	54.2	37	37	58	100	100	100	100	100	37	37	37	37
Area equipped for full control irrigation actually irrigated [AAI_{full}]	54.2												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	159.7												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	34												
Total area equipped for irrigation [AEI_{tot}]	159.7												

Narrative

AEI_{tot} and AEI_{full} are 159 700 ha and AAI_{full} is 54 170 ha in 2007 (Eurostat, 2012). The crop calendar is adapted from AT 2030/2050 (FAO, 2006). AHI_{full} is assumed to be equal to AAI_{full}, resulting in a cropping intensity of 100 percent. The main irrigated crops are permanent fodder (38 percent), sugar beet (21 percent) and rapeseed (17 percent). Some potatoes, pulses and vegetables are also irrigated. All temporary crops are summer crops, irrigated from March (sugar beet only) or April to August.

References

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SWITZERLAND

Irrigated crop calendar

2010

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Maize	2.0				6	6	6	6	6				
Other cereals	2.4				7	7	7	7	7				
Vegetables	7.3				20	20	20	20	20				
Fruit	4.6	13	13	13	13	13	13	13	13	13	13	13	13
Grapes	2.5	7	7	7	7	7	7	7	7	7	7	7	7
Oil crops	0.4				1	1	1	1	1				
Potatoes	3.7				10	10	10	10	10				
Sugar beet	0.7			2	2	2	2	2	2				
Pasture permanent	12.5	35	35	35	35	35	35	35	35	35	35	35	35
Harvested irrigated crop area [AHI_{full}]	36.2	54	54	56	100	100	100	100	100	54	54	54	54
Area equipped for full control irrigation actually irrigated [AAI_{full}]	36.2	* This area refers to the year 2007											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	55.0												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	66												
Total area equipped for irrigation [AEI_{tot}]	55.0												

Narrative

AEI_{tot} and AEI_{full} are 55 000 ha in 2007 (OFAG, 2008). The average area usually irrigated is around 43 000 ha and the additional 12 000 ha are irrigated only in very dry year. However, AHI_{full} in 2010 is 36 200 ha (OFS, 2011), figure also used for AAI_{full}. The main irrigated crops are permanent pasture, vegetables, fruits and cereals (mainly maize). Some potatoes, vineyards, sugar beet and oil crops are also irrigated. Temporary crops are all summer crops irrigated from March (sugar beet only) or April to August. Permanent crops, in particular fruits and vineyards, are assumed to be irrigated almost the whole year either for water deficit in dry periods or frost protection in winter/spring.

References

Office Fédéral de l'Agriculture Suisse [OFAG]. 2008. *Document Thématique 6: Eau*. Confédération Suisse.

Office Fédéral de la Statistique [OFS]. 2011. Recensement des exploitations agricoles 2010. Available at <http://www.bfs.admin.ch/bfs/portal/fr/index/themen/07/03/blank/data/01/02.html>, accessed in June 2012.

SYRIAN ARAB REPUBLIC

Irrigated crop calendar

2000

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	694	57	57	57	57	57						57	57
Vegetables	88						7	7	7	7	7		
Fruits	64	5	5	5	5	5	5	5	5	5	5	5	5
Citrus	27	2	2	2	2	2	2	2	2	2	2	2	2
Sunflower	26						2	2	2	2	2		
Olives	29	2	2	2	2	2	2	2	2	2	2	2	2
Pulses	7						1	1	1	1	1		
Sugar beet	27					2	2	2	2	2	2		
Fodder temporary	101	8	8	8	8							8	8
Cotton	270					22	22	22	22	22	22	22	
Harvested irrigated crop area [AHI_{full}]	1 334	76	76	76	76	92	45	45	45	45	45	98	76
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1 211	* These areas refer to the year 2004											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	110												
Area equipped for full control irrigation [AEI_{full}]	1 439												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	84												
Total area equipped for irrigation [AEI_{tot}]	1 439												

Narrative Syrian Arab Republic

AEI_{tot} and AEI_{full} are equal to 1 439 000 ha in 2004 (CBS, 2006). AAI_{full} is 1 210 500 ha in 2000 (CBS, 2003). The crop calendar comes from the AQUASTAT database. AHI_{full} is 1 334 265 ha in 2000 (FAO, 2012), resulting in a cropping intensity of 110 percent. Wheat is the main irrigated crop (52 percent) followed by cotton (20 percent) and temporary fodder (8 percent). Some vegetables, fruits (including citrus), olives, sugar beets and sunflower are also irrigated. Temporary crops are irrigated either in summer (from June to October, or May to October for sugar beets, and from May to November for cotton) or in winter (from November to April for fodder or May for wheat).

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FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

TAJIKISTAN

Irrigated crop calendar

2009

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	180	27	27	27	27	27						27	27
Rice	14				2	2	2	2	2				
Barley	18	3	3	3								3	3
Maize	15				2	2	2	2	2				
Other cereals	7				1	1	1	1	1				
Vegetables one	7				1	1	1	1					
Vegetables two	30								4	4	4	4	
Fruit	99	15	15	15	15	15	15	15	15	15	15	15	15
Sunflower	3				1	1	1	1	1				
Potatoes	30	4	4	4	4	4							
Pulses	5				1	1	1	1	1				
Fodder temporary	8	1	1	1								1	1
Fodder permanent	34	5	5	5	5	5	5	5	5	5	5	5	5
Cotton	237				35	35	35	35	35	35	35		
Tobacco	0.2				0.03	0.03	0.03	0.03	0.03				
Other temporary crops	1				0.1	0.1	0.1	0.1	0.1				
Pasture permanent	41	6	6	6	6	6	6	6	6	6	6	6	6
Harvested irrigated crop area [AHI_{full}]	729	61	61	61	100	100	69	69	72	65	65	61	56
Area equipped for full control irrigation actually irrigated [AAI_{full}]	674	* This area refers to the year 2008											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	108												
Area equipped for full control irrigation [AEI_{full}]	742												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	91												
Total area equipped for irrigation [AEI_{tot}]	742												

Narrative Tajikistan

AEI_{tot} and AEI_{full} are similar and equal to 742 051 ha in 2009, while AAI_{full} is 674 416 in 2008 and AHI_{full} is 729 283 ha in 2009 (FAO, 2012). The resulting cropping intensity is 108 percent. The main irrigated crops are cotton, cereals (mainly wheat but also maize, barley and rice). Some fruits, fodder (temporary and permanent), permanent pastures, vegetables, potatoes, pulses, sunflower, tobacco and other temporary crops are also irrigated. Temporary crops are irrigated mostly from April to August (or October for cotton), except wheat, barley, potatoes and temporary fodder which are cultivated and irrigated in winter (from November-January to April-May).

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

THAILAND

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	2 327	46	46								46	46	46
Rice two	3 941					78	78	78	78	78			
Vegetables	83	2	2								2	2	2
Fruit	742	15	15	15	15	15	15	15	15	15	15	15	15
Sugarcane	256	5	5	5	5	5	5	5	5	5	5	5	5
Cotton	37	1	1	1	1						1	1	1
Harvested irrigated crop area [AHI_{full}]	7 387	68	68	20	20	98	98	98	98	98	68	68	68
Area equipped for full control irrigation actually irrigated [AAI_{full}]	5 060												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	146												
Area equipped for full control irrigation [AEI_{full}]	6 415												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	79												
Total area equipped for irrigation [AEI_{tot}]	6 415												

Narrative

The crop calendar received through the AQUASTAT questionnaire refers to 2007. AEI_{tot} and AEI_{full} are equal to 6 414 800 ha, of which 5 059 914 ha actually irrigated (AAI_{full}). AHI_{full} is 7 387 072 ha (FAO, 2012), resulting in a cropping intensity of 146 percent. The main irrigated crops are rice (85 percent, double cropping), fruit (7 percent) and sugarcane (3 percent). Some vegetables and cotton are also irrigated. Irrigation is practiced all year round due to the double cropping of rice. Temporary crops with a single cropping are irrigated from October to February (vegetables) or April (cotton).

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA
Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	3.7				5	5	5	5	5				
Maize	16.7				21	21	21	21	21				
Other cereals	6.6				8	8	8	8	8				
Vegetables	16.0				20	20	20	20	20				
Fruit	18.6	23	23	23	23	23	23	23	23	23	23	23	23
Oil crops	1.8				2	2	2	2	2				
Fodder temporary	6.9				9	9	9	9	9				
Pasture permanent	4.3	5	5	5	5	5	5	5	5	5	5	5	5
Tobacco	5.1				6	6	6	6	6				
Harvested irrigated crop area [AHI_{full}]	79.6	29	29	29	100	100	100	100	100	29	29	29	29
Area equipped for full control irrigation actually irrigated [AAI_{full}]	79.6	* This area refers to the year 2004											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	127.8												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	62												
Total area equipped for irrigation [AEI_{tot}]	127.8												

* This area refers to the year 2004

Narrative The former Yugoslav Republic of Macedonia

AEI_{tot} and AEI_{full} are 127 800 ha in 2004 (FAO, 2012), while AHI_{full} is 79 637 ha in 2007 (SSO, 2009). The crop calendar is based on the 2007 Agricultural Census (SSO, 2009) but 'cereals' have been divided into individual cereals based on AT 2030/2050 ratio (FAO, 2006). And 'industrial crops' was assumed to be tobacco also based on AT 2030/2050. AAI_{full} is assumed equal to AHI_{full} , resulting in a cropping intensity of 100 percent. The main irrigated crops are cereals (34 percent mostly maize), fruits (24 percent including 2/3 of vineyards), and vegetables (20 percent). Some temporary fodder, tobacco, permanent pasture and oil crops are also irrigated. Temporary crops are summer crops only, irrigated from April to August. Permanent crops, in particular fruit trees and vineyards, are irrigated almost the whole year, for both water deficit in dry periods and frost protection in winter/spring.

References

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TIMOR-LESTE

Irrigated crop calendar

2002

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	20	69	69	69								69	69
Rice two	4						14	14	14	14	14		
Maize	7						24	24	24	24	24		
Vegetables	1						3	3	3	3	3		
Potatoes	2						7	7	7	7	7		
Harvested irrigated crop area [AHI_{full}]	34	69	69	69	0	0	48	48	48	48	48	69	69
Area equipped for full control irrigation actually irrigated [AAI_{full}]	29												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	118												
Area equipped for full control irrigation [AEI_{full}]	35												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	83												
Total area equipped for irrigation [AEI_{tot}]	35												

Narrative

AEI_{tot} and AEI_{full} are equal to 34 649 ha and AAI_{full} is equal to 28 910 ha in 2002 (FAO, 2012). AHI_{full} is 34 000 ha, which results in a cropping intensity of 118 percent. The main irrigated crops are rice (71 percent) and maize (21 percent). Some vegetables and potatoes are also irrigated. Temporary crops with single cropping are irrigated from June to October.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

TOGO

Irrigated crop calendar

1996

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	0.2						14	14	14	14	14		
Rice two	0.2	14	14	14	14	14							
Sugar cane	0.9	86	86	86	86	86	86	86	86	86	86	86	86
Harvested irrigated crop area [AHI_{full}]	1.2	100	100	100	100	100	100	100	100	100	100	86	86
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1.1												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	114												
Area equipped for full control irrigation [AEI_{full}]	2.3												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	47												
Total area equipped for irrigation [AEI_{tot}]	7.3												

Narrative

AEI_{full} is 2 300 ha in 1996 while AEI_{tot} is 7 300 ha for the same year (FAO, 2012). AAI_{tot} is 6 247 ha and AHI_{full} is 1 247 in 1996. AAI_{full} is thus calculated such as it equals AHI_{full} minus the area of one crop of rice, that is 1 090 ha. As a result the cropping intensity is 114 percent. The two irrigated crops considered in the crop calendar are sugar cane (70 percent) and rice (30 percent, double cropping). Irrigation is practiced all year round.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

TUNISIA

Irrigated crop calendar

2000

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	49	13	13	13	13						13	13	13
Barley	12	3	3	3							3	3	3
Other cereals	3			1	1	1	1	1					
Vegetables	92			25	25	25	25	25					
Fruit	133	36	36	36	36	36	36	36	36	36	36	36	36
Citrus	17	5	5	5	5	5	5	5	5	5	5	5	5
Oil crops	15			4	4	4	4	4					
Potatoes	20			5	5	5	5	5					
Pulses	2			0.5	0.5	0.5	0.5	0.5					
Sugar beets	4			1	1	1	1	1	1				
Fodder permanent	22	6	6	6	6	6	6	6	6	6	6	6	6
Harvested irrigated crop area [AHI_{full}]	367	63	63	100	97	84	84	84	48	47	63	63	63
Area equipped for full control irrigation actually irrigated [AAI_{full}]	367	* This area refers to the year 2001											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	367												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	394												

Narrative

The crop calendar has been updated using the information given by the national expert. AEI_{tot} is 394 000 ha in 2001 and 397 000 ha in 2003 (PNUE Plan Bleu 2007). AEI_{full} is 367 000 ha for 2001 (FAO, 2012). The AQUASTAT database indicates that AAI_{tot} is almost similar to AEI_{tot} (393 000 ha) in 2001, so AAI_{full} is assumed equal to AEI_{full}. In addition, AHI_{full} is 367 000 ha in 2000 (FAO, 2012), resulting in a cropping intensity of 100 percent. The main irrigated crops are fruit (38 percent, citrus, olives, palm trees), vegetables (23 percent, tomatoes, chilies, potatoes and gourds), cereals (16 percent, mainly wheat but also barley), permanent fodder, tobacco and sugar beet. Irrigation is practiced all year round. Temporary crops are mostly cultivated and irrigated in early summer from March to July, except wheat, barley and oil crops which are grown from October to February or April.

References

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TURKEY

Irrigated crop calendar

2004

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	172	4	4	4	4	4						4	4
Barley	86	2	2	2	2	2						2	2
Rice	71					2	2	2	2	2			
Maize	545					13	13	13	13	13			
Vegetables	483					11	11	11	11	11			
Fruit	150	4	4	4	4	4	4	4	4	4	4	4	4
Grapes	79	2	2	2	2	2	2	2	2	2	2	2	2
Citrus	110	3	3	3	3	3	3	3	3	3	3	3	3
Groundnut	24					1	1	1	1	1			
Sunflower	550					13	13	13	13	13			
Potatoes	179					4	4	4	4	4			
Pulses	260					6	6	6	6	6			
Sugar beet	315				7	7	7	7	7	7			
Fodder permanent	475	11	11	11	11	11	11	11	11	11	11	11	11
Cotton	640				15	15	15	15	15	15	15		
Flowers	17					0.4	0.4	0.4	0.4	0.4			
Other temporary crops	50					1	1	1	1	1			
Harvested irrigated crop area [AHI_{full}]	4 206	25	25	25	48	100	94	94	94	94	35	25	25
Area equipped for full control irrigation actually irrigated [AAI_{full}]	4 206	* * These areas refer to the year 2006											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	4 970												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	85												
Total area equipped for irrigation [AEI_{tot}]	4 983												

Narrative Turkey

AEI_{tot} is 4 983 000 ha and AEI_{full} is 4 970 000 ha in 2006 (FAO, 2012). As described in the AQUASTAT country profile, AAI_{full} varies between 38 and 88 percent of AEI_{full} with large regional and annual fluctuations (FAO, 2012). AAI_{full} was estimated to be the same as AHI_{full} , which is thus equal to 85 percent of AEI_{full} . AHI_{full} is 4 206 000 ha in 2004 (TÜİK, 2006). The main irrigated crops are cereals (21 percent, mainly maize but also wheat, barley and rice are), cotton (15 percent), sunflower (13 percent) and vegetables (11 percent). Some fruits (including grapes and citrus), permanent fodder, sugar beet, pulses, potatoes, groundnuts, flowers and other temporary crops are also irrigated. Temporary crops are irrigated from May to September, except sugar beet (from April to September), cotton (from April to October) and some winter cereals (from November to May).

References

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TURKMENISTAN

Irrigated crop calendar

2006

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	917	46	46	46	46	46						46	46
Rice	11						1	1	1	1	1		
Vegetables	29						1	1	1	1	1		
Fruit	65	3	3	3	3	3	3	3	3	3	3	3	3
Potatoes	9	0.4	0.4	0.4	0.4	0.4							
Sugar beet	12					1	1	1	1	1	1		
Fodder temporary	93	5	5	5	5	5						5	5
Cotton	652					33	33	33	33	33	33	33	
Other temporary crops	100						5	5	5	5	5		
Pasture permanent	126	6	6	6	6	6	6	6	6	6	6	6	6
Harvested irrigated crop area [AHI_{full}]	2 014	61	61	61	61	94	50	50	50	50	50	93	60
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1 991												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	101												
Area equipped for full control irrigation [AEI_{full}]	1 991												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	1 991												

Narrative

AEI_{tot}, AEI_{full} and AAI_{full} all are equal to 1 990 800 and AHI_{full} is 2 013 800 ha in 2006 (FAO, 2012), resulting in a cropping intensity of 101 percent. The main irrigated crops are cereals (mainly wheat), cotton and permanent pastures. Some temporary fodder, fruits, vegetables, sugar beets, potatoes and other temporary crops (not detailed) are also irrigated. Irrigation is mostly practiced from June to October on temporary crops, except for wheat and temporary fodder which are cultivated from November to May.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

UGANDA

Irrigated crop calendar

2010

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one	8.4				70	70	70	70	70				
Rice two	8.4	70								70	70	70	70
Maize one	0.2				2	2	2	2	2				
Maize two	0.2	2								2	2	2	2
Vegetables one	0.1	1	1	1	1								
Vegetables two	0.1					1	1	1	1				
Vegetables three	0.1									1	1	1	1
Fruit	0.1	1	1	1	1	1	1	1	1	1	1	1	1
Sesame one	0.1				1	1	1	1	1				
Sesame two	0.1	1								1	1	1	1
Sugarcane	2.8	23	23	23	23	23	23	23	23	23	23	23	23
Flowers	0.2	2	2	2	2	2	2	2	2	2	2	2	2
Harvested irrigated crop area [AHI_{full}]	20.9	99	27	27	99	99	99	99	99	99	99	99	99
Area equipped for full control irrigation actually irrigated [AAI_{full}]	12.1												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	173												
Area equipped for full control irrigation [AEI_{full}]	12.1												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	14.4												

Narrative Uganda

The 2010-2035 Irrigation Master Plan (MWE, 2011) indicates an AEI_{tot} of 14 418 ha and AAI_{tot} is 12 447 ha in 2010; in addition AEI_{full} and AAI_{full} are estimated at 12 082 ha (small scale governmental irrigation schemes are considered equipped lowlands and thus discounted from AEI_{tot}). An FAO project mentions that AEI_{full} is 15 895 ha, but there is no figure available for AAI_{full} (FAO, 2011). Thus the national data is used. The crop calendar is based on the Irrigation Master Plan: rice, maize and sesame have double cropping each year; vegetables have three crops per year while fruit (citrus, mangoes) and sugarcane are permanently irrigated. The harvested areas for each crop have been estimated based on the FAO (2011) Nile Project report (70 percent of rice, 23 percent of sugarcane and 7 percent of vegetables, fruits, etc.; and 220 ha of flowers). However, because these ratios refer to physical areas rather than harvested areas, crops with multiple cropping have had their respective area doubled/tripled to simulate the actual cropping intensity. As a result AHI_{full} is 21 000 ha and the cropping intensity 173 percent. Irrigation is practiced all year round enabling multiple cropping.

References

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UKRAINE

Irrigated crop calendar

2003

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Maize	100				14	14	14	14	14				
Rice	21				3	3	3	3	3				
Vegetables	74				10	10	10	10	10				
Fruit	76	10	10	10	10	10	10	10	10	10	10	10	10
Sunflower	46				6	6	6	6	6				
Potatoes	59				8	8	8	8	8				
Pulses	52				7	7	7	7	7				
Sugar beet	22			3	3	3	3	3	3				
Fodder temporary	100	14	14	14	14							14	14
Fodder permanent	180	25	25	25	25	25	25	25	25	25	25	25	25
Harvested irrigated crop area [AHI_{full}]	731	49	49	52	100	86	86	86	86	35	35	49	49
Area equipped for full control irrigation actually irrigated [AAI_{full}]	731	* This area refers to the year 2010											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	2 175												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	34												
Total area equipped for irrigation [AEI_{tot}]	2 175												

* This area refers to the year 2010

Narrative Ukraine

AEI_{tot} and AEI_{full} declined from 2 605 000 ha in 1992 (FAO, 2012) to 2 175 000 ha in 2010 (SSSU, 2011). But the decline is even more significant for AAI_{full} , from 2 291 600 ha in 1990 (Siebert *et al.*, 2010) to 731 400 ha in 2003 (Dirksen *et al.*, 2005). The crop calendar is adapted from AT 2030/2050 (FAO, 2006). AHI_{full} is assumed equal to AAI_{full} , resulting in a cropping intensity of 100 percent. The main irrigated crops are fodder (all grasslands are considered fodder either temporary or permanent), cereals (mainly maize), fruit and vegetables. Some potatoes, pulses, sunflower and sugar beet are also irrigated. Except fodder, all temporary crops are summer crops irrigated from March (sugar beet only) or April to August.

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UNITED ARAB EMIRATES

Irrigated crop calendar

2003

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Vegetables	8					4	4	4	4	4			
Fruit (Citrus, Mango)	2	1	1	1	1	1	1	1	1	1	1	1	1
Date palm	185	82	82	82	82	82	82	82	82	82	82	82	82
Fodder temporary	30	13	13	13	13							13	13
Fodder permanent	3	1	1	1	1	1	1	1	1	1	1	1	1
Harvested irrigated crop area [AHI_{full}]	229	97	97	97	97	88	88	88	88	88	84	97	97
Area equipped for full control irrigation actually irrigated [AAI_{full}]	227												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	101												
Area equipped for full control irrigation [AEI_{full}]	227												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	227												

Narrative

AEI_{full} is equal to AEI_{tot} and is 226 600 ha in 2003 (FAO, 2012). It is assumed that AAI_{full} is similar. Every crop is irrigated in this country. Adding up all crops, AHI_{full} equals to 228 500 ha (EAIC, 2007). The main irrigated crops are date palm (81 percent) and temporary fodder (13 percent). Some vegetables, fruits and permanent fodder are also irrigated. Irrigation is practiced all year round.

References

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UNITED KINGDOM

Irrigated crop calendar

2007

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Maize	4.3				3	3	3	3	3				
Vegetables	36.8				27	27	27	27	27				
Fruit	5.0	4	4	4	4	4	4	4	4	4	4	4	4
Potatoes	72.4				52	52	52	52	52				
Sugar beet	9.1			7	7	7	7	7	7				
Pasture permanent	10.6	8	8	8	8	8	8	8	8	8	8	8	8
Harvested irrigated crop area [AHI_{full}]	138.2	11	11	18	100	100	100	100	100	11	11	11	11
Area equipped for full control irrigation actually irrigated [AAI_{full}]	138.2												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	152.0												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	91												
Total area equipped for irrigation [AEI_{tot}]	152.0												

Narrative

AEI_{tot} and AEI_{full} are 152 000 ha (FAO, 2012) and AAI_{full} is 138 200 ha in 2007 (Eurostat, 2012). It is assumed that AHI_{full} equals to AAI_{full}. The crop calendar is based on a survey made in 2001 (DEFRA, 2002). The values by crop were adjusted proportionally. The main irrigated crops are potatoes (52 percent), vegetables (27 percent) and permanent pasture (8 percent). Some sugar beet, fruits and maize are also irrigated. Temporary crops are summer crops, irrigated from March or April to August.

References

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UNITED REPUBLIC OF TANZANIA

Irrigated crop calendar

2002

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice	89	48	48	48								48	48
Maize	57				31	31	31	31	31				
Vegetables	41						22	22	22	22	22		
Bananas	20	11	11	11	11	11	11	11	11	11	11	11	11
Cotton	20	11	11	11	11						11	11	11
Harvested irrigated crop area [AHI_{full}]	227	70	70	70	53	42	64	64	64	33	44	70	70
Area equipped for full control irrigation actually irrigated [AAI_{full}]	184												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	123												
Area equipped for full control irrigation [AEI_{full}]	184												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	184												

Narrative

AEI_{full} equals to AEI_{tot} (184 330 ha) in 2002 (FAO, 2012). AQUASTAT also indicated an AHI_{full} of 227 000 ha in 2002. It is assumed that AAI_{full} equals AEI_{full}, resulting in a cropping intensity of 123 percent. The information used to make the crop calendar is based on the study on the National Irrigation Master Plan (MAFS & JICA, 2002). The main irrigated crops are paddy rice and maize. Irrigation is also applied to vegetables, bananas and cotton, as well as to limited areas of tea, coffee, cashew and sugar cane but data are not available and therefore these crops are not included in the crop calendar. Irrigation is practiced all year round, with different crops in turn: rice is irrigated from November to March, maize from April to August, vegetable from June to October and cotton from October to April.

References

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UNITED STATES OF AMERICA - NORTHWEST

(Alaska, Colorado, Idaho, Kansas, Montana, Nebraska, North Dakota, Oregon, South Dakota, Washington, Wyoming)

Irrigated crop calendar

2008

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	874	9	9	9	9	9						9	9
Barley	277	3	3	3	3							3	3
Maize	3 136				31	31	31	31	31				
Sorghum	52				0.5	0.5	0.5	0.5	0.5				
Other cereals	54				0.5	0.5	0.5	0.5	0.5				
Vegetables	500				5	5	5	5	5				
Fruit	141	1	1	1	1	1	1	1	1	1	1	1	1
Soybeans	1 122				11	11	11	11	11				
Sunflower	247				2	2	2	2	2				
Potatoes	291				3	3	3	3	3				
Pulses	125				1	1	1	1	1				
Sugar beets	130			1	1	1	1	1	1				
Fodder temporary	2 544	26	26	26								26	26
Pasture permanent	874	9	9	9	9	9	9	9	9	9	9	9	9
Cotton	4				0.04	0.04	0.04	0.04	0.04	0.04	0.04		
Harvested irrigated crop area [AHI_{full}]	10 372	47	47	49	79	76	67	67	67	10	10	47	47
Area equipped for full control irrigation actually irrigated [AAI_{full}]	9 959	* * These areas refer to the year 2007											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	104												
Area equipped for full control irrigation [AEI_{full}]	11 604												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	86												
Total area equipped for irrigation [AEI_{tot}]	11 604												

UNITED STATES OF AMERICA - NORTHEAST

(Connecticut, Delaware, Illinois, Indiana, Iowa, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia, Wisconsin)

Irrigated crop calendar

2008

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	37	2	2	2	2	2						2	2
Rice	58				4	4	4	4	4				
Maize	642				39	39	39	39	39				
Other cereals	5	0.3	0.3	0.3	0.3							0.3	0.3
Vegetables	266				16	16	16	16	16				
Fruit	45	3	3	3	3	3	3	3	3	3	3	3	3
Soybeans	411				25	25	25	25	25				
Sunflower	31				2	2	2	2	2				
Groundnuts	0				0.03	0.03	0.03	0.03	0.03				
Potatoes	64				4	4	4	4	4				
Pulses	19				1	1	1	1	1				
Sugar beets	2			0.1	0.1	0.1	0.1	0.1	0.1				
Fodder temporary	130	8	8	8								8	8
Pasture permanent	4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Cotton	82				5	5	5	5	5	5	5		
Tobacco	5				0.3	0.3	0.3	0.3	0.3				
Harvested irrigated crop area [AHI_{full}]	1 802	13	13	13	100	100	98	98	98	8	8	13	13
Area equipped for full control irrigation actually irrigated [AAI_{full}]	1 664	* * These areas refer to the year 2007											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	108												
Area equipped for full control irrigation [AEI_{full}]	1 579												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	105												
Total area equipped for irrigation [AEI_{tot}]	1 579												

UNITED STATES OF AMERICA - SOUTHEAST

(Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas)

Irrigated crop calendar

2008

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	438	7	7	7	7	7						7	7
Rice	851				14	14	14	14	14				
Maize	915				15	15	15	15	15				
Sorghum	345				6	6	6	6	6				
Other cereals	17				0.3	0.3	0.3	0.3	0.3				
Vegetables	199				3	3	3	3	3				
Fruit	307	5	5	5	5	5	5	5	5	5	5	5	5
Soybeans	1 317				21	21	21	21	21				
Groundnuts	216				3	3	3	3	3				
Potatoes	13				0.2	0.2	0.2	0.2	0.2				
Pulses	9				0.1	0.1	0.1	0.1	0.1				
Sugarcane	185	3	3	3	3	3	3	3	3	3	3	3	3
Fodder temporary	281	5	5	5								5	5
Pasture permanent	206	3	3	3	3	3	3	3	3	3	3	3	3
Cotton	1 001				16	16	16	16	16	16	16		
Tobacco	5				0.1	0.1	0.1	0.1	0.1				
Harvested irrigated crop area [AHI_{full}]	6 305	23	23	23	97	97	90	90	90	27	27	23	23
Area equipped for full control irrigation actually irrigated [AAI_{full}]	6 203	* * These areas refer to the year 2007											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	102												
Area equipped for full control irrigation [AEI_{full}]	8 187												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	76												
Total area equipped for irrigation [AEI_{tot}]	8 187												

UNITED STATES OF AMERICA - SOUTHWEST

(Arizona, California, Hawaii, Nevada, New Mexico, Utah)

Irrigated crop calendar

2008

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	312	7	7	7	7	7						7	7
Rice	175				4	4	4	4	4				
Barley	28	1	1	1	1							1	1
Maize	67				2	2	2	2	2				
Sorghum	22				1	1	1	1	1				
Other cereals	67				2	2	2	2	2				
Vegetables	629				14	14	14	14	14				
Fruit	1 106	25	25	25	25	25	25	25	25	25	25	25	25
Rapeseed	139				3	3	3	3	3				
Potatoes	19				0.4	0.4	0.4	0.4	0.4				
Pulses	22				0.5	0.5	0.5	0.5	0.5				
Sugar beets	23				1	1	1	1	1				
Fodder temporary	1 635	37	37	37								37	37
Pasture permanent	376	9	9	9	9	9	9	9	9	9	9	9	9
Cotton	178				4	4	4	4	4	4	4		
Harvested irrigated crop area [AHI_{full}]	4 796	79	79	79	72	71	64	64	64	38	38	79	79
Area equipped for full control irrigation actually irrigated [AAI_{full}]	4 403	* * These areas refer to the year 2007											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	109												
Area equipped for full control irrigation [AEI_{full}]	5 273												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	83												
Total area equipped for irrigation [AEI_{tot}]	5 273												

USA - TOTAL

2008
1000 ha

Harvested irrigated crop area [AHI_{full}]	23 275
Area equipped for full control irrigation actually irrigated [AAI_{full}]	22 229
Cropping intensity (%) = $100 \times [AHI_{full}]/[AAI_{full}]$	105
Area equipped for full control irrigation [AEI_{full}]	26 644
% of full control equipped actually irrigated = $100 \times [AAI_{full}]/[AEI_{full}]$	83

This area refers to the year 2007

Narrative United States of America

Given the size of the country and the different climatic zones, the whole country was split into four areas: northwest (Alaska, Colorado, Idaho, Kansas, Montana, Nebraska, North Dakota, Oregon, South Dakota, Washington, Wyoming), northeast (Connecticut, Delaware, Illinois, Indiana, Iowa, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia, Wisconsin), southeast (Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas) and southwest (Arizona, California, Hawaii, Nevada, New Mexico, Utah). At national level, AEI_{tot} and AEI_{full} are 26 644 000 ha in 2007 (sum obtained by adding irrigated cultivated and non-cultivated lands from 2007 National Resources Inventory [USDA, 2009a] and the 'pasturelands' from the 2007 agricultural census [USDA, 2009b]). AAI_{full} (22 229 000 ha) comes from the 2008 farm and ranch irrigation survey (NASS, 2010). AHI_{full} in 2008 is 23 276 000 (NASS, 2010) resulting in a cropping intensity of 105 percent.

References

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URUGUAY

Irrigated crop calendar

2009

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice	160	88	88	88	88								88
Maize	4	2	2	2	2								2
Other cereals	20						11	11	11	11	11		
Vegetables	11					6	6	6	6	6			
Citrus	8	4	4	4	4	4	4	4	4	4	4	4	4
Fruits	4	2	2	2	2	2	2	2	2	2	2	2	2
Grapes	2	1	1	1	1	1	1	1	1	1	1	1	1
Potatoes	2	1	1	1	1								1
Sugarcane	3	2	2	2	2	2	2	2	2	2	2	2	2
Fodder temporary	1						0	0	0	0	0	0	
Harvested irrigated crop area [AHI_{full}]	213	100	100	100	100	15	26	26	26	26	20	9	100
Area equipped for full control irrigation actually irrigated [AAI_{full}]	181	* * These areas refer to the year 1998											
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	118												
Area equipped for full control irrigation [AEI_{full}]	181												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	181												

Narrative Uruguay

Data for 1998 in the AQUASTAT database reports that AEI_{tot} , AEI_{full} , AAI_{tot} and AAI_{full} are equal (181 000 ha; FAO, 2012). AHI_{full} was 217 593 ha from the 2000 national agricultural census (Ministerio de Ganadería, Agricultura y Pesca, 2001), but for the 2008-2009 cropping year AHI_{full} is 213 392 ha (IICA, 2010) resulting in a cropping intensity of 118 percent. Crop calendar for crops that were not in the previous exercise undertaken in 2000 are based on those of neighbouring countries. Rice is by far the main irrigated crop. Temporary crops are mostly irrigated from December to April, ie during the Southern hemisphere's summer and Uruguay's dry season (from November to February), except some cereals and temporary fodder (from July to October or November).

References

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UZBEKISTAN

Irrigated crop calendar

2005

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	1 295	35	35	35	35	35						35	35
Rice	52				1	1	1	1	1				
Barley	48	1	1	1	1							1	1
Maize	25				1	1	1	1	1				
Vegetables	137				4	4	4	4	4				
Fruit	200	5	5	5	5	5	5	5	5	5	5	5	5
Potatoes	37	1	1	1	1	1							
Fodder temporary	300	8	8	8	8	8						8	8
Fodder permanent	100	3	3	3	3	3	3	3	3	3	3	3	3
Cotton	1 406				38	38	38	38	38	38	38		
Pasture permanent	100	3	3	3	3	3	3	3	3	3	3	3	3
Harvested irrigated crop area [AHI_{full}]	3 700	56	56	56	100	99	55	55	55	49	49	55	55
Area equipped for full control irrigation actually irrigated [AAI_{full}]	3 700												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	4 198												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	88												
Total area equipped for irrigation [AEI_{tot}]	4 198												

Narrative Uzbekistan

AEI_{tot} and AEI_{full} are equal to 4 198 000 ha and AAI_{full} is equal to 3 700 000 ha in 2005 (FAO, 2012a). AHI_{full} is assumed to be identical to AAI_{full} . A partial AHI_{full} is 2 753 000 ha (Abdullaev *et al.*, 2009; FAO, 2012b). It has been completed by adding estimated areas for other crops in order to obtain a cropping intensity of 100 percent. By far the main irrigated crops are cotton and wheat. Some rice, maize, barley, potatoes, vegetables, temporary and permanent fodder, fruits and permanent pastures are also irrigated. Temporary crops are either irrigated in summer from April to August (or to October for cotton) or in winter from November (or January for potatoes) to May (such as wheat, barley and temporary fodder).

References

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VENEZUELA (BOLIVARIAN REPUBLIC OF)
Irrigated crop calendar

2008

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice	149					15	15	15	15	15			
Maize	59					6	6	6	6	6			
Sorghum	13					1	1	1	1	1			
Vegetables	23	2	2	2	2								2
Bananas	19	2	2	2	2	2	2	2	2	2	2	2	2
Plantains	38	4	4	4	4	4	4	4	4	4	4	4	4
Citrus	38	4	4	4	4	4	4	4	4	4	4	4	4
Coconut	6	1	1	1	1	1	1	1	1	1	1	1	1
Coffee	35	4	4	4	4	4	4	4	4	4	4	4	4
Cocoa	27	3	3	3	3	3	3	3	3	3	3	3	3
Oil palm	26	3	3	3	3	3	3	3	3	3	3	3	3
Potatoes	13	1	1	1	1								1
Pulses	4	0.4	0.4	0.4	0.4								0.4
Sugarcane	88	9	9	9	9	9	9	9	9	9	9	9	9
Yuca	5	0.5	0.5	0.5	0.5								0.5
Other temporary crops	72	7	7	7	7								7
Other permanent crops	68	7	7	7	7	7	7	7	7	7	7	7	7
Pasture permanent	296	30	30	30	30	30	30	30	30	30	30	30	30
Harvested irrigated crop area [AHI_{full}]	979	77	77	77	77	88	88	88	88	88	65	65	77
Area equipped for full control irrigation actually irrigated [AAI_{full}]	979												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	1 055												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	93												
Total area equipped for irrigation [AEI_{tot}]	1 055												

Narrative Venezuela

AEI_{tot} is 759 500 ha and AAI_{tot} is 683 000 ha in 2008 according to the Agrarian Census 2007-2008 (MAT, 2010). In addition, 295 745 ha of permanent pastures for the same year are actually irrigated, resulting in AEI_{tot} and AAI_{tot} of 1 055 245 ha and 978 845 ha respectively. Consistently with the previous AQUASTAT data set (FAO, 2012), AEI_{full} and AAI_{full} are assumed equal to AEI_{tot} and AAI_{tot} respectively. The main irrigated crops are permanent pastures, rice, fruits (citrus and coconuts), bananas, plantains, sugarcane and cereals (mainly maize). Some coffee, cocoa, oil palm, vegetables, potatoes, yucca, pulses and other unidentified temporary and permanent crops are also irrigated. Temporary crops are irrigated either from May to September (during the dry season) or from December to April, depending on the crops.

References

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VIET NAM
Irrigated crop calendar
2005

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Rice one (Spring)	2 921	64	64	64	64								
Rice two (Summer)	2 017					44	44	44	44				
Rice three (Autumn)	1 904									42	42	42	42
Maize one	135					3	3	3	3	3			
Maize two	131	3	3								3	3	3
Fruit	308	7	7	7	7	7	7	7	7	7	7	7	7
Bananas	55	1	1	1	1	1	1	1	1	1	1	1	1
Citrus	46	1	1	1	1	1	1	1	1	1	1	1	1
Soybean one	42	1	1	1	1								
Soybean two	25					1	1	1	1				
Soybean three	30									1	1	1	1
Groundnut	139	3	3								3	3	3
Sweet potatoes one	52					1	1	1	1	1			
Sweet potatoes two	48	1	1								1	1	1
Cassava	168	4	4	4	4	4	4	4	4	4	4	4	4
Coffee	260	6	6	6	6	6	6	6	6	6	6	6	6
Tea	63	1	1	1	1	1	1	1	1	1	1	1	1
Sugarcane	106	2	2	2	2	2	2	2	2	2	2	2	2
Cotton	15	0.3	0.3	0.3	0.3						0.3	0.3	0.3
Rubber	254	6	6	6	6	6	6	6	6	6	6	6	6
Tobacco	9	0.2	0.2								0.2	0.2	0.2
Other temporary crops	3	0.1	0.1								0.1	0.1	0.1
Harvested irrigated crop area [AHI_{full}]	8 728	100	100	92	92	76	76	76	76	74	77	77	77
Area equipped for full control irrigation actually irrigated [AAI_{full}]	4 585												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	190												
Area equipped for full control irrigation [AEI_{full}]	4 585												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	4 585												

Narrative Viet Nam

AEI_{tot} , AEI_{full} and AAI_{full} are equal to 4 585 000 ha in 2005 (FAO, 2012). AHI_{full} is equal to 8 728 000 ha, resulting in a cropping intensity of 190 percent. The main irrigated crops are rice (78 percent), fruit (4 percent) and maize (3 percent). Some rubber, coffee, cassava, groundnuts, sugarcane, soybeans, sweet potatoes, tea, cotton and other temporary crops are also irrigated. Temporary crops with a single cropping are irrigated from October to February, except cotton from October to April.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>

YEMEN

Irrigated crop calendar

2004

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	42	9	9	9	9	9						9	9
Maize	19						4	4	4	4	4		
Barley	11	2	2	2	2	2							2
Millet	8	2	2	2	2								2
Sorghum	43						9	9	9	9	9		
Vegetables	55						12	12	12	12	12		
Fruit	56	12	12	12	12	12	12	12	12	12	12	12	12
Bananas	9	2	2	2	2	2	2	2	2	2	2	2	2
Citrus	11	2	2	2	2	2	2	2	2	2	2	2	2
Sesame	14						3	3	3	3	3		
Potatoes	17						4	4	4	4	4		
Pulses	27						6	6	6	6	6		
Coffee	19	4	4	4	4	4	4	4	4	4	4	4	4
Fodder temporary	71	16	16	16	16							16	16
Cotton	17					4	4	4	4	4	4	4	
Tobacco	8						2	2	2	2	2		
Qat	100	22	22	22	22	22	22	22	22	22	22	22	22
Harvested irrigated crop area [AHI_{full}]	527	72	72	72	72	58	87	87	87	87	87	71	72
Area equipped for full control irrigation actually irrigated [AAI_{full}]	454												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	116												
Area equipped for full control irrigation [AEI_{full}]	454												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	680												

Narrative Yemen

According to the AQUASTAT database, AEI_{tot} is 680 100 ha and AEI_{full} is 454 310 ha in 2004 (FAO, 2012). It is assumed that AAI_{full} is similar to AEI_{full} . AHI_{full} is equal to 527 000 ha for the same year (MAI, 2005), resulting in a cropping intensity of 116 percent. The main irrigated crops are qat, cereals (mainly wheat and sorghum, but also maize, barley and millet), fruit (including bananas and citrus) and vegetables. Some temporary fodder, pulses, coffee, potatoes, sesame and tobacco are also irrigated. Temporary crops are irrigated from June to October except cotton, which is grown from May to November and winter cereals, which are grown from November to April or May.

References

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Ministry of Agriculture and Irrigation [MAI]. 2005. *Agricultural Statistics Pamphlet 2004*. General Department of Agricultural Statistics & Documentation. Yemen.

ZAMBIA

Irrigated crop calendar

2002

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	12.2					22	22	22	22	22			
Rice	8.0	14	14	14	14								14
Maize	1.5					3	3	3	3	3			
Vegetables	4.4	8	8	8	8								8
Citrus	2.2	4	4	4	4	4	4	4	4	4	4	4	4
Bananas	3.0	5	5	5	5	5	5	5	5	5	5	5	5
Sugarcane	18.4	33	33	33	33	33	33	33	33	33	33	33	33
Coffee	5.2	9	9	9	9	9	9	9	9	9	9	9	9
Tea	0.5	1	1	1	1	1	1	1	1	1	1	1	1
Harvested irrigated crop area [AHI_{full}]	55.4	75	75	75	75	78	78	78	78	78	53	53	75
Area equipped for full control irrigation actually irrigated [AAI_{full}]	55.4												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	100												
Area equipped for full control irrigation [AEI_{full}]	55.4												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	100												
Total area equipped for irrigation [AEI_{tot}]	155.9												

Narrative

AEI_{tot} is 155 900 ha in 2002 while AEI_{full} and AHI_{full} are 55 387 ha (FAO, 2012). Because AAI_{tot} is equal to AEI_{tot} in 2002, AAI_{full} is considered equal to AEI_{full}, resulting in a cropping intensity of 100 percent. The main irrigated crops are cereals (39 percent, mainly wheat and rice, but also maize) and sugarcane (33 percent). Other irrigated crops include vegetables, and commercial crops such as coffee, bananas, citrus and tea. Irrigated cotton which appeared in the previous exercise undertaken in 2000 has collapsed in the country due to commercial farmers opting for high-value irrigated crops like paprika. Irrigation is practiced all year round.

References

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ZIMBABWE

Irrigated crop calendar

1999

Irrigated crops	Irrigated area 1000 ha	Crop area as percentage of the full control equipped and actually irrigated area by month											
		J	F	M	A	M	J	J	A	S	O	N	D
Wheat	49.1					33	33	33	33	33			
Barley and other cereals	6.2					4	4	4	4	4			
Maize	18.4								12	12	12	12	12
Vegetables	3.7					3	3	3	3	3			
Fruit	5.0	3	3	3	3	3	3	3	3	3	3	3	3
Soybeans	19.4	13	13	13								13	13
Groundnuts	4.2	3	3	3								3	3
Potatoes	2.1					1	1	1	1	1			
Pulses	3.1					2	2	2	2	2			
Coffee	5.2	4	4	4	4	4	4	4	4	4	4	4	4
Tea	3.5	2	2	2	2	2	2	2	2	2	2	2	2
Sugarcane	34.5	23	23	23	23	23	23	23	23	23	23	23	23
Fodder temporary	8.6	6	6								6	6	6
Tobacco	12.2					8	8	8	8	8			
Cotton	27.3	19	19	19	19						19	19	19
Harvested irrigated crop area [AHI_{full}]	202.4	73	73	67	51	84	84	84	97	97	69	85	85
Area equipped for full control irrigation actually irrigated [AAI_{full}]	147.5												
Cropping intensity (%) = 100 x [AHI_{full}]/[AAI_{full}]	137												
Area equipped for full control irrigation [AEI_{full}]	173.5												
% of full control equipped actually irrigated = 100 x [AAI_{full}]/[AEI_{full}]	85												
Total area equipped for irrigation [AEI_{tot}]	173.5												

Narrative Zimbabwe

AEI_{tot} and AEI_{full} equal to 173 513 ha in 1999 while AAI_{tot} and AAI_{full} are 123 900 ha (FAO, 2012). AAI_{full} is estimated at 85 percent of AEI_{full} . AHI_{full} is around 202 000 ha in 1999 resulting in a cropping intensity of 137 percent. The main irrigated crops are cereals (37 percent, mainly wheat, but also maize, barley and sorghum), sugar cane (17 percent), cotton (13 percent), soybeans, tobacco, vegetables and temporary fodder. Irrigated permanent crops include coffee, tea and citrus. The greater part of the country receives inadequate rainfall for agriculture making supplementary irrigation necessary even in the wetter regions all year round. Supplementary irrigation is also used to extend the growing season of certain crops or ensure the early planting of such crops as tobacco and cotton.

References

FAO. 2012. AQUASTAT, FAO's global information system on water and agriculture. <http://www.fao.org/nr/aquastat>