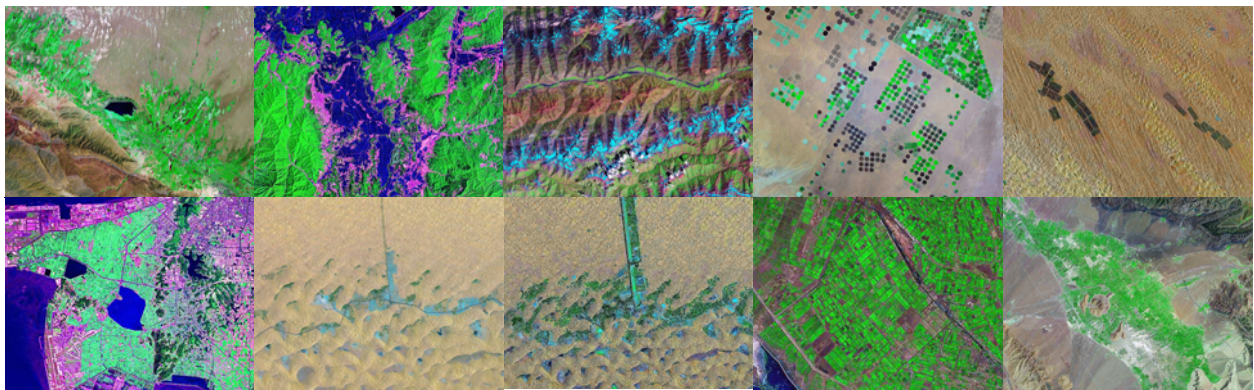


## A Digital Global Map of Irrigated Areas

### An Update for Asia



#### DOCUMENTATION

Stefan Siebert • Sebastian Feick • Jippe Hoogeveen

# Frankfurt Hydrology Paper



# Digital Global Map of Irrigated Areas

## An update for Asia

by

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# Preface

Agriculture is by far the largest water-use sector, accounting for about 70 percent of all water withdrawn worldwide from rivers and aquifers for agricultural, domestic and industrial purposes. In several developing countries, irrigation represents up to 95 percent of all water withdrawn, and it plays a major role in food production and food security. The agriculture development strategies of most of these countries depend on the possibility of maintaining, improving and expanding irrigated agriculture. However, as the pressure on water resources increases, irrigation is facing growing competition from other water-use sectors and becoming a threat to the environment in an increasing number of regions.

In the last decade, the international community has made major efforts to assess the different elements of the water balance and to predict current and future water needs for the different use sectors. However, considerable uncertainty remains concerning the extent and distribution of irrigated land in the world and on agricultural water use, therefore, making it difficult to monitor the irrigation sector adequately. Coverage of irrigated areas in the world, available in a geographical information system (GIS), is the single most important item of information needed to improve future global studies on water and food.

The first version of the Digital Global Map of Irrigated Areas was published in 1999 (see table). It consisted of a raster map with a resolution of 0.5 ° by 0.5 ° containing the percentage of the area that was equipped for irrigation around 1995, the so-called irrigation density. To further develop and improve the global GIS coverage of areas equipped for irrigation and to make it available to users in the international community, cooperation was established between the Johann Wolfgang Goethe University in Frankfurt am Main, Germany, and the Land and Water Development Division of the Food and Agriculture Organization of the United Nations (FAO).

Through this cooperation, the mapping project has been linked closely to the FAO global information system on water and agriculture, Aquastat. The Aquastat programme collects and disseminates data and information by country and by region. Its aim is to provide users interested in global, regional and national analysis (e.g. policy-makers, decision-makers and researchers) with the most accurate, reliable, consistent and up-to-date information available on water resources and agricultural water management. In order to make thorough analyses, the Aquastat programme collects data from many different sources including national water resources and irrigation master plans, statistics and yearbooks, FAO technical reports, and national and international surveys and reports made available by national and international research centres.

The data collected through the Aquastat programme have served as the main source for improving the overall quality and resolution of the Digital Global Map of Irrigated Areas. In addition, the methodology for producing the map has been improved substantially. This has made it possible to increase the spatial resolution of the map to 5 minutes, thus justifying the publication of an improved second version of the Digital Global Map of Irrigated Areas. For Version 2, updated maps of Latin America, Europe, Africa and Oceania have been published. The next step in improving the dataset is the inclusion of the continent of Asia, which is presented in this document. For the update of the map of Asia, an inventory of subnational irrigation statistics for the continent was compiled. Irrigation maps were derived from project reports, irrigation subsector studies and books related to irrigation and drainage and were compared with satellite images in many regions. The reference year for the update of the map is 2000.

#### Brief history of the Digital Global Map of Irrigated Areas

|  |             |  |
|--|-------------|--|
| 1999   | Version 1   | Digital Global Map of Irrigated Areas Version 1 published (resolution: 0.5 ° × 0.5 °).<br><b>Döll, P. &amp; Siebert, S.</b> 1999. <i>A digital global map of irrigated areas</i> . Germany, Center for Environmental Systems Research, University of Kassel.   |
| 2001   | Version 2   | Cooperation was established between the project team of the Global Map of Irrigated Areas and the FAO Aquastat programme. As a result of this cooperation, the map-generation methodology was improved and an update of the continents of Latin America and Europe was made. The global grid resolution was increased to a grid of 5 arc-minutes and the map was made available to the general public as Version 2.<br><b>Siebert, S. &amp; Döll, P.</b> 2001. <i>A digital global map of irrigated areas - an update for Latin America and Europe</i> . Germany, Center for Environmental Systems Research, University of Kassel. |
| 2002   | Version 2.1 | Update of Africa and Oceania using the improved map-generation methodology described in Siebert & Döll (2001).<br><b>Siebert, S., Döll, P. &amp; Hoogeveen, J.</b> 2002. <i>A digital global map of irrigated areas - an update for Africa and Oceania</i> . Germany, Center for Environmental Systems Research, University of Kassel, and Rome, FAO (available at <a href="http://www.fao.org/ag/agl/aglw/aquastat/irrigationmap/index.stm">http://www.fao.org/ag/agl/aglw/aquastat/irrigationmap/index.stm</a> ).  |
| 2004   |             | The Global Map of Irrigated Areas project team at the University of Kassel moved to the Johann Wolfgang Goethe University in Frankfurt am Main, Germany.   |
| 2005   | Version 2.2 | Update of the continent of Asia using the map-generation methodology described in Siebert & Döll (2001).<br><b>Siebert, S., Feick, S. &amp; Hoogeveen, J.</b> 2005. <i>A digital global map of irrigated areas - an update for Asia</i> . Frankfurt am Main, Germany, Johann Wolfgang Goethe University, and Rome, FAO (this publication).   |
| The complete documentation of the Digital Global Map of Irrigated Areas is always available at: <a href="http://www.fao.org/ag/agl/aglw/aquastat/irrigationmap/index.stm">http://www.fao.org/ag/agl/aglw/aquastat/irrigationmap/index.stm</a> . From this address, the map can also be downloaded. |             |  |

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# Summary

The Land and Water Development Division of the Food and Agriculture Organization of the United Nations and the Johann Wolfgang Goethe University, Frankfurt am Main, Germany, are cooperating in the development of a global irrigation-mapping facility. This report describes an update of the Digital Global Map of Irrigated Areas for the continent of Asia. For this update, an inventory of subnational irrigation statistics for the continent was compiled. The reference year for the statistics is 2000. Adding up the irrigated areas per country as documented in the report gives a total of 188.5 million ha for the entire continent. The total number of subnational units used in the inventory is 4 428. In order to distribute the irrigation statistics per subnational unit, digital spatial data layers and printed maps were used. Irrigation maps were derived from project reports, irrigation subsector studies, and books related to irrigation and drainage. These maps were digitized and compared with satellite images of many regions. In areas without spatial information on irrigated areas, additional information was used to locate areas where irrigation is likely, such as land-cover and land-use maps that indicate agricultural areas or areas with crops that are usually grown under irrigation.



# Documentation

Generation of a map of administrative units  
compatible with statistics used to update the  
Digital Global Map of Irrigated Areas in Asia

WORKING REPORT I

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Johann Wolfgang Goethe Universität, Frankfurt, 2005

## **INTRODUCTION**

This report describes the generation of a digital map of administrative units compatible with statistical data collected to update the Digital Global Irrigation Map for the Asian continent (Figure 1). As documented in Working Report II, the collected irrigation statistics for subnational units refer to the situation in different years. The map of administrative units has to be compatible with the administrative setting in the year of the statistics. Therefore, the base year for the mapping of the administrative setting also differs from country to country and even within some (larger) countries.

The map of administrative units is based on a digital map produced by the United Nations Environment Programme (UNEP) to map population densities in the Russian Federation and in Asia (available at <http://www.grid.unep.ch>). However, because the administrative setting changes in many countries year by year, the map has had to be adjusted in many parts to fit to the collected statistics of irrigated areas. This process is documented in the following sections.

## **BASE PROCESSING OF THE UNEP MAP OF ADMINISTRATIVE UNITS**

The first step was to download the Asia and Russia population database (available at <http://www.grid.unep.ch>). The second step was to convert e\_asia.e00, sc\_asia.e00, se\_asia.e00, w\_asia.e00 and russia.e00 to ArcView shapefile format. The final step was to delete all columns in the data table except: name1, name2, name3 and country.

## **MODIFICATIONS OF THE ADMINISTRATIVE UNIT MAP (BY COUNTRY IN ALPHABETICAL ORDER)**

### **Afghanistan**

District and province boundaries were used as provided by the Afghanistan Information Management Service (AIMS). The organization provides the boundaries as polygon- or polyline-shapefile in the present 32-province system (available at <http://www.aims.org.af/>). The country boundary was used as given by the UNEP shapefile.

### **Armenia**

Union of all existing administrative units and digitizing of 39 districts using a map published in [AM01].

### **Azerbaijan**

Union of all administrative units in Azerbaijan mainland. As a result, the map consists of seven administrative units in Azerbaijan (Nagorno Karabakh, Azerbaijan mainland and five districts in the Nakhichevan area).

### **Bahrain**

Digitizing of nine regions using a political map provided by the Cartographic Section of the United Nations (available at <http://www.un.org/Depts/Cartographic>).

### **Bangladesh**

Union of 699 districts (third-level administrative units) to 64 zilas (second-level administrative units).

### **Bhutan**

The boundaries of 20 districts (dzongkhags) were digitized from an atlas at the scale 1:250 000 [BT01], while the country boundary was left unchanged.

### **Brunei Darussalam**

Union of all existing administrative unit polygons. As a result, no subdivision of the country was made.

### **Cambodia**

Union of 204 third-level administrative units to 21 second-level administrative units (provinces).

### **China (including China Hong Kong SAR and China Macao SAR)**

Administrative units had to be changed to be compatible with the dataset of irrigation statistics on the county level. The procedure was to use the county boundaries as provided by the irrigation statistics dataset but to keep the country boundary as it is in the UNEP dataset. This consisted of the following steps:

1. Preparing the county map:
  - download of dataset “China county-level data on population (census) and agriculture, keyed to 1:1 m GIS map” (available at <http://sedac.ciesin.columbia.edu>) including the related county shapefile (my901.e00),
  - converting my901.e00 to ArcView – shapefile format;
  - deleting all columns in county shapefile except columns GBCENMQ (census ID) and NMFULL (county name),
  - changing projection of county shapefile from Lambert Conformal Conic Projection to Latitude–Longitude, WGS84;
  - linking chinaag1.dbf to county shapefile,
  - creating column irriarea and copying content of related database column A616 to column irriarea,
  - renaming column NMFULL to name1,
  - removing link between county shapefile and data table chinaag1.dbf,
  - deleting column GBCENMQ;
2. Merging administrative unit maps:
  - deleting all administrative units belonging to China, China Hong Kong SAR and China Macao SAR in the UNEP file admindata.shp,
  - creating a new shapefile (temp.shp) by a spatial merge of shapefiles admindata.shp and china.shp,
  - copying all polygons of the merged file temp.shp that have their origin alone from file china.shp to file admindata.shp => clipping of China – administrative units along the border with other countries,
  - filling of the gaps along the Chinese border by extending the related Chinese counties.

As a result, China has been divided into 30 provinces, 2 416 counties, China Hong Kong SAR and China Macao SAR.

### **China Macao SAR**

See China.

### **Cyprus**

The administrative-unit polygons were split using a map published in [CY01] along the boundary between the territory under government control and the occupied northern part of the island. Therefore, Cyprus has been divided into 5 districts under government control and 4 occupied districts.

### **Democratic People’s Republic of Korea**

Union of all subnational units to one polygon representing the entire country.

### **East Timor**

See Indonesia (no subdivision of East Timor below the country level).

### **Georgia**

Union of all administrative units (as result no subdivision of Georgia below the country level).

### **India**

#### ***Andaman and Nicobar Islands***

Union of all the single-island polygons to create one multipart polygon representing Andaman and Nicobar Islands.

***Andhra Pradesh***

No modifications (the state is divided into 23 districts).

***Arunachal Pradesh***

Lower Subansiri District was split into the districts of Lower Subansiri and Papumpare; West Siang and East Siang Districts were merged and split to form the districts of West Siang, Upper Siang and East Siang using a district map of Arunachal Pradesh as provided by the Public Health Engineering Department (available at <http://www.arunachalphed.nic.in>). In total, there are 13 districts in Arunachal Pradesh. The administrative setting used here is representative for the situation in the late 1990s.

***Assam***

Union of Karbi Anglong and Karbi Anglong (Diphu) Districts to Karbi Anglong District. No other modifications (the state is divided into 23 districts).

***Bihar***

On 15 November 2000, the state of Jharkhand was formed from the southern districts of Bihar. Therefore, the southern districts of the former state territory were assigned to Jharkhand. In the remaining northern part of the former Bihar territory, the boundaries of the districts were changed to create the new districts of Sheikhpura, Luckeesarai, Jamui, Sheohar, Banka, Supaul, Buxar and Bhabhua by using a district map downloaded from <http://www.mapsofindia.com>. Thereby, the state of Bihar was divided into 37 districts.

***Chandigarh***

No modifications (the state is not divided into districts).

***Chhatisgarh***

Chhatisgarh State was formed on 1 November 2000 from the eastern districts of Madhya Pradesh. The districts of Bastar, Bilaspur, Dantewada, Dhamtari, Durg, Janjgeer-Champa, Jashpur, Kanker, Kawardha, Korba, Koriya, Mahasamund, Raigarh, Raipur, Rajnandgawn and Surguja were defined using a district map downloaded from <http://www.mapsofindia.com>.

***Dadra and Nagar Haveli***

Union of Dadra and Nagar Haveli to one multipart polygon.

***Daman and Diu***

Union of Daman and Nagar Diu to one multipart polygon.

***Delhi***

No modifications (the state is not divided into districts).

***Goa***

Union of two islands belonging to North Goa with the landlocked part of the district. The state consists of two districts (North Goa and South Goa).

***Gujarat***

No modifications (the state is divided into 19 districts).

***Haryana***

Using a district map of Haryana downloaded from <http://www.mapsofindia.com>, Hisar District was split into the districts of Hisar and Fatehabad; Rohtak District was split into the districts of Rohtak and Jhajjar; and the districts of Yamunanagar, Ambala and Panchkula were created in the area previously covered by the districts of Yamunanagar and Ambala. Therefore, the state is now divided into 19 districts.

***Himachal Pradesh***

No modifications (the state is divided into 12 districts).

### ***Jammu and Kashmir***

No modifications (the state is divided into 14 districts).

### ***Jharkhand***

On 15 November 2000, the state of Jharkhand was formed from the southern districts of Bihar. Therefore, the southern districts of the former Bihar state territory were assigned to Jharkhand. Using a district map downloaded from <http://www.thebharat.com>, Hazaribag was split into the districts of Koderma, Chatra and Hazaribag; Giridih District was split into the districts of Giridih and Bokaro; and Palamu District was split into the districts of Palamu and Garhwa. The state is divided into 18 districts.

### ***Karnataka***

Using a district map downloaded from <http://www.thebharat.com>, Bijapur District was split into the districts of Bagalkot and Bijapur; Dharwad District was split into the districts of Gadag, Haveri and Dharwad; Raichur District was split into the districts of Koppal and Raichur; Dakshin Kannada District was split into the districts of Uduki and Dakshin Kannada; and Mysore District was split into the districts of Chamaraja Nagar and Mysore. In addition, the boundaries of the central districts of Shimoga, Davangere and Chitradurga were adjusted to the new administrative setting. As a result of this procedure, the state is now divided into 27 districts.

### ***Kerala***

No modifications (the state is divided into 14 districts).

### ***Lakshadweep***

Union of all the single-islands polygons to create one multipart polygon representing the Lakshadweep Islands.

### ***Madhya Pradesh***

On 1 November 2000, Chhatisgarh State was formed from the eastern districts of Madhya Pradesh. Therefore, using a district map downloaded from <http://www.thebharat.com>, the eastern districts of the former Madhya Pradesh state territory were assigned to Chhatisgarh. In addition, Jabalpur District was split into the districts of Katni and Jabalpur; Mandla District was split into the districts of Dindori and Mandla; Shahdol District was split into the districts of Umaria and Shahdol; Hoshangabad District was split into the districts of Harda and Hoshangabad; Mandsaur District was split into the districts of Neemach and Mandsaur; Morena District was split into the districts of Sheopur Kalan and Morena; and West Nimar District was split into the districts of Badwani and West Nimar. Therefore, the state of Madhya Pradesh is now divided into 45 districts.

### ***Maharashtra***

No modifications (the state is divided into 30 districts).

### ***Manipur***

Union of the two districts Imphal East and Imphal West to the district of Imphal. Thereafter, the state is still divided into eight districts.

### ***Meghalaya***

No modifications (the state is divided into five districts).

### ***Mizoram***

Union of the three districts to one polygon representing the state of Mizoram.

### ***Nagaland***

No modifications (the state is divided into seven districts).

### ***Orissa***

Using a district map downloaded from <http://www.thebharat.com>, Baleshwar District was split into the districts of Balasore and Bhadrak; Cuttack District was split into the districts of Kendrapara, Jajpur, Jagatsinghpur and Cuttack; Dhenkanal District was split into the districts of Angul and Dhenkanal; Sambalpur District was split into the districts of Deogarh, Jharsuguda, Bagarh and Dhenkanal; Bolangir District was split into the districts of Sonepur and Bolangir; Phulbani District was split into the districts of Boudh and Phulbani; Puri District was split into the districts of Khurda, Nayagarh and Puri; Ganjam District was split into the districts of Gajapati and Ganjam; Kalahandi District was split into the districts of Nawapara and Kalahandi; and Koraput District was split into the districts of Nawrangpur, Rayagada, Malkangiri and Koraput. Thus, the state is divided into 30 districts.

### ***Pondicherry***

No modifications (the union territory is divided into four districts).

### ***Punjab***

Using a district map downloaded from <http://www.mapsofindia.com>, Bathinda District was split into the districts of Mansa and Bathinda; and the districts of Fairdkot and Ferozpur were split into the districts of Moga, Muktsar, Fairdkot and Ferozpur. The state is divided into 17 districts.

### ***Rajasthan***

By using a district map downloaded from <http://www.mapsofindia.com>, Kota District was split into the districts of Baran and Kota; Gangangarh District was split into the districts of Hanumangarh and Gangangarh; Udaipur District was split into the districts of Rajsamand and Udaipur; and the districts of Jaipur and Sawai Madhopur were split into the districts of Karauli, Dausa, Jaipur and Sawai Madhopur. The state is now divided into 32 districts.

### ***Sikkim***

Union of North, West, South and East Sikkim into one polygon representing the state of Sikkim.

### ***Tamil Nadu***

Using a district map downloaded from <http://www.mapsofindia.com>, Chengaianna District was split into the districts of Tiruvallur and Kancheepuram; South Arcot District was split into the districts of Villupuram and Cuddalore; Salem District was split into the districts of Namakkal and Salem; Tiruchchirappalli District was split into the districts of Perambalur, Karur and Tiruchchirappalli; Thanjavur District was split into the districts of Nagapattinam, Thiruvarur and Thanjavur; and Madurai District was split into the districts of Theni and Madurai. The state is now divided into 29 districts.

### ***Tripura***

Union of the three districts North, West and South Tripura into one polygon representing the state of Tripura.

### ***Uttaranchal***

On 9 November 2000, the state of Uttaranchal was formed from the districts of Almora, Bageshwar, Chamoli, Champawat, Dehradun, Haridwar, Nainital, Pauri Garhwal, Pithoragarh, Rudra Prayag, Tehri Garhwal, Udham Singh Nagar, and Uttarkashi of Uttar Pradesh. Therefore, the 13 districts of the former Uttar Pradesh territory were assigned to Uttaranchal.

### ***Uttar Pradesh***

On 9 November 2000, the state of Uttaranchal was formed from the districts of Almora, Bageshwar, Chamoli, Champawat, Dehradun, Haridwar, Nainital, Pauri Garhwal, Pithoragarh, Rudra Prayag, Tehri Garhwal, Udham Singh Nagar, and Uttarkashi of Uttar Pradesh. Therefore, the 13 districts of the former Uttar Pradesh territory were assigned to Uttaranchal. In addition, the boundaries of the districts of Uttar Pradesh were adjusted to meet the administrative setup as taken from a district map of Uttar Pradesh downloaded from <http://www.mapsofindia.com>. The state of Uttar Pradesh is now divided into 69 districts.

### **West Bengal**

West Dinajpur District was split into the districts of North Dinajpur and South Dinajpur. The state is divided into 18 districts.

### **Indonesia and East Timor**

Union of all administrative units of Indonesia and East Timor and digitizing of 89 watersheds for Indonesia and 1 watershed for East Timor using a basin map published in [ID01].

### **Iraq**

No modifications (the country is divided into 18 governorates).

### **Islamic Republic of Iran**

Using a political map of the Islamic Republic of Iran provided by the Cartographic Section of the United Nations (available at <http://www.un.org/Depts/Cartographic>), the ostan of East Azarbayejan was split into the ostans of East Azarbayejan and Ardebil. As a result, the country is divided into 25 ostans.

### **Israel**

Using a map provided by the Central Bureau of Statistics [IS01], the existing 5 districts of the UNEP dataset were split into 14 subdistricts and 33 natural regions.

### **Japan**

No modifications (the country is divided into 10 provinces and 47 prefectures).

### **Jordan**

No modifications (the country is divided into 8 governorates).

### **Kazakhstan**

Using a political map published in [KZ01], the oblast of Guryev was split into the oblasts of Mangistau and Atyrau; and the oblast of Kustanay was split into the oblasts of Kostanai and Torgai. As result, the country is divided into 19 oblasts.

### **Kuwait**

The country was split into six regions using a map from the online map collection of the University of Texas (available at <http://www.lib.utexas.edu>).

### **Kyrgyzstan**

Union of administrative units existing in the UNEP map and digitizing of the boundaries of 7 regions and 41 districts using a map provided by GRID-Arendal (available at <http://www.grida.no>).

### **Lao People's Democratic Republic**

Union of second-level administrative units into first-level administrative units. The country is so divided into 18 provinces.

### **Lebanon**

Digitizing of 5 regions (mohafaza) and 26 districts (caza) using a map downloaded from an online collection of materials related to the Near East region (available at <http://almashriq.hiof.no>).

### **Malaysia**

No modifications (the country is divided into 14 states).

### **Maldives**

Union of all the single-island polygons into one multipart polygon representing the country of the Maldives.

### **Mongolia**

No modifications (the country is divided into 18 aimags).

**Myanmar**

Union of second-level administrative units into first-level administrative units. The country is so divided into 14 states.

**Nepal**

No modifications (the country is divided into 75 districts).

**Oman**

Union of 63 districts (welayat) into 8 regions.

**Pakistan**

Union of 70 districts into 4 provinces and digitizing of the boundaries of 107 districts using the maps indicated in references [PK01] – [PK04] for the provinces of Punjab, Balochistan, Sindh and North-West Frontier Province. The boundaries of the five districts of the Northern Territories along the border with China and India were digitized using a map downloaded from <http://www.northernareas.org.pk>.

**Palestinian Authority**

Digitizing of the boundaries of 11 governorates in the West Bank and 5 governorates in the Gaza area using a map as indicated in reference [PL01].

**Papua New Guinea**

Union of all subnational units into one polygon representing the country of Papua New Guinea.

**Philippines**

Union of the administrative units into 12 multipart polygons representing the regions of the country.

**Qatar**

No modifications (the country is not divided into subnational units).

**Republic of Korea**

No modifications (the country is divided into 15 provinces).

**Russian Federation**

All rayons in the European part of the Russian Federation were deleted. In the Asian part of the map, the second-level administrative units (rayons) were aggregated to 33 first-level administrative units (oblasts).

**Saudi Arabia**

Union of the provinces of Al Jawf and Al Qurayyat. The boundary to Yemen was changed in the regions of Najran and Eastern Province according to a map used as the reference for Yemen (see section on Yemen). The country is divided into 13 regions.

**Singapore**

Union of all polygons into one multipart polygon representing the country of Singapore.

**Sri Lanka**

The boundaries of the Uda Walawe System, which covers parts of the provinces of Hambantola, Ratnapura and Moneragala, were digitized using a map published in [SL01]. The province boundaries of Jaffna were digitized using a map downloaded from <http://www.statistics.gov.lk>. Thus, Sri Lanka is now divided into 26 subnational units.

**Syrian Arab Republic**

No modifications (the country is divided into 13 regions).

**Taiwan Province of China**

Union of the counties of Raoping and Penghu. Taiwan Province of China consists of 23 counties.



### **Tajikistan**

Union of all administrative units and splitting of the country into two watersheds (Amu Darya Basin and Syr Darya Basin) using a map provided by GRID Arendal (available at <http://www.grida.no>).

### **Thailand**

Using a map published in [TH01], Udon Thani District was split into the districts of Nong Bua Lam Phu and Udon Thani; the district of Nakhon Phanom and Mukdahan was split into the district of Nakhon Phanom and the district of Mukdahan; the districts of Ubon Ratchathani and Yasothon were split into the districts of Amnat Charoen, Ubon Ratchathani and Yasothon; and Prachin Buri District was split into the districts of Sa Kaeo and Prachin Buri. Thailand is divided into 76 provinces.

### **Turkey**

No modifications (the country is divided into 73 provinces).

### **Turkmenistan**

Using a map provided by the Cartographic Section of the United Nations (available at <http://www.un.org/Depts/Cartographic>), the velayat of Turkmenistan Territories was split into the velayats of Balkan and Akhal. The country is divided into five velayats.

### **United Arab Emirates**

No modifications (the country is divided into 7 emirates).

### **Uzbekistan**

Using a map provided by the Cartographic Section of the United Nations (available at <http://www.un.org/Depts/Cartographic>), the welayat of Samarkand was split into the welayats of Nawoiy and Samarqand; and the welayat of Syrdarya was split into the welayats of Jizzakh and Sirdaryo. The country is divided into 13 welayats.

### **Viet Nam**

Union of districts into provinces as shown in Figure 2 in [VN01] with exception of the districts located in the Mekong Delta. Union of all districts located in the Mekong Delta into one polygon representing the entire delta. Therefore, the country is divided into 30 districts, the Mekong Delta and one polygon representing islands south of continental Viet Nam.

### **Yemen**

Union of all administrative units existing in the UNEP map and digitizing of the boundaries of 19 governorates using a map from the online map collection of the University of Texas (available at <http://www.lib.utexas.edu>). The boundary to Saudi Arabia was also changed to fit this map.

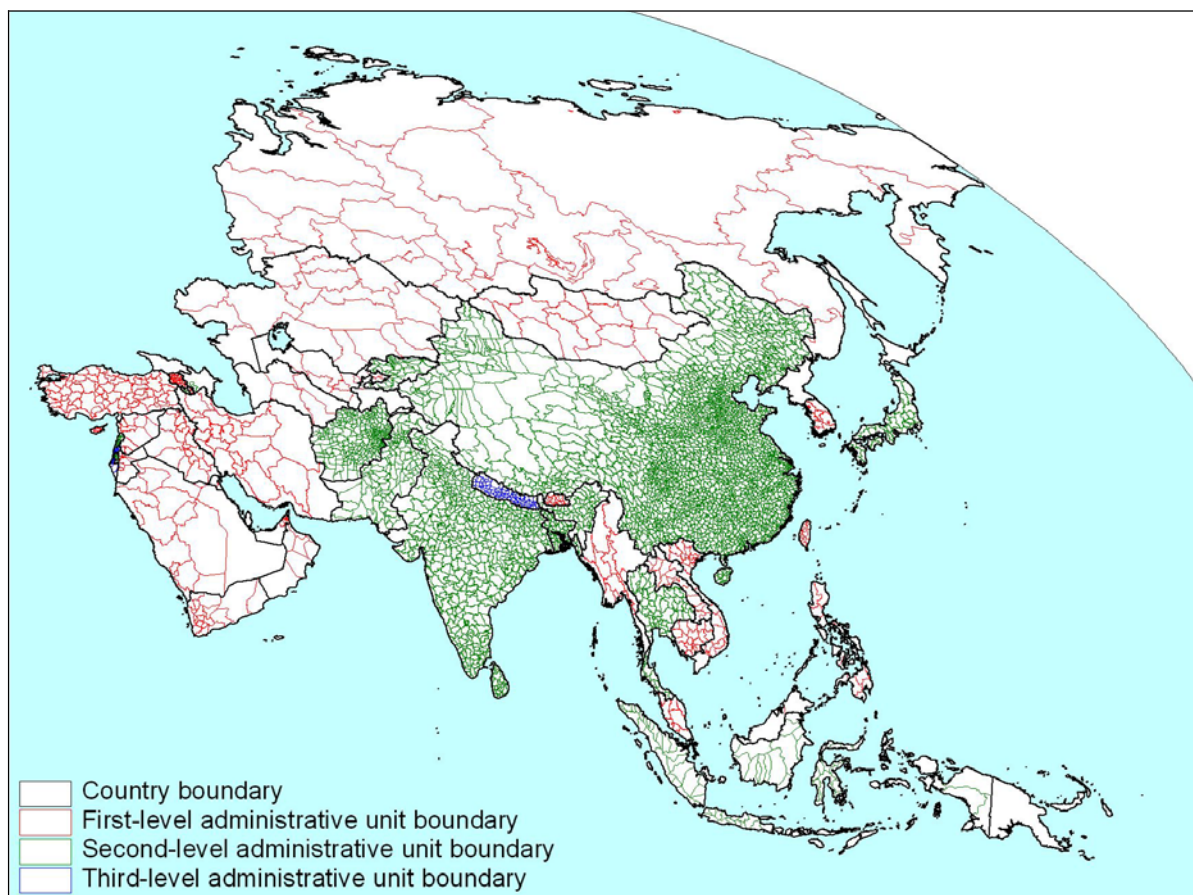


FIGURE 1

**Map of administrative units (Robinson projection) consistent with collected subnational irrigation statistics used to update the Global Map of Irrigated Areas (subnational boundaries shown where irrigation statistics available at that level)**

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# Documentation

## The inventory of subnational irrigation statistics for the Asian part of the Digital Global Map of Irrigated Areas

WORKING REPORT II

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## INTRODUCTION

This report describes how the inventory of subnational irrigation statistics for the Asian continent was compiled and gives references to the data sources. The setting of the subnational units used in this inventory is consistent with the representation of subnational unit boundaries in the polygon shapefile produced as described in Working Report I. The methodology used to produce the global irrigation map (see Working Report III) ensured that the sum total of irrigated area in the final map was equal to the irrigated area per subnational unit as given by this inventory. The base year for the statistics was 2000. Statistics closest to this base year were used where irrigation statistics for more than one year were available.

The irrigated area per country is as documented in Table A1 and totals 188.5 million ha for the entire continent. The total number of subnational units used in this inventory is 4 428. Subnational irrigation statistics were available for all countries except Brunei Darussalam, Democratic People's Republic of Korea, East Timor, Georgia and Qatar. The area equipped for irrigation as a percentage of the total surface area is shown in map form in Annex B (Figure B1).

Although the incorporation of this inventory of subnational irrigation statistics has led to a major improvement in the global irrigation map, uncertainties still remain mainly because of the use of different definitions for irrigated lands. In some countries, there are only statistics available on the irrigated area actually used in the year of statistics while in other countries the area equipped for irrigation is given. Moreover, in some countries, the official figures include types of wild flooding and spate irrigation. It also appears in some cases that statistics from different sources disagree on the area of irrigated lands. These indicators of uncertainty are also mentioned in the following documentation. The list of references at the end of this report is followed by a comprehensive annex of tables showing the irrigated area per subnational unit.

## DOCUMENTATION PER COUNTRY (IN ALPHABETICAL ORDER)

### Afghanistan

The last available census-based inventory of irrigated areas dates back to 1967, giving a total of 2 385 290 ha [AF01]. However, land-cover maps, recently produced through the collaborative efforts of FAO, the United Nations Development Programme (UNDP) and the Afghan Geodesy and Cartography Office (Kabul), indicate that the extent of irrigated areas has not changed much in the last 35 years. Therefore, about 190 000 ha are classified as intensively irrigated (two crops, rice–wheat), about 1 370 000 ha as cropped and irrigated at least once a year, and about 1 650 000 ha as irrigated occasionally (every two or three years) [AF02]. Table A2 provides a comparison of the 1967-reported irrigated areas with the results of the land-cover mapping at province level. The large discrepancies in the provinces of Kunduz and Takhar may be a result of the uncertain position of the province boundary. A large irrigation scheme is located in Takhar when using the UNEP province boundaries, but in Kunduz when using the boundary as given by the AIMS shapefile.

Based on these findings, the area equipped for irrigation was computed on a district level based on the recently produced land-cover map as the sum of areas classified as intensively or occasionally irrigated. The estimates are shown in Table A3 and total 3 199 070 ha. However, the area actually irrigated may be significantly lower. Following statistics recently published by the Central Statistics Office, the extent of paddy cultivation has been 121 000–180 000 ha in the last ten years, and the extent of wheat has been 1 600 000–2 050 000 ha [AF03]. About 46 percent of the harvested wheat area was irrigated in 2003 [AF04].

### Armenia

The area equipped for irrigation per district as shown in Table A4 totals 286 027 ha at the country level [AM01]. The figures are for 1992. The same document reported the total area of irrigation schemes under construction to be 27 341 ha. About 34 000 ha of the 320 000 ha irrigated in 1990 were out of operation. This area depended mainly on runoff from snowmelt, so no irrigation water was available in the summer season.

### **Azerbaijan**

The total area equipped for irrigation was reported to be 1 453 318 ha, which was about 90 percent of the arable land resources of the country. However, the area actually irrigated was about 1 100 000 ha in the 2001 cropping season [AZ01]. The irrigated area in the five rayons of Nakhichevan as taken from report [AZ02] refers to 2000, while the irrigated area in Nagorno-Karabakh was obtained from report [AZ01]. The difference from the total irrigated area of the country was assumed to be located in Azerbaijan mainland. The irrigated area per subnational units is shown in Table A5.

### **Bahrain**

The cultivable area in Bahrain was estimated to be 11 000 ha. The cultivated area increased between 1993 and 2000 from 3 160 ha to more than 4 000 ha [BN01] and it is completely equipped for irrigation. The irrigated area per region is shown in Table A6. The figures refer to 2001 [BN02].

### **Bangladesh**

The area equipped for irrigation is 3 751 045 ha [BG01]. The figures refer to 1995. However, statistics at zila and division level were available for 1998, and they gave a total of 3 360 265 ha [BG02]. Most probably, these statistics refer to the area actually irrigated and not to the area equipped for irrigation. Therefore, it was decided to scale the irrigated area per zila so that the total at the country level was consistent with the area reported as equipped for irrigation in the Aquastat report. The resulting irrigated area per zila and division is shown in Table A7.

### **Bhutan**

The irrigated area is reported to be 38 733.6 ha [BT01]. The figures were published in 1995 and originate from the classification of satellite imagery (base year 1989–90) and groundtruthing carried out in 1993–94 [BT02]. Irrigated area per dzongkhag is shown in Table A8.

### **Brunei Darussalam**

The irrigated area in Brunei Darussalam is reported to be about 1 000 ha [BR01]. The figures refer to 1995. No subnational statistics were available.

### **Cambodia**

A recent inventory reported 802 irrigation systems in 15 provinces, covering a total area of 282 072 ha [CB01]. However, 125 schemes were reported as no longer operational and, therefore, their project area was not included in the total area. The figures refer to the situation in 2001. The irrigated area of the six provinces not included in the inventory (Preah Vihear, Stung Treng, Ratana Kiri, Mondul Kiri, Koh Kong and Tonle Sap) was reported to be about 2 100 ha in 1990 [CB02], so that the total irrigated area of the country is about 284 172 ha. Irrigated area per province is shown in Table A9.

### **China**

The irrigated area was reported to be 53 820 300 ha in the 2000 cropping season [CH01]. The figures given by the report are limited to the provinces in China mainland and are based on census results.

The farm area for China Hong Kong SAR was reported to be 6 960 ha in the 2000 cropping season, while the area actually cropped was 2 710 ha [CH02]. Based on these statistics, the irrigated area in China Hong Kong SAR was estimated to be 2 000 ha.

Irrigated area per province is shown in Table A10. However, there are large uncertainties regarding the irrigated area in China. Inventories based on remote sensing reported a much larger extent of areas under irrigation. Therefore, the irrigated area has been estimated at 78 million ha for the 1992–93 cropping season [CH03].

The irrigated area per county was available for 1990 [CH04] and totalled about 46 million ha. The inventory is based on the agricultural census undertaken in the same year. In addition, irrigated areas were digitized from a 1:1 000 000 land-use atlas [CH05]. The atlas was published in 1990 and is based on satellite images and large-scale aerial photographs taken in

the 1980s. Irrigated areas and paddy areas derived from the land-use map totalled about 68 million ha. The large discrepancy between the results of the agricultural census and the results of the land-use mapping also appears for total cropland, which was reported as 95 million ha (census) and 130 million ha (land-use atlas). This shows again the considerable uncertainty relating to land use in China.

**TABLE 1**  
**Computed limits of irrigated area in Chinese provinces compared with irrigated area as reported by the Statistical Yearbook for 2000**

| Province             | Irrigated area in 2000<br>Statistical Yearbook | Computed lower limit | Computed upper limit |
|----------------------|--|----------------------|----------------------|
|                      |  | (ha)                 |                      |
| Anhui                | 3 197 200                                      | 2 393 380            | 4 659 509            |
| Beijing & Tianjin    | 681 400  | 699 623              | 1 119 617            |
| Chongqing            | 624 600  | 544 546              | 1 582 604            |
| Fujian               | 940 200  | 883 723              | 2 090 074            |
| Gansu                | 981 500  | 795 407              | 2 154 860            |
| Guangdong            | 1 478 500                                      | 1 746 674            | 3 825 079            |
| Guangxi              | 1 501 600                                      | 1 442 889            | 2 657 885            |
| Guizhou              | 653 400  | 513 849              | 1 728 516            |
| Hainan               | 179 800  | 138 826              | 618 077              |
| Hebei                | 4 482 300                                      | 3 189 292            | 4 303 022            |
| Heilongjiang         | 2 032 000                                      | 468 484              | 1 115 970            |
| Henan                | 4 725 300                                      | 3 154 604            | 4 914 514            |
| Hubei                | 2 072 500                                      | 1 999 137            | 2 689 678            |
| Hunan                | 2 677 500                                      | 2 320 441            | 2 877 443            |
| Inner Mongolia       | 2 371 700                                      | 1 091 745            | 2 642 936            |
| Jiangsu              | 3 900 900                                      | 3 990 628            | 5 886 979            |
| Jiangxi              | 1 903 400                                      | 1 808 576            | 3 182 925            |
| Jilin                | 1 315 100                                      | 306 773              | 901 794              |
| Liaoning             | 1 440 700                                      | 714 772              | 1 442 271            |
| Ningxia              | 398 800  | 237 468              | 507 354              |
| Qinghai              | 211 400  | 161 386              | 422 612              |
| Shaanxi              | 1 308 000                                      | 1 173 319            | 2 325 451            |
| Shandong             | 4 824 900                                      | 4 150 802            | 5 748 701            |
| Shanghai             | 285 900  | 237 610              | 352 009              |
| Shanxi               | 1 105 000                                      | 979 825              | 1 873 721            |
| Sichuan              | 2 469 000                                      | 1 969 102            | 3 943 761            |
| Tibet                | 157 000  | 94 809               | 383 604              |
| Xinjiang             | 3 094 800                                      | 1 916 242            | 5 386 233            |
| Yunnan               | 1 403 400                                      | 907 885              | 1 968 769            |
| Zhejiang             | 1 403 200                                      | 1 453 018            | 2 868 969            |
| China mainland total | 53 821 000                                     | 41 484 838           | 76 174 938           |

In order to estimate irrigated area per county in the 2000 cropping season, three inventories were combined. Irrigated area per province was assumed to be as given in [CH01]. The downscaling to county values was achieved by combining the census results for the county level in 1990 [CH04] and the irrigated area per county as taken from the land-use atlas [CH05]. First, the upper and lower limits of irrigated area per province were computed by calculating the sum of minimum and maximum irrigated areas per county as taken from the two inventories (Table 1). It was assumed that the irrigated area per county was at least as high as the minimum of irrigated area taken from the two inventories plus the difference from the maximum value

scaled by a coefficient  $s$ . The coefficient  $s$  was constant for all counties within the same province and was chosen so that the sum of the irrigated area in all counties equalled the irrigated area per province. It was possible to use this method for 23 of the 30 provinces in China mainland. In the provinces of Beijing and Tianjin, Guangdong, Jiangsu, and Zhejiang, the computed lower limits of irrigated area were higher than the irrigated area reported for the provinces in 2000 (Table 1). This indicates either an overestimation of irrigated area in both inventories or a strong decline in irrigated areas between 1990 and 2000 in these provinces. Irrigated area per county was computed here by scaling the minimum of the irrigated area as reported by the two inventories. In contrast, the computed upper limit of irrigated area was lower than the irrigated area reported for 2000 in the provinces of Hebei, Heilongjiang and Jilin (Table 1). This indicates either an underestimation of irrigated areas in both inventories or a considerable increase in irrigated areas in these provinces between 1990 and 2000. Irrigated area per county was computed here as a maximum of the two inventories plus the rainfed agricultural land scaled by a coefficient so that the sum of the computed irrigated areas per county equalled the irrigated area per province in 2000. The percentage of the total land of the counties that was irrigated is shown for 1990 and 2000 in Figure B2.

### **China Macao SAR**

The total land area of China Macao SAR is about 2 680 ha, of which 577 ha are classified as green area. The green area contains about 67 ha of gardens, parks and squares, 3 ha are classified as nurseries [MC01]. However, no information was available on agricultural land use and irrigation. Therefore, it was assumed that there is no irrigated area in China Macao SAR.

### **Cyprus**

The extent of irrigable lands in the part of Cyprus under government control has been reported as being 45 452 ha in 2003, while the area actually irrigated was reported to be 35 931 ha [CP01]. The irrigated area in the Turkish-occupied northern part of the island was estimated by digitizing a land-use map [CP02] and by calculating the sum of the digitized area. Irrigated area per province is shown in Table A11. Thus, the area equipped for irrigation for the entire island was estimated to be 55 813 ha.

### **Democratic People's Republic of Korea**

The irrigated area in the Democratic People's Republic of Korea was reported to be 1 460 000 ha in 1995 [KN01]. According to statistics provided by FAOSTAT (available at <http://faostat.fao.org>), there had been no change in the extent of irrigated area by 2002. No subnational irrigation statistics were available.

### **East Timor**

The total irrigated area of the country was estimated to be about 14 000 ha. The figures have their origin in a study by the Indonesian Ministry of Public Works and relate to 1990 [ID01]. No more recent statistics on a subnational level were available.

### **Georgia**

In the Soviet period, infrastructure was built to irrigate 469 000 ha of agricultural land, mainly located in the more arid east of the country [GG01]. In the 1990s, civil strife, war, vandalism and theft, as well as problems associated with land reform, the transition to a market economy, and the loss of markets with traditional trading partners, contributed to a significant reduction in the irrigated area. It has been reported that only about 160 000 ha were irrigated during the severe drought in 2000. Almost all pumping schemes (about 143 000 ha) were out of order. Therefore, a rehabilitation programme was started by Georgia's State Department of Amelioration and Water Economy to renew the infrastructure of existing irrigation and drainage schemes and to establish amelioration service cooperatives. About 255 000 ha are covered by this programme [GG02]. Based on these reports, the area equipped for irrigation was reduced to 300 000 ha. Irrigation statistics in subnational units were not available.



## **India**

The following sections present subnational irrigation statistics for each of the federal states or union territories of India. The data were collected from various sources and they refer to the so-called “net area irrigated”, because the “area equipped for irrigation” was not available. The term “net area irrigated” means all areas that were irrigated at least one time in the year of the statistics. For example, it does not include areas that were completely fallow in the year of the statistics. Other common terms, such as “irrigation potential created” and “irrigation potential utilized”, could not be used because they are cumulative. They allow for the potential created or used in all the years before the year of the statistics and, therefore, may lead to a doublecounting of rehabilitation areas. The term “gross area irrigated”, which is also present in the statistics, has more the meaning of the area harvested and, therefore, leads to doublecounting of areas cropped more than once.

Because the data were from different sources, there were also different base years for the statistics. Where data for more than one year were available, the data closest to 2000 were used. The irrigated area of all the subnational units as presented here totals 57 286 407 ha. Irrigated area per federal state or union territory is shown in Table A12.

### ***Andaman and Nicobar Islands***

The area equipped for irrigation in the Andaman and Nicobar Islands in the 1993–94 cropping season was 1 093 ha, which was about 8 percent of the cultivable area and 12 percent of the net sown area [IN01]. Most of the cultivated area is located in valleys on the larger islands of the Andaman district.

### ***Andhra Pradesh***

The net irrigated area in Andhra Pradesh was 4 384 124 ha in the 1999–2000 cropping season. Of this total, 1 361 759 ha were cropped more than once. The main irrigation sources are wells (1.9 million ha) and canals (1.63 million ha). The highest irrigation density is to be found on the coast in the districts of West Godavari, Krishna, Guntur, Srikakulam and East Godavari [IN02]. Distribution of irrigated area per district is shown in Table A13.

### ***Arunachal Pradesh***

About 2.4 percent of the total geographical area of the state is cultivable. The area equipped for irrigation is 39 043 ha, which is about 20 percent of the net area sown. The figures refer to 2000. The highest irrigation density is to be found in the district of East Siang. Irrigated area per district [IN03] is shown in Table A14.

### ***Assam***

The latest official irrigation statistics at state level (e.g. [IN04]) estimate irrigated area in Assam at 572 000 ha. These statistics refer to the 1953–54 cropping season. According to a more recent inventory, irrigated areas at district level total 458 071 ha. However, in the 1991–92 cropping season, 221 412 ha were utilized for irrigation, which was about 8 percent of the net area sown [IN05]. About one-third of the total irrigated area is located in the districts of Nagaon and Barpeta. Irrigated area per district is shown in Table A15.

### ***Bihar***

The irrigated area in Bihar and Jharkhand combined was 3 625 000 ha in 2000 [IN06]. The latest available statistics on net irrigated area per district are for the 1993–94 cropping season and, therefore, refer to the former Bihar state territory [IN07]. The irrigated area of all districts in this inventory totalled 3 453 000 ha and was scaled to fit the figures for 2000. In order to compute the irrigated area for the districts created post-1994, an inventory on gross irrigated area per district in the 1997–98 cropping season [IN08] was used. Net irrigated area was assigned to the newly created districts proportional to their gross irrigated area. The total irrigated area for the state of Bihar was calculated as 3 439 545 ha. Irrigated area per district is shown in Table A16.

### ***Chandigarh***

The irrigated area was about 2 000 ha in the 1999–2000 cropping season [IN06].

### ***Chhatisgarh***

The irrigated area in the 1999–2000 cropping season was 1 078 400 ha, which was about 22 percent of the net area sown. More than 70 percent of the total irrigated area was located in the four central districts of Raipur, Durg, Bilaspur and Janjgeer-Champa [IN09]. Irrigated area per district is shown in Table A17.

### ***Dadra and Nagar Haveli***

The irrigated area in this state between Maharashtra and Gujarat is about 6 000 ha, which is about 38 percent of the net area sown [IN06; IN01]. The figure relates to the 1999–2000 cropping season.

### ***Daman and Diu***

The irrigated area is about 1 000 ha [IN06], which is about 21 percent of the net area sown [IN05].

### ***Delhi***

The irrigated area was 39 070 ha in the 1998–99 cropping season [IN10].

### ***Goa***

The irrigated area was 22 372 ha in the 1999–2000 cropping season. There were two medium-sized irrigation projects: Salaulim (2 700 ha) and Anjuna (1 415 ha). The remaining area was irrigated by minor irrigation projects [IN11]. The irrigated area in South Goa was reported to be 8 992 ha in 1994 [IN05]; the difference from the total irrigated area of the state (13 380 ha) was assigned to North Goa.

### ***Gujarat***

The irrigated area was 3 092 400 ha in the 1998–99 cropping season, which was about 32 percent of the net area sown. The cropping intensity on irrigated fields was 125 percent [IN12]. Irrigated area per district is shown in Table A18.

### ***Haryana***

The irrigated area is 2 888 000 ha. This is 82 percent of the net area sown, and in some districts (Kurukshetra, Panipat, Kaithal and Karnal) almost all the cultivated area is irrigated. The cropping intensity in the irrigated areas is reported to be about 177 percent. The figures refer to the 1999–2000 growing season [IN13]. Irrigated area per district is shown in Table A19.

### ***Himachal Pradesh***

The irrigated area was 101 897 ha in the 1999–2000 cropping season, which was about 18 percent of the net area sown. More than 32 000 ha of the irrigated area were located in the district of Kangra. The highest irrigation density is to be found in districts along the boundary with the state of Punjab. The cropping intensity on irrigated fields was about 175 percent [IN14]. Irrigated area per district is shown in Table A20.

### ***Jammu and Kashmir***

A total of 315 870 ha were irrigated in the 2000–01 growing season. This was 42 percent of the net area sown. The cropping intensity on irrigated fields was about 144 percent. Most of the irrigated areas were located in the more humid parts of the state (Anantnang, Jammu and Baramulla) while the irrigated fraction of the net sown area was highest in the arid districts (Leh and Kargil) [IN15]. Irrigated area per district is shown in Table A21.

### ***Jharkhand***

The irrigated area in Bihar and Jharkhand combined was 3 625 000 ha in 2000 [IN06]. The latest available statistics on net irrigated area per district are for the 1993–94 cropping season and, therefore, refer to the former Bihar state territory [IN07]. The irrigated area of all districts in this inventory totalled 3 453 000 ha and was scaled to fit the figures for 2000. In order to

compute the irrigated area for the districts created post-1994, an inventory on gross irrigated area per district in the 1997–98 cropping season [IN16] was used. Net irrigated area was assigned to the newly created districts proportional to their gross irrigated areas. The total irrigated area for the state of Jharkhand was computed to be 185 455 ha. About 61 000 ha of irrigated area were located in the districts of Palamu and Garhwa. Irrigated area per district is shown in Table A22.

#### ***Karnataka***

The irrigated area was 2 491 871 ha in the 1998–99 cropping season, which was about 24 percent of the net area sown. The cropping intensity on irrigated fields was about 125 percent. In the districts of Bagalkot, Bellary, Mandya, Davangere and Belgaum, the irrigation density was relatively high, while the irrigation density in the districts of Uttara Kannada and Chikmagalur was very low [IN17]. Irrigated area per district is shown in Table A23.

#### ***Kerala***

The irrigated area was 380 043 ha in the 1999–2000 cropping season, which was about 17 percent of the net area sown. The cropping intensity on irrigated fields was about 124 percent. More than 60 percent of the total irrigated area was located in the districts of Thrissur, Palakkhad, Kasaragod and Alappuzha [IN18]. Irrigated area per district is shown in Table A24.

#### ***Lakshadweep***

The irrigated area has been reported to be about 1 000 ha [IN06]. The net area sown is 2 755 ha [IN19]. The whole of the cultivated area is cropped with coconuts. In parts of the cultivated area, other crops are grown in intercropping systems. Irrigation water is usually provided by wells. However, because of the limited availability of this resource, the extraction of irrigation water by using motor pumps has been banned [IN20].

#### ***Madhya Pradesh***

The irrigated area was 5 514 979 ha in the 1998–99 cropping season, which was about 36 percent of the net area sown. The cropping intensity on irrigated fields is about 103 percent. High densities of irrigated areas are to be found in the north and west of the state while irrigation density in the east of the state is generally low [IN21]. Irrigated area per district is shown in Table A25.

#### ***Maharashtra***

The irrigated area was 3 140 200 ha in the 1997–98 cropping season, which was about 18 percent of the net area sown. The cropping intensity on irrigated fields is about 118 percent. The highest irrigation density is to be found in Pune Division, which consists of the districts of Pune, Solapur and Ahmadnagar [IN22]. Irrigated area per district is shown in Table A26.

#### ***Manipur***

Statistics on the total extent of irrigated areas on a district level were not available. Therefore, the irrigated area per district was estimated using an inventory on gross irrigated-rice areas per district in the period 1994–2000 [IN23]. For each district, the maximum annual value within this period was selected. These district values gave a total of 92 860 ha for the entire state and were then scaled down to fit to the net irrigated area per state, which was reported to be about 65 000 ha [IN06]. About 40 percent of the net area sown was assumed to be irrigated. According to the estimates, most of the irrigated area is located in the central districts of Bishnupur and Imphal. The estimates of irrigated area per district are shown in Table A27.

#### ***Meghalaya***

The irrigated area on the district level totalled 45 045 ha in the 1991–92 cropping season [IN24], which was about 22 percent of the net area sown. The net irrigated area in the 1999–2000 season was reported to be 48 000 ha [IN06]. However, these figures in the all-India

inventory have their origin in the 1984-85 growing season. Therefore, the district values, shown in Table A28, were not scaled to meet the figures given for 2000.

#### ***Mizoram***

The irrigated area in the 1999–2000 growing season was 9 000 ha, which was about 10 percent of the net area sown [IN06]. Related figures for the three districts of Mizoram were not available.

#### ***Nagaland***

The irrigated area in the 1999–2000 cropping season was 63 000 ha, which was about 24 percent of the net area sown [IN06]. The irrigated areas per district were available for the 1991–92 season and yielded a total of 58 900 ha [IN25]. Therefore, the district-level irrigated area was scaled so that the sum met the statistics for 2000. These estimated irrigated areas per district in the 1999–2000 cropping season are shown in Table A29.

#### ***Orissa***

The irrigated area in the 1999–2000 cropping season was estimated to be 2 090 000 ha. This was about 34 percent of the net area sown [IN06]. However, the figures for Orissa in the all-India inventory refer to 1989–90, because more recent statistics on net irrigated area were not available. In order to estimate irrigated area per district, an inventory of the created irrigation potential on the district level was used [IN26]. The inventory refers to the 1999–2000 season and distinguishes the kharif and rabi cropping seasons. In all districts, the available potential for kharif crops is higher than the potential for rabi crops. Therefore, it was used to estimate the area equipped for irrigation. The potential in the districts totalled 2 380 740 ha and was scaled to fit the figures for the net irrigation area as given by the all-India inventory. The estimates of irrigated area per district are shown in Table A30.

#### ***Pondicherry***

The irrigated area was 21 390 ha in the 2000–01 cropping season. This was about 88 percent of the net sown area. The cropping intensity on irrigated fields was about 160 percent [IN27]. Irrigated area per district is shown in Table A31.

#### ***Punjab***

The irrigated area was 4 020 700 ha in the 2000–01 cropping season. This was about 94 percent of the net area sown and about 80 percent of the total geographical area of the state of Punjab. The cropping intensity on irrigated fields was about 190 percent. In the district of Ludhiana, all the cultivated area was irrigated, and more than 98 percent of the area sown was irrigated in 12 of the 17 districts [IN28]. Therefore, Punjab can be seen as one of the most intensive agricultural and irrigated areas in the world. Irrigated area per district is shown in Table A32.

#### ***Rajasthan***

The irrigated area was 5 611 874 ha in the 1999–2000 cropping season, which was about 36 percent of the net area sown. The cropping intensity on irrigated fields was about 123 percent. The density of irrigated areas tends to be higher in the northern districts of the state (Gangangar, Hanumangarh, Alwar, Baratpur and Dausa). Irrigated area per district is shown in Table A33 [IN29].

#### ***Sikkim***

The irrigated area was 16 000 ha in the 1985–86 cropping season. This was about 17 percent of the net are sown, and these are the most recent statistics available [IN06]. Data for irrigated area on the district level were not available.

#### ***Tamil Nadu***

The irrigated area was 3 018 839 ha in the 1998–99 cropping season. This was about 54 percent of the net area sown. The cropping intensity on irrigated fields was about 120 percent. With the exception of the districts of Nilgiris, Chennai and Toothukudi, the fraction of irrigated net sown

area exceeded 30 percent in all districts [IN30]. The density of irrigated areas was high, in particular in the northeast of the state. Irrigated area per district is shown in Table A34.

### ***Tripura***

The irrigated area in the state of Tripura was about 35 000 ha, which was about 13 percent of the net area sown. The figures refer to the 1992–93 season [IN06]. Irrigation statistics on the district level were not available.

### ***Uttaranchal***

Irrigation statistics for the state of Uttaranchal are not available yet. Therefore, irrigation statistics for the districts of the former Uttar Pradesh territory for the period before the existence of Uttaranchal (1996–97 growing season) were used in order to estimate irrigated area in Uttaranchal [IN31]. For districts formed post-1997, more recent statistics available in the district profiles provided by the National Informatics Centre were also used (available at <http://districts.nic.in>). Irrigated area per district was estimated as shown in Table A35. The areas totalled 332 502 ha. More than 60 percent of the total irrigated area of the state is located in the districts of Hardwar and Udham Singh Nagar.

### ***Uttar Pradesh***

The irrigated area in the 1999–2000 cropping season was 12 469 624 ha [IN32]. This was about 74 percent of the net area sown and 51 percent of the total geographical area of the state. The cropping intensity on irrigated fields was about 141 percent. In particular, in Meerut Division (districts of Meerut, Bagpat, Ghaziabad, Bulandshahar and Gautam Budh Nagar), the cultivated area is completely irrigated. Irrigated area per district is shown in Table A36 [IN32].

### ***West Bengal***

The irrigated area in the 1987–88 cropping season was 1 911 000 ha, which was about 35 percent of the net area sown. More recent statistics on net irrigated area were not available for West Bengal [IN06]. Gross irrigated area in the 1997–98 cropping season was reported to be 4 570 000 ha [IN33]. In order to estimate the area equipped for irrigation on a district level, the gross area irrigated was divided by the district-specific cropping intensity [IN34]. Because separate cropping intensities for irrigated and rainfed land were not available, the irrigated areas so computed totalled 2 484 952 ha and were scaled to fit the total area as given by the statistics (1 911 000 ha). The resulting figures for irrigated area per district are shown in Table A37.

### ***Indonesia***

The irrigated area of 88 basins of the country totals 4 459 000 ha [ID01] and is shown in Table A38. The figures refer to 1990 but they are in good agreement with the area equipped for irrigation (4 427 922 ha) as reported in the Aquastat database (available at <http://www.fao.org>) for 1996. About 65 percent of the irrigated area is located on the island of Java.

### ***Iraq***

The area equipped for irrigation is reported to be 3 525 000 ha [IQ01]. The figures refer to 1990. A large part of this area is not irrigated. Because of waterlogging and salinity, the area irrigated in 1993 was about 1 936 000 ha [IQ02] and this had decreased to 1 775 750 ha in 2001 [IQ03]. However, the three Kurdish provinces in the north of the country (Dahoak, Arbil and Sulaimania) are not included in these figures. The largest decrease in irrigated area is to be found in the downstream provinces where agriculture depends completely on irrigation. In the provinces located more upstream of the Tigris River (Salah Eldin, Tameem and Nineweh), where also rainfed agriculture is practised, the irrigated area increased between 1993 and 2001. No official statistics were available for the mountainous, Kurdish northern provinces. Therefore, statistics originating from a land survey in 1992 and provided by the Kurdistan Democratic Party [IQ04] were used for these provinces.

Statistics on the area equipped for irrigation were not available on a province level. Therefore, it was estimated by combining areas computed from digitized land-use maps [IQ05], tactical pilot charts [IQ06] and satellite imagery [IQ07] with province-level statistics of the area

actually irrigated in 1993 [IQ02] and 2001 [IQ03]. It was assumed that the area equipped for irrigation was as least as high as the maximum of the area actually irrigated in 1993 and 2001. In order to estimate the area of the irrigated areas not in use, the land-use maps, pilot charts and satellite imagery were used for the downstream provinces of Muthannia, Qadisiya, Najaf, Babil, Baghdad, Thegar, Diala, Misan and Wasit. The estimates for the northern provinces of Dahoak, Arbil and Sulaimania are as reported in the land survey. The estimates of the area equipped for irrigation per province are shown in Table A39.

### **Islamic Republic of Iran**

The figures for the irrigated area per ostan as reported in Table A40 total 6 913 800 ha [IR01]. The figures refer to 1994. However, because the data were published in the Statistical Yearbook 2003, it can be assumed that more recent statistics are not available.

### **Israel**

The irrigated area in Israel reached its maximum extent in the mid-1980s at about 230 000 ha and then declined to 186 600 ha in 2000 [IS01]. An irrigated area of about 3 200 ha is located in enclosed settlements in the West Bank and Gaza territories. Irrigated area per natural region as shown in Table A41 was computed using statistics on cultivated crops [IS02] under the assumptions that the flower and garden-plant area was completely irrigated, that citrus plantations were completely irrigated, that 91.88 percent of the vegetable area was irrigated, and that 74.08 percent of the other plantations (except citrus) was irrigated. These coefficients were computed from inventories on the national scale ([IS03]; [IS04]). The extent of irrigated field crops per natural region was given by [IS02].

### **Japan**

Figures on area equipped for irrigation were available for 1993 on a province level and totalled 3 129 000 ha [JP01]. In Japan, paddy-fields are almost completely irrigated, while only about 10 percent of the upland fields are irrigated [JP02]. In addition, statistics on the extent of paddy- and upland fields per prefecture [JP03] were used in order to estimate the irrigated area within the prefectures. These figures refer to 1995. It was assumed that all the paddy-field areas were irrigated and that the fraction of irrigated upland fields was constant for all prefectures within the same province. The resulting figures for extent of irrigated area per prefecture are shown in Table A42.

### **Jordan**

The area equipped for irrigation increased from 64 300 ha in 1990 [JO01] to 76 912 ha in 2000 [JO02]. However, other inventories reported irrigated areas of 84 130 ha in 1993 [JO03] and 95 005 ha in 2000 [JO04]. Irrigated area per governorate was estimated on the basis of the values reported in [JO01] in order to be consistent with the Aquastat country report. The changes post-1990 were estimated based on the differences from inventory [JO03]. The more recent inventory published in 2003 [JO04] could not be used for this purpose because the administrative setting of the country has changed in the meantime. The resulting figures for irrigated area per governorate are shown in Table A43.

### **Kazakhstan**

The area equipped for irrigation was 2 313 100 ha in 1993. In addition, there existed 138 700 ha of equipped wetland and inland valley bottoms [KZ01]. However, it has been estimated that about 680 000 ha of the land were out of use in the 1994 cropping season because of soil salinization, waterlogging, broken or incomplete distribution systems or because of other reasons [KZ02]. The irrigated areas in 2002 consisted of 1 220 000 ha of regular irrigation and 580 600 ha of so-called “engineering-liman irrigation and inundated hay lands” [KZ03]. Irrigated area per oblast was available for 1993 [KZ02]. The oblast values give a total of 1 855 200 ha and are shown in Table A44.

### **Kuwait**

The cultivated area in Kuwait increased from 4 770 ha in 1994 to 6 968 ha in 2000 [KU01]. Because of the climate conditions, all the cultivated area is irrigated. Irrigated area per governorate is shown in Table A45.

### **Kyrgyzstan**

In 1994, 1 075 040 ha were equipped for irrigation [KY01]. Irrigated area per oblast and per raion is shown in Table A46.

### **Lao People's Democratic Republic**

The area equipped for irrigation almost doubled in the period 1995–2000. Most of the increase was based on the establishment of pumping schemes, which covered 46 150 ha in 1997 and 153 330 ha of agricultural land in 2000. Irrigated areas per province, as shown in Table A47, totalled 295 535 ha in the wet season and 197 100 ha in the dry season [LA01].

### **Lebanon**

The irrigated areas per mohafaza and caza, as shown in Table A48, totalled 117 113 ha. This was about 40 percent of the cultivated area [LE01]. The figures refer to 1997.

### **Malaysia**

The area equipped for irrigation is about 362 600 ha [ML01]. The figures refer to 1994. Irrigated area per state was available for 1993 and totalled 321 696 ha [ML02]. Therefore, irrigated area per state was scaled so that the sum was equal to the value given by the Aquastat report for the entire country. The resulting figures for irrigated area per state are shown in Table A49.

### **Maldives**

The cultivated area was estimated to be about 3 000 ha, but there is no irrigation in the Maldives [MD01].

### **Mongolia**

The area equipped for irrigation is about 57 300 ha, of which 43 400 ha under highly mechanized sprinkler systems and about 13 900 ha covered by surface-irrigation systems. However, only 16 674 ha of the sprinkler-irrigation area was operational in 1994 [MG01]. An inventory of the irrigated area per aimag (district) was only available for the sprinkler-irrigation schemes [MG02]. Most of the sprinkler-irrigated area is located in the west and the north of the country. It was also reported that about 80 percent of the surface-irrigation schemes are located in the west of the country [MG01]. Therefore, in order to estimate the total area equipped for irrigation at aimag level, the sprinkler-irrigated area per aimag was scaled so that the sum of the irrigated areas was 57 300 ha. The resulting estimated areas equipped for irrigation per aimag are shown in Table A50.

### **Myanmar**

The irrigated area in Myanmar increased from about 1 000 000 ha in the 1991–92 cropping season to 1 841 320 ha in the 1999–2000 cropping season [MY01]. Subnational statistics were available for the 1994–95 cropping season [MY02]. Irrigated area per state totalled 1 555 361 ha in 1995 and was scaled so that the sum of the irrigated areas per state fitted the total irrigated area of the country reported for the 1999–2000 season. The resulting estimates for irrigated area per state are shown in Table A51.

### **Nepal**

The area equipped for irrigation in Nepal is 1 168 349 ha [NP01]. The figure refers to the 2001–02 cropping season. Irrigated area per district and development region is shown in Table A52.

### **Oman**

The cultivated area in the sultanate of Oman was 72 714 ha in 2000 [OM01]. Because of the arid climate, the cultivated area is completely irrigated [OM02]. Irrigated area per region, as documented in Table A53, was available for 2001 and totalled 72 630 ha [OM03].

### **Pakistan**

The following sections present district-level subnational irrigation statistics for each of the federal states. The area equipped for irrigation per federal state, as documented in Table A54, was taken from the Aquastat country report [PK01] because the national statistics usually report the gross or net area actually irrigated in the year of the statistics. As defined at the beginning of this report, irrigated area includes “full or partial control irrigation” and “equipped wetland and inland valley bottoms”, but excludes spate irrigation. The figures refer to 1990 and give a total of 14 327 000 ha. The net area irrigated in 2000 was reported to be 12 030 983 ha. In addition, there were 432 825 ha with spate irrigation. The gross area irrigated was 19 505 416 ha in the same year; 9 074 329 ha were cropped with kharif crops, 10 069 697 ha were cropped with rabi crops, and 361 388 ha with irrigated orchards [PK02].

The cultivated area in the districts of the Northern Territories along the border with India and China was assumed to be completely irrigated and totalled 90 464 ha [PK03]. The figures have their origin in the 1990 agricultural census. The total area equipped for irrigation in the country is 14 417 464 ha.

### **Balochistan**

The irrigated area per district by irrigation-water source was derived from a recent inventory [PK04]. In most of the districts, the figures refer to 1995. For each of the districts, area irrigated by canals, tubewells, wells, springs and karezes was included, while irrigated area classified as flood irrigation or rainfed was not taken into consideration. The resulting area equipped for irrigation totalled 807 335 ha and the figures were then scaled so that the sum of the irrigated area of all districts was 767 120 ha. Almost 30 percent of the irrigated area of the state is located in the district of Jaffarabad. More than 90 percent of this district located in the Indus plain is equipped for irrigation. Irrigated area per district is shown in Table A55.

### **Northern Territories**

Irrigated area per district, as documented in Table A56, totals 90 464 ha. It was assumed that all the cultivated area as reported by the 1990 agricultural census [PK03] was irrigated. However, other studies indicate that the irrigated area in this very remote, mountainous region might be even larger than that reported by the census [PK05].

### **North-West Frontier Province**

Irrigated area per district totalled 804 282 ha in North-West Frontier Province [PK06] and 88 074 ha in the Federally Administered Tribal Areas [PK07]. Only areas irrigated by canals, tanks, tubewells, wells and pumps were considered because areas irrigated by other sources most probably indicate spate-irrigation areas. The figures refer to the 1999–2000 cropping season. Irrigated area per district was scaled so that the total was equal to the area equipped for irrigation as reported in the Aquastat database (719 152 ha). The resulting figures for irrigated area per district are shown in Table A57.

### **Punjab**

The area equipped for irrigation is 10 325 678 ha [PK01]. The cultivated area was reported to be 12 350 000 ha in the 1999–2000 cropping season, of which 1 330 000 ha were current fallow [PK08]; 6 872 204 ha were reported cropped in the kharif season, 8 839 377 ha in the rabi season, and 173 086 ha were classified as orchard. Of the area sown, 13 395 904 ha were irrigated [PK02]. Therefore, about 84 percent of the cultivated area was equipped for irrigation and about 84 percent of the sown crops were growing on irrigated fields.

The area equipped for irrigation was not available at district level. Therefore, it was estimated by computing first the fraction of area sown that was irrigated [PK09], and then by



multiplying this fraction by the cultivated area per district [PK10]. The resulting area equipped for irrigation gave a total of 10 178 276 ha for the entire Punjab state territory. Therefore, the area equipped for irrigation per district was scaled so that the total area corresponded with the figures in the Aquastat report. Area equipped for irrigation per district is shown in Table A58.

### **Sindh**

The area equipped for irrigation was reported to be 2 515 050 ha [PK01]. The net area sown in the 1997–98 cropping season was 3 040 000 ha; 906 000 ha were sown more than once. In addition, 2 645 000 ha of the cultivated area were fallow land in the same season [PK11]. Area equipped for irrigation was not available at district level. Therefore, it was estimated as follows:

- Area equipped for irrigation should be at least as high as the maximum value of irrigated areas per district in the 1997–98 rabi season [PK12] and the 1998 kharif-season [PK13]. The resulting figures for irrigated area per district gave a total of 2 073 100 ha.
- District-based statistics on net area sown [PK14] and the proportion of irrigated to rainfed crops [PK15] were used to estimate the additional areas given by the difference from the Aquastat figures for the entire state.

The resulting estimates for area equipped for irrigation per district are shown in Table A59.

### **Palestinian Authority**

The irrigated area decreased from 17 247 ha in 1982 to 16 990 ha in 1990 [PL01] and to 16 222 ha in 2001 [PL02]. Of the irrigated area, 6 990 ha were located in the West Bank and 9 220 ha in the Gaza Strip [PL02]. In addition, 12.2 ha under drip irrigation were reported to be in Jerusalem [PL03]. Based on the methodology described in the section on Israel, the irrigated area located in Israeli settlements was estimated to be 3 244 ha. Irrigated area per governorate is shown in Table A60.

### **Papua New Guinea**

There are no areas equipped for irrigation in Papua New Guinea. Some types of flood irrigation are reported [PG01]. However, these types of irrigation do not meet the criteria for full or partially equipped irrigation.

### **Philippines**

The area equipped for irrigation per region, as documented in Table A61 totals 1 550 000 ha [PH01]. The figures refer to 1993. The area actually irrigated was reported to be 1 470 691 ha in that year.

### **Qatar**

The area equipped for irrigation was estimated at 12 520 ha in 1993 [QT01], while the area actually irrigated in 2000 was reported to be 9 762 ha [QT02]. Subnational-level statistics were not available.

### **Republic of Korea**

The irrigated areas per province total 880 365 ha and are shown in Table A62. The figures refer to irrigated paddy lands in the 2002 cropping season. In addition, 258 043 ha of paddy lands are classified in the same inventory as “partially irrigated” [KS01].

### **Russian Federation**

Irrigated area per oblast, as documented in Table A63, totals 897 000 ha in the Asian part of the country. The figures refer to 1997 [RU01].

### **Saudi Arabia**

The cultivable area was estimated at 4 987 000 ha in 2000 [SA01], but only 1 119 750 ha were used in that year [SA02]. Another inventory reported 1 620 983 ha as being used in the 1992 cropping season [SA03]. All agriculture is irrigated, and the extent of cultivation depends mainly on the availability of irrigation water as a limiting factor [SA04]. The area equipped for irrigation on the regional level, as documented in Table A64, was estimated by using the maximum value of the cultivated areas in the 1992 and 2000 cropping seasons as reported by

the inventories [SA03] and [SA02]. The resulting estimated total irrigated area was 1 730 767 ha.

### **Singapore**

Agrotechnology parks, which are agriculture estates developed with the necessary infrastructure for farming, cover about 1 465 ha. Of this total, 937 ha were used for farming in 2000 [SI01]. However, there are no records that would indicate irrigation in Singapore.

### **Sri Lanka**

The area equipped for irrigation in 1995 was about 570 000 ha [SL01]. Area equipped for irrigation was not available at district level. It was estimated by using an inventory of irrigated paddy-fields in the 2001–02 cropping season [SL02] and an inventory of other irrigated field crops in the 1990–1991 cropping season [SL03]. Irrigated paddy area totalled 335 026 ha in major schemes and 177 433 ha in minor schemes while the area of other irrigated crops totalled 61 351 ha. The resulting total irrigated area was 573 810 ha. Irrigated area per district was then scaled so that the total irrigated area within the country matched the value of 570 000 ha given in the Aquastat report. Irrigated area per district is shown in Table A65.

### **Syrian Arab Republic**

The irrigated area in the Syrian Arab Republic increased from 670 134 ha in 1989 to 1 088 891 ha in 1995 [SY01] and to 1 266 900 ha in 2001 [SY02]. Irrigated area per governorate in the 2001 growing season is shown in Table A66.

### **Taiwan Province of China**

The cultivated area decreased from 667 602 ha in 1990 to 656 676 ha in 1995 [TW01] and to 627 160 ha in 2000 [TW02]. In contrast, the irrigated area increased from 510 500 ha in 1990 to 525 528 ha in 1995 [TW03]. No information was available on the extent of irrigated area per county or irrigated area in 2000. Therefore, irrigated area per county was estimated by using statistics related to irrigated area per region in 1995 [TW03] as well as paddy area per county and other cultivated area per county in 1995 [TW04]. It was assumed that all the paddy area was irrigated and that the fraction of irrigated other fields was constant in all counties within the same region. The resulting estimates for irrigated area per county in 1995 are shown in Table A67.

### **Tajikistan**

The area equipped for irrigation has been reported to be 719 200 ha, with 240 200 ha of the irrigated area located in the Syr Darya River Basin and 479 000 ha in the Amu Darya River Basin [TJ01]. The figures refer to 1994, but more recent reports indicate that there had been no change by 2002 [TJ02]. No subnational statistics were available.

### **Thailand**

The irrigated area per province and region, as documented in Table A68, totals 4 985 708 ha [TH01]. The figures refer to 2000.

### **Turkey**

The area equipped for irrigation was 4 185 910 ha in 1994 [TK01]. The area actually irrigated was 3 093 545 ha in 1991 [TK02] and 3 143 000 ha in 1994 [TK03]. At province level, only area actually irrigated was available. Therefore, the area equipped for irrigation was estimated by choosing the maximum value of the areas reported as irrigated in the inventories [TK02] and [TK03]. The resulting total for irrigated areas was 3 756 555 ha and the figures were then scaled so that the total irrigated area of the country matched the value reported in the Aquastat database [TK01]. Irrigated area per district is shown in Table A69.

### **Turkmenistan**

The area equipped for irrigation is 1 744 100 ha [TM01]. The figures refer to 1994. Irrigated area per welayat in 1996 totalled 1 711 800 ha [TM02] and was scaled so that the total irrigated

area of the country was equal to the area equipped for irrigation as reported in the Aquastat database [TM01]. Irrigated area per welayat is shown in Table A70.

#### **United Arab Emirates**

The cultivated area increased from 68 877 ha in 1992 to 111 356 ha in 1998 [UE01] and 280 341 ha in 2001 [UE02]. About 82 percent of the irrigated area is located in the emirate of Abu Dhabi. Of the total figure, 213 530 ha are equipped with modern irrigation systems, mainly drip irrigation [UE03]. The most important irrigated crops are palm trees (185 329 ha), field crops (43 253 ha) and vegetables (9 683 ha) [UE02]. Irrigated area per emirate in the 2000–01 cropping season is shown in Table A71.

#### **Uzbekistan**

The irrigated area per oblast, as documented in Table A72, totalled 4 223 000 ha in 1996 [UZ01]. The highest irrigation densities are to be found in the oblasts of Andijon, Sirdarjo and Farghona, where more than 50 percent of the oblast area is equipped for irrigation.

#### **Viet Nam**

The area equipped for irrigation in Viet Nam is about 3 000 000 ha. About 2 000 000 ha are used while about 1 000 000 ha are within the design command area but currently not being irrigated. The area harvested on irrigated fields is about 5 400 000 ha, which indicates a very high cropping intensity [VN01]. The area equipped for irrigation per district, as documented in Table A73, was taken from an inventory of design capacities per district [VN02], an inventory on irrigable land per basin [VN03], and an inventory of irrigated areas in the Mekong River Basin [VN04].

#### **Yemen**

The area equipped for irrigation was 388 000 ha in 1996. In addition, there were about 100 000 ha of spate irrigation [YE01], mainly located in the governorates along the coast (Taiz, Hodeidah, Laheg, Abyan, Shabwa, Haja and Hadramout) [YE02]. Irrigated area per governorate totalled 576 570 ha in 2001 [YE03]. The irrigated area of the governorates was first reduced by 100 000 ha to remove the spate irrigation areas, and then scaled so that the total for the irrigated areas of the country was equal to the value reported for equipped irrigation in [YE01]. The resulting estimates for irrigated area per governorate are shown in Table A74.

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# **Annex A**

## **Tables**

**TABLE A1**  
**Irrigated area per country in Asia as used in this report**

| Country                               | Irrigated area (ha) | Country                                 | Irrigated area (ha) |
|---------------------------------------|---------------------|---|---------------------|
| Afghanistan                           | 3 199 070           | Lebanon                                 | 117 113             |
| Azerbaijan                            | 1 453 318           | Malaysia                                | 362 600             |
| Armenia                               | 286 027             | Mongolia                                | 57 300              |
| Bahrain                               | 11 000              | Myanmar                                 | 1 841 320           |
| Bangladesh                            | 3 751 045           | Nepal                                   | 1 168 349           |
| Bhutan                                | 38 734              | Oman                                    | 72 714              |
| Brunei Darussalam                     | 1 000               | Pakistan                                | 14 417 464          |
| Cambodia                              | 284 172             | Palestinian Authority (Gaza, West Bank) | 16 222              |
| China (excl. Taiwan)                  | 53 822 300          | Philippines                             | 1 550 000           |
| Cyprus                                | 55 813              | Qatar                                   | 12 520              |
| Democratic People's Republic of Korea | 1 460 000           | Republic of Korea                       | 880 365             |
| East Timor                            | 14 000              | Russian Federation (Asian part)         | 897 000             |
| Georgia                               | 300 000             | Saudi Arabia                            | 1 730 767           |
| India                                 | 57 286 407          | Sri Lanka                               | 570 000             |
| Indonesia                             | 4 459 000           | Syrian Arab Republic                    | 1 266 900           |
| Iraq                                  | 3 525 000           | Taiwan Province of China                | 525 528             |
| Islamic Republic of Iran              | 6 913 800           | Tajikistan                              | 719 200             |
| Israel                                | 186 600             | Thailand                                | 4 985 708           |
| Japan                                 | 3 129 000           | Turkey                                  | 4 185 910           |
| Jordan                                | 76 912              | Turkmenistan                            | 1 744 100           |
| Kazakhstan                            | 1 855 200           | United Arab Emirates                    | 280 341             |
| Kuwait                                | 6 968               | Uzbekistan                              | 4 223 000           |
| Kyrgyzstan                            | 1 075 040           | Viet Nam                                | 3 000 000           |
| Lao People's Democratic Republic      | 295 535             | Yemen                                   | 388 000             |
|                                       |                     | <b>Asia total</b>                       | <b>188 503 362</b>  |

**TABLE A2**  
**Comparison of irrigated areas in Afghanistan in surveys 1967 and 1990–93**

| Province        | Irrigated area 1967 (ha) | Irrigated area two seasons 1990–93 (ha) | Irrigated area one season 1990–93 (ha) | Irrigated area occasionally 1990–93 (ha) |
|-----------------|--------------------------|---|--|--|
| Badakhshan      | 61 760                   | 3 122                                   | 30 964                                 | 17 720                                   |
| Badghis         | 33 300                   | 416                                     | 19 802                                 | 30 756                                   |
| Baghlan         | 80 180                   | 14 356                                  | 58 224                                 | 17 098                                   |
| Balkh           | 224 500                  | 5 369                                   | 85 790                                 | 145 596                                  |
| Bamyan          | 23 150                   | 0                                       | 18 921                                 | 31 645                                   |
| Farah           | 125 730                  | 23                                      | 45 937                                 | 176 232                                  |
| Faryab          | 121 600                  | 0                                       | 53 894                                 | 83 581                                   |
| Ghazni          | 117 490                  | 88                                      | 129 347                                | 160 452                                  |
| Ghor            | 72 860                   | 0                                       | 29 575                                 | 36 676                                   |
| Helmand         | 162 720                  | 13 462                                  | 104 959                                | 119 444                                  |
| Herat           | 163 700                  | 394                                     | 123 324                                | 64 090                                   |
| Jawzjan         | 184 600                  | 0                                       | 99 207                                 | 131 264                                  |
| Kabul           | 57 600                   | 30                                      | 39 327                                 | 20 762                                   |
| Kandahar        | 117 920                  | 441                                     | 51 365                                 | 203 560                                  |
| Kapisa & Parwan | 75 140                   | 1 704                                   | 69 335                                 | 9 583                                    |
| Kunar           | 23 320                   | 2 684                                   | 9 373                                  | 12 979                                   |

| Province                 | Irrigated area 1967 (ha) | Irrigated area two seasons 1990–93 (ha) | Irrigated area one season 1990–93 (ha) | Irrigated area occasionally 1990–93 (ha) |
|--------------------------|--------------------------|---|--|--|
| Kunduz                   | 209 590                  | 66 910                                  | 58 856                                 | 6 426                                    |
| Laghman                  | 23 580                   | 13 482                                  | 5 659                                  | 4 212                                    |
| Logar                    | 26 650                   | 0                                       | 22 649                                 | 12 931                                   |
| Nangarhar                | 42 340                   | 26 143                                  | 40 847                                 | 29 414                                   |
| Nimroz                   | 60 300                   | 0                                       | 0                                      | 76 778                                   |
| Oruzgan                  | 126 580                  | 0                                       | 65 988                                 | 57 689                                   |
| Paktya                   | 56 350                   | 665                                     | 62 760                                 | 54 977                                   |
| Samangan                 | 44 330                   | 201                                     | 21 442                                 | 37 003                                   |
| Takhar                   | 61 860                   | 39 086                                  | 68 278                                 | 2 077                                    |
| Wardak                   | 25 600                   | 0                                       | 30 838                                 | 26 568                                   |
| Zabul                    | 62 540                   | 74                                      | 22 367                                 | 72 326                                   |
| <b>Afghanistan total</b> | <b>2 385 290</b>         | <b>188 651</b>                          | <b>1 369 027</b>                       | <b>1 641 841</b>                         |

TABLE A3  
Irrigated area per district and province in Afghanistan

| District     | Province          | Irrigated area (ha) | District     | Province       | Irrigated area (ha) |
|--------------|-------------------|---------------------|--------------|----------------|---------------------|
| Baharak      | Badakhshan        | 11 494              | Khost Wa Fir | Baghlan        | 12 609              |
| Darwaz       | Badakhshan        | 1 647               | Nahrin       | Baghlan        | 9 441               |
| Fayz Abad    | Badakhshan        | 5 901               | Puli Khumri  | Baghlan        | 17 971              |
| Ishkashim    | Badakhshan        | 4 192               | Tala Wa Barf | Baghlan        | 4 335               |
| Jurm         | Badakhshan        | 8 662               |              | <b>Baghlan</b> | 108 015             |
| Khwahan      | Badakhshan        | 344                 | Balkh        | Balkh          | 33 326              |
| Kishim       | Badakhshan        | 7 232               | Chahar Bolak | Balkh          | 40 802              |
| Kuran Wa Mun | Badakhshan        | 2 308               | Chahar Kint  | Balkh          | 343                 |
| Ragh         | Badakhshan        | 1 120               | Chimtal      | Balkh          | 15 213              |
| Shahri Buzur | Badakhshan        | 332                 | Dawlat Abad  | Balkh          | 73 957              |
| Shighnan     | Badakhshan        | 2 783               | Dihdadi      | Balkh          | 14 134              |
| Wakhan       | Badakhshan        | 4 656               | Kaldar       | Balkh          | 5 507               |
| Zebak        | Badakhshan        | 715                 | Khulm        | Balkh          | 32 389              |
|              | <b>Badakhshan</b> | 51 387              | Kishindih    | Balkh          | 4 044               |
| Ab Kamari    | Badghis           | 572                 | Marmul       | Balkh          | 245                 |
| Ghormach     | Badghis           | 12 640              | Mazari Shari | Balkh          | 1 712               |
| Jawand       | Badghis           | 3 098               | Nahri Shahi  | Balkh          | 37 404              |
| Muqur        | Badghis           | 4 135               | Sholgara     | Balkh          | 7 629               |
| Murghab      | Badghis           | 14 406              | Shortepa     | Balkh          | 8 579               |
| Qadis        | Badghis           | 10 023              |              | <b>Balkh</b>   | 275 285             |
| Qalay-l- Naw | Badghis           | 2 307               | Bamyan       | Bamyan         | 8 968               |
|              | <b>Badghis</b>    | 47 180              | Panjab       | Bamyan         | 6 749               |
| Andarab      | Baghlan           | 9 696               | Shibar       | Bamyan         | 3 141               |
| Baghlan      | Baghlan           | 15 952              | Waras        | Bamyan         | 9 554               |
| Baghlani Jad | Baghlan           | 10 593              | Yakawlang    | Bamyan         | 6 633               |
| Burka        | Baghlan           | 10 249              |              | <b>Bamyan</b>  | 35 044              |
| Dahana-l- Gh | Baghlan           | 1 009               | Anar Dara    | Farah          | 6 414               |
| Dushi        | Baghlan           | 4 978               | Bakwa        | Farah          | 12 983              |
| Kahmard      | Baghlan           | 7 277               | Bala Buluk   | Farah          | 19 925              |
| Khinjan      | Baghlan           | 3 905               | Farah        | Farah          | 23 990              |

| District     | Province      | Irrigated area (ha) | District     | Province       | Irrigated area (ha) |
|--------------|---------------|---------------------|--------------|----------------|---------------------|
| Gulistan     | Farah         | 5 371               | Garmser      | Hilmand        | 25 458              |
| Khaki Safed  | Farah         | 14 423              | Kajaki       | Hilmand        | 22 141              |
| Lash Wa Juwa | Farah         | 16 410              | Lashkar Gah  | Hilmand        | 14 226              |
| Pur Chaman   | Farah         | 9 754               | Musa Qala    | Hilmand        | 15 752              |
| Pusht Rod    | Farah         | 36 006              | Nad Ali      | Hilmand        | 24 941              |
| Qalay-I-Kah  | Farah         | 13 625              | Nahri Sarraj | Hilmand        | 30 910              |
| Shib Koh     | Farah         | 9 364               | Naw Zad      | Hilmand        | 28 482              |
|              | <b>Farah</b>  | <b>168 265</b>      | Naway i Bara | Hilmand        | 26 786              |
| Almar        | Faryab        | 19 182              | Reg          | Hilmand        | 16 855              |
| Andkhoy      | Faryab        | 9 413               | Sangin       | Hilmand        | 8 208               |
| Bilchiragh   | Faryab        | 7 954               | Washer       | Hilmand        | 5 288               |
| Dawlat Abad  | Faryab        | 8 247               |              | <b>Hilmand</b> | <b>236 709</b>      |
| Khani Chahar | Faryab        | 16 376              | Adraskan     | Hirat          | 10 713              |
| Khwaja Sabz  | Faryab        | 13 010              | Chishti Shar | Hirat          | 4 557               |
| Kohistan     | Faryab        | 2 843               | Farsi        | Hirat          | 12 023              |
| Maymana      | Faryab        | 1 976               | Ghoryan      | Hirat          | 24 395              |
| Pashtun Kot  | Faryab        | 1 972               | Gulran       | Hirat          | 2 375               |
| Qaramqol     | Faryab        | 13 339              | Guzara       | Hirat          | 25 157              |
| Qaysar       | Faryab        | 29 791              | Hirat        | Hirat          | 1 739               |
| Shirin Tagab | Faryab        | 9 706               | Injil        | Hirat          | 41 644              |
|              | <b>Faryab</b> | <b>133 809</b>      | Karukh       | Hirat          | 13 023              |
| Ab Band      | Ghazni        | 15 704              | Kohsan       | Hirat          | 7 732               |
| Ajristan     | Ghazni        | 7 561               | Kushk        | Hirat          | 5 241               |
| Andar        | Ghazni        | 35 242              | Kushki Kuhna | Hirat          | 1 689               |
| Bahrami Shah | Ghazni        | 14 895              | Obe          | Hirat          | 14 202              |
| Dih Yak      | Ghazni        | 7 509               | Pashtun Zarg | Hirat          | 26 061              |
| Gelan        | Ghazni        | 25 339              | Shindand     | Hirat          | 44 051              |
| Ghazni       | Ghazni        | 8 915               | Zinda Jan    | Hirat          | 13 974              |
| Giro         | Ghazni        | 14 878              |              | <b>Hirat</b>   | <b>248 577</b>      |
| Jaghatu      | Ghazni        | 10 247              | Aqcha        | Jawzjan        | 21 193              |
| Jaghuri      | Ghazni        | 18 555              | Darzab       | Jawzjan        | 3 502               |
| Malistan     | Ghazni        | 6 451               | Fayz Abad    | Jawzjan        | 35 087              |
| Muqur        | Ghazni        | 15 471              | Khamyab      | Jawzjan        | 258                 |
| Nawa         | Ghazni        | 19 384              | Khwaja Du Ko | Jawzjan        | 16 705              |
| Nawur        | Ghazni        | 17 886              | Mardyan      | Jawzjan        | 25 797              |
| Qarabagh     | Ghazni        | 26 309              | Mingajik     | Jawzjan        | 27 808              |
| Zana Khan    | Ghazni        | 1 486               | Qarqin       | Jawzjan        | 2 821               |
|              | <b>Ghazni</b> | <b>245 831</b>      | Shibirghan   | Jawzjan        | 50 404              |
| Chaghcharan  | Ghor          | 14 094              |              | <b>Jawzjan</b> | <b>183 573</b>      |
| Lal Wa Sarja | Ghor          | 6 300               | Bagrami      | Kabul          | 6 457               |
| Pasaband     | Ghor          | 11 922              | Chahar Asyab | Kabul          | 2 531               |
| Saghar       | Ghor          | 2 703               | Dih Sabz     | Kabul          | 6 820               |
| Shahrak      | Ghor          | 16 212              | Guldara      | Kabul          | 3 069               |
| Taywara      | Ghor          | 12 617              | Istalif      | Kabul          | 1 268               |
| Tulak        | Ghor          | 7 128               | Kabul        | Kabul          | 4 552               |
|              | <b>Ghor</b>   | <b>70 977</b>       | Kalakan      | Kabul          | 2 103               |
| Baghran      | Hilmand       | 11 164              | Khaki Jabbar | Kabul          | 1 219               |
| Dishu        | Hilmand       | 6 499               | Mir Bacha Ko | Kabul          | 5 144               |

| District     | Province        | Irrigated area (ha) | District     | Province         | Irrigated area (ha) |
|--------------|-----------------|---------------------|--------------|------------------|---------------------|
| Musayi       | Kabul           | 1 999               | Nari         | Kunar            | 707                 |
| Paghman      | Kabul           | 10 526              | Nurgal       | Kunar            | 1 810               |
| Qarabagh     | Kabul           | 5 766               | Pech         | Kunar            | 2 177               |
| Shakardara   | Kabul           | 8 794               | Sirkanay     | Kunar            | 2 650               |
| Surobi       | Kabul           | 2 231               |              | <b>Kunar</b>     | 21 994              |
|              | <b>Kabul</b>    | 62 480              | Ali Abad     | Kunduz           | 3 675               |
| Arghandab    | Kandahar        | 2 297               | Archi        | Kunduz           | 23 105              |
| Arghistan    | Kandahar        | 12 768              | Chahar Dara  | Kunduz           | 17 316              |
| Daman        | Kandahar        | 34 437              | Imam Sahib   | Kunduz           | 46 877              |
| Ghorak       | Kandahar        | 4 493               | Khan Abad    | Kunduz           | 19 110              |
| Kandahar     | Kandahar        | 30 475              | Kunduz       | Kunduz           | 32 212              |
| Khakrez      | Kandahar        | 12 563              | Qalay-I- Zal | Kunduz           | 14 673              |
| Maruf        | Kandahar        | 7 645               |              | <b>Kunduz</b>    | 156 969             |
| Maywand      | Kandahar        | 12 813              | Alingar      | Laghman          | 5 344               |
| Panjwayi     | Kandahar        | 28 798              | Alishing     | Laghman          | 3 569               |
| Reg          | Kandahar        | 3 526               | Dawlat Shah  | Laghman          | 2 011               |
| Shah Wali Ko | Kandahar        | 20 628              | Mihtarlam    | Laghman          | 5 527               |
| Shorabak     | Kandahar        | 43 983              | Qarghayi     | Laghman          | 4 588               |
| Spin Boldak  | Kandahar        | 34 253              |              | <b>Laghman</b>   | 21 038              |
|              | <b>Kandahar</b> | 248 678             | Baraki Barak | Logar            | 8 990               |
| Alasay       | Kapisa          | 1 233               | Charkh       | Logar            | 6 150               |
| Koh Band     | Kapisa          | 1 241               | Khushi       | Logar            | 1 697               |
| Kohistan     | Kapisa          | 7 714               | Muhammad Agh | Logar            | 6 114               |
| Mahmud Raqi  | Kapisa          | 3 157               | Puli Alam    | Logar            | 10 984              |
| Nijrab       | Kapisa          | 3 392               |              | <b>Logar</b>     | 33 935              |
| Tagab        | Kapisa          | 328                 | Achin        | Nangarhar        | 5 869               |
|              | <b>Kapisa</b>   | 17 064              | Bati Kot     | Nangarhar        | 9 530               |
| Bak          | Khost           | 1 517               | Chaparhar    | Nangarhar        | 4 105               |
| Gurbuz       | Khost           | 2 445               | Dara-I-Nur   | Nangarhar        | 2 635               |
| Jaji Maydan  | Khost           | 421                 | Dih Bala     | Nangarhar        | 3 229               |
| Khost(Matun) | Khost           | 10 299              | Dur Baba     | Nangarhar        | 295                 |
| Mando Zayi   | Khost           | 6 196               | Goshta       | Nangarhar        | 1 730               |
| Musa Khel    | Khost           | 379                 | Hisarak      | Nangarhar        | 4 027               |
| Nadir Shah K | Khost           | 1 981               | Jalal Abad   | Nangarhar        | 4 106               |
| Qalandar     | Khost           | 333                 | Kama         | Nangarhar        | 5 281               |
| Sabari       | Khost           | 3 710               | Khogyani     | Nangarhar        | 9 012               |
| Spera        | Khost           | 391                 | Kuz Kunar    | Nangarhar        | 2 823               |
| Tani         | Khost           | 786                 | Lal Pur      | Nangarhar        | 995                 |
| Tere Zayi    | Khost           | 6 514               | Muhmand Dara | Nangarhar        | 3 365               |
|              | <b>Khost</b>    | 34 971              | Nazyan       | Nangarhar        | 566                 |
| Asad Abad    | Kunar           | 2 539               | Pachir Wa A  | Nangarhar        | 2 587               |
| Bar Kunar    | Kunar           | 859                 | Rodat        | Nangarhar        | 14 866              |
| Chapa Dara   | Kunar           | 1 577               | Sherzad      | Nangarhar        | 8 056               |
| Chawkay      | Kunar           | 2 230               | Shinwar      | Nangarhar        | 3 921               |
| Dangam       | Kunar           | 1 520               | Surkh Rod    | Nangarhar        | 8 990               |
| Khas Kunar   | Kunar           | 2 871               |              | <b>Nangarhar</b> | 95 988              |
| Marawara     | Kunar           | 798                 | Chahar Burja | Nimroz           | 13 199              |
| Narang       | Kunar           | 2 253               | Chakhansur   | Nimroz           | 15 909              |

| District     | Province        | Irrigated area (ha) | District     | Province        | Irrigated area (ha) |
|--------------|-----------------|---------------------|--------------|-----------------|---------------------|
| Kang         | Nimroz          | 2 326               | Salang       | Parwan          | 2 156               |
| Khash Rod    | Nimroz          | 31 338              | Shekh Ali    | Parwan          | 3 353               |
| Zaranj       | Nimroz          | 10 310              | Shinwari     | Parwan          | 1 878               |
|              | <b>Nimroz</b>   | <b>73 082</b>       | Surkhi Parsa | Parwan          | 4 627               |
| Bargi Matal  | Nuristan        | 1 497               |              | <b>Parwan</b>   | <b>60 099</b>       |
| Kamdesh      | Nuristan        | 223                 | Aybak        | Samangan        | 5 426               |
| Mandol       | Nuristan        | 1 775               | Dara-I- Suf  | Samangan        | 4 149               |
| Nuristan     | Nuristan        | 829                 | Hazrati Sult | Samangan        | 6 884               |
| Wama         | Nuristan        | 1 349               | Khuram Wa Sa | Samangan        | 1 733               |
| Waygal       | Nuristan        | 89                  | Ruyi Du Ab   | Samangan        | 3 049               |
|              | <b>Nuristan</b> | <b>5 762</b>        |              | <b>Samangan</b> | <b>21 242</b>       |
| Barmal       | Paktika         | 4 841               | Balkhab      | Sari Pul        | 6 253               |
| Dila         | Paktika         | 11 302              | Kohistanat   | Sari Pul        | 12 505              |
| Gayan        | Paktika         | 383                 | Sangcharak   | Sari Pul        | 11 269              |
| Gomal        | Paktika         | 657                 | Sari Pul     | Sari Pul        | 13 779              |
| Mata Khan    | Paktika         | 2 519               | Sayyad       | Sari Pul        | 881                 |
| Nika         | Paktika         | 450                 | Sozma Qala   | Sari Pul        | 3 980               |
| Omna         | Paktika         | 1 433               |              | <b>Sari Pul</b> | <b>48 667</b>       |
| Sar Hawza    | Paktika         | 882                 | Bangi        | Takhar          | 3 615               |
| Sarobi       | Paktika         | 2 086               | Chah Ab      | Takhar          | 354                 |
| Sharan       | Paktika         | 10 652              | Chal         | Takhar          | 114                 |
| Urgun        | Paktika         | 3 940               | Darqad       | Takhar          | 6 978               |
| Waza Khwa    | Paktika         | 3 050               | Farkhar      | Takhar          | 3 199               |
| Wor Mamay    | Paktika         | 3 282               | Ishkamish    | Takhar          | 6 123               |
| Zarghun Shah | Paktika         | 17 599              | Kalafgan     | Takhar          | 1 561               |
| Ziruk        | Paktika         | 492                 | Khwaja Ghar  | Takhar          | 6 543               |
|              | <b>Paktika</b>  | <b>63 571</b>       | Rustaq       | Takhar          | 2 522               |
| Azra         | Paktya          | 1 379               | Taluqan      | Takhar          | 21 304              |
| Chamkani     | Paktya          | 1 868               | Warsaj       | Takhar          | 4 372               |
| Dand Wa Pata | Paktya          | 1 338               | Yangi Qala   | Takhar          | 15 835              |
| Gardez       | Paktya          | 15 923              |              | <b>Takhar</b>   | <b>72 520</b>       |
| Jadran       | Paktya          | 1 086               | Chora        | Uruzgan         | 12 908              |
| Jaji         | Paktya          | 4 077               | Day Kundi    | Uruzgan         | 20 683              |
| Jani Khel    | Paktya          | 889                 | Dihrawud     | Uruzgan         | 8 205               |
| Lija Mangal  | Paktya          | 1 260               | Gizab        | Uruzgan         | 8 620               |
| Sayid Karam  | Paktya          | 12 442              | Khas Uruzgan | Uruzgan         | 12 972              |
| Shamal       | Paktya          | 202                 | Kijran       | Uruzgan         | 9 117               |
| Shwak        | Paktya          | 288                 | Nesh         | Uruzgan         | 15 729              |
| Zurmat       | Paktya          | 27 993              | Shahidi Hass | Uruzgan         | 9 448               |
|              | <b>Paktya</b>   | <b>68 745</b>       | Shahristan   | Uruzgan         | 14 860              |
| Bagram       | Parwan          | 15 525              | Tirin Kot    | Uruzgan         | 12 363              |
| Chaharikar   | Parwan          | 10 928              |              | <b>Uruzgan</b>  | <b>124 906</b>      |
| Ghorband     | Parwan          | 7 016               | Chaki Wardak | Wardak          | 6 685               |
| Hisa-I-Awali | Parwan          | 2 898               | Day Mirdad   | Wardak          | 4 054               |
| Hisa-I-Duwum | Parwan          | 1 584               | Hisa-I- Awal | Wardak          | 6 541               |
| Jabalussaraj | Parwan          | 5 680               | Jalrez       | Wardak          | 3 589               |
| Kohi Safi    | Parwan          | 1 651               | Markazi Bihs | Wardak          | 18 369              |
| Panjsher     | Parwan          | 2 803               | Maydan Shahr | Wardak          | 2 477               |



| District  | Province      | Irrigated area (ha) |
|-----------|---------------|---------------------|
| Nirkh     | Wardak        | 9 764               |
| Sayd Abad | Wardak        | 10 850              |
|           | <b>Wardak</b> | 62 329              |
| Arghandab | Zabul         | 12 367              |
| Atghar    | Zabul         | 4 379               |
| Daychopan | Zabul         | 19 173              |
| Mizan     | Zabul         | 9 211               |
| Qalat     | Zabul         | 14 693              |
| Shahjoy   | Zabul         | 16 848              |

| District                 | Province     | Irrigated area (ha) |
|--------------------------|--------------|---------------------|
| Shamulzayi               | Zabul        | 7 249               |
| Shinkay                  | Zabul        | 7 321               |
| Tarnak Wa Ja             | Zabul        | 9 138               |
|                          | <b>Zabul</b> | 100 379             |
| <b>Afghanistan total</b> |              | <b>3 199 070</b>    |

TABLE A4  
**Irrigated area per district in Armenia**

| District   | Irrigated area (ha) |
|------------|---------------------|
| Akhurian   | 17 148              |
| Amasia     | 4 230               |
| Ani        | 2 299               |
| Aparan     | 6 601               |
| Aragats    | 2 011               |
| Ararat     | 16 255              |
| Armavir    | 23 851              |
| Artashat   | 13 671              |
| Artik      | 3 482               |
| Ashotsk    | 2 490               |
| Ashtarak   | 16 768              |
| Bagramian  | 11 040              |
| Echmiadzin | 20 007              |
| Egegnadzor | 7 824               |
| Goris      | 6 289               |
| Gugark     | 1 871               |
| Hrazdan    | 5 592               |
| Ijevan     | 6 369               |
| Kamo       | 3 118               |
| Kapan      | 1 831               |
| Kotaik     | 10 670              |

| District             | Irrigated area (ha) |
|----------------------|---------------------|
| Krasnoselsk          | 982                 |
| Lake Sevan           | 0                   |
| Martuni              | 9 012               |
| Masis                | 9 304               |
| Megri                | 1 557               |
| Nairi                | 10 251              |
| Novemberian          | 11 112              |
| Sevan                | 1 566               |
| Sisian               | 7 036               |
| Spitak               | 4 420               |
| Stepanavan           | 2 686               |
| Talin                | 9 048               |
| Tashir               | 713                 |
| Taush                | 6 305               |
| Tumanian             | 6 862               |
| Vaik                 | 3 609               |
| Vardenis             | 9 153               |
| Yerevan              | 8 994               |
| <b>Armenia total</b> | <b>286 027</b>      |

TABLE A5  
**Irrigated area in Azerbaijan**

| Region                  | Region / District     | Irrigated area (ha) |
|-------------------------|-----------------------|---------------------|
| Azerbaijan mainland     | Azerbaydzhan mainland | 1 397 118           |
| Nakhichevan             | Sharur                | 24 500              |
| Nakhichevan             | Babek                 | 19 300              |
| Nakhichevan             | Shahbuz               | 2 600               |
| Nakhichevan             | Julfa                 | 4 900               |
| Nakhichevan             | Ordubad               | 4 900               |
| <b>Azerbaijan total</b> |                       | <b>1 453 318</b>    |

TABLE A6  
Irrigated area per region in Bahrain

| Region               | Irrigated area (ha) |
|----------------------|---------------------|
| Northern             | 1 220               |
| Jidhafs              | 590                 |
| Sitra                | 120                 |
| Isa Town             | 0                   |
| Central              | 310                 |
| Western              | 1 410               |
| Riffa & Southern     | 0                   |
| Muharraq             | 190                 |
| Manama               | 220                 |
| <b>Bahrain total</b> | <b>4 060</b>        |

TABLE A7  
Irrigated area per zila and division in Bangladesh

| Zila         | Division          | Irrigated area (ha) | Zila        | Division      | Irrigated area (ha) |
|--------------|-------------------|---------------------|-------------|---------------|---------------------|
| Barguna      | Barisal           | 2 221               | Mymensingh  | Dhaka         | 136 930             |
| Barisal      | Barisal           | 29 274              | Narayanganj | Dhaka         | 26 891              |
| Bhola        | Barisal           | 18 023              | Narsingdi   | Dhaka         | 47 365              |
| Jhalakati    | Barisal           | 5 787               | Netrokona   | Dhaka         | 96 775              |
| Patuakhali   | Barisal           | 6 229               | Rajbari     | Dhaka         | 29 042              |
| Pirojpur     | Barisal           | 5 456               | Shariatpur  | Dhaka         | 18 474              |
|              | <b>Barisal</b>    | <b>66 990</b>       | Sherpur     | Dhaka         | 58 467              |
| Bandarban    | Chittagong        | 4 067               | Tangail     | Dhaka         | 129 161             |
| Brahmanbaria | Chittagong        | 81 078              |             | <b>Dhaka</b>  | <b>1 004 962</b>    |
| Chandpur     | Chittagong        | 63 991              | Bagerhat    | Khulna        | 8 993               |
| Chittagong   | Chittagong        | 93 664              | Chuadanga   | Khulna        | 57 264              |
| Comilla      | Chittagong        | 125 364             | Jessore     | Khulna        | 125 474             |
| Cox Bazar    | Chittagong        | 48 486              | Jhenaidaha  | Khulna        | 86 347              |
| Feni         | Chittagong        | 30 568              | Khulna      | Khulna        | 9 234               |
| Habiganj     | Chittagong        | 73 593              | Kushtia     | Khulna        | 73 299              |
| Khagrachhari | Chittagong        | 6 308               | Magura      | Khulna        | 15 020              |
| Lakshmipur   | Chittagong        | 23 418              | Meherpur    | Khulna        | 44 458              |
| Maulvibazar  | Chittagong        | 26 969              | Narail      | Khulna        | 16 357              |
| Noakhali     | Chittagong        | 17 431              | Satkhira    | Khulna        | 59 400              |
| Rangamati    | Chittagong        | 8 147               |             | <b>Khulna</b> | <b>495 845</b>      |
| Sunamganj    | Chittagong        | 95 444              | Bogra       | Rajshahi      | 227 185             |
| Sylhet       | Chittagong        | 35 898              | Dinajpur    | Rajshahi      | 167 048             |
|              | <b>Chittagong</b> | <b>734 425</b>      | Gaibandha   | Rajshahi      | 96 302              |
| Dhakala      | Dhaka             | 40 993              | Joypurhat   | Rajshahi      | 63 036              |
| Faridpur     | Dhaka             | 45 398              | Kurigram    | Rajshahi      | 56 324              |
| Gazipur      | Dhaka             | 45 590              | Lalmonirhat | Rajshahi      | 43 153              |
| Gopalganj    | Dhaka             | 24 791              | Naogaon     | Rajshahi      | 180 656             |
| Jamalpur     | Dhaka             | 86 238              | Natore      | Rajshahi      | 67 923              |
| Kishoreganj  | Dhaka             | 142 890             | Nawabganj   | Rajshahi      | 32 961              |
| Madaripur    | Dhaka             | 29 389              | Nilphamari  | Rajshahi      | 66 719              |
| Manikganj    | Dhaka             | 28 373              | Pabna       | Rajshahi      | 47 508              |
| Munshiganj   | Dhaka             | 18 195              | Panchagarh  | Rajshahi      | 13 623              |

| Zila       | Division | Irrigated area (ha) |
|------------|----------|---------------------|
| Rajshahi   | Rajshahi | 99 376              |
| Rangpur    | Rajshahi | 118 831             |
| Sirajganj  | Rajshahi | 115 973             |
| Thakurgaon | Rajshahi | 52 206              |

| Zila                    | Division        | Irrigated area (ha) |
|-------------------------|-----------------|---------------------|
|                         | <b>Rajshahi</b> | 1 448 823           |
| <b>Bangladesh total</b> |                 | <b>3 751 045</b>    |

TABLE A8  
**Irrigated area per dzongkhag in Bhutan**

| Dzongkhag         | Irrigated area (ha) |
|-------------------|---------------------|
| Bumthang          | 75                  |
| Chukha            | 1 538               |
| Dagana            | 2 115               |
| Gasa              | 148                 |
| Ha                | 101                 |
| Lhuentse          | 944                 |
| Mongar            | 627                 |
| Paro              | 2 351               |
| Pemagatshel       | 0                   |
| Punakha           | 3 247               |
| Samdrup - Jongkha | 2 187               |

| Dzongkhag           | Irrigated area (ha) |
|---------------------|---------------------|
| Samtse              | 6 254               |
| Sarpang             | 4 527               |
| Thimphu             | 1 615               |
| Trashy Yangtse      | 2 021               |
| Trashigang          | 1 659               |
| Trongsa             | 1 965               |
| Tsirang             | 2 292               |
| Wangdue - Phodrang  | 3 952               |
| Zhemgang            | 1 115               |
| <b>Bhutan total</b> | <b>38 734</b>       |

TABLE A9  
**Irrigated area per provinces in Cambodia**

| Province         | Irrigated area (ha) |
|------------------|---------------------|
| Banteay Meanchey | 4 975               |
| Battambang       | 23 990              |
| Kampong Cham     | 16 870              |
| Kampong Chhnang  | 9 622               |
| Kampong Speu     | 21 360              |
| Kampong Thom     | 27 731              |
| Kampot           | 3 000               |
| Kandal           | 34 768              |
| Koh Kong         | 600                 |
| Kratie           | 5 703               |
| Mondul Kiri      | 200                 |
| Phnom Penh       | 2 770               |

| Province              | Irrigated area (ha) |
|-----------------------|---------------------|
| Preah Vihear          | 300                 |
| Prey Veng             | 25 360              |
| Pursat                | 5 329               |
| Ratana Kiri           | 200                 |
| Siem Reap             | 48 195              |
| Stung Treng           | 800                 |
| Svay Rieng            | 3 683               |
| Takeo                 | 48 716              |
| Tonle Sap             | 0                   |
| <b>Cambodia total</b> | <b>284 172</b>      |

TABLE A10  
**Irrigated area per province in China**

| Province  | Irrigated area (ha) |
|-----------|---------------------|
| Anhui     | 3 197 200           |
| Beijing   | 681 400             |
| Chongqing | 624 600             |
| Fujian    | 940 200             |
| Gansu     | 981 500             |
| Guangdong | 1 478 500           |
| Guangxi   | 1 501 600           |
| Guizhou   | 653 400             |

| Province       | Irrigated area (ha) |
|----------------|---------------------|
| Hainan         | 179 800             |
| Hebei          | 4 482 300           |
| Heilongjiang   | 2 032 000           |
| Henan          | 4 725 300           |
| Hong Kong SAR  | 2 000               |
| Hubei          | 2 072 500           |
| Hunan          | 2 677 500           |
| Inner Mongolia | 2 371 700           |

| Province | Irrigated area (ha) | Province    | Irrigated area (ha) |
|----------|---------------------|-------------|---------------------|
| Jiangsu  | 3 900 900           | Shanxi      | 1 105 000           |
| Jiangxi  | 1 903 400           | Sichuan     | 2 469 000           |
| Jilin    | 1 315 100           | Tibet       | 157 000             |
| Liaoning | 1 440 700           | Xinjiang    | 3 094 800           |
| Ningxia  | 398 800             | Yunnan      | 1 403 400           |
| Qinghai  | 211 400             | Zhejiang    | 1 403 200           |
| Shaanxi  | 1 308 000           | China total | 53 823 000          |
| Shandong | 4 824 900           |             |                     |
| Shanghai | 285 900             |             |                     |

TABLE A11  
Irrigated area per district in Cyprus

| District     | Irrigated area (ha) |
|--------------|---------------------|
| Ammochostos  | 11 500              |
| Keryneia     | 1 400               |
| Larnaka      | 9 117               |
| Lefkosia     | 18 000              |
| Lemesos      | 7 383               |
| Pafos        | 8 413               |
| Cyprus total | 55 813              |

TABLE A12  
Irrigated area per federal state and union territory in India

| Federal state or union territory | Irrigated area (ha) | Federal state or union territory | Irrigated area (ha) |
|----------------------------------|---------------------|----------------------------------|---------------------|
| Andaman & Nicobar                | 1 093               | Madhya Pradesh                   | 5 514 979           |
| Andhra Pradesh                   | 4 384 124           | Maharashtra                      | 3 140 200           |
| Arunachal Pradesh                | 39 043              | Manipur                          | 65 000              |
| Assam                            | 458 071             | Meghalaya                        | 45 045              |
| Bihar                            | 3 439 545           | Mizoram                          | 9 000               |
| Chandigarh                       | 2 000               | Nagaland                         | 63 000              |
| Chhatisgarh                      | 1 078 400           | Orissa                           | 2 090 000           |
| Dadra & Nagar Haveli             | 6 000               | Pondicherry                      | 21 390              |
| Daman & Diu                      | 1 000               | Punjab                           | 4 020 700           |
| Delhi                            | 39 070              | Rajasthan                        | 5 611 874           |
| Goa                              | 22 372              | Sikkim                           | 16 000              |
| Gujarat                          | 3 092 400           | Tamil Nadu                       | 3 018 839           |
| Haryana                          | 2 888 000           | Tripura                          | 35 000              |
| Himachal Pradesh                 | 101 897             | Uttar Pradesh                    | 12 469 624          |
| Jammu & Kashmir                  | 310 870             | Uttaranchal                      | 332 502             |
| Jharkhand                        | 185 455             | West Bengal                      | 1 911 000           |
| Karnataka                        | 2 491 871           | India total                      | 57 286 407          |
| Kerala                           | 380 043             |                                  |                     |
| Lakshadweep                      | 1 000               |                                  |                     |

**TABLE A13**  
**Irrigated area per district in Andhra Pradesh (India)**

| District      | Irrigated area (ha) | District                    | Irrigated area (ha) |
|---------------|---------------------|-----------------------------|---------------------|
| Adilabad      | 77 024              | Nalgonda                    | 211 687             |
| Anantapur     | 138 405             | Nellore                     | 231 849             |
| Chittoor      | 172 648             | Nizamabad                   | 169 805             |
| Cuddapah      | 133 104             | Prakasam                    | 184 162             |
| East Godavari | 282 408             | Rangareddi                  | 75 866              |
| Guntur        | 372 503             | Srikakulam                  | 181 538             |
| Hyderabad     | 172                 | Vishakhapatnam              | 112 621             |
| Karimnagar    | 256 184             | Vizianagaram                | 143 599             |
| Khammam       | 196 092             | Warangal                    | 287 163             |
| Krishna       | 324 531             | West Godavari               | 368 068             |
| Kurnool       | 168 374             | <b>Andhra Pradesh total</b> | <b>4 384 124</b>    |
| Mahbubnagar   | 157 186             |                             |                     |
| Medak         | 139 135             |                             |                     |

**TABLE A14**  
**Irrigated area per district in Arunachal Pradesh (India)**

| District        | Irrigated area (ha) | District                       | Irrigated area (ha) |
|-----------------|---------------------|--------------------------------|---------------------|
| Changlang       | 2 972               | Tirap                          | 1 352               |
| Dibang Valley   | 2 951               | Upper Siang                    | 2 247               |
| East Kameng     | 1 418               | Upper Subansiri                | 2 324               |
| East Siang      | 8 610               | West Kameng                    | 1 086               |
| Lohit           | 3 263               | West Siang                     | 3 197               |
| Lower Subansiri | 5 718               | <b>Arunachal Pradesh total</b> | <b>39 043</b>       |
| Papumpare       | 2 431               |                                |                     |
| Tawang          | 1 474               |                                |                     |

**TABLE A15**  
**Irrigated area per district in Assam (India)**

| District      | Irrigated area (ha) | District           | Irrigated area (ha) |
|---------------|---------------------|--------------------|---------------------|
| Barpeta       | 56 068              | Karimganj          | 5 021               |
| Bongaigaon    | 6 136               | Kokrajhar          | 24 233              |
| Cachar        | 4 836               | Lakhimpur          | 6 878               |
| Darrang       | 43 339              | Marigaon           | 14 993              |
| Dhemaji       | 8 158               | Nagaon             | 82 790              |
| Dhubri        | 13 744              | Nalbari            | 16 080              |
| Dibrugarh     | 11 453              | North Cacha Hills  | 4 687               |
| Goalpara      | 10 973              | Sibsagar           | 15 648              |
| Golaghat      | 11 245              | Sonitpur           | 50 306              |
| Hajlakandi    | 3 521               | Tinsukia           | 4 879               |
| Jorhat        | 10 041              | <b>Assam total</b> | <b>458 071</b>      |
| Kamrup        | 32 776              |                    |                     |
| Karbi Anglong | 20 266              |                    |                     |

**TABLE A16**  
**Irrigated area per district in Bihar (India)**

| District    | Irrigated area (ha) | District                 | Irrigated area (ha) |
|-------------|---------------------|--------------------------|---------------------|
| Araria      | 65 272              | Muzaffarpur              | 91 174              |
| Aurangabad  | 169 914             | Nalanda                  | 118 111             |
| Banka       | 98 426              | Nawada                   | 76 669              |
| Begusarai   | 96 354              | Paschim (West) Champaran | 105 678             |
| Bhabhua     | 123 291             | Patna                    | 126 400             |
| Bhagalpur   | 41 443              | Purbi (East) Champaran   | 166 806             |
| Bhojpur     | 164 734             | Purnia                   | 102 570             |
| Buxar       | 129 508             | Rhotas                   | 269 376             |
| Darbhanga   | 63 200              | Saharsa                  | 53 875              |
| Gaya        | 150 229             | Samastipur               | 104 642             |
| Gopalganj   | 109 823             | Saran                    | 110 859             |
| Jahanabad   | 91 174              | Sheikhpura               | 34 812              |
| Jamui       | 20 203              | Sheohar                  | 11 915              |
| Katihar     | 87 029              | Sitamadhi                | 44 033              |
| Khagaria    | 68 380              | Siwan                    | 120 000             |
| Kishanganj  | 21 757              | Supaul                   | 76 669              |
| Luckeesarai | 37 505              | Vaishali                 | 74 597              |
| Madhepura   | 73 560              | <b>Bihar total</b>       | <b>3 439 545</b>    |
| Madhubani   | 108 787             |                          |                     |
| Munger      | 30 771              |                          |                     |

**TABLE A17**  
**Irrigated area per district in Chhatisgarh (India)**

| District        | Irrigated area (ha) | District                 | Irrigated area (ha) |
|-----------------|---------------------|--------------------------|---------------------|
| Bastar          | 5 200               | Korba                    | 5 600               |
| Bilaspur        | 128 200             | Koriya                   | 5 600               |
| Dantewada       | 5 000               | Mahasamund               | 57 600              |
| Dhamtari        | 95 900              | Raigarh                  | 35 000              |
| Durg            | 194 400             | Raipur                   | 286 300             |
| Janjgeer-Champa | 120 000             | Rajnandgawn              | 59 000              |
| Jashpur         | 7 300               | Surguja                  | 28 700              |
| Kanker          | 16 300              | <b>Chhatisgarh total</b> | <b>1 078 400</b>    |
| Kawardha        | 28 300              |                          |                     |

**TABLE A18**  
**Irrigated area per district in Gujarat (India)**

| District    | Irrigated area (ha) | District      | Irrigated area (ha) |
|-------------|---------------------|---------------|---------------------|
| Ahmadabad   | 173 400             | Kachchh       | 127 700             |
| Amreli      | 82 300              | Kheda         | 308 300             |
| Banaskantha | 361 700             | Mahesana      | 398 100             |
| Bharuch     | 91 700              | Panchmahals   | 120 700             |
| Bhavnagar   | 165 100             | Rajkot        | 148 500             |
| Gandhinagar | 29 600              | Sabarkantha   | 191 500             |
| Jamnagar    | 85 500              | Surat         | 210 900             |
| Junagadh    | 152 400             | Surendranagar | 127 300             |

| District  | Irrigated area (ha) |
|-----------|---------------------|
| The Dangs | 400                 |
| Vadodara  | 188 100             |
| Valsad    | 129 200             |

| District      | Irrigated area (ha) |
|---------------|---------------------|
| Gujarat total | 3 092 400           |

TABLE A19  
**Irrigated area per district in Haryana (India)**

| District    | Irrigated area (ha) |
|-------------|---------------------|
| Ambala      | 95 000              |
| Bhiwani     | 208 000             |
| Faridabad   | 116 000             |
| Fatehabad   | 208 000             |
| Gurgaon     | 76 000              |
| Hisar       | 271 000             |
| Jhajjar     | 111 000             |
| Jind        | 220 000             |
| Kaithal     | 196 000             |
| Karnal      | 207 000             |
| Kurukshetra | 147 000             |

| District      | Irrigated area (ha) |
|---------------|---------------------|
| Mahendragarh  | 119 000             |
| Panchkula     | 13 000              |
| Panipat       | 97 000              |
| Rewari        | 84 000              |
| Rohtak        | 110 000             |
| Sirsa         | 333 000             |
| Sonipat       | 174 000             |
| Yamunanagar   | 103 000             |
| Haryana total | 2 888 000           |

TABLE A20  
**Irrigated area per district in Himachal Pradesh (India)**

| District      | Irrigated area (ha) |
|---------------|---------------------|
| Bilaspur      | 3 164               |
| Chamba        | 6 165               |
| Hamirpur      | 1 790               |
| Kangra        | 32 194              |
| Kinnaur       | 4 690               |
| Kullu         | 2 510               |
| Lahul & Spiti | 3 386               |

| District               | Irrigated area (ha) |
|------------------------|---------------------|
| Mandi                  | 13 138              |
| Shimla                 | 3 086               |
| Sirmaur                | 14 405              |
| Solan                  | 9 530               |
| Una                    | 7 839               |
| Himachal Pradesh total | 101 897             |

TABLE A21  
**Irrigated area per district in Jammu and Kashmir (India)**

| District | Irrigated area (ha) |
|----------|---------------------|
| Anantnag | 49 620              |
| Bagdam   | 31 760              |
| Baramula | 40 150              |
| Doda     | 7 410               |
| Jammu    | 54 900              |
| Kargil   | 9 470               |
| Kathua   | 21 980              |
| Kupwara  | 19 260              |
| Leh      | 8 480               |

| District              | Irrigated area (ha) |
|-----------------------|---------------------|
| Mirpur                | 5 000               |
| Poonch                | 3 840               |
| Pulwama               | 34 120              |
| Rajouri               | 7 320               |
| Srinagar              | 17 210              |
| Udhampur              | 5 350               |
| Jammu & Kashmir total | 315 870             |

TABLE A22  
**Irrigated area per district in Jharkhand (India)**

| District | Irrigated area (ha) |
|----------|---------------------|
| Bokaro   | 2 072               |
| Chatra   | 5 180               |

| District | Irrigated area (ha) |
|----------|---------------------|
| Deoghar  | 7 252               |
| Dhanbad  | 1 036               |

| District   | Irrigated area (ha) |
|------------|---------------------|
| Dumka      | 12 433              |
| Garhwa     | 21 757              |
| Giridih    | 8 289               |
| Godda      | 9 325               |
| Gumla      | 7 252               |
| Hazaribag  | 17 613              |
| Kodarma    | 2 072               |
| Lohardagga | 2 072               |
| Pakur      | 12 433              |

| District                   | Irrigated area (ha) |
|----------------------------|---------------------|
| Palamu                     | 39 370              |
| Pashchimi (West) Singhbhum | 10 361              |
| Purbi (East) Singhbhum     | 2 072               |
| Ranchi                     | 19 685              |
| Sahibganj                  | 5 180               |
| <b>Jharkhand total</b>     | <b>185 455</b>      |

TABLE A23  
**Irrigated area per district in Karnataka (India)**

| District         | Irrigated area (ha) |
|------------------|---------------------|
| Bagalkot         | 189 609             |
| Bangalore Rural  | 57 888              |
| Bangalore Urban  | 20 044              |
| Belgaum          | 326 225             |
| Bellary          | 151 796             |
| Bidar            | 37 155              |
| Bijapur          | 121 238             |
| Chamaraja Nagar  | 44 017              |
| Chikmagalur      | 26 140              |
| Chitradurga      | 54 182              |
| Dakshina Kannada | 66 015              |
| Davangere        | 128 815             |
| Dharwad          | 39 652              |
| Gadag            | 65 764              |
| Gulbarga         | 165 813             |

| District               | Irrigated area (ha) |
|------------------------|---------------------|
| Hassan                 | 77 847              |
| Haveri                 | 73 699              |
| Kodagu                 | 3 094               |
| Kolar                  | 81 887              |
| Koppal                 | 97 368              |
| Mandya                 | 116 901             |
| Mysore                 | 120 620             |
| Raichur                | 125 790             |
| Shimoga                | 128 733             |
| Tumkur                 | 112 235             |
| Udupi                  | 34 250              |
| Uttara Kannada         | 25 094              |
| <b>Karnataka total</b> | <b>2 491 871</b>    |

TABLE A24  
**Irrigated area per district in Kerala (India)**

| District  | Irrigated area (ha) |
|-----------|---------------------|
| Alappuzha | 42 275              |
| Ernakulam | 34 195              |
| Idukki    | 12 635              |
| Kannur    | 24 550              |
| Kasaragod | 43 813              |
| Kollam    | 1 350               |
| Kottayam  | 15 653              |
| Kozhikode | 5 997               |

| District            | Irrigated area (ha) |
|---------------------|---------------------|
| Malappuram          | 33 468              |
| Palakkad            | 65 057              |
| Pathanamthitta      | 6 849               |
| Thiruvananthapuram  | 3 833               |
| Thrissur            | 86 728              |
| Wayanad             | 3 640               |
| <b>Kerala total</b> | <b>380 043</b>      |

TABLE A25  
**Irrigated area per district in Madhya Pradesh (India)**

| District | Irrigated area (ha) |
|----------|---------------------|
| Badwani  | 77 993              |
| Balaghat | 121 442             |
| Betul    | 104 503             |

| District   | Irrigated area (ha) |
|------------|---------------------|
| Bhind      | 125 382             |
| Bhopal     | 71 900              |
| Chhatrapur | 169 515             |



| District    | Irrigated area (ha) | District                    | Irrigated area (ha) |
|-------------|---------------------|-----------------------------|---------------------|
| Chindwara   | 120 046             | Raisen                      | 147 732             |
| Damoh       | 81 336              | Rajgarh                     | 169 280             |
| Datia       | 81 391              | Ratlam                      | 145 549             |
| Dewas       | 158 405             | Rewa                        | 87 306              |
| Dhar        | 232 642             | Sagar                       | 168 439             |
| Dindori     | 951                 | Satna                       | 106 516             |
| East Nimar  | 151 434             | Sehore                      | 171 530             |
| Guna        | 154 156             | Seoni                       | 73 316              |
| Gwalior     | 123 940             | Shahdol                     | 17 871              |
| Harda       | 127 238             | Shajapur                    | 215 922             |
| Hoshangabad | 232 517             | Sheopur Kalan               | 98 385              |
| Indore      | 160 059             | Shivpuri                    | 166 756             |
| Jabalpur    | 92 731              | Sidhi                       | 50 189              |
| Jhabua      | 80 835              | Tikamgarh                   | 177 972             |
| Katni       | 45 736              | Ujjain                      | 261 259             |
| Mandla      | 13 591              | Umaria                      | 16 301              |
| Mandsaur    | 155 833             | Vidisha                     | 143 913             |
| Morena      | 156 170             | West Nimar                  | 175 747             |
| Narsimhapur | 157 860             | <b>Madhya Pradesh total</b> | <b>5 514 979</b>    |
| Neemach     | 73 071              |                             |                     |
| Panna       | 50 319              |                             |                     |

TABLE A26  
Irrigated area per district in Maharashtra (India)

| District    | Irrigated area (ha) | District                 | Irrigated area (ha) |
|-------------|---------------------|--------------------------|---------------------|
| Ahmadnagar  | 305 300             | Nanded                   | 60 000              |
| Akola       | 29 200              | Nasik                    | 195 400             |
| Amravati    | 63 300              | Osmanabad                | 107 200             |
| Aurangabad  | 152 500             | Parbhani                 | 90 100              |
| Beed        | 210 500             | Pune                     | 255 100             |
| Bhandara    | 193 500             | Raigad                   | 12 100              |
| Buldana     | 39 500              | Ratnagiri                | 2 500               |
| Chandrapur  | 106 300             | Sangli                   | 132 800             |
| Dhule       | 96 900              | Satara                   | 176 500             |
| Garhchiroli | 55 000              | Sindhudurg               | 36 100              |
| Jalgaon     | 155 400             | Solapur                  | 232 000             |
| Jalna       | 72 700              | Thane                    | 16 700              |
| Kolhapur    | 115 700             | Wardha                   | 25 700              |
| Latur       | 38 700              | Yavatmal                 | 50 700              |
| Mumbai      | 0                   | <b>Maharashtra total</b> | <b>3 140 200</b>    |
| Nagpur      | 112 800             |                          |                     |

TABLE A27  
Irrigated area per district in Manipur (India)

| District      | Irrigated area (ha) | District   | Irrigated area (ha) |
|---------------|---------------------|------------|---------------------|
| Bishnupur     | 12 271              | Imphal     | 24 821              |
| Chandel       | 3 010               | Senapati   | 8 827               |
| Churachandpur | 1 561               | Tamenglong | 980                 |

| District | Irrigated area (ha) |
|----------|---------------------|
| Thoubal  | 6 454               |
| Ukhul    | 7 077               |

| District      | Irrigated area (ha) |
|---------------|---------------------|
| Manipur total | 65 000              |

TABLE A28  
**Irrigated area per district in Meghalaya (India)**

| District         | Irrigated area (ha) |
|------------------|---------------------|
| East Garo Hills  | 6 931               |
| East Khasi Hills | 8 261               |
| Jaintia Hills    | 8 760               |
| West Garo Hills  | 15 542              |

| District         | Irrigated area (ha) |
|------------------|---------------------|
| West Khasi Hills | 5 551               |
| Meghalaya total  | 45 045              |

TABLE A29  
**Irrigated area per district in Nagaland (India)**

| District   | Irrigated area (ha) |
|------------|---------------------|
| Kohima     | 15 852              |
| Mokokchung | 5 230               |
| Mon        | 4 257               |
| Phek       | 15 274              |
| Tuesang    | 10 076              |

| District       | Irrigated area (ha) |
|----------------|---------------------|
| Wokha          | 9 466               |
| Zunheboto      | 2 845               |
| Nagaland total | 63 000              |

TABLE A30  
**Irrigated area per district in Orissa (India)**

| District      | Irrigated area (ha) |
|---------------|---------------------|
| Angul         | 49 425              |
| Balasore      | 85 426              |
| Bargarh       | 127 521             |
| Bhadrak       | 100 148             |
| Bolangir      | 61 048              |
| Boudh         | 33 298              |
| Cuttack       | 125 308             |
| Deogarh       | 14 134              |
| Dhenkanal     | 49 916              |
| Gajapati      | 27 925              |
| Ganjam        | 234 069             |
| Jagatsinghpur | 39 548              |
| Jajpur        | 92 186              |
| Jharsuguda    | 11 351              |
| Kalahandi     | 101 448             |
| Kendrapara    | 92 107              |

| District     | Irrigated area (ha) |
|--------------|---------------------|
| Keonjhar     | 73 540              |
| Khurda       | 70 617              |
| Koraput      | 81 739              |
| Malkangiri   | 63 471              |
| Mayurbhanj   | 81 730              |
| Nawapara     | 33 482              |
| Nawrangpur   | 21 455              |
| Nayagarh     | 45 202              |
| Phulbani     | 20 595              |
| Puri         | 119 146             |
| Rayagada     | 46 844              |
| Sambalpur    | 53 884              |
| Sonepur      | 65 648              |
| Sundargarh   | 67 790              |
| Orissa total | 2 090 000           |

TABLE A31  
**Irrigated area per district in Pondicherry (India)**

| District    | Irrigated area (ha) |
|-------------|---------------------|
| Karaikal    | 7 847               |
| Mahe        | 45                  |
| Pondicherry | 13 135              |

|                          |               |
|--------------------------|---------------|
| Yanam                    | 363           |
| <b>Pondicherry total</b> | <b>21 390</b> |

**TABLE A32**  
**Irrigated area per district in Punjab (India)**

| District        | Irrigated area (ha) | District            | Irrigated area (ha) |
|-----------------|---------------------|---------------------|---------------------|
| Amritsar        | 439 500             | Mansa               | 199 000             |
| Bathinda        | 294 900             | Moga                | 197 400             |
| Fairkot         | 128 800             | Muktsar             | 217 500             |
| Fatehgarh Sahib | 102 600             | Nawanshahr          | 83 400              |
| Firozpur        | 470 900             | Patiala             | 289 700             |
| Gurdaspur       | 217 500             | Rupnagar            | 93 100              |
| Hoshiarpur      | 188 300             | Sangrur             | 422 500             |
| Jalandhar       | 236 700             | <b>Punjab total</b> | <b>4 020 700</b>    |
| Kapurthala      | 134 700             |                     |                     |
| Ludhiana        | 304 200             |                     |                     |

**TABLE A33**  
**Irrigated area per district in Rajasthan (India)**

| District     | Irrigated area (ha) | District               | Irrigated area (ha) |
|--------------|---------------------|------------------------|---------------------|
| Ajmer        | 84 470              | Jaisalmer              | 70 927              |
| Alwar        | 401 196             | Jalor                  | 226 842             |
| Banswara     | 74 074              | Jhalawar               | 180 666             |
| Baran        | 225 601             | Jhunjhun               | 213 194             |
| Barmer       | 103 615             | Jodhpur                | 142 485             |
| Bharatpur    | 234 963             | Karauli                | 93 154              |
| Bhilwara     | 113 432             | Kota                   | 211 831             |
| Bikaner      | 175 562             | Nagaur                 | 259 170             |
| Bundi        | 187 053             | Pali                   | 156 296             |
| Chittaurgarh | 162 491             | Rajsamand              | 20 666              |
| Churu        | 60 410              | Sawai Madhopur         | 155 614             |
| Daulpur      | 94 483              | Sikar                  | 219 204             |
| Dausa        | 158 700             | Sirohi                 | 48 542              |
| Dungarpur    | 21 654              | Tonk                   | 189 189             |
| Gangangar    | 579 583             | Udaipur                | 47 944              |
| Hanumangarh  | 339 631             | <b>Rajasthan total</b> | <b>5 611 874</b>    |
| Jaipur       | 359 232             |                        |                     |

**TABLE A34**  
**Irrigated area per district in Tamil Nadu (India)**

| District     | Irrigated area (ha) | District      | Irrigated area (ha) |
|--------------|---------------------|---------------|---------------------|
| Chennai      | 0                   | Kanniyakumari | 29 071              |
| Coimbatore   | 163 615             | Karur         | 48 451              |
| Cuddalore    | 146 407             | Madurai       | 108 067             |
| Dharamapuri  | 130 303             | Nagapattinam  | 127 128             |
| Dindigul     | 106 622             | Namakkal      | 65 511              |
| Erode        | 164 155             | Nilgiris      | 462                 |
| Kancheepuram | 147 946             | Perambalur    | 67 166              |

| District        | Irrigated area (ha) | District                | Irrigated area (ha) |
|-----------------|---------------------|-------------------------|---------------------|
| Pudukkottai     | 103 215             | Tiruvannamalai          | 162 266             |
| Ramanathapuram  | 72 779              | Tiruvarur               | 145 176             |
| Salem           | 111 566             | Toothukudi              | 42 516              |
| Sivagangai      | 92 157              | Vellore                 | 125 275             |
| Thanjavur       | 173 161             | Villupuram              | 225 885             |
| Theni           | 58 485              | Virudhunagar            | 64 115              |
| Tiruchirappalli | 102 186             | <b>Tamil Nadu total</b> | <b>3 018 839</b>    |
| Tirunelveli     | 114 797             |                         |                     |
| Tiruvallur      | 120 356             |                         |                     |

TABLE A35  
**Irrigated area per district in Uttaranchal (India)**

| District  | Irrigated area (ha) | District                 | Irrigated area (ha) |
|-----------|---------------------|--------------------------|---------------------|
| Almora    | 8 000               | Pithoragarh              | 2 000               |
| Bageshwar | 4 000               | Rudra Prayag             | 5 000               |
| Chamoli   | 3 000               | Tehri-Garhwal            | 9 000               |
| Champawat | 2 000               | Udhamsingh Nagar         | 115 000             |
| Dehra Dun | 34 000              | Uttarkashi               | 6 000               |
| Hardwar   | 101 000             | <b>Uttaranchal total</b> | <b>332 502</b>      |
| Nainital  | 36 000              |                          |                     |
| Pauri     | 7 502               |                          |                     |

TABLE A36  
**Irrigated area per district in Uttar Pradesh (India)**

| District       | Irrigated area (ha) | District             | Irrigated area (ha) |
|----------------|---------------------|----------------------|---------------------|
| Agra           | 233 632             | Farrukhabad          | 126 126             |
| Aligarh        | 278 568             | Fatehpur             | 178 291             |
| Allahabad      | 266 096             | Firozabad            | 163 846             |
| Ambedkar Nagar | 162 893             | Gautam Budh Nagar    | 124 908             |
| Auraiya        | 117 465             | Gazipur              | 211 648             |
| Azamgarh       | 271 858             | Ghaziabad            | 140 682             |
| Baghpat        | 104 550             | Gonda                | 169 876             |
| Bahraich       | 87 669              | Gorakhpur            | 195 049             |
| Ballia         | 160 901             | Hamirpur             | 98 998              |
| Balrampur      | 80 813              | Hardoi               | 322 767             |
| Banda          | 124 716             | Hathras              | 142 587             |
| Barabanki      | 213 078             | Jalaun               | 155 658             |
| Bareilly       | 302 050             | Jaunpur              | 251 540             |
| Basti          | 131 597             | Jhansi               | 183 437             |
| Bijnor         | 285 189             | Jyotiba Phule Nagar  | 106 506             |
| Budaun         | 377 752             | Kanauj               | 129 224             |
| Bulandshahar   | 256 787             | Kandur Nagar (Urban) | 142 433             |
| Chandauli      | 123 117             | Kanpur Dehat (Rural) | 149 222             |
| Chitrakut      | 41 117              | Kaushambi            | 71 465              |
| Deoria         | 156 352             | Kheri                | 341 251             |
| Etah           | 278 259             | Kushinagar           | 150 981             |
| Etawah         | 117 529             | Lalitpur             | 184 773             |
| Faizabad       | 145 318             | Lucknow              | 121 844             |

| District      | Irrigated area (ha) | District                   | Irrigated area (ha) |
|---------------|---------------------|----------------------------|---------------------|
| Maharajganj   | 158 513             | Saharanpur                 | 251 374             |
| Mahoba        | 94 279              | Saint Kabir Nagar          | 91 537              |
| Mainpuri      | 175 802             | Sant Ravidas Nagar         | 57 687              |
| Mathura       | 259 707             | Shahjahanpur               | 327 279             |
| Mau           | 115 936             | Shravasti                  | 71 370              |
| Meerut        | 188 042             | Siddharthnagar             | 138 350             |
| Mirzapur      | 134 462             | Sitapur                    | 294 640             |
| Moradabad     | 233 940             | Sonbhadra                  | 49 211              |
| Muzaffarnagar | 299 547             | Sultanpur                  | 219 600             |
| Partapgarh    | 176 460             | Unnao                      | 260 967             |
| Pilibhit      | 190 836             | Varanasi                   | 89 794              |
| Raibareli     | 239 203             | <b>Uttar Pradesh total</b> | <b>12 469 624</b>   |
| Rampur        | 170 670             |                            |                     |

TABLE A37  
Irrigated area per district in West Bengal (India)

| District   | Irrigated area (ha) | District                 | Irrigated area (ha) |
|------------|---------------------|--------------------------|---------------------|
| Bankura    | 210 750             | Midnapur                 | 293 320             |
| Birbhum    | 103 321             | Murshidabad              | 197 666             |
| Burdwan    | 239 107             | Nadia                    | 162 500             |
| Calcutta   | 0                   | North 24 Panganas        | 98 233              |
| Coochbehar | 24 109              | North Dinajpur           | 64 833              |
| Darjiling  | 10 148              | Purulia                  | 35 473              |
| Hooghly    | 144 661             | South 24 Panganas        | 34 850              |
| Howrah     | 48 270              | South Dinajpur           | 56 993              |
| Jalpaiguri | 50 208              | <b>West Bengal total</b> | <b>1 911 000</b>    |
| Malda      | 136 557             |                          |                     |

TABLE A38  
Irrigated areas per river basin in Indonesia

| Basin                | Island     | Irrigated area (ha) | Basin              | Island     | Irrigated area (ha) |
|----------------------|------------|---------------------|--------------------|------------|---------------------|
| Bali                 | Bali       | 87 000              | Madura             | Java       | 81 000              |
| Flores               | Flores     | 10 000              | Pekalen – Sampean  | Java       | 354 000             |
| Digul – Bikuma       | Irian Jaya | 1 000               | Pemail – Comal     | Java       | 93 000              |
| Eilanden – Edera     | Irian Jaya | 2 000               | Progo – Opak – Oyo | Java       | 113 000             |
| Memberamo            | Irian Jaya | 1 000               | Serayu             | Java       | 173 000             |
| Wasi – Kais – Omba   | Irian Jaya | 1 000               | Barito             | Kalimantan | 16 000              |
| Bengawan – Solo      | Java       | 376 000             | Berau – Kelai      | Kalimantan | 3 000               |
| Cimanuk              | Java       | 264 000             | Cengal – Batulicin | Kalimantan | 7 000               |
| Cisadane – Cillwung  | Java       | 160 000             | Kahayan            | Kalimantan | 1 000               |
| Cisadeg – Cikuningan | Java       | 90 000              | Kapuas             | Kalimantan | 6 000               |
| Citanduy             | Java       | 121 000             | Karangan           | Kalimantan | 4 000               |
| Citarum              | Java       | 415 000             | Kayan              | Kalimantan | 4 000               |
| Ciujung – Ciliman    | Java       | 66 000              | Mahakam            | Kalimantan | 6 000               |
| Ciwulan              | Java       | 50 000              | Mempawah – Sambas  | Kalimantan | 3 000               |
| Iratun – Seluna      | Java       | 286 000             | Mendawai           | Kalimantan | 1 000               |
| K. Brantas           | Java       | 265 000             | Pawan              | Kalimantan | 3 000               |

| Basin                       | Island     | Irrigated area (ha) | Basin                       | Island  | Irrigated area (ha) |
|-----------------------------|------------|---------------------|-----------------------------|---------|---------------------|
| Pembuang                    | Kalimantan | 1 000               | Bt. Gladis Bt. Toru – Natas | Sumatra | 28 000              |
| Sampit                      | Kalimantan | 0                   | Indragki                    | Sumatra | 35 000              |
| Sesayao                     | Kalimantan | 4 000               | Ipuh – Teramang – Majunto   | Sumatra | 13 000              |
| Lombok                      | Lombok     | 90 000              | Jambu Aye                   | Sumatra | 23 000              |
| Halmahera                   | Maluku     | 5 000               | Kampar                      | Sumatra | 27 000              |
| Seram – Buru – Sula         | Maluku     | 7 000               | Kanal – Alas – Talo         | Sumatra | 22 000              |
| Wetar – Aru                 | Maluku     | 3 000               | Krueng Aceh                 | Sumatra | 11 000              |
| Bolango – Bone              | Sulawesi   | 17 000              | Lais – Bintunan – Ketahun   | Sumatra | 18 000              |
| Bongka – Malik              | Sulawesi   | 11 000              | Mesuji – Tl. Bawang         | Sumatra | 74 000              |
| Jeneberang                  | Sulawesi   | 36 000              | Meureudu – Ureun            | Sumatra | 4 000               |
| Kaluku – Karama             | Sulawesi   | 41 000              | Musi                        | Sumatra | 33 000              |
| Laa – Tambalako             | Sulawesi   | 11 000              | Pase Peusangan              | Sumatra | 7 000               |
| Lambunu – Bual              | Sulawesi   | 14 000              | Rokan                       | Sumatra | 28 000              |
| Lasolo – Sampara            | Sulawesi   | 14 000              | Semangka                    | Sumatra | 32 000              |
| Lombok – Mantawa            | Sulawesi   | 9 000               | Seputih – Sekampung         | Sumatra | 70 000              |
| Paguyaman – Randangan       | Sulawesi   | 21 000              | Siak                        | Sumatra | 5 000               |
| Paleang – Roraya            | Sulawesi   | 8 000               | Silaul                      | Sumatra | 47 000              |
| Palu – Lariang              | Sulawesi   | 19 000              | Singkil                     | Sumatra | 51 000              |
| Parigi – Poso               | Sulawesi   | 10 000              | Sinkulat – Tripa            | Sumatra | 29 000              |
| Pompangan – Kalaena – Laron | Sulawesi   | 67 000              | Sugihan                     | Sumatra | 8 000               |
| Ranowangko – Tondano        | Sulawesi   | 25 000              | Tamiyng – Langsa            | Sumatra | 12 000              |
| Sadang                      | Sulawesi   | 35 000              | Wampu – Besitang            | Sumatra | 26 000              |
| Towari – Susua              | Sulawesi   | 6 000               | Woyla – Lambesi             | Sumatra | 14 000              |
| Walanae – Cenrane           | Sulawesi   | 32 000              | Sumba                       | Sumba   | 11 000              |
| Asahan                      | Sumatra    | 35 000              | Sumbawa                     | Sumbawa | 80 000              |
| Bahbolon                    | Sumatra    | 11 000              | Timor Barat                 | Timor   | 17 000              |
| Barumun – Kualuh            | Sumatra    | 50 000              | Indonesia total             |         | 4 459 000           |
| Batangari                   | Sumatra    | 57 000              |                             |         |                     |
| Baturusa – Cerucut          | Sumatra    | 13 000              |                             |         |                     |
| Belawan – Belumai – Ular    | Sumatra    | 19 000              |                             |         |                     |

TABLE A39  
Irrigated area per governorate in Iraq

| Province     | Irrigated area (ha) | Province    | Irrigated area (ha) |
|--------------|---------------------|-------------|---------------------|
| Al-Anbar     | 102 750             | Dahoak      | 14 123              |
| Al-Basrah    | 59 250              | Diala       | 420 701             |
| Al-Muthanna  | 100 731             | Kerbala     | 31 500              |
| Al-Qadisiyah | 355 622             | Misan       | 238 489             |
| An-Najaf     | 111 869             | Nineweh     | 71 250              |
| Arbil        | 5 119               | Salah Eldin | 189 750             |
| At-Tameem    | 176 500             | Sulaimania  | 35 002              |
| Babil        | 387 190             | Wasit       | 614 658             |
| Baghdad      | 262 032             | Iraq total  | 3 525 000           |
| Thegar       | 348 463             |             |                     |

TABLE A40

**Irrigated area per ostan in the Islamic Republic of Iran**

| Ostan                  | Irrigated area (ha) | Ostan                             | Irrigated area (ha) |
|------------------------|---------------------|-----------------------------------|---------------------|
| Ardebil                | 228 900             | Kohgiluyeh & Boyer Ahmad          | 48 200              |
| Bushehr                | 40 800              | Kordestan                         | 143 100             |
| Chaharmahal & Bakhtiar | 104 400             | Lorestan                          | 188 600             |
| East Azarbaijejan      | 425 700             | Markazi                           | 275 400             |
| Esfahan                | 310 400             | Mazandaran                        | 390 400             |
| Fars                   | 641 100             | Semnan                            | 111 700             |
| Gilan                  | 169 800             | Sistan & Baluchestan              | 187 800             |
| Hamadan                | 289 000             | Tehran                            | 198 400             |
| Horasan                | 1 144 600           | West Azarbaijejan                 | 418 400             |
| Hormozgan              | 72 300              | Yazd                              | 85 300              |
| Ilam                   | 39 800              | Zanjan                            | 350 800             |
| Kerman                 | 355 700             | Islamic Republic of Iran<br>total | 6 913 800           |
| Kermanshah             | 119 800             |                                   |                     |
| Khuzestan              | 573 400             |                                   |                     |

TABLE A41

**Irrigated area per natural region, subdistrict and district in Israel**

| Natural region                                   | Subdistrict        | District           | Irrigated area (ha) |
|--|--------------------|--------------------|---------------------|
| Petah Tiqwa Region                               | Petah Tiqwa        | Central            | 2 867               |
| Southern Sharon                                  | Petah Tiqwa        | Central            | 4 460               |
| Lod Region                                       | Ramla              | Central            | 6 363               |
| Rehovot Region                                   | Rehovot            | Central            | 7 427               |
| Eastern Sharon                                   | Sharon             | Central            | 3 456               |
| Western Sharon                                   | Sharon             | Central            | 8 646               |
| Rishon Le Ziyon & Tel Aviv Regions               | Rehovot & Tel Aviv | Central & Tel Aviv | 3 362               |
| Carmel Coast                                     | Hadera             | Haifa              | 1 417               |
| Hadera Region                                    | Hadera             | Haifa              | 5 182               |
| Zikhron Ya'akov, Haifa & Alexander Mountain Reg. | Haifa & Hadera     | Haifa              | 5 729               |
| Judean Foothills                                 | Jerusalem          | Jerusalem          | 3 821               |
| Judean Mountains                                 | Jerusalem          | Jerusalem          | 667                 |
| Nahariyya & Akko Regions                         | Akko               | Northern           | 4 993               |
| Shefar'am & Karmi'el Regions                     | Akko               | Northern           | 5 785               |
| Yehi'am & Elon Regions                           | Akko               | Northern           | 3 044               |
| Golan  | Golan              | Northern           | 7 198               |
| Kinnerot   | Kinneret           | Northern           | 3 578               |
| Sea of Galilee                                   | Kinneret           | Northern           | 0                   |
| Eastern Lower Galilee & Kokhav Plateau Regions   | Kinneret & Zefat   | Northern           | 6 608               |
| Bet Shean Basin & Harod Valley                   | Zefat              | Northern           | 11 255              |
| Eastern Upper Galilee                            | Zefat              | Northern           | 2 133               |
| Hula Basin & Hazor Regions                       | Zefat              | Northern           | 10 537              |
| Menashe Plateau                                  | Zefat              | Northern           | 702                 |
| Nazareth-Tir'an Mountains                        | Zefat              | Northern           | 2 909               |
| Yizre'el & Yoqne'am Regions                      | Zefat              | Northern           | 11 030              |
| Ashdod & Ashqelon Regions                        | Ashqelon           | Southern           | 10 678              |
| Lakhish Region                                   | Ashqelon           | Southern           | 4 558               |
| Mal'akhi Region                                  | Ashqelon           | Southern           | 13 242              |

| Natural region                                | Subdistrict | District | Irrigated area (ha) |
|---|-------------|----------|---------------------|
| Arava, Dead Sea & Southern Negev Mts. Regions | Be'er Sheva | Southern | 3 688               |
| Be'er Sheva & Northern Negev Mountain Regions | Be'er Sheva | Southern | 2 941               |
| Besor Region                                  | Be'er Sheva | Southern | 17 581              |
| Dead Sea                                      | Be'er Sheva | Southern | 0                   |
| Gerar Region                                  | Be'er Sheva | Southern | 7 550               |
| Settlements West Bank                         |             |          | 2 912               |
| Settlements Gaza Strip                        |             |          | 280                 |
| <b>Israel total</b>                           |             |          | <b>186 600</b>      |

TABLE A42  
**Irrigated area per province and prefecture in Japan**

| Prefecture | Province        | Irrigated area (ha) | Prefecture         | Province       | Irrigated area (ha) |
|------------|-----------------|---------------------|--------------------|----------------|---------------------|
| Hiroshima  | Chugoku         | 56 480              |                    | <b>Kinki</b>   | 220 000             |
| Okajama    | Chugoku         | 68 605              | Fukuoka            | Kyushu         | 81 357              |
| Shimane    | Chugoku         | 38 537              | Kagoshima          | Kyushu         | 63 364              |
| Tottori    | Chugoku         | 31 012              | Kumamoto           | Kyushu         | 89 771              |
| Yamaguchi  | Chugoku         | 50 366              | Miyazaki           | Kyushu         | 47 250              |
|            | <b>Chugoku</b>  | 245 000             | Nagasaki           | Kyushu         | 33 186              |
| Hokkaido   | <b>Hokkaido</b> | 354 000             | Oita               | Kyushu         | 50 293              |
| Fukui      | Hokuriku        | 42 566              | Saga               | Kyushu         | 49 779              |
| Ishikawa   | Hokuriku        | 44 549              |                    | <b>Kyushu</b>  | 415 000             |
| Niigata    | Hokuriku        | 175 986             | Okinawa            | <b>Okinawa</b> | 7 000               |
| Toyama     | Hokuriku        | 62 899              | Ehime              | Shikoku        | 41 062              |
|            | <b>Hokuriku</b> | 326 000             | Kagawa             | Shikoku        | 32 158              |
| Gifu       | Kanto           | 51 073              | Kochi              | Shikoku        | 28 418              |
| Gumma      | Kanto           | 41 316              | Tokushima          | Shikoku        | 27 362              |
| Ibaraki    | Kanto           | 120 369             |                    | <b>Shikoku</b> | 129 000             |
| Kanagawa   | Kanto           | 8 015               | Akita              | Tohoku         | 135 561             |
| Nagano     | Kanto           | 74 719              | Aomori             | Tohoku         | 94 391              |
| Saitama    | Kanto           | 60 430              | Fukushima          | Tohoku         | 117 221             |
| Tochigi    | Kanto           | 111 371             | Iwate              | Tohoku         | 104 345             |
| Tokyo      | Kanto           | 1 919               | Miyagi             | Tohoku         | 118 924             |
| Tshiba     | Kanto           | 93 907              | Yamagata           | Tohoku         | 105 558             |
| Yamanashi  | Kanto           | 12 881              |                    | <b>Tohoku</b>  | 676 000             |
|            | <b>Kanto</b>    | 576 000             | Aichi              | Tokai          | 67 965              |
| Hyogo      | Kinki           | 79 389              | Mie                | Tokai          | 60 236              |
| Kyoto      | Kinki           | 30 053              | Shizuoka           | Tokai          | 52 799              |
| Nara       | Kinki           | 20 844              |                    | <b>Tokai</b>   | 181 000             |
| Osaka      | Kinki           | 13 813              |                    |                |                     |
| Shiga      | Kinki           | 54 813              |                    |                |                     |
| Wakayama   | Kinki           | 21 088              |                    |                |                     |
|            |                 |                     | <b>Japan total</b> |                | <b>3 129 000</b>    |

TABLE A43  
**Irrigated area per governorate in Jordan**

| Governorate | Irrigated area (ha) |
|-------------|---------------------|
| Amman       | 8 708               |
| Irbid       | 18 200              |
| Karak       | 6 821               |



| Governorate         | Irrigated area (ha) |
|---------------------|---------------------|
| Ma-an               | 9 178               |
| Mafraq              | 10 535              |
| Balqa               | 14 771              |
| Tafila              | 1 193               |
| Zarqa               | 7 506               |
| <b>Jordan total</b> | <b>76 912</b>       |

TABLE A44  
Irrigated area per oblast in Kazakhstan

| Oblast           | Irrigated area (ha) | Oblast                  | Irrigated area (ha) |
|------------------|---------------------|-------------------------|---------------------|
| Akmola           | 30 370              | Pavlodar                | 70 030              |
| Aktobe           | 35 710              | Semei                   | 101 360             |
| Almaty           | 260 030             | South Kazakhstan        | 395 280             |
| Atyrau           | 25 690              | Taldy Korgan            | 246 200             |
| East Kazakhstan  | 80 910              | Torgai                  | 3 170               |
| Karaganda        | 66 550              | West Kazakhstan         | 46 470              |
| Kokshetau        | 5 600               | Zhambyl                 | 199 120             |
| Kostanai         | 21 590              | Zhezkazgan              | 12 440              |
| Kzyl-Orda        | 240 730             | <b>Kazakhstan total</b> | <b>1 855 200</b>    |
| Mangistau        | 210                 |                         |                     |
| North Kazakhstan | 13 740              |                         |                     |

TABLE A45  
Irrigated area per governorate in Kuwait

| Governorate         | Irrigated area (ha) |
|---------------------|---------------------|
| Ahmadi              | 2 911.4             |
| Farwaniya           | 0.0                 |
| Hawalli             | 0.4                 |
| Jhara               | 4 056.3             |
| Kuwait City         | 0.0                 |
| <b>Kuwait total</b> | <b>6 968.1</b>      |

TABLE A46  
Irrigated area per raion and oblast in Kyrgyzstan

| Raion     | Oblast               | Irrigated area (ha) | Raion        | Oblast                   | Irrigated area (ha) |
|-----------|----------------------|---------------------|--------------|--------------------------|---------------------|
| Batken    | Batken Region        | 14 846              |              | <b>Chui Region</b>       | 331 135             |
| Kadamjai  | Batken Region        | 26 997              | Aksyi        | Jalal-Abad Region        | 12 357              |
| Lailak    | Batken Region        | 13 639              | Ala-Buka     | Jalal-Abad Region        | 16 218              |
|           | <b>Batken Region</b> | <b>55 482</b>       | Bazar-Korgon | Jalal-Abad Region        | 18 652              |
| Alamüdüń  | Chui Region          | 34 618              | Chatkal      | Jalal-Abad Region        | 8 765               |
| Chui      | Chui Region          | 33 769              | Nooken       | Jalal-Abad Region        | 22 868              |
| Jaiyl     | Chui Region          | 42 658              | Suzak        | Jalal-Abad Region        | 45 001              |
| Kemin     | Chui Region          | 28 438              | Togus-Toro   | Jalal-Abad Region        | 4 072               |
| Moskovsky | Chui Region          | 44 426              | Toktogul     | Jalal-Abad Region        | 14 013              |
| Panfilov  | Chui Region          | 31 731              |              | <b>Jalal-Abad Region</b> | <b>141 946</b>      |
| Sokuluk   | Chui Region          | 59 906              | Ak-Talaa     | Naryn Region             | 15 962              |
| Ysyk-Ata  | Chui Region          | 55 589              |              |                          |                     |

| Raion       | Oblast              | Irrigated area (ha) | Raion      | Oblast                 | Irrigated area (ha) |
|-------------|---------------------|---------------------|------------|------------------------|---------------------|
| At-Bashi    | Naryn Region        | 32 330              | Kara-Buura | Talas Region           | 30 468              |
| Jumgal      | Naryn Region        | 19 223              | Manas      | Talas Region           | 18 214              |
| Kochkor     | Naryn Region        | 24 785              | Talas      | Talas Region           | 38 743              |
| Tien-Shan   | Naryn Region        | 27 505              |            | <b>Talas Region</b>    | 115 115             |
|             | <b>Naryn Region</b> | 119 805             | Ak-Suu     | Ysyk-Köl Region        | 41 342              |
| Alai        | Osh Region          | 6 755               | Djety-Oguz | Ysyk-Köl Region        | 42 956              |
| Aravan      | Osh Region          | 22 517              | Ton        | Ysyk-Köl Region        | 25 937              |
| Chong-Alay  | Osh Region          | 14 179              | Tyup       | Ysyk-Köl Region        | 24 826              |
| Kara-Kuldja | Osh Region          | 7 275               | Ysyk-Köl   | Ysyk-Köl Region        | 34 331              |
| Kara-Suu    | Osh Region          | 42 930              | Ysyk-Köl   |                        |                     |
| Nookat      | Osh Region          | 26 328              | Lake       | Ysyk-Köl Region        | 0                   |
| Uzgen       | Osh Region          | 22 181              |            | <b>Ysyk-Köl Region</b> | 169 392             |
|             | <b>Osh Region</b>   | 142 165             | Kyrgyzstan |                        |                     |
| Bakai-Ata   | Talas Region        | 27 690              | total      |                        | 1 075 040           |

TABLE A47

**Irrigated area per province in Lao People's Democratic Republic**

| Province     | Irrigated area (ha) | Province                | Irrigated area (ha) |
|--------------|---------------------|-------------------------|---------------------|
| Attapeu      | 4 310               | Savannakhet             | 46 900              |
| Bokeo        | 7 728               | Sekong                  | 3 249               |
| Borikhamxay  | 19 875              | Vientiane               | 32 172              |
| Champasack   | 29 979              | Vientiane (Munic.)      | 38 852              |
| Huaphanh     | 10 597              | Xayabury                | 16 669              |
| Khammuane    | 23 637              | Xaysomboon              | 3 277               |
| Luangnamtha  | 7 874               | Xiengkhuang             | 12 240              |
| Luangprabang | 9 561               |                         |                     |
| Oudomxay     | 8 400               | Lao People's Democratic |                     |
| Phongsaly    | 5 230               | Republic total          | 295 535             |
| Saravane     | 14 985              |                         |                     |

TABLE A48

**Irrigated area per mohafaza and caza in Lebanon**

| Mohafaza   | Caza          | Irrigated area (ha) | Mohafaza   | Caza                 | Irrigated area (ha) |
|------------|---------------|---------------------|------------|----------------------|---------------------|
| Baalbeck   | Bekaa         | 25 919              |            | <b>Mount Lebanon</b> | 10 788              |
| Hermel     | Bekaa         | 4 734               | Bent Jbail | Nabatiye             | 174                 |
| Rachaiya   | Bekaa         | 329                 | Hasbaya    | Nabatiye             | 310                 |
| West Bekaa | Bekaa         | 10 566              | Marjaayoun | Nabatiye             | 319                 |
| Zahle      | Bekaa         | 14 506              | Nabatiye   | Nabatiye             | 1 429               |
|            | <b>Bekaa</b>  | 56 054              |            | <b>Nabatiye</b>      | 2 232               |
| Aley       | Mount Lebanon | 1 074               | Akkar      | North Lebanon        | 21 611              |
| Baabda     | Mount Lebanon | 906                 | Bcharre    | North Lebanon        | 2 191               |
| Beirut     | Mount Lebanon | 0                   | El Batroun | North Lebanon        | 441                 |
| Chouf      | Mount Lebanon | 3 657               | El Minie   | North Lebanon        | 6 619               |
| El Metn    | Mount Lebanon | 1 253               | Koura      | North Lebanon        | 440                 |
| Jbail      | Mount Lebanon | 2 613               | Tripoli    | North Lebanon        | 166                 |
| Keserouan  | Mount Lebanon | 1 285               | Zgharta    | North Lebanon        | 1 519               |

| Mohafaza | Caza                 | Irrigated area (ha) |
|----------|----------------------|---------------------|
|          | <b>North Lebanon</b> | 32 987              |
| Jezzine  | South Lebanon        | 1 252               |
| Saida    | South Lebanon        | 6 993               |
| Sour     | South Lebanon        | 6 807               |

| Mohafaza             | Caza                 | Irrigated area (ha) |
|----------------------|----------------------|---------------------|
|                      | <b>South Lebanon</b> | 15 052              |
| <b>Lebanon total</b> |                      | 117 113             |

TABLE A49  
**Irrigated area per state in Malaysia**

| State           | Irrigated area (ha) |
|-----------------|---------------------|
| Johor           | 3 443               |
| Kedah           | 105 580             |
| Kelantan        | 45 122              |
| Kuala Lumpur    | 0                   |
| Melaka          | 6 969               |
| Negeri Sembilan | 9 784               |
| Pahang          | 19 599              |
| Perak           | 55 263              |

| State                 | Irrigated area (ha) |
|-----------------------|---------------------|
| Perlis                | 24 841              |
| Pulau Pinang          | 16 789              |
| Sabah                 | 19 345              |
| Sarawak               | 17 061              |
| Selangor              | 22 073              |
| Terengganu            | 16 730              |
| <b>Malaysia total</b> | <b>362 600</b>      |

TABLE A50  
**Irrigated area per aimag in Mongolia**

| Aimag            | Irrigated area (ha) |
|------------------|---------------------|
| Arhangay         | 1 217               |
| Bayan-Olgii      | 2 946               |
| Bayanhongor      | 1 560               |
| Bulgan & Erdenet | 1 071               |
| Dornod           | 2 339               |
| Dornogovi        | 421                 |
| Dundgovi         | 137                 |
| Dzavhan          | 2 181               |
| Govi-Altay       | 7 327               |
| Hentiy           | 1 841               |

| Aimag                 | Irrigated area (ha) |
|-----------------------|---------------------|
| Hovd                  | 7 209               |
| Hovsgol               | 406                 |
| Omnogovi              | 618                 |
| Ovorhangay            | 4 933               |
| Selenge & Darhan Uul  | 7 525               |
| Suhbaatar             | 119                 |
| Tov & Ulaanbaatar     | 6 121               |
| Uvs                   | 9 329               |
| <b>Mongolia total</b> | <b>57 300</b>       |

TABLE A51  
**Irrigated area per division in Myanmar**

| State / Division | Irrigated area (ha) |
|------------------|---------------------|
| Ayeyarwady       | 563 445             |
| Bago             | 130 210             |
| Chin             | 9 352               |
| Kachin           | 59 375              |
| Kayah            | 19 127              |
| Kayin            | 17 802              |
| Magway           | 113 654             |
| Mandalay         | 268 370             |

| State / Division     | Irrigated area (ha) |
|----------------------|---------------------|
| Mon                  | 45 504              |
| Rakhine              | 7 144               |
| Sagaing              | 328 708             |
| Shan                 | 232 071             |
| Tanintharyi          | 4 498               |
| Yangon               | 42 059              |
| <b>Myanmar total</b> | <b>1 841 320</b>    |

TABLE A52

**Irrigated area per district and development region in Nepal**

| District       | Development region | Irrigated area (ha) | District    | Development region | Irrigated area (ha) |
|----------------|--------------------|---------------------|-------------|--------------------|---------------------|
| Bhaktapur      | Bagmati            | 2 588               |             | <b>Mahakali</b>    | 42 982              |
| Dhading        | Bagmati            | 10 428              | Achham      | Seti               | 6 678               |
| Kathmandu      | Bagmati            | 5 004               | Bajhang     | Seti               | 4 700               |
| Kavrepalanchok | Bagmati            | 11 406              | Bajura      | Seti               | 2 501               |
| Lalitpur       | Bagmati            | 2 824               | Doti        | Seti               | 7 270               |
| Nuwakot        | Bagmati            | 11 447              | Kailali     | Seti               | 43 316              |
| Rasuwa         | Bagmati            | 1 036               |             | <b>Seti</b>        | 64 465              |
| Sindhupalchok  | Bagmati            | 10 030              | Banke       | Bheri              | 6 055               |
|                | <b>Bagmati</b>     | 54 763              | Bardiya     | Bheri              | 32 653              |
| Dhanusha       | Janakpur           | 39 118              | Dailekh     | Bheri              | 7 932               |
| Dolakha        | Janakpur           | 6 810               | Jajarkot    | Bheri              | 3 468               |
| Mahottari      | Janakpur           | 30 425              | Surkhet     | Bheri              | 15 051              |
| Ramechhap      | Janakpur           | 7 263               |             | <b>Bheri</b>       | 65 159              |
| Sarlahi        | Janakpur           | 58 323              | Dolpa       | Karnali            | 363                 |
| Sindhuli       | Janakpur           | 12 241              | Humla       | Karnali            | 972                 |
|                | <b>Janakpur</b>    | 154 180             | Jumla       | Karnali            | 955                 |
| Bara           | Narayani           | 47 598              | Kalikot     | Karnali            | 7 478               |
| Chitwan        | Narayani           | 28 442              | Mugu        | Karnali            | 947                 |
| Makwanpur      | Narayani           | 9 131               |             | <b>Karnali</b>     | 10 715              |
| Parsa          | Narayani           | 38 306              | Dang        | Rapti              | 41 687              |
| Rautahat       | Narayani           | 34 657              | Pyuthan     | Rapti              | 5 845               |
|                | <b>Narayani</b>    | 158 133             | Rolpa       | Rapti              | 7 701               |
| Bhojpur        | Koshi              | 8 751               | Rukum       | Rapti              | 5 062               |
| Dhankuta       | Koshi              | 7 151               | Salyan      | Rapti              | 7 216               |
| Morang         | Koshi              | 82 835              |             | <b>Rapti</b>       | 67 512              |
| Sankhuwasabha  | Koshi              | 12 051              | Baglung     | Dhawalagi          | 5 370               |
| Sunsari        | Koshi              | 65 766              | Mustang     | Dhawalagi          | 1 004               |
| Terhathum      | Koshi              | 8 495               | Myagdi      | Dhawalagi          | 3 703               |
|                | <b>Koshi</b>       | 185 049             | Parbat      | Dhawalagi          | 5 788               |
| Ilam           | Mechi              | 13 343              |             | <b>Dhawalagi</b>   | 15 865              |
| Jhapa          | Mechi              | 59 643              | Gorkha      | Gandaki            | 10 764              |
| Panchthar      | Mechi              | 6 951               | Kaski       | Gandaki            | 11 969              |
| Taplejung      | Mechi              | 8 040               | Lamjung     | Gandaki            | 10 611              |
|                | <b>Mechi</b>       | 87 977              | Manang      | Gandaki            | 229                 |
| Khotang        | Sagarmath          | 8 209               | Syangja     | Gandaki            | 10 041              |
| Okhaldhunga    | Sagarmath          | 4 107               | Tanahu      | Gandaki            | 9 124               |
| Saptari        | Sagarmath          | 37 021              |             | <b>Gandaki</b>     | 52 739              |
| Siraha         | Sagarmath          | 26 737              | Argkhanchi  | Lumbini            | 4 060               |
| Solukhumbu     | Sagarmath          | 1 901               | Gulmi       | Lumbini            | 5 382               |
| Udayapur       | Sagarmath          | 14 883              | Kapilvastu  | Lumbini            | 16 234              |
|                | <b>Sagarmath</b>   | 92 858              | Nawalparasi | Lumbini            | 36 797              |
| Baitadi        | Mahakali           | 5 399               | Palpa       | Lumbini            | 8 372               |
| Dadeldhura     | Mahakali           | 3 882               | Rupandehi   | Lumbini            | 45 108              |
| Darchula       | Mahakali           | 3 073               |             | <b>Lumbini</b>     | 115 952             |
| Kanchanpur     | Mahakali           | 30 629              | Nepal total |                    | 1 168 349           |

**TABLE A53**  
**Irrigated area per region in Oman**

| Region            | Irrigated area (ha) |
|-------------------|---------------------|
| A Dakhliya        | 7 070               |
| A Sharqiya        | 7 620               |
| Al Batinah        | 40 800              |
| Al Dhahira        | 9 810               |
| Al Wusta          | 100                 |
| Dhofar            | 2 930               |
| Musandam          | 900                 |
| Muscat            | 3 400               |
| <b>Oman total</b> | <b>72 630</b>       |

**TABLE A54**  
**Irrigated area in Pakistan**

| Federal state, territory     | Irrigated area (ha) |
|------------------------------|---------------------|
| Balochistan                  | 767 120             |
| Northern Territories         | 90 464              |
| North-West Frontier Province | 719 152             |
| Punjab                       | 10 325 678          |
| Sindh                        | 2 515 050           |
| <b>Pakistan total</b>        | <b>14 417 464</b>   |

**TABLE A55**  
**Irrigated area per district in Balochistan (Pakistan)**

| District        | Irrigated area (ha) | District                 | Irrigated area (ha) |
|-----------------|---------------------|--------------------------|---------------------|
| Awaran          | 6 117               | Kohlu                    | 2 936               |
| Barkhan         | 14 581              | Lasbela                  | 10 272              |
| Bolan           | 24 929              | Loralai                  | 26 406              |
| Chagai          | 12 408              | Mastung                  | 31 454              |
| Dera Bugti      | 4 239               | Musakhel                 | 3 388               |
| Gwadar          | 2 569               | Nasirabad                | 126 495             |
| Jaffarabad      | 226 477             | Panjgur                  | 14 443              |
| Jhall Magsi     | 25 655              | Pishin                   | 38 249              |
| Kalat           | 30 722              | Quetta                   | 11 436              |
| Kech (Turbat)   | 40 223              | Sibi                     | 21 087              |
| Kharan          | 5 112               | Zhob                     | 17 702              |
| Khuzdar         | 30 996              | Ziarat                   | 3 490               |
| Killa Abdullah  | 16 502              | <b>Balochistan total</b> | <b>767 120</b>      |
| Killa Saifullah | 19 232              |                          |                     |

**TABLE A56**  
**Irrigated area per district in Northern Territories (Pakistan)**

| District | Irrigated area (ha) |
|----------|---------------------|
| Diamir   | 32 000              |
| Gahkuch  | 11 636              |
| Ghizar   | 7 896               |
| Gilgit   | 18 073              |

| District                   | Irrigated area (ha) |
|----------------------------|---------------------|
| Skardu                     | 20 859              |
| Northern Territories total | 90 464              |

TABLE A57

**Irrigated area per district in North-West Frontier Province (Pakistan)**

| District         | Irrigated area (ha) | District                           | Irrigated area (ha) |
|------------------|---------------------|------------------------------------|---------------------|
| Abottabad        | 5 689               | Lakki Marwat                       | 37 813              |
| Bajaur Agency    | 19 554              | Malakand Agency                    | 27 540              |
| Bannu            | 40 529              | Mansehra                           | 16 254              |
| Battagram        | 3 976               | Mardan                             | 63 372              |
| Buner            | 10 329              | Mohmand Agency                     | 5 065               |
| Charsadda        | 57 716              | North Waziristan                   | 8 083               |
| Chitral          | 16 871              | Nowshera                           | 19 778              |
| Dera Ismail Khan | 97 736              | Orakzai Agency                     | 1 871               |
| Dir              | 49 213              | Peshawar                           | 45 174              |
| Hangu            | 5 734               | Shangla                            | 0                   |
| Haripur          | 26 412              | South Waziristan                   | 8 460               |
| Karak            | 1 097               | Swabi                              | 27 064              |
| Khyber Agency    | 8 611               | Swat                               | 56 041              |
| Kohat            | 14 393              | Tank                               | 9 637               |
| Kohistan         | 21 200              | North-West Frontier Province total | 719 152             |
| Kurram Agency    | 13 942              |                                    |                     |

TABLE A58

**Irrigated area per district in Punjab (Pakistan)**

| District        | Irrigated area (ha) | District         | Irrigated area (ha) |
|-----------------|---------------------|------------------|---------------------|
| Attok           | 42 312              | Mainwali         | 210 151             |
| Bahawalnagar    | 587 000             | Mandi Bahaud-Din | 221 000             |
| Bahawalpur      | 435 000             | Multan           | 303 000             |
| Bhakkar         | 333 727             | Muzaffargarh     | 465 000             |
| Chakwal         | 24 237              | Narowal          | 119 163             |
| Dera Ghazi Khan | 412 504             | Okara            | 350 000             |
| Faisalabad      | 517 000             | Pak Pattan       | 242 000             |
| Gujarat         | 124 738             | Rahim Yar Khan   | 628 000             |
| Gujranwala      | 305 000             | Rajanpur         | 337 000             |
| Hafizabad       | 188 000             | Rawalpindi       | 11 704              |
| Islamabad       | 169                 | Sahiwal          | 261 000             |
| Jhang           | 658 707             | Sargodha         | 520 000             |
| Jhelum          | 36 365              | Sheikhupura      | 492 000             |
| Kasur           | 306 000             | Sialkot          | 245 211             |
| Khanewal        | 364 000             | Toba Tek Singh   | 257 000             |
| Kushab          | 140 678             | Vehari           | 392 000             |
| Lahore          | 126 000             | Punjab total     | 10 325 678          |
| Layyah          | 412 010             |                  |                     |
| Lodhran         | 258 000             |                  |                     |

TABLE A59  
**Irrigated area per district in Sindh (Pakistan)**

| District             | Irrigated area (ha) | District           | Irrigated area (ha) |
|----------------------|---------------------|--------------------|---------------------|
| Badin                | 200 000             | Naushero Feroze    | 191 000             |
| Dadu                 | 109 550             | Nawabshah          | 208 000             |
| Ghotki               | 166 400             | Sanghar            | 254 000             |
| Hyderabad            | 262 000             | Shikarpur          | 102 000             |
| Jacobabad            | 135 100             | Sukkur             | 98 000              |
| Karachi              | 6 300               | Tharparkar         | 24 700              |
| Khaipur              | 223 000             | Thatta             | 138 000             |
| Larkana              | 174 000             | <b>Sindh total</b> | <b>2 515 050</b>    |
| Mirpurkhas & Umerkot | 223 000             |                    |                     |

TABLE A60  
**Irrigated area per district and region in the Palestinian Authority**

| Governorate                                       | Region           | Irrigated area (ha) |
|---|------------------|---------------------|
| Deir Al-Balah                                     | Gaza             | 1 370               |
| Gaza  | Gaza             | 1 920               |
| Khan Yunis  | Gaza             | 2 120               |
| North Gaza  | Gaza             | 2 120               |
| Rafah   | Gaza             | 1 690               |
|   | <b>Gaza</b>      | <b>9 220</b>        |
| Bethlehem   | West Bank        | 180                 |
| Hebron  | West Bank        | 220                 |
| Jenin   | West Bank        | 1 080               |
| Jericho   | West Bank        | 1 910               |
| Jerusalem   | West Bank        | 12                  |
| Nablus  | West Bank        | 590                 |
| Qualquiya   | West Bank        | 720                 |
| Ramallah & Al-Bireh                               | West Bank        | 50                  |
| Salfit  | West Bank        | 40                  |
| Tubas   | West Bank        | 1 020               |
| Tulkarm   | West Bank        | 1 180               |
|   | <b>West Bank</b> | <b>7 002</b>        |
| Palestinian Authority (excl. Israeli settlements) |                  | 16 222              |
| Gaza  | Gaza             | 285                 |
| Jericho & Tubas                                   | West Bank        | 2 434               |
| Nablus & Ramallah                                 | West Bank        | 254                 |
| Bethlehem & Hebron                                | West Bank        | 271                 |
| Israeli settlements                               |                  | 3 244               |

TABLE A61  
**Irrigated area per region in the Philippines**

| Region   | Irrigated area (ha) | Region   | Irrigated area (ha) |
|----------|---------------------|----------|---------------------|
| Region 1 | 187 000             | Region 5 | 91 000              |
| Region 2 | 265 000             | Region 6 | 111 000             |
| Region 3 | 285 000             | Region 7 | 24 000              |
| Region 4 | 161 000             | Region 8 | 57 000              |

| Region    | Irrigated area (ha) |
|-----------|---------------------|
| Region 9  | 40 000              |
| Region 10 | 81 000              |
| Region 11 | 137 000             |

| Region            | Irrigated area (ha) |
|-------------------|---------------------|
| Region 12         | 111 000             |
| Philippines total | 1 550 000           |

TABLE A62  
Irrigated area per province in the Republic of Korea

| Province  | Irrigated area (ha) |
|-----------|---------------------|
| Busan     | 6 437               |
| Chungbuk  | 49 821              |
| Chungnam  | 144 976             |
| Daegu     | 6 352               |
| Daejeon   | 2 717               |
| Gangwon   | 38 325              |
| Gwangju   | 9 181               |
| Gyeongbuk | 133 372             |
| Gyeonggi  | 87 218              |

| Province                | Irrigated area (ha) |
|-------------------------|---------------------|
| Gyeongnam & Ulsan       | 108 753             |
| Incheon                 | 11 313              |
| Jeju                    | 117                 |
| Jeonbuk                 | 126 267             |
| Jeonnam                 | 154 829             |
| Seoul                   | 687                 |
| Republic of Korea total | 880 365             |

TABLE A63  
Irrigated area per oblast in the Russian Federation (Asian part of the country)

| Oblast                          | Irrigated area (ha) |
|---------------------------------|---------------------|
| Aginsky-Buryatsky okrug         | 2 000               |
| Altaysky krai                   | 109 000             |
| Altay, Republic of              | 7 000               |
| Amurskaya oblast                | 9 000               |
| Buryatia, Republic of           | 150 000             |
| Chelyabinskaya oblast           | 99 000              |
| Chitinskaya oblast              | 15 000              |
| Chukotsky national okrug        | 0                   |
| Evensky national okrug          | 0                   |
| Irkutskaya oblast               | 29 000              |
| Jewish autonomous oblast        | 3 000               |
| Kamchatskaya oblast             | 2 000               |
| Kemerovskaya oblast             | 26 000              |
| Khabarovskiy krai               | 7 000               |
| Khakasia, Republic of           | 52 000              |
| Khanty-Mansiysky national okrug | 0                   |
| Koryaksky national okrug        | 0                   |
| Krasnoyarsky krai               | 20 000              |

| Oblast                                | Irrigated area (ha) |
|---------------------------------------|---------------------|
| Kurganskaya oblast                    | 19 000              |
| Magadanskaya oblast                   | 4 000               |
| Nenetsky national okrug               | 0                   |
| not irrigated island or lake          | 0                   |
| Novosibirskaya oblast                 | 39 000              |
| Omskaya oblast                        | 86 000              |
| Primorsky krai                        | 94 000              |
| Sakha, Republic of                    | 16 000              |
| Sakhalinskaya oblast                  | 0                   |
| Sverdlovskaya oblast                  | 50 000              |
| Taimyrski national okrug              | 0                   |
| Tomskaya oblast                       | 5 000               |
| Tumenskaya oblast                     | 6 000               |
| Tyva, Republic of                     | 39 000              |
| Ust-Ordynsky okrug                    | 9 000               |
| Russian Federation (Asian part) total | 897 000             |

TABLE A64  
Irrigated area per region in Saudi Arabia

| Region           | Irrigated area (ha) |
|------------------|---------------------|
| Al Baha          | 9 021               |
| Asier            | 38 220              |
| Eastern Province | 95 830              |
| El Jouf          | 68 560              |

| Region | Irrigated area (ha) |
|--------|---------------------|
| Hail   | 117 320             |
| Jizan  | 262 329             |
| Mecca  | 103 576             |
| Medina | 27 860              |



| Region           | Irrigated area (ha) |
|------------------|---------------------|
| Najran           | 14 750              |
| Northern Borders | 170                 |
| Qaseem           | 329 509             |
| Riyadh           | 608 592             |

| Region                    | Irrigated area (ha) |
|---------------------------|---------------------|
| Tabouk                    | 55 030              |
| <b>Saudi Arabia total</b> | <b>1 730 767</b>    |

TABLE A65  
**Irrigated area per district and region in Sri Lanka**

| District     | Region               | Irrigated area (ha) | District               | Region              | Irrigated area (ha) |
|--------------|----------------------|---------------------|------------------------|---------------------|---------------------|
| Kandy        | Central              | 11 565              |                        | <b>Northern</b>     | 71 515              |
| Matale       | Central              | 14 395              | Kegalle                | Sabaragamuwa        | 2 385               |
| Nuwara Eliya | Central              | 6 470               | Ratnapura              | Sabaragamuwa        | 11 632              |
|              | <b>Central</b>       | <b>32 429</b>       |                        | <b>Sabaragamuwa</b> | <b>14 017</b>       |
| Ampara       | Eastern              | 64 465              | Galle                  | Southern            | 127                 |
| Batticaloa   | Eastern              | 26 922              | Hambantota             | Southern            | 29 411              |
| Trincomalee  | Eastern              | 25 249              | Matara                 | Southern            | 8 341               |
|              | <b>Eastern</b>       | <b>116 637</b>      |                        | <b>Southern</b>     | <b>37 879</b>       |
| Anuradhapura | North Central        | 100 731             | Badulla                | Uva                 | 21 211              |
| Polonnaruwa  | North Central        | 56 461              | Moneragala             | Uva                 | 11 523              |
|              | <b>North Central</b> | <b>157 192</b>      |                        | <b>Uva</b>          | <b>32 734</b>       |
| Kurunegala   | North Western        | 55 455              | Colombo                | Western             | 1 835               |
| Puttalam     | North Western        | 18 657              | Gampaha                | Western             | 4 682               |
|              | <b>North Western</b> | <b>74 112</b>       | Kalutara               | Western             | 2 268               |
| Jaffna       | Northern             | 4 320               |                        | <b>Western</b>      | <b>8 784</b>        |
| Kilinochchi  | Northern             | 13 017              | Uda Walawe             | <b>Uda Walawe</b>   | 24 700              |
| Mannar       | Northern             | 20 331              |                        |                     |                     |
| Mullaittivu  | Northern             | 12 250              |                        |                     |                     |
| Vavuniya     | Northern             | 21 597              |                        |                     |                     |
|              |                      |                     | <b>Sri Lanka total</b> |                     | <b>570 000</b>      |

TABLE A66  
**Irrigated area per governorate in the Syrian Arab Republic**

| Governorate | Irrigated area (ha) | Governorate                       | Irrigated area (ha) |
|-------------|---------------------|-----------------------------------|---------------------|
| Al Hasake   | 430 520             | Idleb                             | 45 890              |
| Al Rakka    | 166 130             | Kuneitra                          | 4 270               |
| Aleppo      | 172 120             | Lattikia                          | 34 980              |
| Damascus    | 65 160              | Sweida                            | 1 300               |
| Dier Elzzor | 106 720             | Tartous                           | 25 730              |
| Diraa       | 28 250              |                                   |                     |
| Hama        | 140 390             | <b>Syrian Arab Republic total</b> | <b>1 266 900</b>    |
| Homs        | 45 440              |                                   |                     |

TABLE A67  
**Paddy area, area of upland crops and irrigated area per county and region in Taiwan Province of China**

| County   | Region  | Paddy area (ha) | Upland fields (ha) | Irrigated area (ha) |
|----------|---------|-----------------|--------------------|---------------------|
| Miaoli   | Central | 18 662          | 11 180             | 25 596              |
| Nantou   | Central | 13 241          | 40 603             | 38 424              |
| Taizhong | Central | 23 163          | 21 213             | 36 320              |

| County                         | Region         | Paddy area (ha) | Upland fields (ha) | Irrigated area (ha) |
|--------------------------------|----------------|-----------------|--------------------|---------------------|
| Taizhong Shi                   | Central        | 2 389           | 1 431              | 3 277               |
| Yunlin                         | Central        | 51 766          | 12 740             | 59 667              |
| Zhanghua                       | Central        | 48 802          | 9 565              | 54 734              |
|                                | <b>Central</b> | 158 023         | 96 732             | 218 018             |
| Hualia                         | East           | 12 309          | 17 059             | 19 156              |
| Taidong                        | East           | 11 172          | 18 143             | 18 454              |
|                                | <b>East</b>    | 23 481          | 35 202             | 37 610              |
| Jinmen                         | Kinma          | 4               | 2 203              | 0                   |
| Lienkiang                      | Kinma          | 0               | 14                 | 0                   |
|                                | <b>Kinma</b>   | 4               | 2 218              | 0                   |
| Jilong Shi                     | North          | 32              | 295                | 164                 |
| Taibei                         | North          | 8 631           | 9 912              | 13 066              |
| Taibei Shi                     | North          | 862             | 2 243              | 1 865               |
| Taoyuan                        | North          | 33 578          | 3 588              | 35 183              |
| Xinzhu                         | North          | 15 931          | 9 195              | 20 044              |
| Yilan                          | North          | 16 363          | 4 956              | 18 580              |
|                                | <b>North</b>   | 75 396          | 30 189             | 88 902              |
| Gaoxiong                       | South          | 13 634          | 21 955             | 26 760              |
| Gaoxiong Shi                   | South          | 1 148           | 1 135              | 1 827               |
| Jiayi                          | South          | 38 307          | 16 269             | 48 033              |
| Penghu                         | South          | 0               | 1 515              | 906                 |
| Pingdong                       | South          | 28 473          | 20 603             | 40 791              |
| Tainan                         | South          | 38 468          | 34 335             | 58 995              |
| Tainan Shi                     | South          | 2 406           | 2 141              | 3 686               |
|                                | <b>South</b>   | 122 436         | 97 953             | 180 998             |
| Taiwan Province of China total |                | 379 341         | 262 294            | 525 528             |

TABLE A68  
Irrigated area per province and region in Thailand

| Province                | Region  | Irrigated area (ha) | Province        | Region         | Irrigated area (ha) |
|-------------------------|---------|---------------------|-----------------|----------------|---------------------|
| Bangkok                 | Bangkok | 74 864              | Ratchaburi      | Central        | 136 553             |
| Ang Thong               | Central | 81 242              | Rayong          | Central        | 26 430              |
| Chachoengsao            | Central | 150 100             | Sa Kaeo         | Central        | 21 481              |
| Chainat                 | Central | 142 025             | Samut Prakan    | Central        | 60 528              |
| Chanthaburi             | Central | 27 568              | Samut Sakhon    | Central        | 37 696              |
| Chon Buri               | Central | 22 827              | Samut Songkhram | Central        | 8 736               |
| Kanchanaburi            | Central | 126 188             | Sara Buri       | Central        | 59 355              |
| Lop Buri                | Central | 116 680             | Sing Buri       | Central        | 67 840              |
| Nakhon Pathom           | Central | 183 382             | Suphan Buri     | Central        | 309 283             |
| Nakon Nayok             | Central | 95 407              | Trat            | Central        | 18 445              |
| Nonthaburi              | Central | 36 766              |                 | <b>Central</b> | 2 229 083           |
| Pathum Thani            | Central | 110 958             | Amnat Charoen   | Northeastern   | 6 684               |
| Phetcha Buri            | Central | 83 494              | Buri Rum        | Northeastern   | 57 677              |
| Phranakhon Si Ayutthaya | Central | 197 571             | Chaiyaphum      | Northeastern   | 50 142              |
| Prachin Buri            | Central | 57 185              | Kalasin         | Northeastern   | 72 689              |
| Prachuap Khiri Khan     | Central | 51 341              | Khon Kaen       | Northeastern   | 53 197              |
|                         |         |                     | Loei            | Northeastern   | 20 862              |

| Province          | Region              | Irrigated area (ha) | Province         | Region          | Irrigated area (ha) |
|-------------------|---------------------|---------------------|------------------|-----------------|---------------------|
| Maha Sarakham     | Northeastern        | 37 446              | Phichit          | Northern        | 155 856             |
| Mukdahan          | Northeastern        | 13 407              | Phitsanulok      | Northern        | 75 839              |
| Nakhon Phanom     | Northeastern        | 17 925              | Phrae            | Northern        | 69 600              |
| Nakhon Ratchasima | Northeastern        | 150 251             | Sukhothai        | Northern        | 48 439              |
| Nong Bua Lam Phu  | Northeastern        | 15 387              | Tak              | Northern        | 26 704              |
| Nong Khai         | Northeastern        | 25 494              | Uthai Thani      | Northern        | 106 048             |
| Roi Et            | Northeastern        | 60 781              | Uttaradit        | Northern        | 22 179              |
| Sakon Nakhon      | Northeastern        | 85 493              |                  | <b>Northern</b> | 1 321 226           |
| Sisaket           | Northeastern        | 38 585              | Chumphon         | Southern        | 17 834              |
| Surin             | Northeastern        | 40 915              | Krabi            | Southern        | 9 098               |
| Ubon Ratchathani  | Northeastern        | 45 855              | Nakhon Thammarat | Southern        | 135 205             |
| Udon Thani        | Northeastern        | 33 856              | Narathiwat       | Southern        | 76 482              |
| Yasothon          | Northeastern        | 13 096              | Pattani          | Southern        | 66 132              |
|                   | <b>Northeastern</b> | 839 741             | Phangnga         | Southern        | 8 446               |
| Chiang Mai        | Northern            | 214 540             | Phatthalung      | Southern        | 68 123              |
| Chiang Rai        | Northern            | 87 380              | Phuket           | Southern        | 1 981               |
| Kamphaeng Phet    | Northern            | 78 746              | Ranong           | Southern        | 3 138               |
| Lampang           | Northern            | 78 282              | Satun            | Southern        | 14 308              |
| Lamphun           | Northern            | 64 159              | Songkhla         | Southern        | 55 538              |
| Mae Hong Son      | Northern            | 12 129              | Surat Thani      | Southern        | 34 818              |
| Nakhon Sawan      | Northern            | 155 077             | Trang            | Southern        | 22 576              |
| Nan               | Northern            | 40 407              | Yala             | Southern        | 7 116               |
| Phayao            | Northern            | 42 086              |                  | <b>Southern</b> | 520 794             |
| Phetchabun        | Northern            | 43 757              | Thailand total   |                 | 4 985 708           |

TABLE A69  
Irrigated area per province in Turkey

| Province  | Irrigated area (ha) | Province   | Irrigated area (ha) |
|-----------|---------------------|------------|---------------------|
| Adana     | 291 945             | Canakkale  | 30 647              |
| Adiyaman  | 21 172              | Cankiri    | 27 857              |
| Afyon     | 63 515              | Corum      | 36 489              |
| Agri      | 37 886              | Denizli    | 118 504             |
| Aksaray   | 46 652              | Diyarbakir | 114 494             |
| Amasya    | 76 886              | Edirne     | 37 941              |
| Ankara    | 62 401              | Elazig     | 61 286              |
| Antalya   | 142 630             | Erzincan   | 73 543              |
| Artvin    | 14 486              | Erzurum    | 81 344              |
| Aydin     | 103 766             | Eskisehir  | 110 315             |
| Balikesir | 38 120              | Gaziantep  | 36 772              |
| Batman    | 20 757              | Giresun    | 4 457               |
| Bayburt   | 19 523              | Gumushane  | 16 714              |
| Bilecik   | 21 172              | Hakkari    | 12 611              |
| Bingol    | 20 323              | Hatay      | 117 797             |
| Bitlis    | 43 479              | Icel       | 164 916             |
| Bolu      | 43 458              | Isparta    | 78 001              |
| Burdur    | 46 800              | Istanbul   | 12 271              |
| Bursa     | 91 476              | Izmir      | 139 515             |

| Province      | Irrigated area (ha) | Province     | Irrigated area (ha) |
|---------------|---------------------|--------------|---------------------|
| Kahramanmaras | 95 093              | Rize         | 45                  |
| Karaman       | 51 258              | Sakarya      | 18 943              |
| Kars          | 89 144              | Samsun       | 56 432              |
| Kastamonu     | 26 743              | Sanliurfa    | 49 029              |
| Kayseri       | 90 258              | Siirt        | 10 052              |
| Kinkkale      | 31 200              | Sinop        | 21 637              |
| Kirklareli    | 14 072              | Simak        | 48 289              |
| Kirsehir      | 25 629              | Sivas        | 55 715              |
| Kocaeli       | 10 029              | Tekirdag     | 23 400              |
| Konya         | 261 731             | Tokat        | 76 886              |
| Kutahya       | 31 200              | Trabzon      | 3 343               |
| Malatya       | 134 830             | Tunceli      | 16 633              |
| Manisa        | 134 830             | Usak         | 10 029              |
| Mardin        | 11 224              | Van          | 84 948              |
| Mugla         | 60 114              | Yozgat       | 46 800              |
| Mus           | 40 115              | Zinguldak    | 7 162               |
| Nevsehir      | 21 686              | Turkey total | 4 185 910           |
| Nigde         | 43 265              |              |                     |
| Ordu          | 2 229               |              |                     |

TABLE A70

**Irrigated area per welayat in Turkmenistan**

| Welayat            | Irrigated area (ha) |
|--------------------|---------------------|
| Akhal              | 499 130             |
| Balkan             | 65 627              |
| Dashkhovuz         | 409 861             |
| Lebap              | 290 836             |
| Mary               | 478 647             |
| Turkmenistan total | 1 744 100           |

TABLE A71

**Irrigated area per emirate in the United Arab Emirates**

| Emirate                    | Irrigated area (ha) |
|----------------------------|---------------------|
| Abu Dhabi                  | 230 187             |
| Ajman                      | 2 078               |
| Fujeira                    | 6 071               |
| Dubai                      | 8 059               |
| Ras Al Khaima              | 16 106              |
| Sharjah                    | 16 468              |
| Umm Al Qiwayn              | 1 371               |
| United Arab Emirates total | 280 341             |

TABLE A72

**Irrigated area per oblast in Uzbekistan**

| Oblast  | Irrigated area (ha) | Oblast   | Irrigated area (ha) |
|---------|---------------------|----------|---------------------|
| Andijon | 282 000             | Farghona | 355 000             |
| Bukhara | 264 000             | Jizzakh  | 288 000             |

| Oblast         | Irrigated area (ha) |
|----------------|---------------------|
| Karakalpakstan | 502 000             |
| Khorazm        | 262 000             |
| Namangan       | 273 000             |
| Nawoiy         | 122 000             |
| Qashqadaryo    | 490 000             |
| Samarqand      | 369 000             |

| Oblast                  | Irrigated area (ha) |
|-------------------------|---------------------|
| Sirdaryo                | 300 000             |
| Surkhondaryo            | 315 000             |
| Tashkent Oblast         | 401 000             |
| <b>Uzbekistan total</b> | <b>4 223 000</b>    |

**TABLE A73**  
**Irrigated area per province in Viet Nam**

| Province         | Irrigated area (ha) |
|------------------|---------------------|
| Bac Thai         | 33 100              |
| Bia Lai Cong Tum | 17 700              |
| Bin Tri Tien     | 60 000              |
| Cao Bang         | 7 550               |
| Dac Lac          | 19 350              |
| Dong Nai         | 13 000              |
| Ha Bac           | 111 200             |
| Ha Giang         | 14 850              |
| Ha Nam Ninh      | 147 500             |
| Ha Noi           | 55 600              |
| Hai Hung         | 118 700             |
| Hai Phong        | 54 400              |
| Ho Chi Minh      | 23 000              |
| Hoa Binh         | 74 100              |
| Lai Chau         | 8 700               |
| Lam Dong         | 8 600               |
| Lang Son         | 18 000              |

| Province              | Irrigated area (ha) |
|-----------------------|---------------------|
| Lao Cai               | 20 300              |
| Mekong Delta          | 1 578 230           |
| Nghe Tinh             | 143 000             |
| Nghia Binh            | 47 800              |
| Phu Khanh             | 53 100              |
| Quang Nam-Da Nang     | 53 000              |
| Quang Ninh            | 17 500              |
| Son La                | 7 820               |
| Song Be               | 9 800               |
| Tay Ninh              | 7 500               |
| Thai Binh             | 87 500              |
| Thanh Hoa             | 107 600             |
| Thuan Hai             | 34 200              |
| Vinh Phu              | 47 300              |
| <b>Viet Nam total</b> | <b>3 000 000</b>    |

**TABLE A74**  
**Irrigated area per governorate in Yemen**

| Governorate | Irrigated area (ha) |
|-------------|---------------------|
| Abyan       | 8 674               |
| Aden        | 671                 |
| Al Jawf     | 27 823              |
| Albada      | 10 657              |
| Amran       | 38 794              |
| Dhammar     | 45 185              |
| El Daleh    | 6 637               |
| El Mahrah   | 595                 |
| Hadramaout  | 7 694               |
| Haja        | 20 023              |
| Hodeidah    | 72 248              |
| Ibb         | 25 562              |
| Laheg       | 5 446               |
| Mahwaet     | 11 846              |
| Mareb       | 14 693              |
| Saadah      | 11 591              |
| Sanaa       | 61 408              |

| Governorate | Irrigated area (ha) |
|-------------|---------------------|
| Shabwa      | 3 986               |
| Taiz        | 14 466              |
| Yemen total | 388 000             |

# **Annex B**

## **Figures**

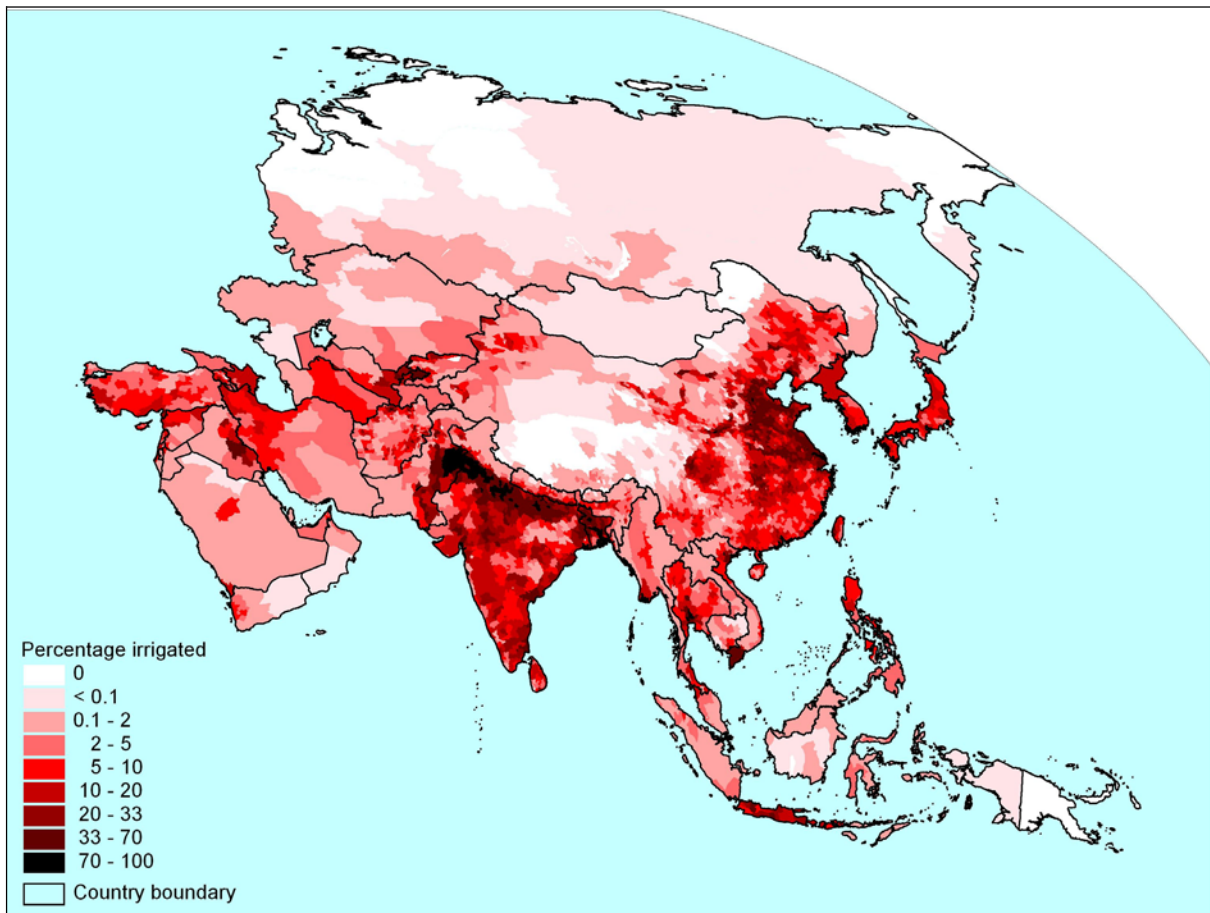


FIGURE B1  
Irrigated area in subnational administrative units of Asia as a percentage of the surface area



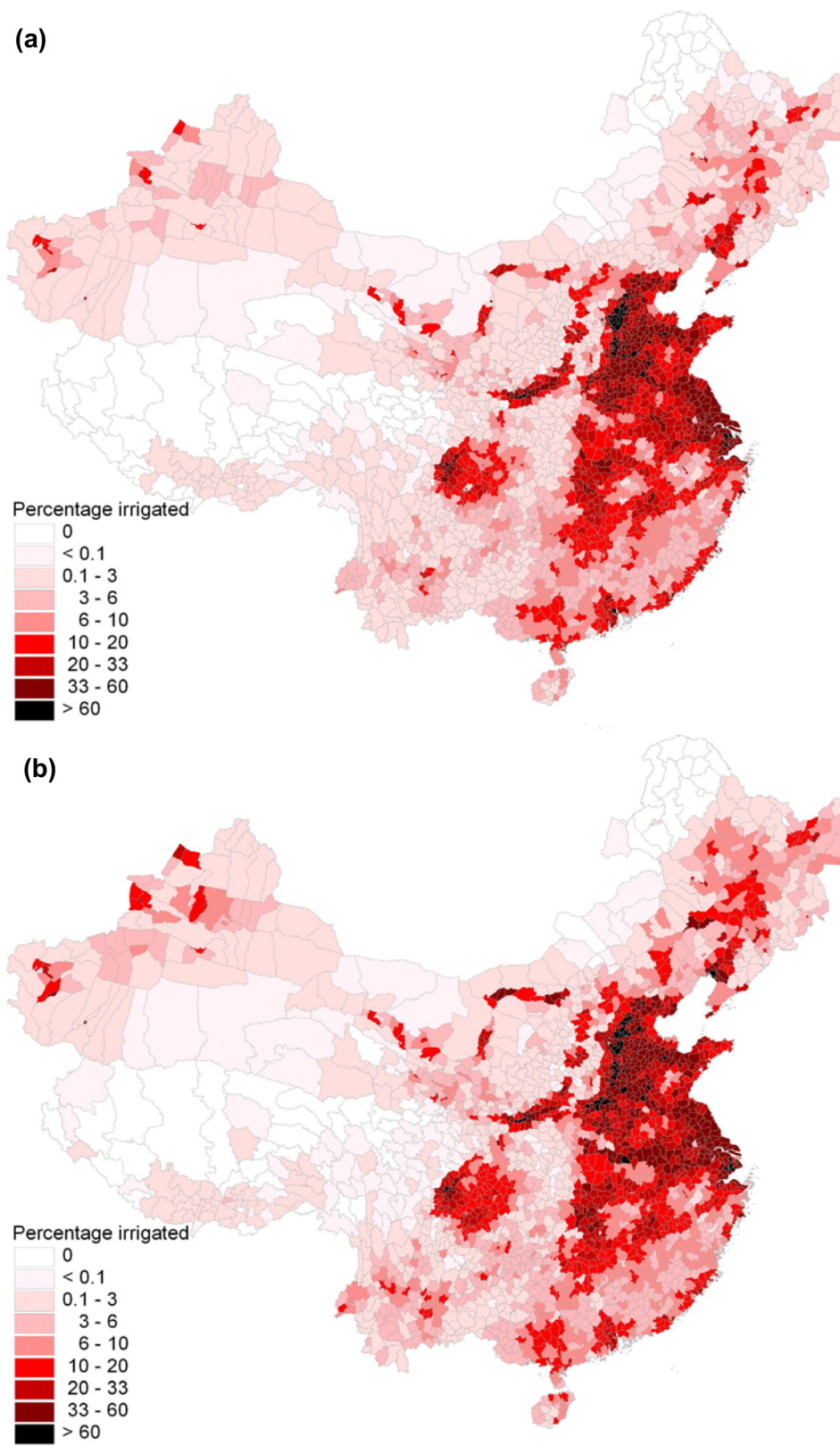


FIGURE B2  
Irrigated area in China as a percentage of the county surface area: (a) as reported by Skinner for 1990 [CH04]; and (b) as estimated in this report for 2000

# Documentation

Geospatial information used to locate irrigated areas within the subnational units in the Asian part of the Digital Global Map of Irrigated Areas

WORKING REPORT III

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## **INTRODUCTION**

This report describes the digital spatial datasets and printed maps used to locate irrigated areas within the subnational administrative units. Irrigation maps were derived from publications such as project reports, irrigation subsector studies and books related to irrigation and drainage. After on-screen digitizing of the maps, the boundaries of the digitized irrigated areas were compared with satellite images in many regions. The shape and size of the digitized areas were then adjusted where necessary. However, for many subnational units, irrigation maps are not available. This is particularly the case in areas with a low irrigation density dominated by small-scale private schemes. In these cases, additional information was used to find areas where irrigation is probable (e.g. land-use maps that show where the main irrigated crops are growing). By assigning so-called priorities or weights to each digitized area, it was possible to control the distribution of irrigated areas within the subnational units. First, irrigated area was distributed only to areas having the highest priority, then to areas having the second-highest priority and so on. The distribution process was stopped where the sum of the distributed irrigated area was equal to or larger than the irrigated area of the subnational unit as taken from the statistics (see Working Report II). Where the distributed irrigated area was larger than the irrigated area as taken from the statistics (e.g. because the same priority was assigned to several irrigated areas digitized from the same map), the distributed irrigated area was downscaled. Therefore, this methodology, described in more detail in previous reports of the irrigation mapping project (e.g. update for Latin America and Europe), ensures that the sum of irrigated area per subnational unit is exactly as reported in the statistics.

The map resolution during the distribution process was 0.01 degrees. The map was aggregated subsequently to a resolution of 5 minutes (0.0833 degrees) and it is presented in the results section (Working Report IV). The following sections describe the maps and digital datasets used per country in alphabetical order.

### **Afghanistan**

The irrigated areas were derived from land-cover maps, recently produced through the collaborative efforts of FAO, the United Nations Development Programme and the Afghan Geodesy and Cartography Office Kabul [AF01].

### **Armenia**

Twelve major irrigation schemes were digitized from a map as shown in [AM01]. Because these large-scale schemes covered only 16 of the 39 districts, irrigation schemes under construction and potential irrigable areas were digitized from another map [AM02].

### **Azerbaijan**

The irrigated areas were digitized from a map showing irrigation in the Caucasus region [AZ01]. The boundaries of the digitized irrigated areas were then adjusted using recent satellite imagery [AZ02].

### **Bahrain**

The location of irrigated areas was detected using a land-use map [BN01] showing the cultivated areas of the country. The irrigated areas were then digitized in detail from Landsat satellite imagery [BN02].

### **Bangladesh**

The irrigated areas were derived from a map showing irrigation accumulated in dot form [BG01]. Each dot represented 1 000 acres of irrigated area, and this also allowed the separation of areas with high and low irrigation density within the zilas.

### **Bhutan**

The irrigated areas were digitized from a land-use atlas with a scale of 1:250 000 [BT01].

### **Brunei Darussalam**

No map of irrigated areas was available. Therefore, arable land, mainly located in the north of the country, was digitized from satellite imagery [BR01].

### **Cambodia**

Digital maps of irrigated areas (polygon dataset) and irrigation projects (point dataset) were used as compiled by the Mekong River Commission ([CB01]; [CB02]). In general, the point dataset was used for small schemes (fewer than 300 ha) while the polygon dataset was used for large schemes (more than 300 ha). Exceptions had to be made where schemes were available in only one of the two datasets – 278 000 ha of irrigated area were located this way in the country. The remainder of the irrigated area was distributed to paddy areas taken from a digital land-cover map [CB03].

### **China**

The irrigated areas were derived from a land-use atlas published in 1990 (scale: 1:1 000 000). The atlas was available in a printed hardcover version [CH01] and in a digital version [CH02]. The digital version had a lower resolution and consisted of fewer classes than the printed version. Therefore, fields classified as irrigated or as paddy were digitized from the printed atlas version for 754 counties, covering about 67 percent of the country area. The digital version of the map was used for the other counties, which are mainly located in southeast China and usually very small.

It was assumed that all the paddy-fields were irrigated. However, in 287 counties, covering about 9 percent of the country area, the sum of irrigated and paddy areas as derived from the land-use map was smaller than the total irrigated area of the related county. In these cases, the difference from the irrigated area was distributed to rainfed agriculture fields digitized from the land-use map. The total amount of irrigated area distributed to fields classified as rainfed was 1.5 million ha for the entire country.

### **Cyprus**

Eleven government schemes were digitized from a recent inventory [CP01]. In addition, a large number of other irrigated plots were derived from a land-use map produced in 1975 [CP02]. This map also shows irrigated areas outside the current government-controlled area.

### **Democratic People's Republic of Korea**

No map of irrigated areas was available for the Democratic People's Republic of Korea. Therefore, a recent inventory of land form, land cover and crop-use intensity [KN01] was used. The map is based on remote sensing and distinguishes land forms (alluvial land, upland, hilly or steep land, and wetland), land uses (paddy rice, forest, rangeland or pasture, and urban) as well as five different classes of cultivation intensity. It was assumed that the paddy-fields (about 557 000 ha) were completely equipped for irrigation. It was further assumed that the fields assigned to other crops were also equipped for irrigation where they were located in the plains or river valleys with alluvial land (about 637 000 ha). The difference from the total area equipped for irrigation (about 266 000 ha) was distributed to fields cropped with upland crops.

### **East Timor**

No map of irrigated areas in East Timor was available. Instead, paddy areas were derived from a digital land cover map (scale: 1:250 000) available from the FAO–UN Geo Network [ET01]. All records attributed as “irrigated and rainfed paddy land” were selected.

### **Georgia**

The irrigated areas were digitized from an irrigation map published in a recent project report [GG01] and from a map showing irrigated areas in the Caucasus region [GG02]. The boundaries of the digitized areas were adjusted using Landsat satellite imagery [GG03].

### **India**

The irrigated areas were digitized from an irrigation atlas published in 1987 [IN01] and from an irrigation map published in 1994 [IN02]. Both maps show the outlines of the large-scale irrigation schemes of the country and distinguish between existing schemes, schemes under construction and proposed schemes. In addition, the location of minor irrigation schemes is shown in the irrigation atlas in dot-map form, whereby each dot represents 4 000 ha of irrigated area outside the major irrigation schemes. These areas were digitized by enclosing areas closed by dots on the map. The outlines of some irrigation schemes located in the state of Arunachal Pradesh were derived from a Chinese land-use atlas [IN03].

Irrigated areas classified as “existing” and areas classified as “minor irrigation schemes” received the highest priority in the distribution process. Where the irrigated area per district was larger than the digitized existing irrigation schemes, then the irrigated area was also distributed to schemes classified as “under construction”. Where the irrigated area on the map was still not sufficient, then the schemes classified as “proposed” were also incorporated. However, in several districts (mainly located in the centre and south of the country), the irrigated area per district as taken from the statistics was still larger than the digitized areas. In these cases, the irrigated area was also distributed to areas classified as “irrigated intensive agriculture” or “irrigated agriculture” in a recent remote-sensing-based land-cover inventory [IN04]. The outlines of the digitized irrigation schemes in the northeast (Arunachal Pradesh, Assam, Meghalaya, Mizoram, Manipur, Nagaland, Sikkim and Tripura) and northwest of India (Jammu and Kashmir, and Himachal Pradesh) were adjusted using satellite imagery [IN05].

### **Indonesia**

No map of irrigated areas in Indonesia was available. Therefore, rice fields were digitized from a land-use map (scale: 1:2 500 000) [ID01]. In some basins, the area of digitized rice fields was smaller than the reported irrigated area. In these cases, areas classified as lowland cultivation and highland cultivation were also incorporated, and wet rice fields were digitized from another land-use map [ID02].

### **Iraq**

The irrigated areas were located using a land-use map published in [IQ01]. The areas were then digitized in more detail from satellite imagery [IQ02] and tactical pilot charts [IQ03].

### **Islamic Republic of Iran**

The irrigated areas in the west of the country were digitized from a land-use map [IR01]. Because the map covers only the west of the country, a large-scale land-use map [IR02] and two large-scale irrigation maps ([IR03]; [IR04]) were used to localize irrigated areas in the east of the country. In addition, satellite imagery [IR05] was used to find small irrigation schemes and to adjust the boundaries of the large schemes.

### **Israel**

The irrigated areas were digitized from two irrigation maps ([IS01]; [IS02]). The outlines of the digitized areas were then adjusted using satellite imagery [IS03]. Some smaller irrigation schemes visible on the satellite images were also digitized and incorporated.

### **Japan**

The irrigated areas were digitized from an irrigation map sent to FAO with the Aquastat country questionnaire [JP01].

### **Jordan**

The irrigated areas were localized using an irrigation map of the Jordan Valley [JO01] and a map showing irrigated areas outside the Jordan Valley [JO02]. The irrigation schemes were then digitized using satellite imagery [JO03].

### **Kazakhstan**

The irrigated areas were localized using a map of irrigation projects [KZ01] and two large-scale maps showing the outlines of the major irrigated areas of the country ([KZ02]; [KZ03]). By using Landsat satellite imagery [KZ04] and a map of irrigation areas in the Aral Sea Basin [KZ05], the outlines of the irrigated areas were then digitized in detail.

### **Kuwait**

The irrigated areas were digitized from Landsat satellite images [KU01]. The digitized areas were in good agreement with areas shown as vegetated in recent governorate and municipality maps [KU02].

### **Kyrgyzstan**

The irrigated areas were localized using a map of irrigation projects [KY01] and then digitized using satellite imagery [KY02] and a map of irrigated areas [KY03].

### **Lao People's Democratic Republic**

Digital maps of irrigated areas (polygon dataset) and irrigation projects (point dataset) were used as compiled by the Mekong River Commission ([LA01]; [LA02]). In general, the point dataset was used for small schemes (fewer than 300 ha) while the polygon dataset was used for large schemes (more than 300 ha) – 265 000 ha of irrigated area was located in this way. The remaining part of the irrigated area was distributed to paddy areas taken from a digital land-cover map [LA03].

### **Lebanon**

The irrigated areas were digitized from a land-use map [LE01] and from satellite imagery [LE02].

### **Malaysia**

The boundaries of nine large, government irrigation schemes, designated as granary schemes and totalling 196 284 ha, were digitized from maps provided by the Department of Irrigation and Drainage [ML01]. The remaining part of the irrigated area was assigned to a large number of small-scale irrigation schemes as digitized from another irrigation map [ML02].

### **Mongolia**

The location of 156 sprinkler-irrigation schemes was derived from a recent inventory [MG01]. The total area equipped for irrigation in these schemes was reported as being 43 381 ha. Geographical coordinates of the schemes were missing in the inventory. However, the name of the project and the name of the closest village were given. Therefore, the geographical coordinates of the villages were detected by using the Geographical Names Server of the National Geospatial-Intelligence Agency (available at <http://earth-info.nga.mil>), and the related irrigated areas were assigned to these locations. However, the location of 13 schemes covering 2 060 ha in total could not be found in this way. In addition, the location of several unregistered schemes covering about 13 900 ha in total was unknown. Therefore, arable land was digitized from satellite imagery [MG02], and the irrigated area of the unregistered schemes as well as the irrigated area of the sprinkler schemes of unknown position was distributed to the digitized fields.

### **Myanmar**

The location of 135 major irrigation works (dams, weirs and tanks) was digitized using three maps showing irrigation works constructed in the periods before independence, between 1969 and 1988, and post-1988 [MY01]. However, many projects are large and the irrigated fields may be located far from the major reservoir or weir belonging to the project. Therefore, irrigation maps ([MY02]; [MY03]; [MY04]) were also used to locate the main irrigation areas of the country. The location of known irrigated areas was in good agreement with the area classified as agricultural land in the GLC2000 land-cover dataset for Southeast Asia ([MY05]). Therefore, this dataset was used to distribute the irrigated areas in regions outside the main

irrigation schemes. Because several irrigation schemes were found in areas classified as “cultivated and managed, not irrigated (mixed)”, this land-cover class was also considered as potentially irrigated. About 25 percent of the irrigated area of the subnational units was distributed to this class and about 75 percent to areas classified as “cultivated and managed, irrigated (flooded, rice, shrimp farms)”.

### **Nepal**

The irrigated areas were derived from the GLC2000 land-cover dataset for South Asia [NP01]. Areas classified as “irrigated intensive agriculture” or “irrigated agriculture” were in good agreement with irrigated areas as shown on maps published in an irrigation master plan [NP02]. Some additional projects were incorporated based on these maps and satellite imagery [NP03].

### **Oman**

The cultivated area, which is completely irrigated in Oman, was digitized from Landsat satellite imagery [OM01].

### **Pakistan**

The large-scale canal-irrigated area was digitized from a map showing the irrigation infrastructure and the irrigated areas of the country [PK01]. Satellite imagery [PK02] was used to incorporate the small-scale schemes and to adjust the outlines of the digitized canal-irrigated areas.

### **Palestinian Authority**

The irrigated areas were digitized from a land-use map [PL01]. In addition, satellite imagery [PL02] was used to map schemes developed more recently.

### **Philippines**

The irrigated areas were digitized from several irrigation maps ([PH01]; [PH02]; [PH03]; [PH04]). The outlines of the irrigated areas were then adjusted using satellite imagery [PH05].

### **Qatar**

The location of the main irrigation schemes was shown on a land-use map [QT01]. The irrigated areas were digitized in detail from Landsat satellite imagery [QT02], using the land-use map for verification purposes.

### **Republic of Korea**

The outlines of paddy areas were digitized from a land-use map provided by the Perry-Castañeda Library of the University of Texas [KS01]. Because this map dates back to the year 1973, the shape of the single paddy areas was then adjusted using Landsat satellite imagery [KS02].

### **Russian Federation**

The irrigated areas and arable land were derived from a land-use map [RU01] and from an agricultural map [RU02], both provided by the International Institute for Applied Systems Analysis. In the Asian part of Russia, only a few areas are classified as irrigated. Therefore, irrigated areas were also distributed to other agricultural areas using the priorities as documented in Table 1. Irrigated area was first distributed only to cells with a priority of 7, then to cells with a priority of 6, and so on until the sum of the distributed irrigated area was equal to the irrigated area of the specific oblast as derived from the statistics.

**TABLE 1**

**Priorities assigned to specific land uses to distribute irrigated areas within oblasts in the Asian part of Russia**

| Dataset | Attribute information   | Priority |
|---------|---|----------|
| RU01    | Irrigated cropland  | 7        |
| RU01    | Irrigated cropland (more than 50%) combined with multiyear plantation | 7        |
| RU01    | Irrigated meadows   | 7        |

| Dataset | Attribute information  | Priority |
|---------|--|----------|
| RU01    | Irrigated multiyear plantation   | 7        |
| RU01    | Irrigated multiyear plantation (more than 50%) combined with irrigated cropland    | 7        |
| RU01    | Cropland   | 6        |
| RU01    | Cropland (more than 50%) combined with forest                                      | 6        |
| RU01    | Cropland (more than 50%) combined with improved forage land, forest and bushes     | 6        |
| RU01    | Cropland (more than 50%) combined with multiyear plantation                        | 6        |
| RU01    | Cropland (more than 50%) combined with natural and improved forage land            | 6        |
| RU01    | Cropland (more than 50%) combined with natural forage land                         | 6        |
| RU01    | Cropland (more than 50%) combined with natural forage land and forest              | 6        |
| RU01    | Desert and semi-desert combined with cropland (up to 20%)                          | 6        |
| RU01    | Improved forage land combined with cropland (up to 20%)                            | 6        |
| RU01    | Multiyear plantation   | 6        |
| RU01    | Multiyear plantation (more than 50%) combined with cropland                        | 6        |
| RU01    | Forest combined with cropland (up to 20%) and natural meadow forage land           | 5        |
| RU01    | Forest combined with natural forage land and cropland (up to 20%)                  | 5        |
| RU01    | Meadow and meadow-steppe combined with cropland (up to 30%) and forest             | 5        |
| RU01    | Meadow and meadow-steppe combined with cropland (up to 30%), forest and bogs       | 5        |
| RU01    | Meadow and meadow-steppe combined with cropland (up to 30%), forest and solonchaks | 5        |
| RU01    | Meadows combined with improved meadows, forest and cropland (up to 30%)            | 5        |
| RU01    | Natural forest forage land combined with cropland (up to 20%)                      | 5        |
| RU01    | Natural meadow forage land combined with cropland (up to 20%) and forest           | 5        |
| RU01    | Park forest and bushes combined with cropland (up to 20%)                          | 5        |
| RU01    | Park forest and bushes combined with cropland (up to 20%) and bogs                 | 5        |
| RU01    | Sparse forest and open woodland combined with cropland (up to 20%)                 | 5        |
| RU01    | Steppe combined with cropland (up to 20%)  | 5        |
| RU02    | Little used in agriculture   | 4        |

### Saudi Arabia

The irrigated areas were digitized using Landsat satellite imagery [SA01], MODIS Vegetation Indices [SA02] and several large-scale irrigation maps ([SA03]; [SA04]; [SA05]). The approximate position and extent of the major irrigation schemes was detected based on the large-scale maps, and their more precise extent was derived by digitizing vegetated areas from the satellite imagery.

### Sri Lanka

The locations of 308 major irrigation schemes (more than 40 ha) and 12 lift-irrigation schemes covering 246 700 ha in total were digitized from an irrigation map [SL01]. The rest of the irrigated area was assigned to paddy areas as digitized from a land-use map [SL02], from another map with a higher resolution but dating from 1972 [SL03], and from a map that was part of the 1976 Water Resources Development Plan [SL04].

### Syrian Arab Republic

The irrigated areas were digitized from an irrigation map covering the west of the country [SY01] and from two land-use maps ([SY02]; [SY03]). In addition, satellite imagery [SY04] was used to locate recently developed schemes and to adjust the outlines of the digitized polygons.

### Taiwan Province of China

Plain irrigated areas and paddy areas were digitized from a land-use atlas (scale: 1:1 000 000) [TW01]. For the island of Penghu, satellite imagery [TW02] was used in order to locate arable land.



### Tajikistan

The irrigated areas were digitized from a map showing irrigated areas in the Aral Sea Basin [TJ01]. The shape of the boundaries of the irrigated areas was then adjusted using satellite imagery [TJ02].

### Thailand

Digital maps of irrigated areas (polygon dataset) and irrigation projects (point dataset) were used as compiled by the Mekong River Commission ([TH01]; [TH02]). However, these inventories covered only the part of the country that belongs to the Mekong river watershed. In the other part of the country two similar datasets provided by the remote sensing department of FAO were used ([TH03]; [TH04]). In general, the point dataset was used for small schemes (fewer than 1 000 ha) while the polygon dataset was used for large schemes (more than 1 000 ha). Exceptions had to be made in cases where schemes were available only in the polygon dataset or only in the point dataset. In addition, irrigated area was assigned to agricultural land as taken from a digital land-cover map [TH05] using the priorities documented in Table 2.

**TABLE 2**

**Priorities assigned to specific land uses to distribute irrigated areas within the provinces of Thailand**

| Attribute information                                  | Priority |
|--|----------|
| Broadcasted paddy-field                                | 5        |
| Paddy-field  | 5        |
| Paddy-field 50%; broadcasted paddy-field 50%           | 5        |
| Paddy-field 70%; broadcasted paddy-field 30%           | 5        |
| Transplanted paddy-field                               | 5        |
| Broadcasted paddy-field 70%; bush and shrubs 30%       | 4        |
| Coconut 50%; transplanted paddy-field 50%              | 4        |
| Coconut 70%; paddy-field 30%                           | 4        |
| Coconut 70%; transplanted paddy-field 30%              | 4        |
| Corn 70%; paddy-field 30%                              | 4        |
| Field crops 70%; paddy-field 30%                       | 4        |
| Mixed field crops 50%; paddy-field 50%                 | 4        |
| Mixed field crops 70%; paddy-field 30%                 | 4        |
| Mixed orchards 50%; transplanted paddy-field 50%       | 4        |
| Mixed orchards 70%; transplanted paddy-field 30%       | 4        |
| Mixed orchards 70%; paddy-field 30%                    | 4        |
| Mixed perennial crops 70%; broadcasted paddy-field 30% | 4        |
| Mixed perennial crops 70%; paddy-field 30%             | 4        |
| Paddy-field 50%; bush and shrubs 50%                   | 4        |
| Paddy-field 50%; corn 50%                              | 4        |
| Paddy-field 50%; deciduous forest 50%                  | 4        |
| Paddy-field 50%; evergreen forest 50%                  | 4        |
| Paddy-field 50%; field crops 50%                       | 4        |
| Paddy-field 50%; mixed orchards 50%                    | 4        |
| Paddy-field 50%; para rubber 50%                       | 4        |
| Paddy-field 50%; perennial crops 50%                   | 4        |
| Paddy-field 50%; swidden cultivation 50%               | 4        |
| Paddy-field 70%; bush and shrubs 30%                   | 4        |
| Paddy-field 70%; corn 30%                              | 4        |
| Paddy-field 70%; deciduous forest 30%                  | 4        |
| Paddy-field 70%; evergreen forest 30%                  | 4        |

| Attribute information  | Priority |
|--|----------|
| Paddy-field 70%; field crops 30%                             | 4        |
| Paddy-field 70%; mixed field crops 30%                       | 4        |
| Paddy-field 70%; mixed orchards 30%                          | 4        |
| Paddy-field 70%; mixed perennial crops 30%                   | 4        |
| Paddy-field 70%; sugar cane 30%                              | 4        |
| Paddy-field 70%; swidden cultivation 30%                     | 4        |
| Paddy-field 70%; disturbed deciduous forest 30%              | 4        |
| Sugar cane 50%; paddy-field 50%                              | 4        |
| Transplanted paddy-field 50%; bush and shrubs 50%            | 4        |
| Transplanted paddy-field 50%; para rubber 50%                | 4        |
| Transplanted paddy-field 50%; wetland 50%                    | 4        |
| Transplanted paddy-field 70%; bush and shrubs 30%            | 4        |
| Transplanted paddy-field 70%; coconut 30%                    | 4        |
| Transplanted paddy-field 70%; mixed field crops 30%          | 4        |
| Transplanted paddy-field 70%; mixed orchards 30%             | 4        |
| Transplanted paddy-field 70%; para rubber 30%                | 4        |
| Village 70%; paddy-field 30%                                 | 4        |
| Bush and shrubs 50%; paddy-field 50%                         | 3        |
| Bush and shrubs 70%; paddy-field 30%                         | 3        |
| Bush and shrubs 70%; transplanted paddy-field 30%            | 3        |
| Deciduous forest 70%; paddy-field 30%                        | 3        |
| Disturbed deciduous forest 50%; paddy-field 50%              | 3        |
| Disturbed deciduous forest 70%; paddy-field 30%              | 3        |
| Disturbed evergreen forest 70%; paddy-field 30%              | 3        |
| Disturbed tropical rain forest 70%; transplanted paddy-field | 3        |
| Marsh 50%; paddy-field 50%                                   | 3        |
| Marsh 70%; paddy-field 30%                                   | 3        |
| Para rubber 50%; transplanted paddy-field 50%                | 3        |
| Para rubber 70%; transplanted paddy-field 30%                | 3        |
| Swidden cultivation 70%; paddy-field 30%                     | 3        |
| Wetland 70%; transplanted paddy-field 30%                    | 3        |
| Beans and Peas 70%; sugar cane 30%                           | 2        |
| Cassava  | 2        |
| Cassava 50%; coconut 50%                                     | 2        |
| Cassava 50%; mixed orchards 50%                              | 2        |
| Cassava 50%; pineapple 50%                                   | 2        |
| Cassava 70%; corn 30%  | 2        |
| Cassava 70%; sugar cane 30%                                  | 2        |
| Coconut  | 2        |
| Coconut 50%; mixed orchards 50%                              | 2        |
| Coconut 50%; para rubber 50%                                 | 2        |
| Coconut 70%; corn 30%  | 2        |
| Coconut 70%; mixed field crops 30%                           | 2        |
| Coconut 70%; mixed orchards 30%                              | 2        |
| Coconut 70%; para rubber 30%                                 | 2        |
| Coffee   | 2        |
| Coffee 50%; para rubber 50%                                  | 2        |
| Corn   | 2        |
| Corn 50%; cassava 50%  | 2        |

| Attribute information                            | Priority |
|--|----------|
| Corn 50%; mixed orchards 50%                     | 2        |
| Corn 50%; sugar cane 50%                         | 2        |
| Corn 70%; beans and peas 30%                     | 2        |
| Corn 70%; cassava 30%                            | 2        |
| Corn 70%; mixed field crops 30%                  | 2        |
| Corn 70%; mixed orchards 30%                     | 2        |
| Corn 70%; sugar cane 30%                         | 2        |
| Field crops                                      | 2        |
| Field crops 50%; orchard 50%                     | 2        |
| Field crops 50%; perennial crops 50%             | 2        |
| Field crops 70%; orchard 30%                     | 2        |
| Mixed field crops                                | 2        |
| Mixed field crops 50%; mixed orchards 50%        | 2        |
| Mixed field crops 70%; coconut 30%               | 2        |
| Mixed field crops 70%; mixed horticulture 30%    | 2        |
| Mixed field crops 70%; mixed orchards 30%        | 2        |
| Mixed orchards 50%; coconut 50%                  | 2        |
| Mixed orchards 50%; mixed field crops 50%        | 2        |
| Mixed orchards 50%; para rubber 50%              | 2        |
| Mixed orchards 70%; coconut 30%                  | 2        |
| Mixed orchards 70%; corn 30%                     | 2        |
| Mixed orchards 70%; mixed field crops 30%        | 2        |
| Mixed orchards 70%; para rubber 30%              | 2        |
| Mixed orchards 70%; mixed horticulture 30%       | 2        |
| Mixed perennial crops                            | 2        |
| Mixed perennial crops 50%; mixed field crops 50% | 2        |
| Mixed perennial crops 50%; mixed orchards 50%    | 2        |
| Mixed perennial crops 70%; coconut 30%           | 2        |
| Mixed perennial crops 70%; mixed orchards 30%    | 2        |
| Perennial crops                                  | 2        |
| Sugar cane                                       | 2        |
| Sugar cane 50%; cassava 50%                      | 2        |
| Sugar cane 50%; corn 50%                         | 2        |
| Sugar cane 50%; mixed orchards 50%               | 2        |
| Sugar cane 70%; cassava 30%                      | 2        |
| Sugar cane 70%; corn 30%                         | 2        |
| Sugar cane 70%; mixed horticulture 30%           | 2        |
| Sugar cane 70%; mixed orchards 30%               | 2        |
| Sugar cane 70%; pineapple 30%                    | 2        |

### Turkey

The irrigated areas were digitized from a land-use map [TK01] and from a map showing the actual development status of the Southeastern Anatolia Project in the southeast of the country [TK02]. In addition, satellite imagery [TK03] was used to locate irrigated areas developed after the publishing date of the maps in [TK01].

### Turkmenistan

The irrigated areas were digitized from a map showing irrigated areas in the Aral Sea Basin [TM01]. The shape of the boundaries of the irrigated areas was then adjusted using satellite

imagery [TM02]. The location of the digitized irrigated areas was in good agreement with a map showing the irrigation infrastructure of the country [TM03].

#### **United Arab Emirates**

The cultivated area of the country, which is completely irrigated, was digitized from Landsat satellite imagery [UE01]. The digitized areas were in good agreement with areas classified as “agricultural areas and plantations” in a recently published atlas [UE02].

#### **Uzbekistan**

The irrigated areas were digitized from a map showing irrigated areas in the Aral Sea Basin [UZ01]. The shape of the boundaries of the irrigated areas was then adjusted using satellite imagery [UZ02].

#### **Viet Nam**

Digital maps of irrigated areas (polygon dataset) and irrigation projects (point dataset) were used as compiled by the Mekong River Commission ([VN01]; [VN02]). However, these inventories covered only the part of the country that belongs to the Mekong River watershed. In the other part of the country, irrigated area was distributed according to the GLC2000 land-cover map to areas classified as “cultivated and managed, irrigated (flooded, rice, shrimp farms)”. These areas fitted well with areas indicated as irrigated by a large-scale irrigation map ([VN03]) and maps showing the irrigation infrastructure of the country ([VN04]).

#### **Yemen**

The irrigated areas were digitized using Landsat satellite imagery [YE01], MODIS Vegetation Indices [YE02] and several large-scale irrigation maps ([YE03]; [YE04]; [YE05]). The approximate position and extent of the major irrigation schemes was detected based on the large-scale maps, and their more precise extent was derived by digitizing vegetated areas from the satellite imagery.

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# Documentation

## Update of the Digital Global Map of Irrigated Areas in Asia Results – Maps

WORKING REPORT IV

Stefan Siebert  
University of Frankfurt/M., Germany

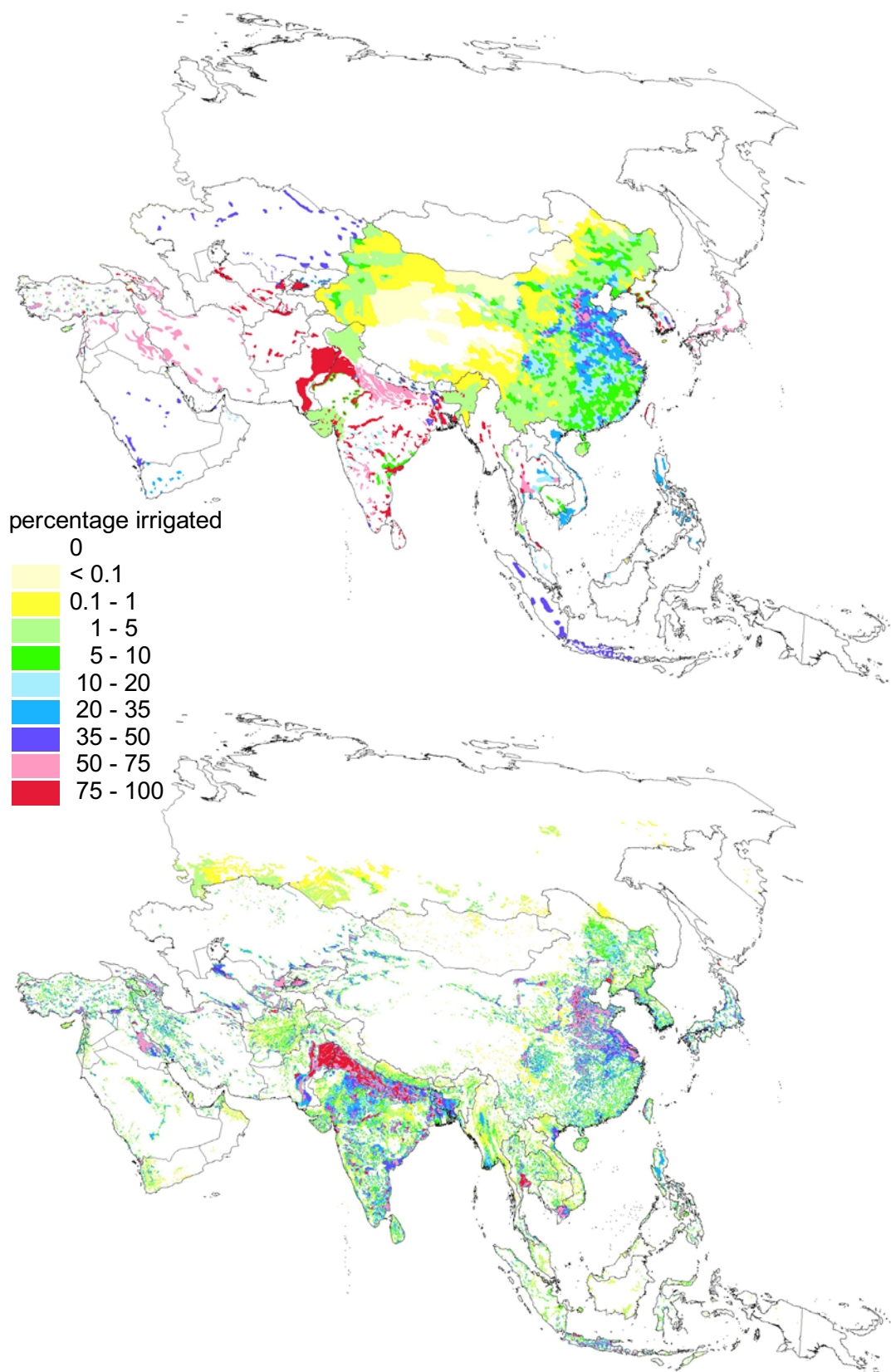
Johann Wolfgang Goethe Universität, Frankfurt, 2005

## INTRODUCTION

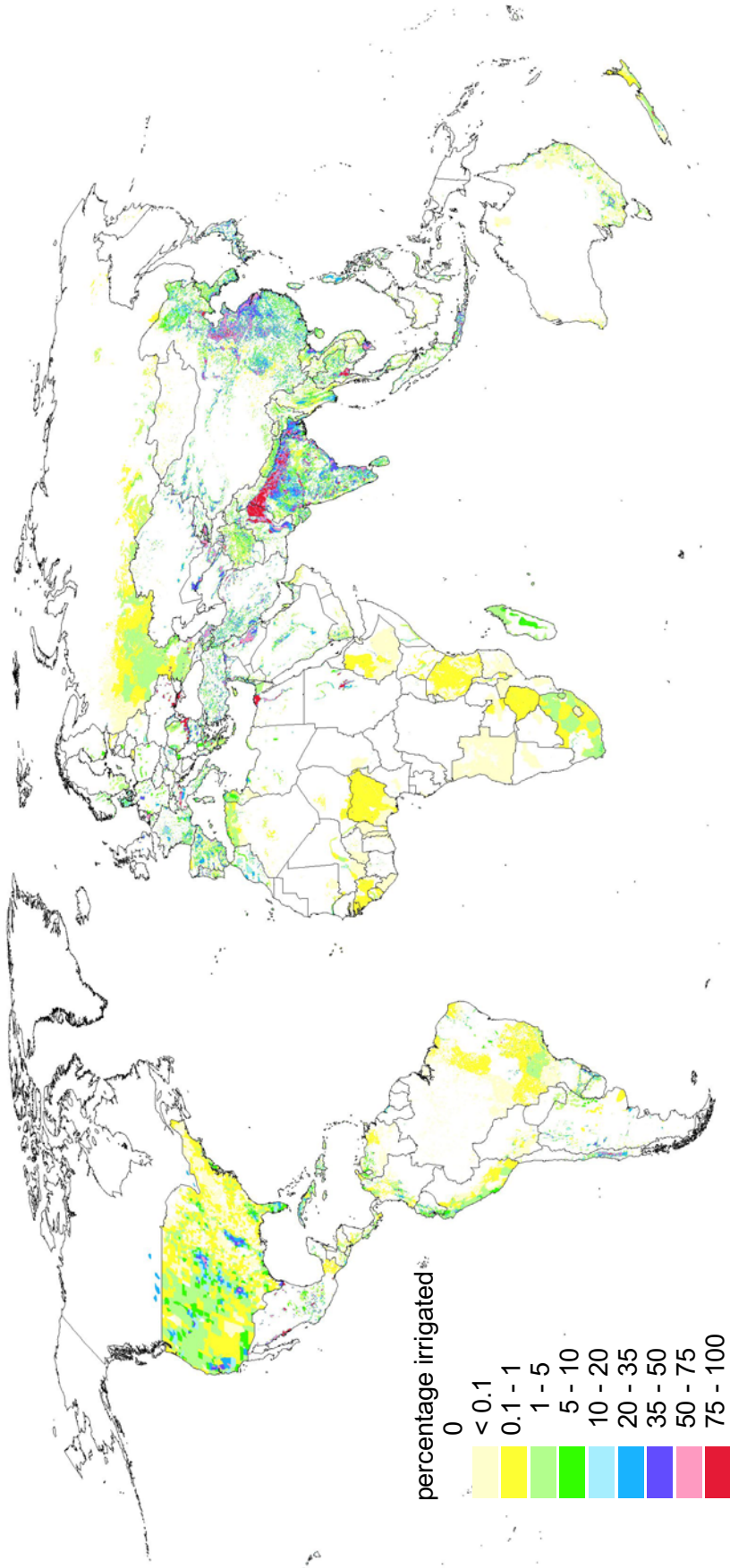
This report presents maps showing the percentage of the surface area equipped for irrigation in the new Version 2.2 of the Digital Global Map of Irrigated Areas. The map resolution is 5 minutes (0.0833 degrees), equivalent to about  $9 \times 9$  km at the equator. Map 1 compares the new map version in the Asian part of the globe with the previous map version. Irrigation is much more widespread in the new map version and the resolution of the irrigation mapping has increased. Map 2 shows the updated global irrigation map, while Maps 3–12 show the irrigation maps for subregions of Asia. The colour scheme used in the maps is based on a paired-colour categorical scheme (as presented at <http://geography.uoregon.edu>). The colours can better be differentiated by colour-deficient and colour-blind users.

## List of maps

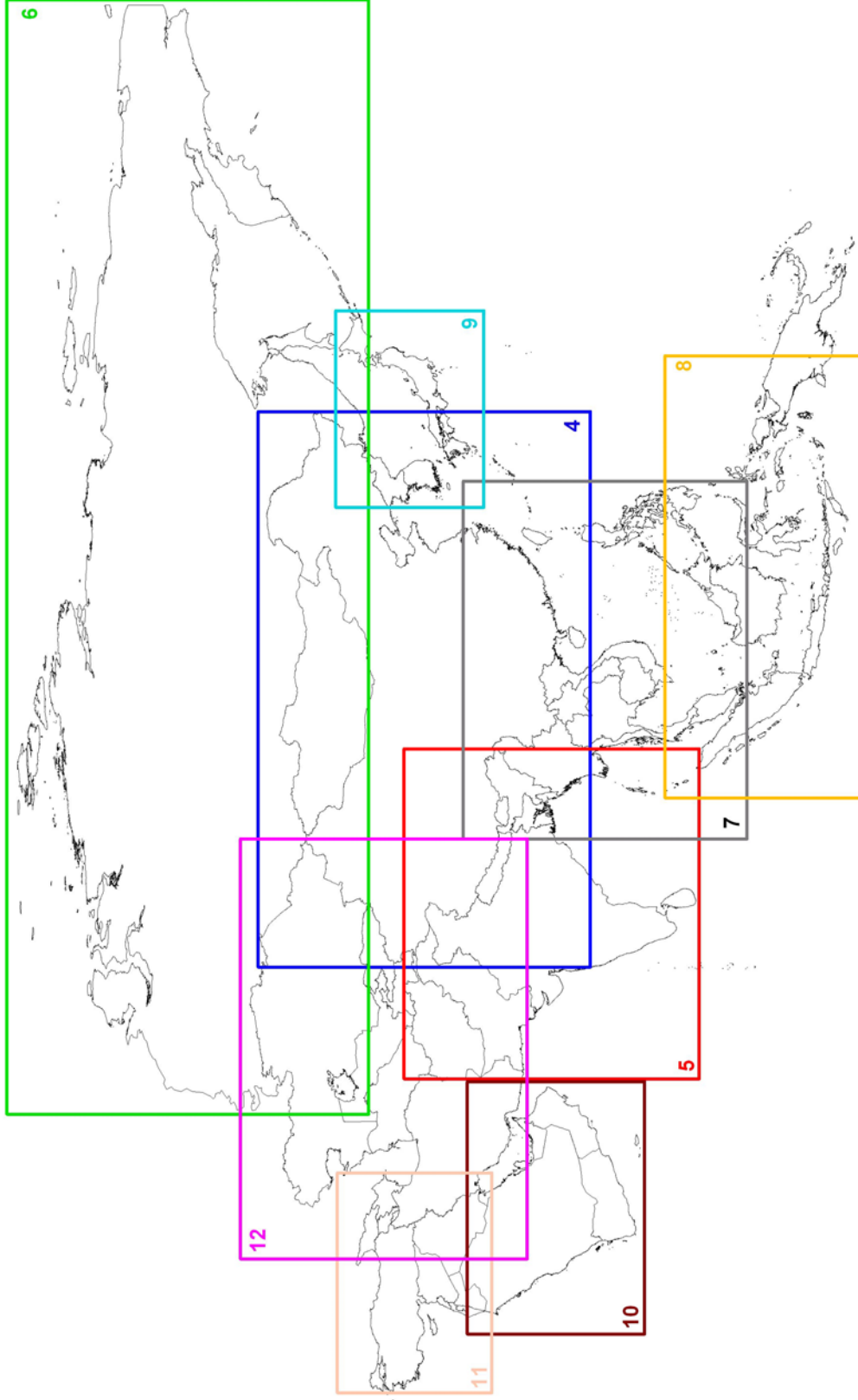
| Map no. | Map description  |
|---------|--|
| 1       | Percentage of surface area equipped for irrigation, Versions 2.1 and 2.2   |
| 2       | Digital Global Map of Irrigated Areas showing percentage of surface area equipped for irrigation, Version 2.2  |
| 3       | Position and extent of Maps 4–12 relative to the entire Asian continent  |
| 4       | Percentage of surface area equipped for irrigation, East Asia (Bangladesh, Bhutan, China, Democratic People's Republic of Korea, Mongolia, Nepal, Republic of Korea, and Taiwan Province of China)         |
| 5       | Percentage of surface area equipped for irrigation, South Asia (Afghanistan, Bangladesh, Bhutan, India, Nepal and Pakistan)  |
| 6       | Percentage of surface area equipped for irrigation, Russian Federation   |
| 7       | Percentage of surface area equipped for irrigation, Southeast Asia (Brunei Darussalam, Cambodia, Lao People's Democratic Republic, Myanmar, Philippines, Thailand, Taiwan Province of China, and Viet Nam) |
| 8       | Percentage of surface area equipped for irrigation, Southeast Asia (Brunei Darussalam, East Timor, Indonesia and Malaysia)   |
| 9       | Percentage of surface area equipped for irrigation, East Asia (Democratic People's Republic of Korea, Japan and Republic of Korea)   |
| 10      | Percentage of surface area equipped for irrigation, Arabian Peninsula (Bahrain, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, and Yemen)  |
| 11      | Percentage of surface area equipped for irrigation, Mediterranean and Mesopotamia (Cyprus, Iraq, Israel, Jordan, Lebanon, Palestinian Authority, Syrian Arab Republic, and Turkey)                         |
| 12      | Percentage of surface area equipped for irrigation, Near East and Central Asia (Islamic Republic of Iran, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan)                                 |



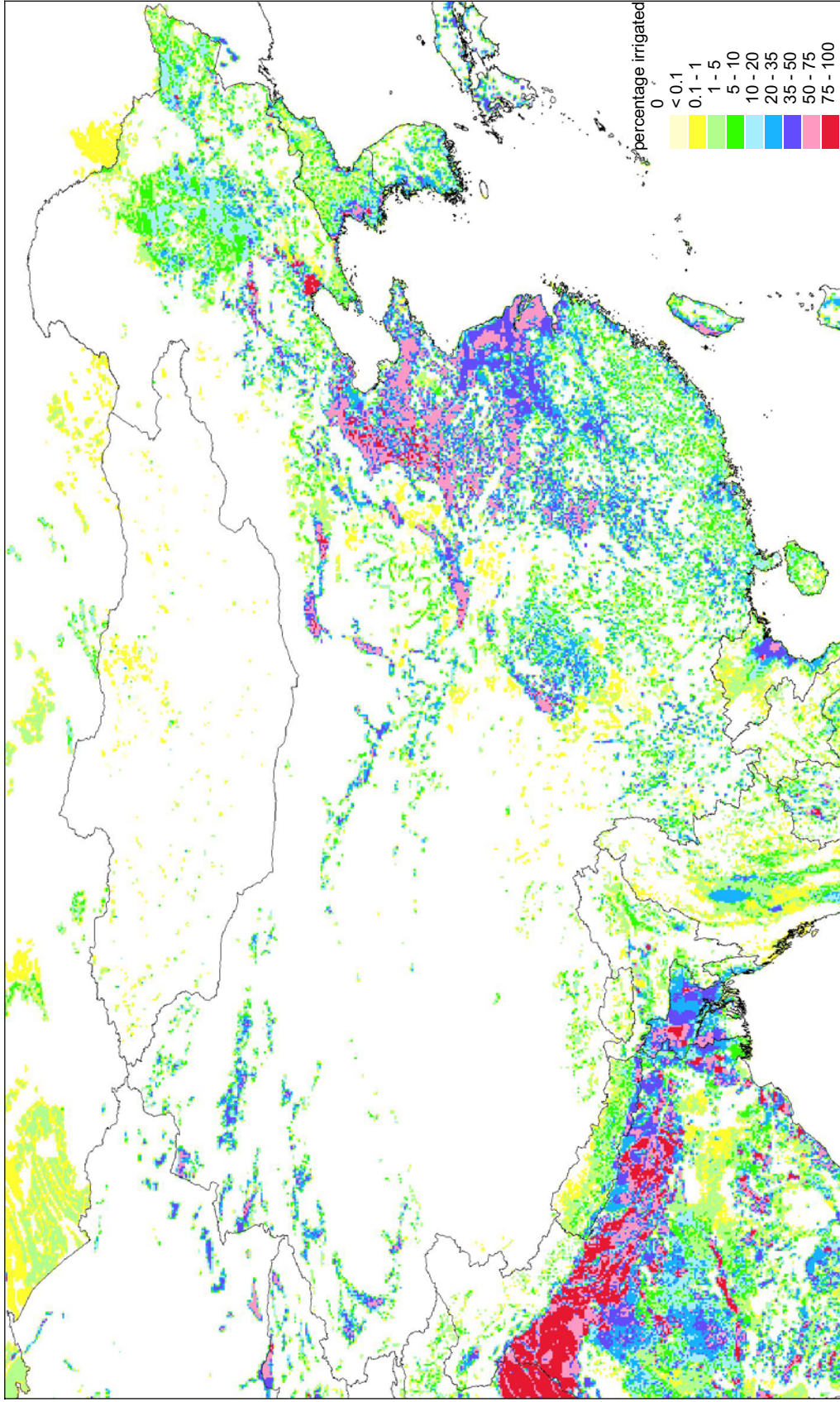
MAP 1  
Percentage of surface area equipped for irrigation: (a) Asia – Version 2.1; and (b) Asia – Version 2.2



MAP 2  
Digital Global Map of Irrigated Areas showing percentage of surface area equipped for irrigation, Version 2.2 (January 2005)



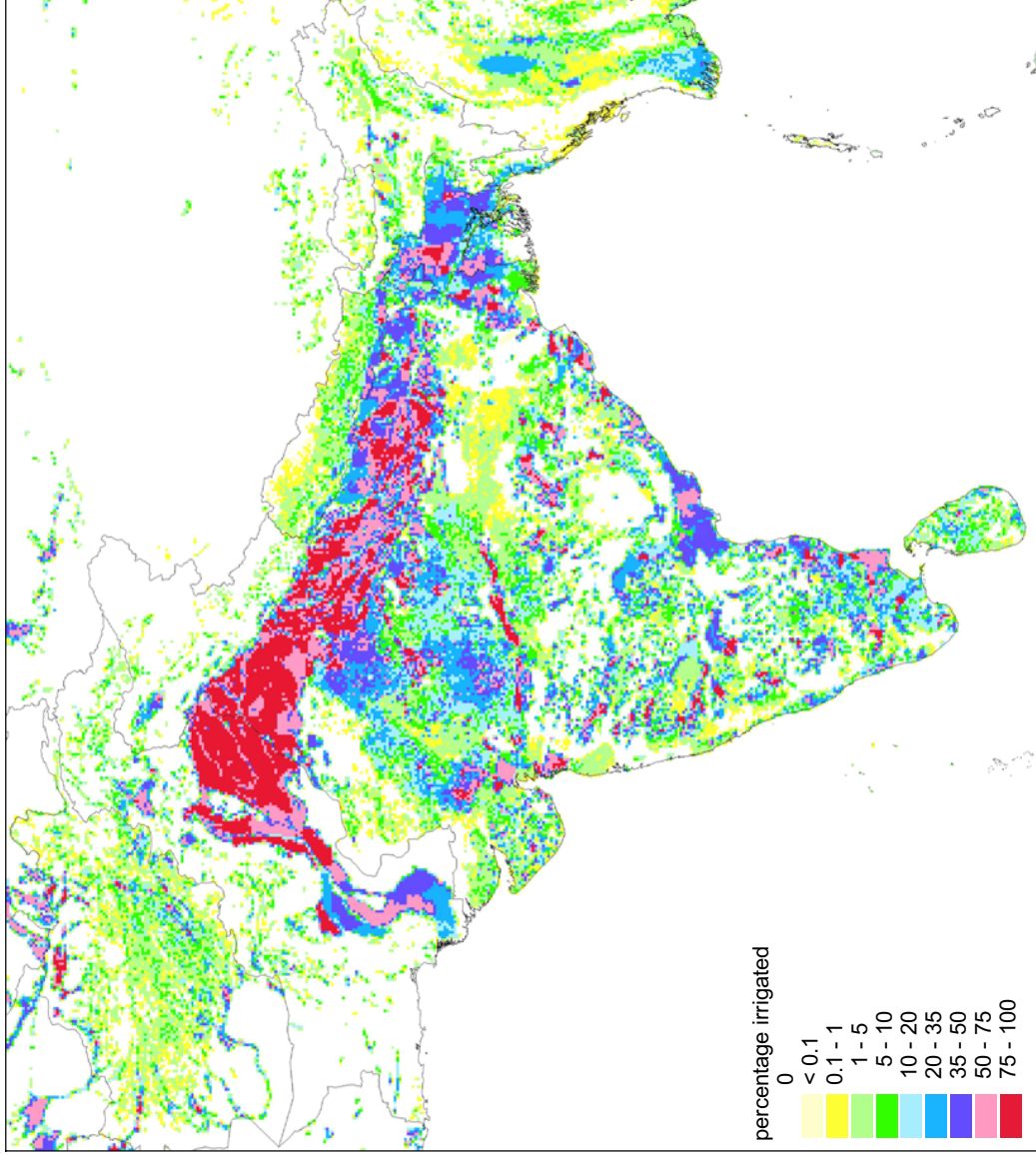
MAP 3  
Position and extent of Maps 4–12 relative to the entire Asian continent



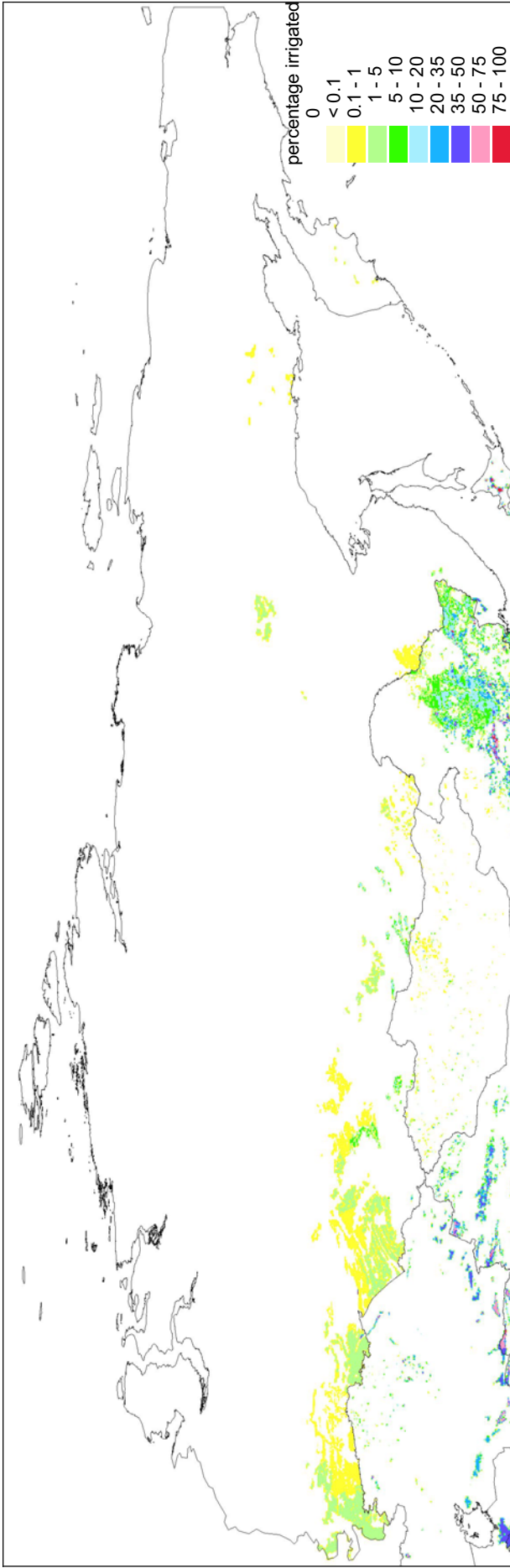
MAP 4

Percentage of surface area equipped for irrigation, East Asia (Bangladesh, Bhutan, China, Democratic People's Republic of Korea, Mongolia, Nepal, Republic of Korea, and Taiwan Province of China)

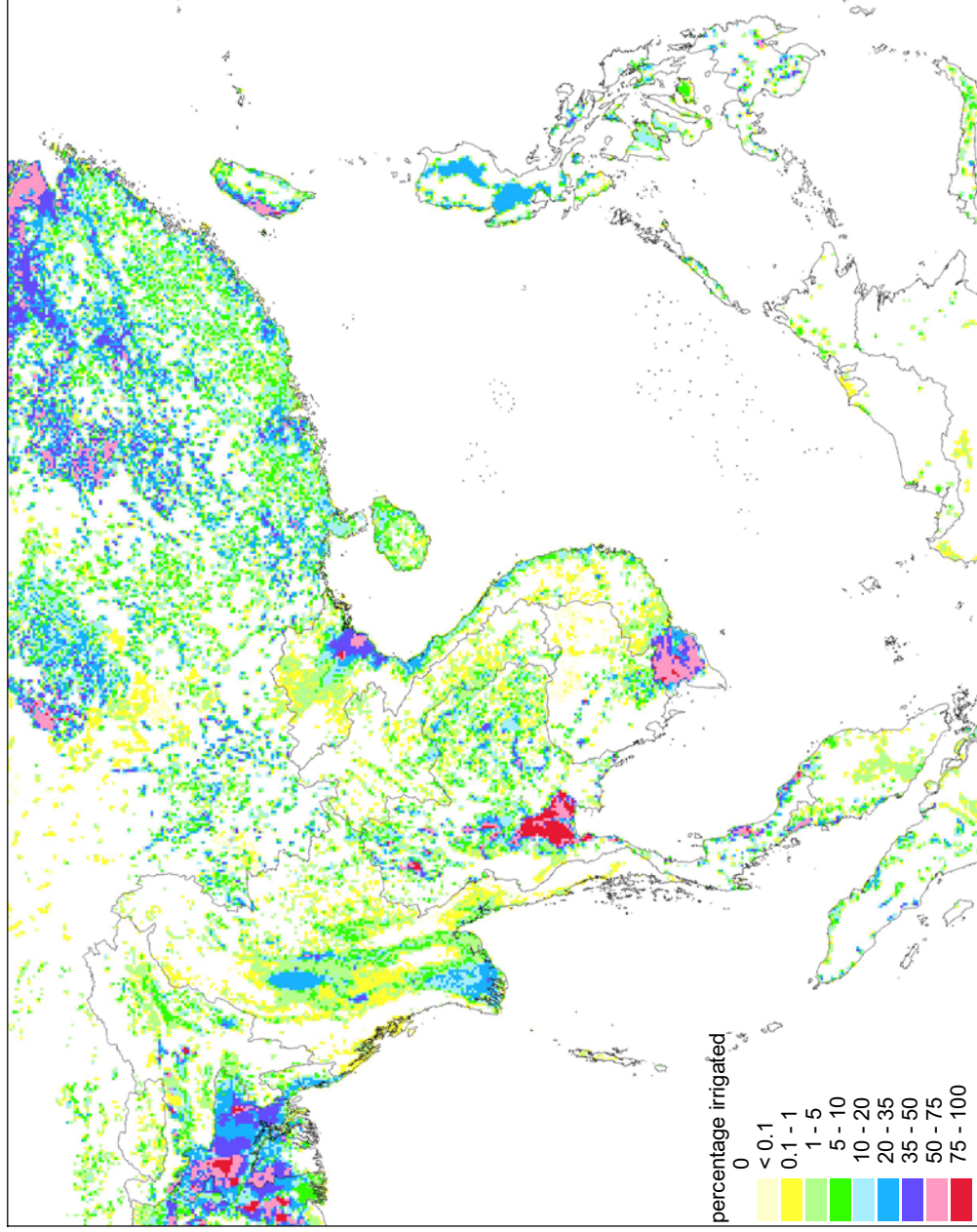




MAP 5  
Percentage of surface area equipped for irrigation, South Asia (Afghanistan, Bangladesh, Bhutan, India, Nepal and Pakistan)

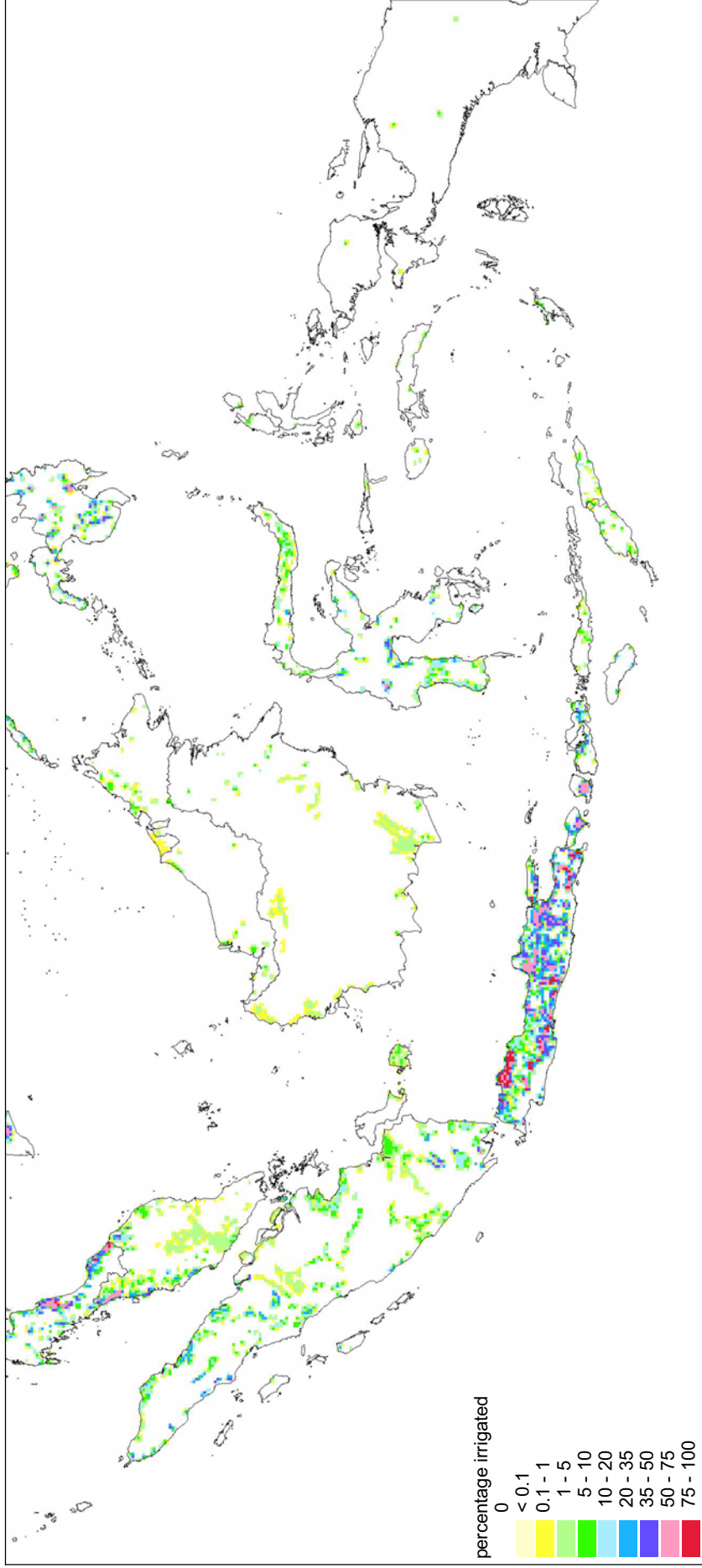


MAP 6  
Percentage of surface area equipped for irrigation, Russian Federation



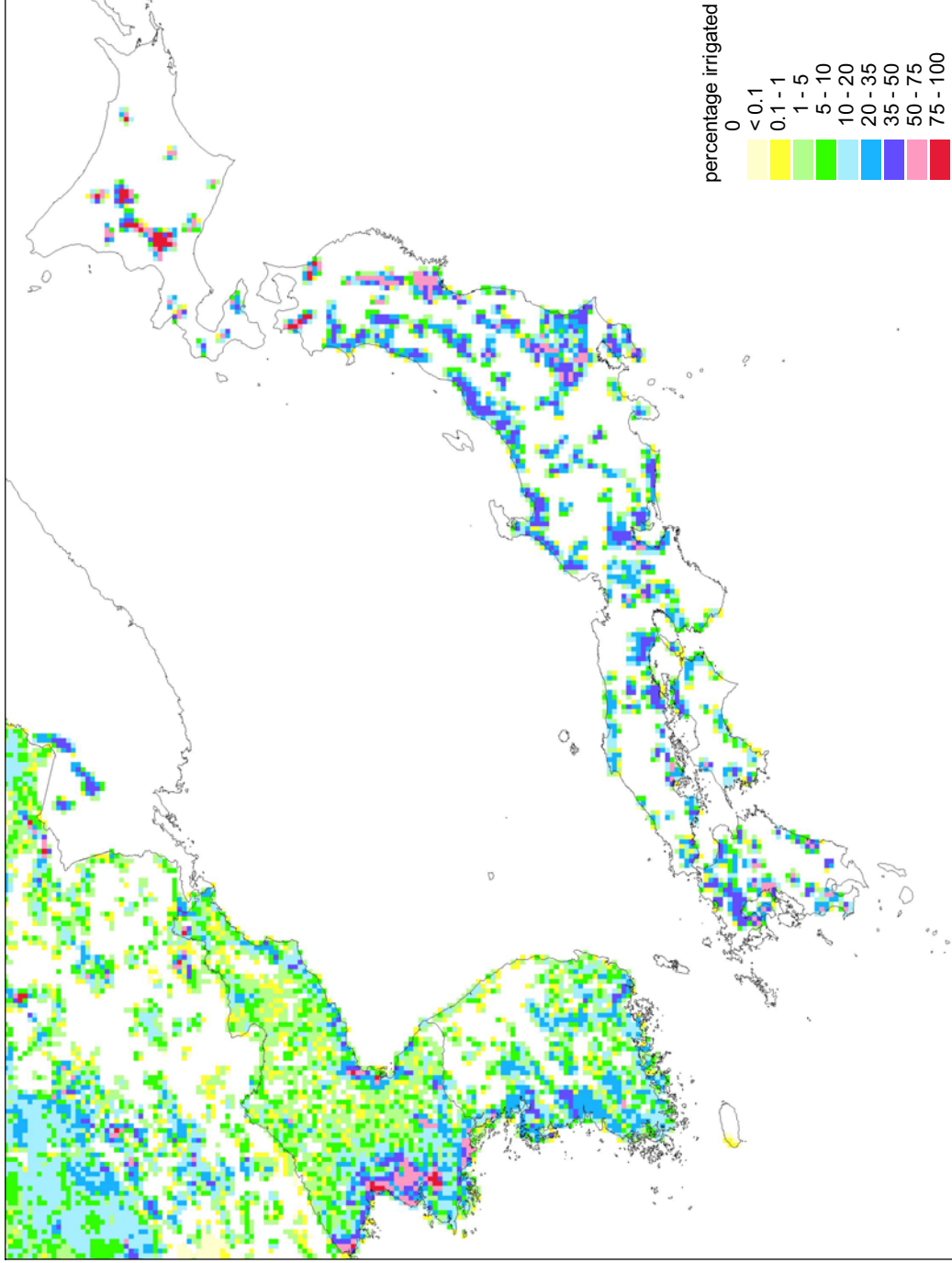
MAP 7

Percentage of surface area equipped for irrigation, Southeast Asia (Brunei Darussalam, Cambodia, Lao People's Democratic Republic, Myanmar, Philippines, Thailand, Taiwan Province of China, and Viet Nam)

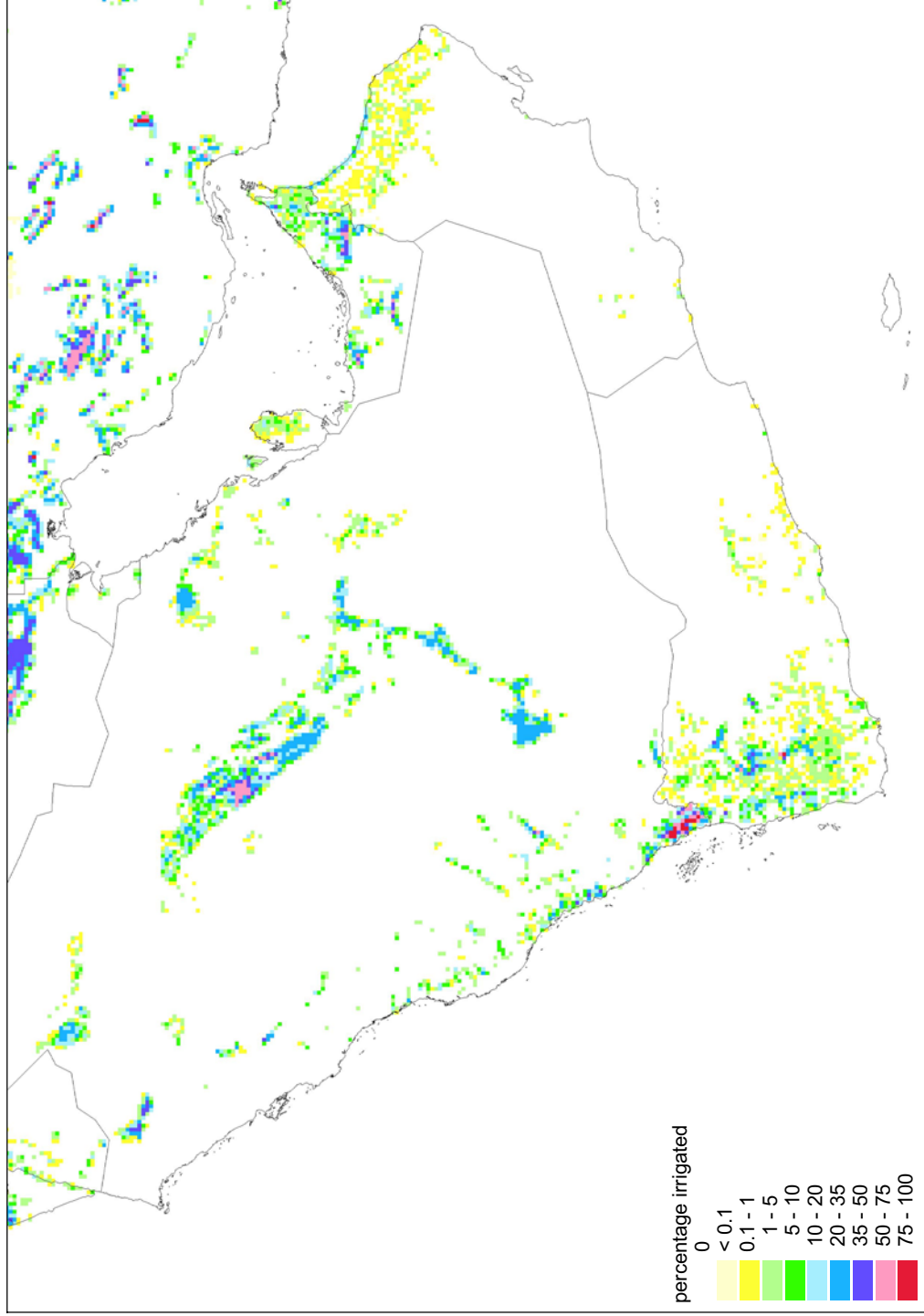


MAP 8

Percentage of surface area equipped for irrigation, Southeast Asia (Brunei Darussalam, East Timor, Indonesia and Malaysia)

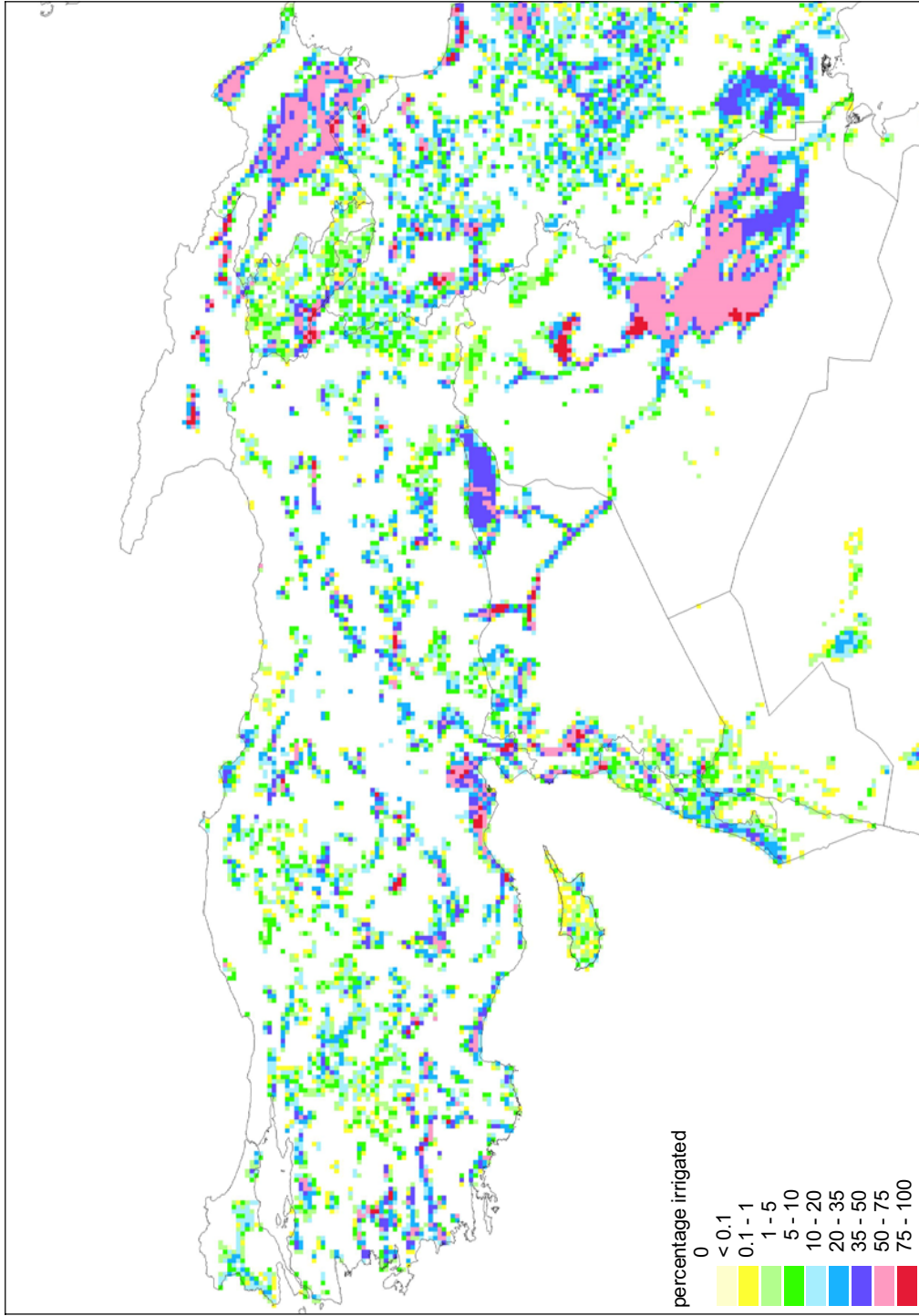


MAP 9  
Percentage of surface area equipped for irrigation, East Asia (Democratic People's Republic of Korea, Japan and Republic of Korea)



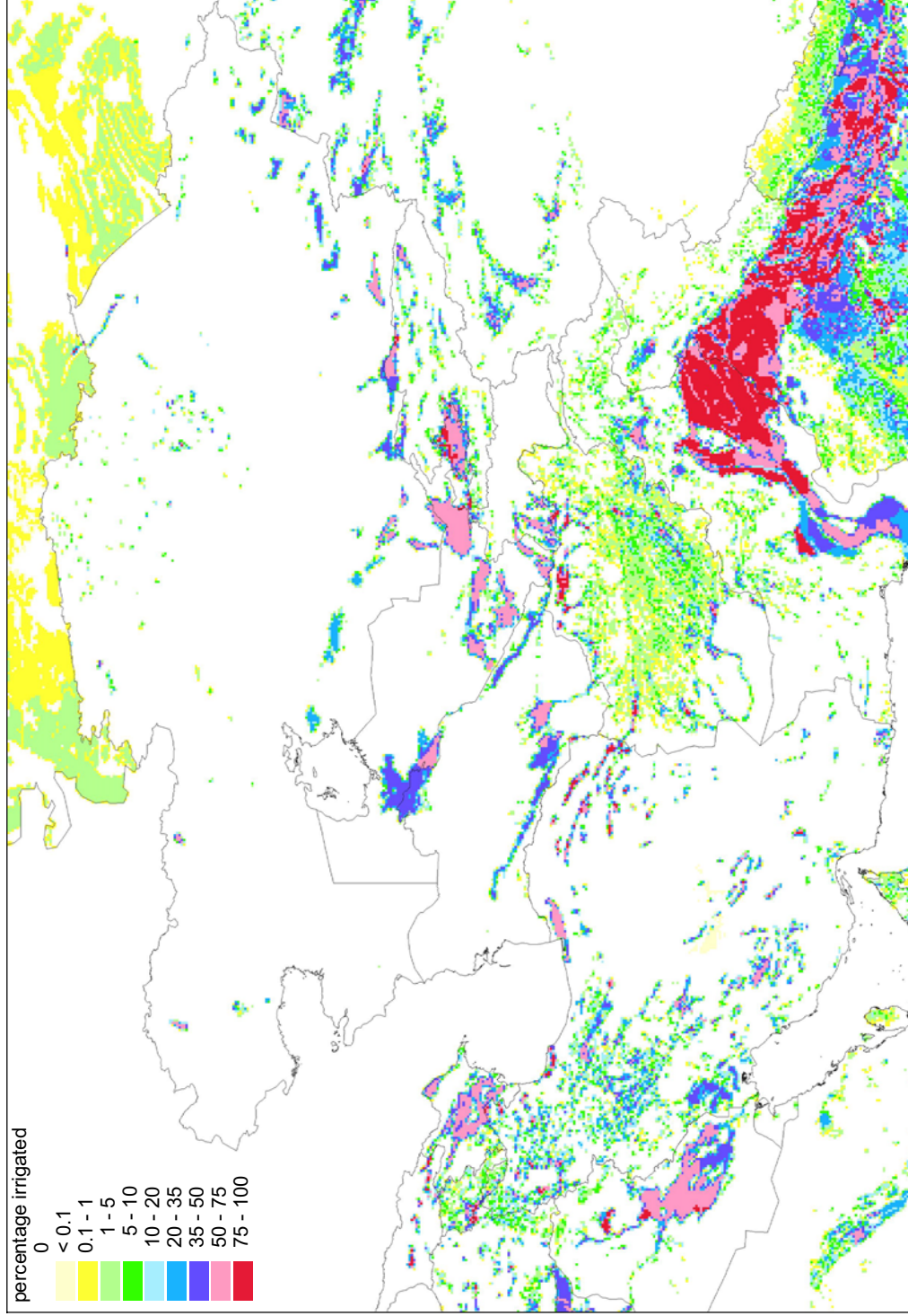
MAP 10

Percentage of surface area equipped for irrigation, Arabian Peninsula (Bahrain, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, and Yemen)



MAP 11

Percentage of surface area equipped for irrigation, Mediterranean and Mesopotamia (Cyprus, Iraq, Israel, Jordan, Lebanon, Palestinian Authority, Syrian Arab Republic, and Turkey)



MAP 12

Percentage of surface area equipped for irrigation, Near East and Central Asia (Islamic Republic of Iran, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan)



The Land and Water Development Division of the Food and Agriculture Organization of the United Nations and the Johann Wolfgang Goethe University, Frankfurt am Main, Germany, are cooperating in the development of a global irrigation-mapping facility. This report describes an update of the Digital Global Map of Irrigated Areas for the continent of Asia. For this update, an inventory of subnational irrigation statistics for the continent was compiled. The reference year for the statistics is 2000. Adding up the irrigated areas per country as documented in the report gives a total of 188.5 million ha for the entire continent. The total number of subnational units used in the inventory is 4 428. In order to distribute the irrigation statistics per subnational unit, digital spatial data layers and printed maps were used. Irrigation maps were derived from project reports, irrigation subsector studies, and books related to irrigation and drainage. These maps were digitized and compared with satellite images of many regions. In areas without spatial information on irrigated areas, additional information was used to locate areas where irrigation is likely, such as land-cover and land-use maps that indicate agricultural areas or areas with crops that are usually grown under irrigation.