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Title: Majority of 21st century global irrigation expansion has been in water stressed regions

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Abstract

The expansion of irrigated agriculture has increased global crop production but resulted in widespread stress to freshwater resources. Ensuring that increases in irrigated production only occur in places where water is relatively abundant is a key objective of sustainable agriculture, and knowledge of how irrigated land has evolved is important for measuring progress towards water sustainability. Yet a spatially detailed understanding of the evolution of global area equipped for irrigation (AEI) is missing. Here we utilize the latest sub-national irrigation statistics (covering 17298 administrative units) from

various official sources to develop a gridded (5 arc-min resolution) global product of AEI for the years 2000, 2005, 2010, and 2015. We find that AEI increased by 11% from 2000 (297 Mha) to 2015 (330 Mha) with locations of both substantial expansion such as northwest India and northeast China and decline, such as Russia. Combining these outputs with information on green (i.e., rainfall) and blue (i.e., surface and ground) water stress, we also examine to what extent irrigation has expanded unsustainably in places already experiencing water stress. We find that more than half (52%) of irrigation expansion has taken place in areas that were already water stressed in year 2000, with India alone accounting for 36% of global unsustainable expansion. These findings provide new insights into the evolving patterns of global irrigation with important implications for global water sustainability and food security.

Introduction

The global population is projected to increase to over 10 billion people by 2050[1], and food production will need to increase by roughly 70% to meet the associated food demand of the growing population[2]. Because increasing the amount of cropland area would mean the conversion of forests and other ecosystems[3], intensifying agriculture on existing croplands by sustainably increasing irrigation and other inputs is a promising potential alternative[4,5]. While irrigated areas account for 24% of croplands, roughly 40% of global food production is from irrigated croplands[6,7]. In addition, over 90% of humanity's consumptive water use is for irrigated agricultural production[8]. Depending on the relative water demand and availability in a location, this extensive water use can alter the water cycle, deplete aquifers and surface water bodies[9], increase water stress[10], and escalate competition for freshwater resources[11]. Given the critical role that irrigation will likely play in meeting future food demand and the highly heterogeneous nature of water availability and demand, it is essential to understand how spatial patterns of global irrigation have recently evolved and to evaluate whether these changes have tended to occur in locations where water resources are relatively abundant or scarce.

Several global and regional efforts have begun to address the challenges of mapping spatial patterns and temporal trends in irrigation. Datasets on the extent of irrigated land have been developed at global[12] and regional scales[13], but these analyses do not have the spatio-temporal coverage to evaluate the (un)sustainability of irrigation changes since the start of the century. A growing number of studies have also attempted to map irrigated areas at global or national scales using satellite imagery and remotely sensed data[13–15]. While these studies often provide fine spatial resolution, the resultant maps are not necessarily consistent with irrigation statistics and do not include areas that are equipped for irrigation but are not actively in use in the year of the assessment[13,14,16]. Other databases[17–19] offer greater temporal coverage but for coarse national or sub-national units, limiting their utility in spatially-explicit assessments of irrigation changes with respect to regions experiencing water scarcity. While all of these efforts have provided valuable insights into aspects of either spatial patterns or temporal trends of global irrigation, there remains a critical need for information on global area equipped for irrigation (AEI) that is both spatially and temporally detailed in order to examine the sustainability of the evolution of irrigated areas in the 21st century.

Here we quantify the water sustainability of global changes in AEI since the start of the century. To do so, we first gather (sub-)national irrigation statistics for the year 2000 through 2015 for 243 countries (consisting of 17298 administrative units) from international databases, national agricultural censuses, and government reports. We then combine these data with global gridded maps of cropland[20], pastureland[20], and irrigated area[21] into a spatial allocation and downscaling model[12] to develop global gridded (5 arc-min) maps of AEI for the year 2000, 2005, 2010, and 2015. Assessing spatial patterns of AEI expansion and decline, we overlay global maps of blue and green water stress[22] to evaluate the fraction of AEI changes that have occurred in water stressed regions (i.e., unsustainable) since the start of the century. This new understanding of the sustainability of recent global irrigation changes can point to areas that have had success in sustainable irrigation expansion and inform strategies to address undesirable water scarcity outcomes.

Results

Changing patterns of global irrigation

We find that global AEI in the year 2015 was 330 Mha (Figure 1), with Asia dominating – accounting for 222 Mha (68%) of total AEI, followed by North America (37 Mha, 11%), and Europe (31 Mha, 9%). China (71 Mha), India (70 Mha), and the United States (28 Mha) alone account for more than half (51%) of global total AEI.

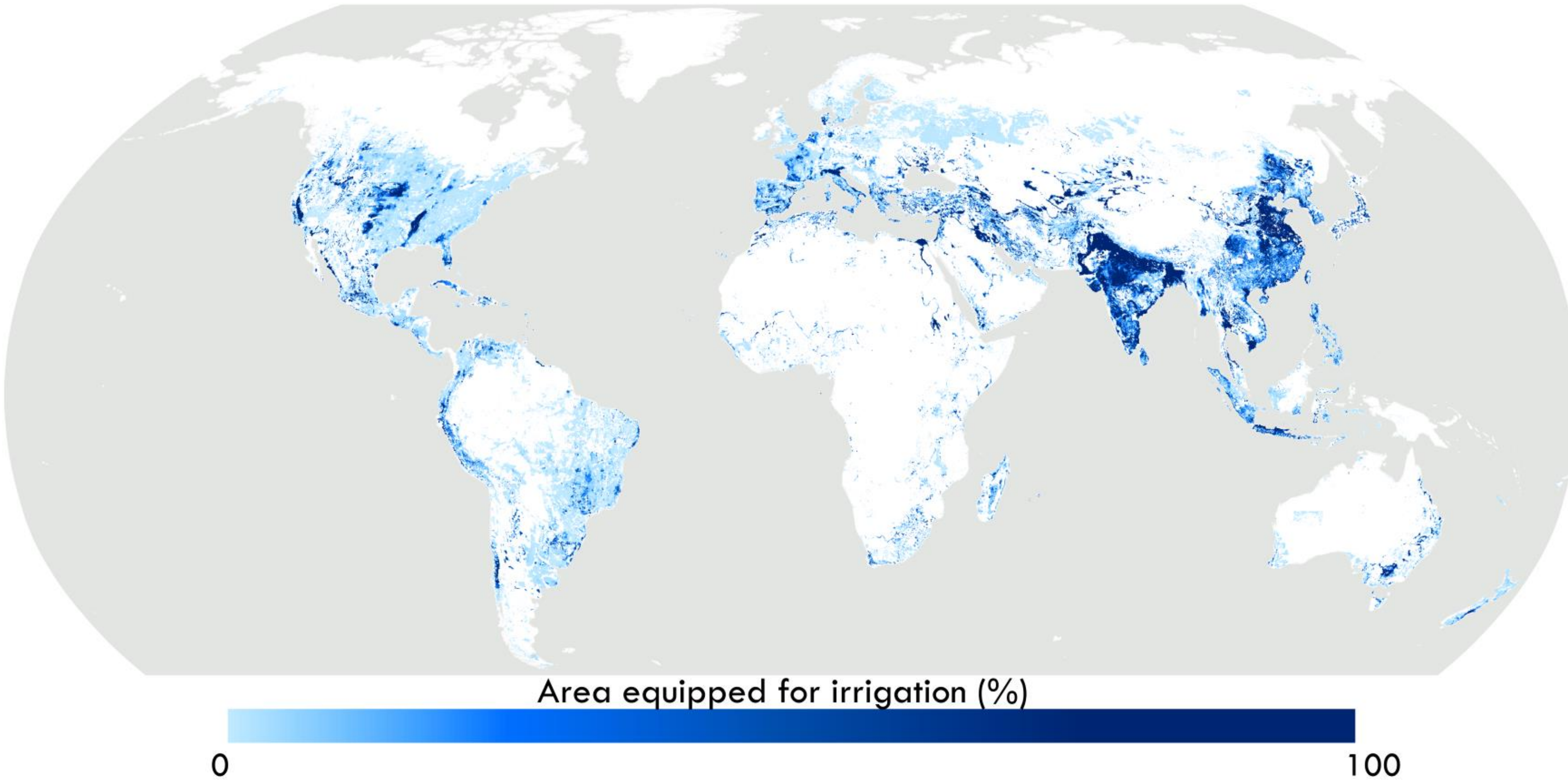

Figure 1. Global map of area equipped for irrigation (AEI) in 2015. Each 5 arc-min pixel area shown as percentage of land equipped for irrigation.

We also estimate that global AEI increased on net by 33 Mha (+11%) from the year 2000 (297 Mha) (Figure 2). This net increase was the result of a 60 Mha gross increase in AEI in some areas and a 27 Mha gross decrease in other areas (Figure 3). Asia and South America observed the largest net increases in AEI of about 28 Mha (+14%) and 5.6 Mha (+49%), respectively, followed by Africa (1.8 Mha, +13%) and Oceania (1.7 Mha, +40%). The countries where we find that irrigation expanded (on net) the most are China (12.1 Mha) and India (8.5 Mha) (Table 1; full list of countries in Table S2). A major reason behind this expansion is increasing investment in irrigation projects to maintain food self-sufficiency[23,24]. Expansion of AEI in relative terms was exceptionally large in Brazil where AEI more than doubled in period 2000 to 2015 (Table 1).

Table 1. Countries with largest net positive and net negative changes in area equipped for irrigation (AEI).

Country	AEI net change (Mha)	Percent net change (%)
China	12.1	+21
India	8.5	+14
Brazil	3.6	+113
Iran	1.7	+22
Australia	1.5	+41
Indonesia	1.2	+22
Bangladesh	1.1	+24
Vietnam	1.0	+26
Peru	0.9	+52
Thailand	0.8	+15
Japan	-0.3	-11
Cuba	-0.3	-36
Kazakhstan	-1.4	-40
Russia	-2.0	-53
Romania	-2.2	-83
Rest of the world	6.1	+5

In Europe, AEI decreased by 4.8 Mha overall (-13%) largely attributable to former centrally controlled irrigation infrastructure designed to serve very large irrigation schemes which often went out of operation and adverse economic conditions in Eastern European countries such as Romania[25] (-83%) and Russia[26] (-53%). Other countries, such as Japan (-36%) and Saudi Arabia (-16%), also saw substantial declines in irrigation extent (Figure 2; Table S2), potentially due to a growing reliance on food imports[17]. Overall, these findings point to substantial shifts in irrigation patterns since the start of the century.

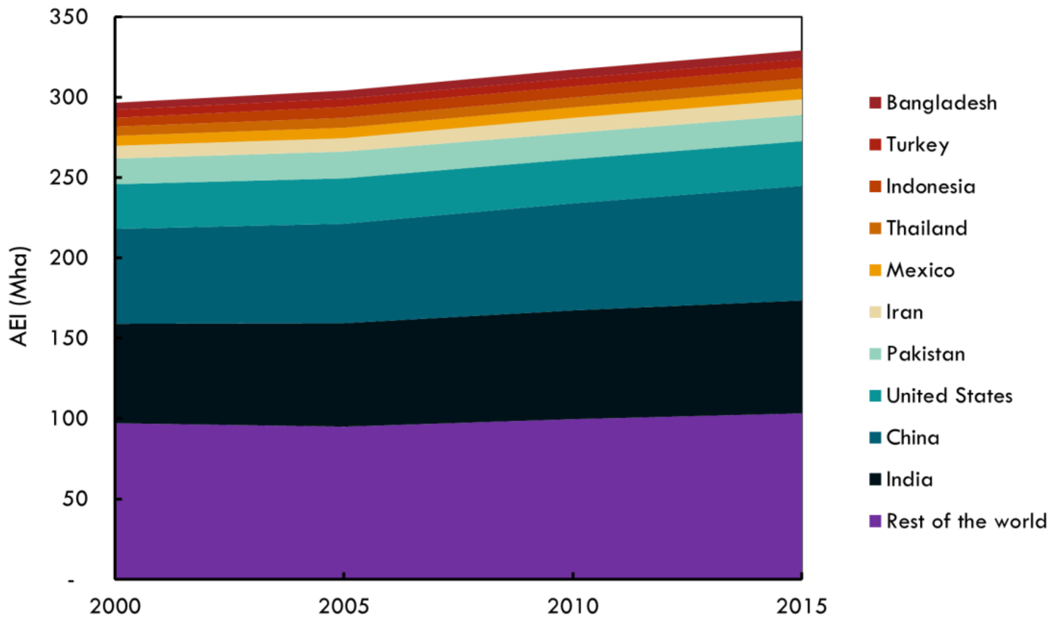

Figure 2. Area equipped for irrigation (AEI) for major countries between 2000 and 2015. Countries are ordered in ascending order based on their year 2000 AEI.

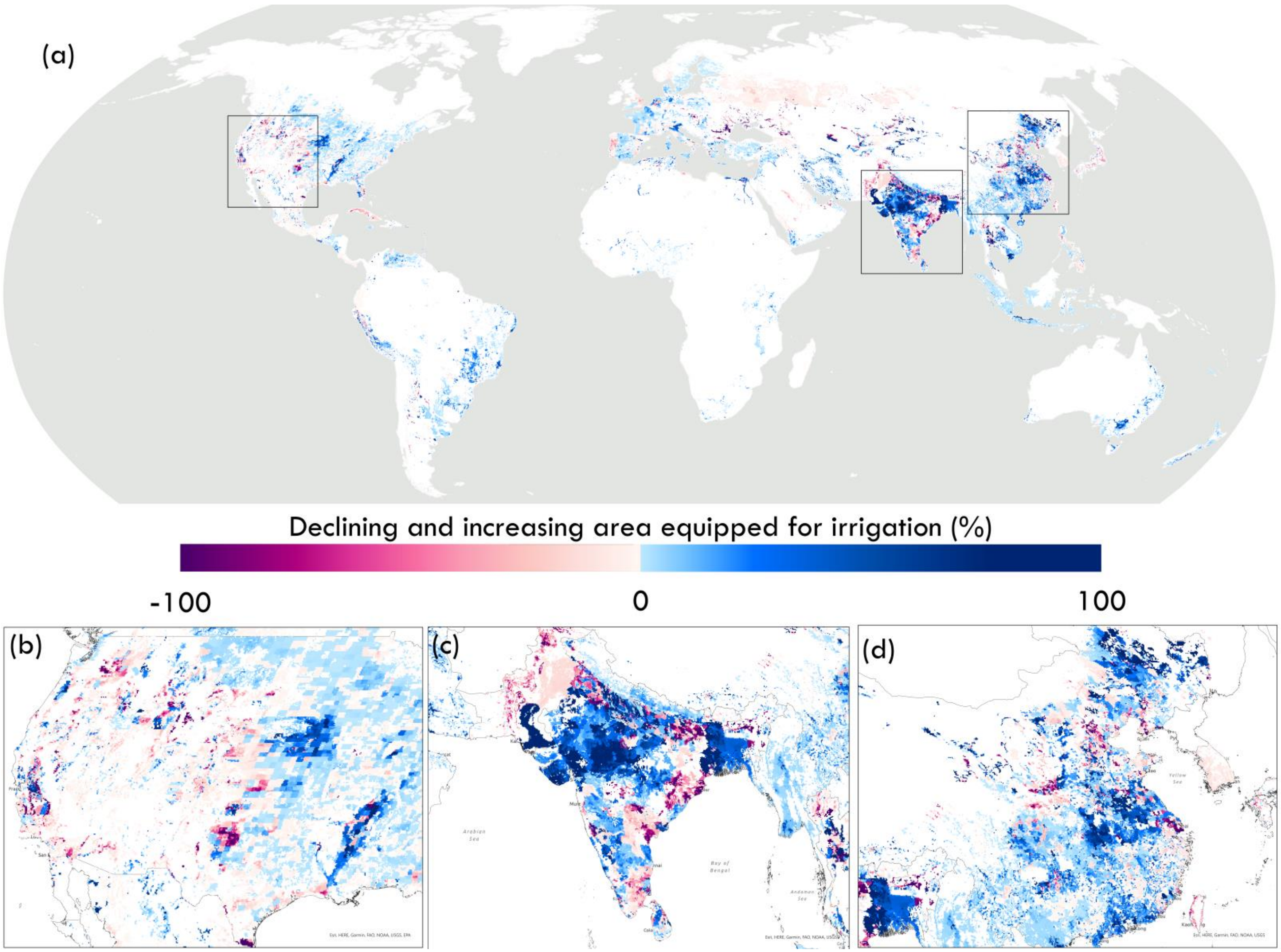

Figure 3. Global changes in area equipped for irrigation (AEI) from 2000 to 2015. (a) Areas of expansion are shown in blue, and areas of decline are shown in purple as percentage change in AEI. (b-d) Insets show the western US, India, and eastern China.

The state of water stress in areas of irrigation change

Of equal importance as shifts in AEI is the extent to which these shifts have occurred within locations where water resources are relatively abundant and can support additional blue water demand without depleting streamflow or aquifers (i.e., sustainable expansion). We assessed sustainable AEI expansion by combining our spatio-temporal AEI database with information on global patterns of water stress. We define water stress as the condition in which consumptive demand (i.e., withdrawals minus return flows) by all sectors exceeds freshwater availability[27]. Water stress can be the result of either green water stress (GWS) – when rainfall is insufficient to meet a crop's water requirement and supplementary irrigation is needed – or blue water stress (BWS) – when renewable surface and groundwater availability (i.e., total availability after accounting for environmental flows) is insufficient to meet irrigation water demand. In the case of GWS, expansion of irrigation infrastructure can be a valuable strategy for buffering against variations in rainfall, provided that blue water resources are sufficiently available. In the case of BWS, expansion of irrigation infrastructure can lead to enhanced depletion of aquifers and streamflow.

Of the 62 Mha of gross irrigation expansion that we observe, we find that 1.2 Mha occurred in regions with only blue water stress, 16.8 Mha occurred in regions with only green water stress, 30.9 Mha occurred in regions with both blue and green water stress, and 13.1 Mha occurred in regions with no water stress (Figure 4). This means 52% (1.2+30.9 Mha) of gross AEI expansion has been unsustainable, taking place in locations already experiencing some form of blue water stress. Of the countries with the largest AEI areas in 2015, India and Pakistan experienced the most unsustainable expansion – 83% (11.64 Mha) and 87% (1.53 Mha) of the gross expansion in AEI took place in locations that were already blue water stressed. The fraction of unsustainable AEI expansion in China (34%) and the United States (45%) was also substantial (Supplementary Table S2). Conversely, there were also countries in which most of the AEI expansion was sustainable (from the perspective of water resources), such as Brazil (3.4 Mha, 94% of total expansion was sustainable), Indonesia (0.9 Mha, 78%), Peru (0.9 Mha, 72%), Italy (0.4 Mha, 82%), and

France (0.1 Mha, 89%) (Supplementary Table S2). In many places, we also observed substantial declines in AEI in areas that were previously experiencing unsustainable water demand (i.e., under blue water stressed (BWS) conditions). Globally, AEI declines in water-stressed regions (BWS and BWS+GWS) totaled -15.2 Mha (51% of the total decline). Countries with the largest decreases in AEI in water-stressed regions include India (-4.3 Mha, 79%), China (-3.2 Mha, 53%), and United States (-2.3 Mha, 56%) (see Supplementary Table S3 for full list). Taken together, all of these results demonstrate that both sustainable and unsustainable shifts in irrigation patterns have occurred across diverse geographies and contexts (and often within the same country) since the start of the century. These findings provide critical understanding of whether and where irrigation trends have been on a sustainable trajectory (i.e., in locations where water resources are relatively abundant) and highlight regions where interventions are most urgently needed to address unsustainable practices.

Table 2. Countries with largest net area equipped for irrigation (AEI) expansion in already water stressed regions. BWS stands for blue water scarcity and is defined as the condition when renewable surface and groundwater availability (i.e., total availability after accounting for environmental flows) is insufficient to meet irrigation water demand. GWS in turn stands for green water scarcity and is defined as the condition when rainfall is insufficient to meet a crop's water requirement and supplementary irrigation is needed.

Country	Unsustainable expansion (% of gross expansion)	Net AEI change in BWS or BWS+GWS regions (Mha)
India	83	7.3
China	34	3.0
Iran	71	1.2
Bangladesh	94	1.0
Australia	62	0.9
Thailand	81	0.8
Pakistan	87	0.7
Vietnam	45	0.4
Egypt	85	0.3
Indonesia	22	0.3
Algeria	37	0.2

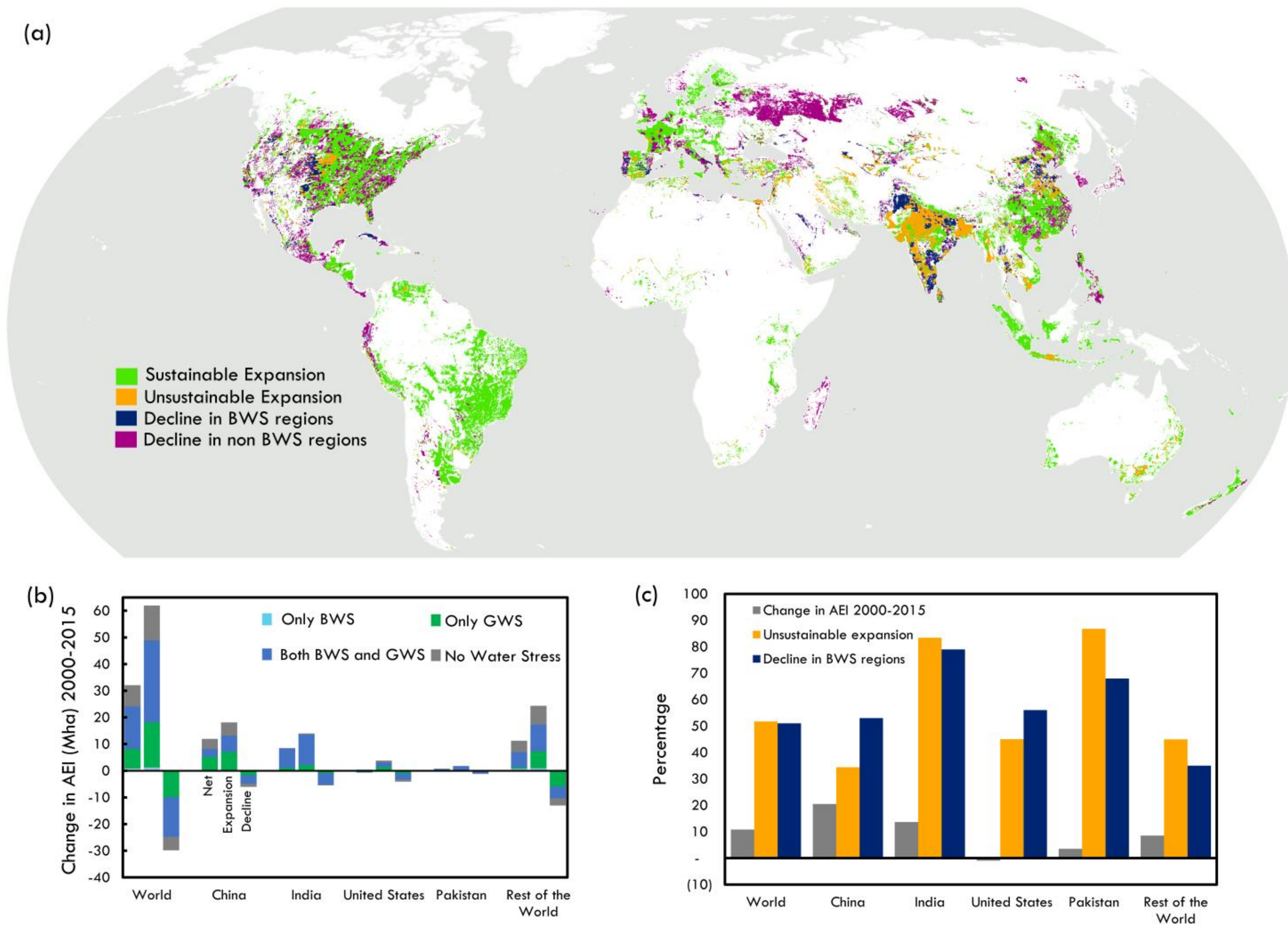

Figure 4. Sustainability of 21st century area equipped for irrigation (AEI) changes. (a) Map showing four categories for AEI change: sustainable expansion (i.e., in areas of GWS or no water stress), unsustainable expansion (i.e., in areas of BWS or BWS+GWS), decline in BWS regions, decline in non-BWS regions. (b) Change in AEI from 2000 to 2015 by water stress category for major countries. Blue water scarcity (BWS) is defined as the condition when renewable surface and groundwater availability (i.e., total availability after accounting for environmental flows) is insufficient to meet irrigation water demand. Green water scarcity (GWS) is defined as the condition when rainfall is insufficient to meet a crop's water requirement and supplementary irrigation is needed. (c) Percentage change in net AEI change from 2000 to 2015, percentage of unsustainable expansion of AEI (i.e., in areas of blue water scarcity) and percentage of decline in BWS regions.

Discussion

Our findings shed new light on the extent to which irrigation shifts have been sustainable since the start of the century. Globally we find that the area equipped for irrigation has expanded by 11% since 2000 – a necessary and important step towards increasing food supply and buffering against rising climate variability. Most notably, the irrigation expansion that we observe in sub-Saharan Africa and South and Southeast Asia offers promise for helping to address widespread and persistent malnutrition[28] and in aiding the productivity and adaptive capacity of the many smallholder farmers in these regions[29,30]. Yet our analysis also demonstrates that in many places, irrigation expansion has occurred where water stress already existed, suggesting the further depletion of streamflow and aquifers in these locations. In all, these findings paint a mixed picture of progress towards global water sustainability and highlight deep differences in irrigation shifts both within and between countries.

The extent to which countries increase crop production through unsustainable irrigation expansion will also have important implications for the food self-sufficiency of nations as well as global food security given many countries' growing reliance on food imports[31]. Countries continuing to practice and expand irrigated agriculture in places where water is scarce subject themselves to an increasing likelihood that freshwater resources could become inaccessible (i.e., groundwater table drawdown, streamflow depletion) and ultimately impose physical and/or economic limits on levels of irrigated production. For food importing countries (e.g., Saudi Arabia, South Africa), such a situation may cause local food production to falter and necessitate growing reliance on food trade. For food exporters (e.g., US, Australia), continued unsustainable irrigation practices could force a reduction in food exports in order to continue meeting domestic food demand. Sustainable irrigation is particularly important in these exporting countries as a failure in water resources would potentially have cascading effects on the nations to which they export food[32]. Thus, ensuring that irrigation expansion occurs only in those places where water resources are relatively abundant can avoid these undesirable outcomes. By quantifying global patterns of irrigation change, our results can provide spatially detailed information on where targeted interventions are most urgently needed to avoid or reverse unsustainable irrigation expansion. Our analysis can also point to areas where policies and investments have been successful in moving towards sustainable water resource management. Understanding the socio-political conditions that enabled and informed these examples of sustainable expansion can provide valuable insights for potential application to other locations and contexts.

While an estimated 3.8 billion additional people could be fed through irrigation expansion[33], our findings demonstrate that much of the irrigation expansion that has taken place is compromising the long-term viability of freshwater resources. With 129 countries currently off-track to sustainably manage their water resources by 2030[34], urgent action is needed, and sustainable irrigation will play a central role. To this end, our study enables the identification of opportunities to realize co-benefits (e.g., increased food production, improved water sustainability, and enhanced climate adaptation) and avoid trade-offs – a critical condition for achieving multiple Sustainable Development Goals (SDGs)[35]. In addition to quantifying the sustainability of changing global irrigation patterns and pointing to locations where expansion is advisable, our results can also provide the basis for evaluating a suite of potential solutions for reduced water consumption in irrigated croplands, including improved irrigation efficiencies paired with water consumption caps[36,37,38] switching to less water-intensive crops[39], soil water conservation[36], and selective fallowing[40].

Taken in hand with the important advances that our study provides, two key caveats are prudent to consider in the use and interpretation of our AEI database. First, reported changes in irrigated areas are based on the best available information on global irrigation extent (i.e., the Global Map of Irrigated Areas (circa 2005)). However, changes in AEI may not be captured in certain locations (e.g., India’s Chhattisgarh and Odisha states) where new croplands have been established via land use change. Second, for a number of countries, for example in sub-Saharan Africa, irrigation statistics are only available at the national level (see Supplementary Table S3). As such, assessments of grid cell level changes in these places should be performed with caution. For future versions of this AEI database, a combination of updates to global maps of irrigated extent as well as spatially disaggregated irrigation statistics for currently data-scarce nations will largely address these limitations.

Our assessment provides critical information for quantifying and measuring the progress of global irrigated agriculture. The fine-scale spatial heterogeneity of changing irrigation patterns that we observe will likely have implications that propagate to subsequent food supply chain steps[41] and that alter the entire food system[42]. Holistic and coordinated approaches to promoting irrigation that account for these interconnections offer promise for maximizing environmental and socio-economic co-benefits while minimizing trade-offs[43]. Yet our study also clearly demonstrates that irrigation expansion continues to occur in water stressed areas either because current efforts have been ineffective in defining or achieving water sustainability targets in many places or because the long-term sustainability of freshwater resources remains secondary to other societal priorities in these locations. Thus, ensuring that meeting the water demands of humanity – to increase food production and meet other needs – do not compromise other dimensions of sustainability is critical to moving beyond the shortcomings of the Green Revolution and meeting multiple Sustainable Development Goals.

Methods

Terminology

The main variable mapped in the study is area equipped for irrigation (AEI), defined as the area of land equipped with infrastructure to provide water to crops[44]. It includes the areas equipped for surface irrigation, full/partial control irrigation, spate irrigation, and equipped lowland areas[44], but excludes rainwater harvesting. The areas that are irrigated seasonally and switch between rainfed and irrigation farming are also included.

For defining water stress, we follow the terminology of Kummu et al. (2016)[45] who define water stress as the ratio of water use (i.e., consumption) to total water availability.

Data sources

Sub-national administrative boundaries came from the Global Administrative Areas database (GADM)[46] (version 3.6). Information on the areas equipped for irrigation in the year 2005 came from the global map of irrigated areas (GMIA) (5 arcminute resolution)[21]. Data on cropland and pasture land for the years 2000 through 2015 came from the History Database of the Global Environment (HYDE) (version 3.2, 5 arcminute resolution)[20].

We acquired AEI statistics from three major international sources for all countries for the years 2000 onwards: FAOSTAT[17], Aquastat[18], and Eurostat[19]; and also from various national censuses (see Supplementary Table S3). A few countries with large extents of irrigated area (i.e., [Canada, China, India, United States]) only collect and report data on area actually irrigated (AAI) (Supplementary Table S3). Since AEI refers to all land that is equipped with irrigation, we expect AAI to be lower or equal to AEI of a country. AAI can be lower than AEI when a part of irrigation infrastructure is not used, as a result of rainfed crops cultivation, or simply because the land was not used for agriculture (left fallow). In these cases, we scaled the statistics on AAI to match reported AEI values.

To develop the spatial database of AEI, we first collected sub-national irrigated area statistics from multiple national and international sources (see Supplementary Table S3). Many of the irrigation statistics on AEI were taken from the FAO databases Aquastat and FAOSTAT[17]; and Historical Irrigation Data set (HID)[12]. We also used data from Eurostat[19] (years 2007, 2010, 2013 and 2016) that reports data on AEI (irrigable land) for countries in the European Union at the nomenclature of territorial units for statistics 2

(NUTS2) sub-national level. In addition to these international and global databases, we obtained data from national censuses, surveys, reports, and statistical yearbooks for many countries, as these sources often contain information with greater spatial detail (Supplementary Table S3).

Following the methodology of Siebert et al. (2015)[12], we pre-processed the irrigation data using data type harmonizing and temporal harmonizing to eliminate inconsistencies of the irrigation statistics between information sources and across years. We used data type harmonizing when the definition of irrigated land in statistics differed from the definition of AEI used in this study. We used temporal harmonizing when the time steps of the input data did not exactly correspond with the predefined time steps of this dataset. Specifically, we linearly interpolated the data between available years to match the year with the exact study year. This was carried out at both national and sub-national levels (see Supplementary S2).

Grid cell level downscaling

We then downscaled the cleaned global database of AEI to 5 arcmin resolution following Siebert et al. (2015). The objective of this was to spatially allocate AEI information from the sub-national statistics to each 5 arcmin grid cell, so that the sum of AEI assigned to grid cells was equal to the AEI of subnational statistics for the corresponding sub-national administrative unit and year. This process was also meant to ensure that for each grid cell the assigned AEI value was less than or equal to the sum of cropland and pasture area in that year. However, for certain administrative units, AEI was larger than the sum of cropland and pasture extent in a specific year. In these cases, we prioritized maximizing consistency with either sub-national irrigation statistics or the HYDE dataset (Supplementary Table S1; see detailed methodology in Supplementary Information). The output AEI maps for 2015 were validated for China[47], India[16], and the US[48], using remotely sensed data products, finding overall accuracies of 0.52, 0.58, and 0.91. The low accuracies for China and India could be a result of differences in the scale of planting (smallholder farms are difficult to locate by remote sensing), irrigation techniques used (flood or border irrigation are difficult to identify as compared to sprinklers in US), topographic factors (complex terrains in China), and meteorological factors (subtropical climate results in cloudy remotely sensed images).

Comparison of irrigation changes and water stressed areas

The locations and magnitude of AEI expansion and decline were identified by taking the grid cell-by-grid cell difference between the year 2000 and year 2015 AEI maps. Subsequently, this difference map was combined with maps (5 arcminute; year 2000) of existing monthly blue water stress (BWS) and green water stress (GWS) – which account for irrigation, other societal water consumption, and environmental flow requirements – taken from Rosa et al. (2020)[22]. This enabled us to identify locations where AEI expansion occurred under four categories of existing (i.e., year 2000) water stress conditions: 1) both BWS and GWS; 2) BWS but no GWS; 3) GWS but no BWS; and 4) no water stress. AEI expansion in the first two categories were defined as 'unsustainable' because they would exacerbate the depletion of surface water and groundwater resources[9]. The same steps were repeated with areas of AEI decline, where AEI decline in the first two categories was defined as 'sustainable'. In other words, the most sustainable outcomes for changes in AEI would show expansion of AEI in places where surface water and groundwater resources are relatively abundant and declines in AEI in places where water resources were already relatively scarce.

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Author Contributions

P.M. and K.F.D. framed the study. P.M., K.F.D. and S.S. carried out the analyses. All authors contributed towards data development, discussed, and interpreted the results. P.M. and K.F.D. wrote the manuscript with support from all authors.

Competing interests

The authors declare no financial competing interests.

Data Availability

All data used in this study are either publicly available through https://zenodo.org/record/6886564 or available upon request from the corresponding author.

Supplementary Materials

Majority of 21st century global irrigation expansion has been in water stressed regions

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S1 Description of Input data and sources of information

To develop the spatial database of AEI, we first collected sub-national irrigated area statistics from multiple national and international sources. These sources included the FAO databases Aquastat[18] and FAOSTAT[17] and Historical Irrigation Data set (HID)[12] to obtain a large amount of irrigation statistics on AEI. Aquastat only reports data for years with national surveys at sub-national level. FAOSTAT contains AEI statistics only at national level for the survey years and also uses expert estimates to fill the gaps between those surveys. We also compared the statistics from HID database for years 2000 and 2005 with FAOSTAT estimates for the same year and made corrections to the input data for 2000 and 2005 if there was a difference between the two. FAOSTAT also corrects its data backwards in time, so this step was necessary in order to make the data consistent from the timesteps before 2005. For example, if for a specific country, FAOSTAT corrected its data for year 2005, we then revised the earlier data with the updated FAOSTAT statistics. Another international source that we used was Eurostat[19] - it reports data on AEI (irrigable land) for countries in the European Union at the NUTS2 sub-national level. We used the data available for countries for the years 2007, 2010, 2013 and 2016. At the time of updating the AEI data set, the data from Eurostat for 2016 was not complete for some of the countries, so a few modifications were made to acquire estimates for AEI for 2015 (described in Supplementary S2).

In addition to these international and global databases, we also used the data collected in national censuses, surveys, and statistical yearbooks for many countries, as these sources often contain information with greater spatial detail. We obtained reports and yearbooks from either the agricultural ministry websites or from other relevant governmental departments such as irrigation and water resources for the corresponding country (Supplementary Table S3).

To develop the spatial database of AEI, the sub-national irrigated area statistics were combined with georeferenced data on sub-national administrative boundaries taken from the Global Administrative Areas database (GADM)[46] version 3.6. For countries whose boundaries changed between years, we used administrative boundaries shapefiles sourced from their national ministries.

We also used the global map of irrigated areas which contains the information of areas equipped with irrigation at 5 arcmin grid cell level around the year 2005[21]. We used this dataset as one of the inputs in our model to allocate (sub)national AEI statistics to grid cell level. The assumption is that irrigated areas are generally found in the regions that are already equipped with irrigation.

History Database of the Global Environment (HYDE) (version 3.2)[20] from years 2000 to 2015 was used, containing information on cropland extent and pasture at 5 arcmin grid cell level, that corresponds to the grid cell level of this analysis. The dataset assigns the sub-national cropland statistics to grid cells based on two weighing maps: one based on satellite imagery from ESA for year 2010, and the other one considers urban built-up areas, protected areas, population density, soil suitability for crops, extent of coastlines and river plains, slope, and the annual mean temperature.

To calculate the AEI changes from 2000 to 2015 in different water scarcity categories, we used the monthly maps of blue water scarcity (BWS) and green water scarcity (GWS)[22]. These monthly maps contain the spatial information of croplands that are facing blue water scarcity or green water scarcity at 5 arcmin resolution around the year 2000. These maps were created by first identifying croplands affected by GWS, and monthly GWS was calculated by the ratio between irrigation blue water requirements and crop water requirements. Croplands with monthly GWS >0.1 was considered to be facing GWS. Following this, monthly BWS was calculated as the ratio between blue water consumption and renewable blue water availability, and therefore, BWS occurs when this ratio is greater than 1 (total blue water consumption exceeds blue water availability).

S2 Methods used to harmonize data from different sources

Because we acquired irrigation statistics of AEI from many different sources at different temporal and spatial resolutions and so the definitions of the variable of interest AEI were inconsistent and varied among different sources, which resulted in inconsistencies within the datasets. Therefore, to combine and make the global dataset consistent, it was important to harmonize the data. To do this, we employed a two-step procedure following Siebert et al. (2015)[12]: (i) data type harmonizing and (ii) temporal harmonizing. These procedures are briefly described below. Table SY contains the detailed description of all procedures used, data sources and assumptions made for each country and time step.

Data type harmonizing was performed when the definition of irrigated land in statistics differed from the definition of AEI used in this study. For many countries for which statistics came from national sources (e.g., reports, yearbooks, websites), the definition of irrigated land either differed from AEI or was not available. In the cases where the definition was different and typically referred to AAI (e.g., China, India, US), we scaled the data to the Aquastat or FAOSTAT estimates by using a conversion factor and applied it to the sub-national data (state, district, county, or municipality). We calculated the conversion factor by dividing the total national AEI (from FAOSTAT/Aquastat) by the reported national AAI for the reference year (equation [1]). We then multiplied the conversion factor for the reference year with the sub-national AAI data to obtain the sub-national AEI data. In this conversion, we assumed that the ratio between AEI and AAI reported in the original source remains the same across sub-national units.

$$Conversion\ Factor_{reference\ year} = \frac{Reported\ AEI}{Reported\ AAI} \qquad [1]$$

For other countries for which AAI was reported, we used the maximum value of AAI reported for different years around the reference years 2010 and 2015. For example, we used the sub-national Eurostat data for irrigable area for years 2007, 2010, 2013 and 2016. We calculated the AEI at sub-national (NUTS2 unit) level by taking the maximum of irrigable area. We calculated the AEI by taking the maximum of irrigable area of 2007, 2010 and 2013 to get AEI for 2010, and maximum of irrigable area of 2010, 2013 and 2016 to get AEI for the year 2015. We used this method because the data corresponding to years 2007, 2013 and 2016 are from sample surveys, where only a sample of farmers get interviewed, and the data is extrapolated. On the other hand, the 2010 data is from a full agricultural census survey. We assumed that for each NUTS2 unit, the maximum reported in these three years will be the AEI around the year 2010 and 2015. This assumption is reasonable because the AEI likely cannot drastically decrease in a short amount of time. Therefore, using the maximum areas can correctly represent the AEI as compared to farm sample surveys.

Temporal Harmonizing was carried out when the time steps of the input data did not exactly correspond with the predefined time steps. Specifically, we interpolated the data between available years to match the year with the exact study year. We used linear interpolation to make the data consistent. This exercise was carried out at both national and sub-national levels. For example, for Russia, we obtained sub-national AEI data for the census years 2006 and 2016 from their agricultural ministry, but we couldn't locate any information on AEI for years 2010 and 2015. In order to obtain the national AEI data for 2010 and 2015, we interpolated between the national totals for years 2006 and 2016. After that, we used the resulting national AEI values and the proportions of AEI from years 2006 and 2016 to proportionately distribute the AEI to the subnational units for the years 2010 and 2015.

S3 Downscaling of irrigation statistics to 5 arcmin resolution

Following Siebert et al. (2015), the database of subnational AEI statistics for each country for time steps 2010 and 2015 was downscaled to 5 arcmin resolution based on georeferenced administrative boundaries. The objective of this was to spatially allocate AEI from the sub-national statistics to each 5 arcmin grid cell, so that the sum of AEI assigned to grid cells was equal to the AEI of subnational statistics for the corresponding sub-national administrative unit and year. This process was also meant to ensure that for each grid cell the assigned AEI value was less than or equal to the sum of cropland and pasture area in that year. However, for some administrative units, the AEI is larger than the sum of cropland and pasture extent in a specific year. To account for these inconsistencies, we followed the downscaling approach developed by Siebert et al. (2015) to maximize the consistency with the sub-national irrigation statistics and the HYDE dataset (Supplementary Table S1).

For the recent years 2010 and 2015, the AEI is allocated to the grid cells where irrigated land was found in the later years. Specifically, the downscaling process starts with the most recent year of the timesteps i.e., 2015 and goes back in time until the year 2000. This process followed a ten-step procedure (adapted from Siebert et al, 2015) which was repeated for each sub-national statistical unit and for each year in the time series (Table S1). The maximum irrigation area $IRRI_{max}$ is calculated for each step and grid cell according to the criterion described in Fig. 6. With each procedural step and criterion, the $IRRI_{max}$ increased by considering additional areas outside the irrigated land extent allotted in the previous step. All steps and criterion follow an assumption that (a) irrigated areas in earlier years are more likely to occur in places where irrigated areas are located at present; (b) irrigation of cropland is more likely than that of pastureland; and (c) irrigation of pasture is more likely than that of non-agricultural land.

The downscaling process maximizes consistency with sub-national irrigation statistics (which we report in the main results) for each grid cell based on the input provided. In the gridded product maximizing consistency with the historical irrigation statistics, AEI can exceed the sum of cropland and pasture extent. Therefore, the AEI reported in sub-national irrigation statistics for an administrative unit was fully allocated to grid cells within that unit.

Two modifications have been made to the downscaling methodology described in Siebert et al., 2015. First, step S7 (Table S1) was additionally included to constrain expansion of irrigated land in countries with rapid increase of irrigated land between 2005 and 2015 to regions where AEI was mapped in year 2005. Second, the downscaling procedure for years 2015, 2010 and 2005 used version 5 of the Global Map of Irrigation Areas (Siebert et al., 2013) as starting point for the downscaling ($IRRI_{t+1}$ in Table S1) while for year 2000 the result of the downscaling in year 2005 was used.

In many administrative units, the downscaling procedure terminated in the first step, since for most of the countries, AEI was lower in the previous years as compared to the present. Therefore, $IRRI_{max}$ calculated in the first step was reduced to match the reported AEI for the respective administrative unit. We performed the reduction half in relative terms (equal fraction of cell specific $IRRI_{max}$) and half in absolute terms (equal area in each grid cell) (see example below). This resulted in many grid cells with AEI as 0, and therefore, the number of irrigated grid cells decreased in the hindcasting process (i.e., moving backwards in time).

When the sum of $IRRI_{max}$ (i.e., sum of AEI of all grid cells) in the administrative unit calculated in a specific step was less than the AEI reported for that administrative unit, the AEI for each grid cell was set to $IRRI_{max}$ and the process continued to the next step. When the sum of $IRRI_{max}$ in the administrative unit exceeded the reported AEI_SU, the procedure terminated. Half of the increment in AEI is allotted to the grid cells in relative terms and the other half as an area equal for each grid cell (explained in detail below in an Example).

Table S1. Illustration of downscaling process to assign irrigated area to specific grid cells (from Siebert et al. 2015). Steps 1-7 were performed only in grid cells containing AEI in the time step before (year 2000) or in the Global Map of Irrigation Areas (years 2015, 2010, 2005) while steps 8-10 were performed also for grid cells not irrigated in the Global Map of Irrigation Areas or the time step before.

	Maximizing consistency with sub-national irrigation statistics (AEI_SU)
S1	$IRRI_{max}$ = Min ($IRRI_{t+1}$, CROP)
S2	$IRRI_{max}$ = Min ($IRRI_{t+1}$, CROP+PAST)
S3	$IRRI_{max}$ = Min ($IRRI_{t+1}$, LAND)
S4	$IRRI_{max}$ = $IRRI_{t+1}$
S5	$IRRI_{max}$ = Max ($IRRI_{t+1}$, CROP)
S6	$IRRI_{max}$ = Max ($IRRI_{t+1}$, CROP+PAST)
S7	$IRRI_{max}$ = LAND
S8	$IRRI_{max}$ = CROP if $IRRI_{t+1}$ =0 $IRRI_{max}$ = $IRRI_{max}$ from S6 if IRRI $_{t+1}$ >0
S9	$IRRI_{max}$ = Max ($IRRI_{t+1}$, CROP+PAST)
S10	$IRRI_{max}$ = Max ($IRRI_{t+1}$, LAND)

Variable definitions

$IRRI_{t+1}$ Irrigated area in the previous time step (t+1) assigned to the grid cell (ha)

$IRRI_t$ Irrigated area (t) assigned to the grid cell in the current time step (t) of the hindcasting (ha) => result of the downscaling

CROP Cropland in the grid cell in the current time step (t) according to the historical land use data set (ha)

PAST Cropland in the grid cell in the current time step (t) according to the historical land use data set (ha)

LAND Land area of the grid cell (ha)

$IRRI\_ADM_{t+1}$ Irrigated area in the previous time step (t+1) of the hindcasting for the whole administrative unit (ha)

$IRRI\_ADM_{t}$ Irrigated area in the current time step (t) of the hindcasting for the whole administrative unit (ha)

Example of the downscaling procedure:

For simplicity, we assumed that the administrative unit consists of 2 grid cells only.

Information at the beginning of the downscaling:

Grid cell A		Grid cell B		Whole administrative unit (A + B)	
$IRRI_{t+1}$	20	$IRRI_{t+1}$	80	$IRRI\_ADM_{t+1}$	100
CROP	40	CROP	60	$IRRI\_ADM_{t}$	160
PAST	80	PAST	40		
LAND	200	LAND	200		
$IRRI_{t}$	?	$IRRI_{t}$	?		

Calculation of the maximum area available for irrigation in steps S1-S10 (maximizing similarity to GMIA5):

Rule	$IRRI_{max}$ A	$IRRI_{max}$ B	$IRRI_{max}$ total
S1: $IRRI_{max}$ = Min ($IRRI_{t+1}$, CROP)	20	60	80
S2: $IRRI_{max}$ = Min ($IRRI_{t+1}$, CROP+PAST)	20	80	100
S3: $IRRI_{max}$ = Min ($IRRI_{t+1}$, LAND)	20	80	100
S4: $IRRI_{max}$ = $IRRI_{t+1}$	20	80	100
S5: $IRRI_{max}$ = Max ($IRRI_{t+1}$, CROP) if $IRRI_{t+1} > 0$	40	80	120
S6: $IRRI_{max}$ = Max ($IRRI_{t+1}$, CROP+PAST) if $IRRI_{t+1} > 0$	120	100	220
S7: IRRImax = LAND	200	200	400
S8: $IRRI_{max}$ = CROP if $IRRI_{t+1} = 0$ or $IRRI_{max}$ from S6 if $IRRI_{t+1} > 0$	120	100	220
S9: $IRRI_{max}$ = Max ($IRRI_{t+1}$, CROP+PAST)	120	100	220
S10: $IRRI_{max}$ = Max ($IRRI_{t+1}$, LAND)	200	200	400

=> The allocation procedure terminates in **S6** because the sum of $IRRI_{max}$ in both grid cells becomes larger than $IRRI\_ADM_{t}$ (220>160).Finally, the values 60 ha and 100 ha (total 160 ha) are used for grid cells A and B respectively.

In the first step S1, $IRRI_{max}$ is calculated as the minimum of AEI in the previous time step ($IRRI_{t+1}$) and total cropland (CROP) in the grid cell in the current time step. If the sum of AEI within the grid cells is below the reported total AEI of the corresponding administrative unit in the current time step, the procedure continues to S2. In S2, $IRRI_{max}$ is calculated by taking a minimum of AEI in the previous time step ($IRRI_{t+1}$) (process in going back in time)and the sum of the cropland and pasture (CROP+PAST) in the grid cell in the current time step. At this point, the $IRRI_{max}$ total is 100, which is less than 160 ($IRRI\_ADM_t$). In step S3, $IRRI_{max}$ is calculated as the minimum of $IRRI_{t+1}$ and the total land area of the grid cell (LAND). In step S4, $IRRI_{max}$ is set equal to the AEI of grid cell in previous time step ($IRRI_{t+1}$). In step S5, $IRRI_{max}$ is calculated as the maximum of $IRRI_{t+1}$ and cropland in the grid cell, if $IRRI_{t+1}$ is greater than zero. Now, the AEI allocated to grid cells A and B is 40 and 80, with a total of 120. In step S6, $IRRI_{max}$ is calculated as the maximum of $IRRI_{t+1}$ and the total of cropland and pasture in the grid cell. At this stage, the AEI for A and B is 120 and 100 respectively, and the total goes above the total AEI for the admin unit (220 > 160). Therefore, the procedure terminated in step S6, and so now we have AEI assigned to cell A = 40 ha, and AEI cell B = 80 ha.

The total is 120 ha, and 40 ha still needs to be distributed among these two grid cells. Now, half of the increment (20 ha) is assigned relative to the AEI existing after S5 and half of the increment (20 ha) is assigned as an absolute extent equal for all grid cells. The calculation of the scaling factor for the relative increment is done as follows.

$$\text{Relative increment} = \text{AEI in grid cell at terminating step} \times \frac{\text{Total AEI left to assign as relative increment}}{\text{Total AEI}}$$

Therefore, for grid cell A, relative increment = 40*(20/120) = 6.67, and for grid cell B, it is 80*(20/120) = 13.33. After adding the relative increment, the total AEI for grid cells A and B is 46.67 ha and 93.33 ha respectively, and the total is 140 ha. Next, we are still left with 20 ha, and that will be allocated using absolute increment, which is calculated by:

$$\text{Absolute increment} = \frac{\text{Total AEI left to assign as absolute increment}}{\text{Number of grid cells}}$$

Absolute increment will be 20/2 = 10 ha. After this, a check is required for each grid cell, to see if the total AEI is less than or equal to $IRRI_{max}$ calculated for S6. For cell A: $56.67 \leq 120$, is correct, but for cell B: $103.3333 > 100$, which is not okay. Therefore, AEI in cell B will be constrained to IRRImax and the difference will be redistributed in equal parts to all the other grid cells (in this example to grid cell A). So finally, we will have the IRR_{It} in grid cell A is 60 ha, and IRR_{It} in grid cell B is 100 ha.

Supplementary Tables

Table S2. Country-level summary table showing in AEI change, and (un)sustainable expansion and decline from 2000 to 2015. Water stressed regions are defined as the regions already experiencing blue water scarcity.

COUNTRY	AEI CHANGE 2000-2015 (HA)	DECLINE IN WATER STRESSED REGIONS (HA)	DECLINE IN NOT WATER STRESSED REGIONS (HA)	EXPANSION IN WATER STRESSED REGIONS (HA)	EXPANSION IN WATER STRESSED REGIONS (%)	EXPANSION IN NOT WATER STRESSED REGIONS (HA)
CHINA	12,068,882	-3,228,079	-2,812,350	6,230,420	34	11,878,890
INDIA	8,478,297	-4,320,444	-1,151,291	11,640,929	83	2,309,104
BRAZIL	3,553,200	-218	-82,330	205,867	6	3,429,844
IRAN	1,730,000	-	-	1,234,240	71	495,759
AUSTRALIA	1,482,142	-	-6,355	918,398	62	570,081
INDONESIA	1,220,885	-	-	266,705	22	954,180
BANGLADESH	1,061,898	-1,673	-1,107	998,365	94	66,312
VIETNAM	945,698	-	-5	422,354	45	523,349
PERU	889,527	-22,867	-211,040	272,921	24	850,507
THAILAND	825,000	-652,484	-276,765	1,429,633	81	324,616
ALGERIA	626,447	-42,914	-61,884	271,809	37	459,436
PAKISTAN	559,466	-817,045	-391,086	1,534,069	87	233,528
VENEZUELA	445,125	-	-974	126,933	28	319,157
ITALY	374,281	-34,920	-72,003	85,714	18	395,490
MYANMAR	338,241	-	-	196,076	58	142,165
ARGENTINA	334,517	-104,133	-230,627	263,826	39	405,450
EGYPT	331,130	-58,235	-10,121	339,840	85	59,647
MEXICO	288,100	-106,337	-132,480	440,656	84	86,259
SPAIN	282,630	-54,561	-50,672	268,196	69	119,667
TURKMENISTAN	280,572	-10,835	-2,886	287,288	98	7,004
FRANCE	241,583	-6,456	-70,491	34,973	11	283,557
NEPAL	239,439	-74,231	-11,495	194,457	60	130,708
GREECE	216,258	-4,818	-19,333	145,325	60	95,084
GUATEMALA	208,000	-5,209	-12,380	48,414	21	177,176
YEMEN	203,312	-	-	112,468	55	90,844
CANADA	190,977	-374	-54,210	58,971	24	186,588
COLOMBIA	189,995	-	-5	64,396	34	125,603
NEW ZEALAND	187,783	-7	-28,253	14,893	7	201,149
GERMANY	176,926	-	-31,568	-	-	208,494
BOLIVIA	175,395	-	-	1,888	1	173,504
TANZANIA	147,034	-	-	33,347	23	113,687

TURKEY	146,889	-30,414	-74,364	88,224	35	163,443
MALI	144,209	-	-	117,620	82	26,589
NICARAGUA	136,612	-	-492	10,053	7	127,051
POLAND	134,051	-	-18,059	-	-	152,110
CAMBODIA	123,669	-	-	101,428	82	22,242
SOUTH AFRICA	120,053	-	-	79,622	66	40,430
MOROCCO	87,361	-	-	82,906	95	4,455
TUNISIA	81,937	-9,303	-2,962	66,337	70	27,866
SYRIA	74,910	-4,639	-7,159	73,849	85	12,859
PARAGUAY	73,005	-	-	-	-	73,005
UZBEKISTAN	70,099	-395,066	-33,767	482,508	97	16,425
KENYA	65,430	-	-	7,048	11	58,382
SRI LANKA	60,000	-16,729	-58,380	83,534	62	51,575
SERBIA	38,475	-	-	-	-	38,475
MALAWI	35,563	-	-	15,112	42	20,451
NIGERIA	34,809	-	-	12,103	35	22,706
DENMARK	33,251	-	-80	-	-	33,331
TAJIKISTAN	32,626	-18,060	-37,460	56,605	64	31,541
DOMINICAN REPUBLIC	32,000	-	-	19,759	62	12,241
GHANA	31,100	-	-	-	-	31,100
SUDAN	30,100	-	-	28,988	96	1,112
BURKINA FASO	30,000	-	-	4,737	16	25,263
NETHERLANDS	29,221	-	-63,380	-	-	92,601
SWEDEN	28,469	-	-	-	-	28,466
KOSOVO	28,094	-	-3,140	-	-	31,234
CROATIA	27,299	-	-	-	-	27,299
NIGER	26,652	-	-	10,327	39	16,325
AUSTRIA	25,643	-	-953	-	-	26,596
HUNGARY	23,408	-	-43,934	1,923	3	65,419
OMAN	21,395	-2,045	-374	9,518	40	14,296
ISRAEL	18,824	-48	-	10,950	58	7,922
JORDAN	18,345	-397	-378	15,219	80	3,901
LEBANON	17,982	-1,043	-878	17,177	86	2,726
FINLAND	16,164	-	-444	-	-	16,608
MALAYSIA	15,014	-	-	2,311	15	12,703
LAOS	14,465	-	-	2,264	16	12,201
SWITZERLAND	13,946	-	-11	-	-	13,957
ALBANIA	13,402	-784	-1,271	3,497	23	11,960
SENEGAL	12,389	-	-1	12,390	100	-
KUWAIT	11,032	-	-	7,936	72	3,096
BENIN	10,742	-	-	-	-	10,742
HONDURAS	10,000	-212	-2,203	1,252	10	11,163

AFGHANISTAN	9,000	-	-	9,000	100	-
SURINAME	8,820	-	-	-	-	8,820
QATAR	8,000	-	-	1,764	22	6,236
ANGOLA	6,000	-	-	1,253	21	4,747
JAMAICA	5,700	-	-	-	-	5,700
HAITI	5,000	-	-	-	-	5,000
PALESTINA	4,000	-	-	1,268	32	2,732
CHAD	4,000	-36	-237	1,777	42	2,496
PHILIPPINES	3,808	-17,544	-144,826	21,981	13	144,197
GUADELOUPE	3,740	-	-	-	-	3,740
CAMEROON	3,346	-	-	2,443	73	903
TIMOR-LESTE	3,000	-	-	-	-	3,000
GAMBIA	2,851	-	-	1,231	43	1,620
MALTA	2,200	-	-	-	-	2,200
TRINIDAD AND TOBAGO	2,000	-	-	-	-	2,000
UGANDA	1,990	-	-	-	-	1,990
GRENADA	1,800	-	-	-	-	1,800
BURUNDI	1,570	-	-	-	-	1,570
SLOVENIA	1,530	-	-	-	-	1,530
ZIMBABWE	1,487	-	-	343	23	1,144
ETHIOPIA	1,368	-	-1	1,199	88	170
ESTONIA	1,367	-	-	-	-	1,367
RWANDA	1,100	-	-	-	-	1,100
BOTSWANA	1,061	-	-	-	-	1,061
FIJI	1,000	-	-	-	-	1,000
NEW CALEDONIA	1,000	-	-	-	-	1,000
LATVIA	541	-	-24	-	-	558
CAPE VERDE	540	-	-	-	-	540
BELIZE	500	-	-	124	25	376
REUNION	430	-	-120	-	-	550
NAMIBIA	427	-	-	427	100	-
BARBADOS	400	-	-	-	-	400
LESOTHO	346	-	-	-	-	346
MICRONESIA	300	-	-	-	-	300
SÃO TOMÉ AND PRÍNCIPE	300	-	-	-	-	300
ANTIGUA AND BARBUDA	250	-	-	-	-	250
MACEDONIA	200	-	-	-	-	200
DOMINICA	200	-	-	-	-	200
EL SALVADOR	200	-35	-68	-	-	303
NORTH KOREA	191	-	-10	-	-	201

MONTENEGRO	179	-	-138	-	-	317
SWAZILAND	140	-5	-12	157	100	-
NORTHERN MARIANA ISLANDS	100	-	-	-	-	100
GUINEA	86	-	-	-	-	86
SAINT KITTS AND NEVIS	12	-	-	-	-	12
SEYCHELLES	1	-	-	-	-	1
BOSNIA AND HERZEGOVINA	-	-	-18	-	-	18
MONGOLIA	-	-	-18	18	100	-
DJIBOUTI	-11	-	-11	-	-	-
MAURITANIA	-11	-	-11	-	-	-
BAHRAIN	-60	-	-60	-	-	-
VIRGIN ISLANDS, U.S.	-85	-	-85	-	-	-
GUAM	-112	-	-112	-	-	-
MOZAMBIQUE	-120	-1	-119	-	-	-
LIBERIA	-150	-	-150	-	-	-
MADAGASCAR	-291	-5	-286	-	-	-
TOGO	-300	-	-300	-	-	-
SAINT LUCIA	-321	-	-321	-	-	-
SIERRA LEONE	-370	-25	-345	-	-	-
ERITREA	-590	-36	-554	-	-	-
SAINT VINCENT AND THE GRENADINES	-1,000	-	-1,000	-	-	-
MARTINIQUE	-1,040	-	-1,040	-	-	-
FRENCH GUIANA	-1,100	-	-1,673	-	-	573
LITHUANIA	-2,496	-	-2,588	-	-	91
MAURITIUS	-4,023	-	-4,023	-	-	-
ARMENIA	-5,297	-506	-4,791	-	-	-
COSTA RICA	-6,000	-914	-5,586	-	-	500
GUYANA	-7,000	-	-7,000	-	-	-
BHUTAN	-8,057	-660	-8,849	-	-	1,451
BELGIUM	-8,097	-	-9,825	-	-	1,728
CYPRUS	-9,550	-1,915	-7,634	-	-	-
PANAMA	-10,541	-2	-10,538	-	-	-
ECUADOR	-11,659	-1,860	-9,799	-	-	-
PUERTO RICO	-11,822	-	-16,517	-	-	4,695
AZERBAIJAN	-23,672	-20,296	-14,812	9,283	81	2,152
GEORGIA	-24,000	-2,037	-21,963	-	-	-
KYRGYZSTAN	-26,428	-14,562	-14,366	2,500	100	-

NORWAY	-39,693	-	-39,693	-	-	-
UNITED KINGDOM	-47,599	-1,433	-112,136	-	-	65,971
CZECH REPUBLIC	-47,717	-	-49,776	-	-	2,059
TAIWAN	-68,254	-1,971	-66,283	-	-	-
LIBYA	-70,000	-43,217	-26,783	-	-	-
SOUTH KOREA	-73,865	-	-73,865	-	-	-
MOLDOVA	-77,905	-17,289	-60,616	-	-	-
BELARUS	-87,094	-	-87,261	-	-	167
SLOVAKIA	-116,320	-	-116,320	-	-	-
UNITED ARAB EMIRATES	-126,241	-91,773	-36,269	1,178	65	623
BULGARIA	-149,020	-7,564	-143,446	141	7	1,849
PORTUGAL	-215,010	-134,907	-87,919	4,880	62	2,936
UKRAINE	-238,112	-488,796	-574,778	389,047	47	436,415
SAUDI ARABIA	-272,908	-165,311	-107,596	-	-	-
UNITED STATES	-273,922	-2,299,572	-1,771,511	1,709,076	45	2,088,042
JAPAN	-308,200	-6,507	-342,072	-	-	40,378
CUBA	-310,000	-207,437	-102,809	-	-	246
KAZAKHSTAN	-1,407,833	-768,931	-1,121,707	302,315	63	180,489
RUSSIA	-1,997,335	-325,708	-1,755,597	32,874	39	51,089
ROMANIA	-2,179,572	-584,955	-1,597,358	-	-	2,741
WORLD	**32,112,655**	**-15,230,393**	**-14,635,024**	**32,062,851**	**52**	**29,915,077**

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Table S3. Country level Data Sources.

Sources

COUNTRY	CODE	ID	PERIOD	ADMINLEVEL	SOURCES	NOTES	REFERENCENO.
AFGHANISTAN	AFG	2	2010, 2015	0	FAOSTAT		3
			2005	0	GMIA v5; AIMS, FAO (2003)		1, 2
			1997-2000	0	FAOSTAT	AEI constant	3
			1997	1	GMIA v4; AIMS, FAO (2003)		4, 2
			1967-1997	0	FAOSTAT	FAOSTAT trend scaled to data on years 1967 and 1997	3
			1967	1	CENSUS		5
			1931-1966		Interpolated		0
			1930	0	Estimate	Based on Central Asian and Turkey development	0
			1901-1929		Interpolated		0
			1900	0	IWMI working paper 49 (Qureshi, 2002)		6
ALBANIA	ALB	6	1995-2015	0	FAOSTAT		3
			1990	2	FAO (1992)		7
			1961-1990	0	FAOSTAT		3
			1951-1960		Interpolated		0
			1950	0	Toepfer (1993)		8
			1939-1949		Interpolated		0
			1938	0	Toepfer (1993)		8
			1901-1937		Interpolated		0
			1900	0	Estimate	Assumed no irrigation, based on World Bank (1994)	9

ALGERIA	DZA	65	2010, 2015	1	Office National des Statistiques (2017)	Used AEI 2010 for 2010 and AEI 201402015 for 2015.	31 3
			2001-2005	0	GMIA v5; FAO (2005)	Assumed constant	1, 10
			2001	1	Aquastat		11
			1994-2000	0	FAOSTAT		3
			1993	1	AOAD (1994)	Scaled at national level to FAOSTAT	12
			1961-1992	0	FAOSTAT		3
			1955-1960		Interpolated		0
			1954	0	Framji et al. (198101983)		13
			1931-1954		Interpolated		0
			1930	0	Commission Perspectives de Développement Economique et Social (1999)		14
			1901-1929		Estimate	Assumed constant	0
			1900	0	Commission Perspectives de Développement Economique et Social (1999)		14
AMERICAN SAMOA	ASM	12	2010, 2015	0	FAOSTAT		3
			2004-2005		Estimate	Assumed no irrigation	0
			2003	0	Census		15
			1900-2002		Estimate	Assumed no irrigation	0
ANDORRA	AND	7	2010, 2015	0	FAOSTAT		3
			2000-2005		Estimate	Assumed constant	0
			1990	0	EEA (1999)		16
			1900-1989		Estimate	Assumed constant	0
ANGOLA	AGO	3	2010, 2015	0	FAOSTAT		3

			2005	0	GMIA v5; FAO (2005)		1, 17
			2000	0	FAOSTAT		3
			1901-1960		Interpolated		0
			1900	0	Estimate	Assumed half of AEI in 1961	0
ANGUILLA	AIA	4	1961-2015	0	FAOSTAT		3
			1900-1960		Estimate	Assumed no irrigation	
ANTARCTICA	ATA	13	1961-2015	0	FAOSTAT		3
			1900-1960		Estimate	Assumed no irrigation	
ANTIGUA AND BARBUDA	ATG	15	2010, 2015	0	FAOSTAT		3
			1998-2005	0	Estimate	Assumed constant	0
			1993-1997	0	Aquastat		11
			1971-1992		Interpolated		0
			1970	0	Estimate		0
			1961-1969		Interpolated		0
			1960	0	Estimate		0
			1900-1959	0	Estimate	Assumed no irrigation	0
ARGENTINA	ARG	10	2015	1	Ministerio de Agricultura (2015)	For each province, AEI was calculated by taking the sum of Superficie Regada con Subterránea (Groundwater use) and Superficie Regada con Superficial (surface water use)	31 4
			2010	0	Estimate	Interpolated between AEI of 2005 and 2015	0
			2005	0	Estimate	Assumed constant at the level of year 2000	0
			2000	1	GMIA v5	Maximum of AEI reported in three inventories for period 199502002	1, 18 02 0

			1995	1	GMIA v5		1, 20
			1989-1994		Interpolated		0
			1988	1	INDEC (1988)	Subnational AAI data scaled to FAOSTAT at national level	3, 21
			1980-1985	1	Fiorentino (1988)	Subnational AAI data scaled to FAOSTAT at national level	3, 22
			1961-1980	0	FAOSTAT		3
			1938-1960		Interpolated		0
			1937	1	Framji et al. (198101983)		13
			1928-1936		Interpolated		0
			1927	1	Sisson & Whitbeck (1933)	Scaled sub0national data to 3,000,000 acres as national total	23
			1900-1926	1	Estimated, HYDE	Subnational data from year 1927 scaled to match to the relative change in HYDE (version 3.1, central estimate) cropland extent	24
ARMENIA	ARM	11	2010, 2015	0	FAOSTAT		3
			2006	0	GMIA v5, Ministry of Territorial Administration (2007)		1, 25
			2001-2005		Interpolated		0
			1995-2000	0	FAOSTAT		3
			1992	1	GMIA v4, Republic of Armenia (1993)		4, 26
			1975-1991	0	AQUASTAT, FAO (1997)		27
			1970		Interpolated		0
			1930-1963	0	Greenwood (1965)	Interpolated between 1920 and AEI reported in Greenwood (1965) for 1930, 1938, 1950, 1958 and 1963	28
			1920		Extrapolated	Extrapolated using trend between 1919 and 1913	0
			1919	0	Shtepa et al. (1985)		29

			1914-1918		Interpolated		0
			1913	0	Shtepa et al. (1985)		29
			1900-1912	0	Estimate	Assumed constant (1913 value)	0
ARUBA	ABW	1	1961-2015	0	FAOSTAT		3
			1900-1960		Estimate	Assumed no irrigation	0
AUSTRALIA	AUS	16	2018	2	ABARES (2019)	AEI 2015 at sub-national level was calculated by taking the maximum of AAI of 2015 (from ABS) and AAI (from ABARES) for 2018.	35 8
			2015	2	ABS (2017)		31 5
			2010	0	Interpolated		-
			2006	0	GMIA v5, ABS (2008), BRS (2010)		1, 30 , 31
			1997-2005		Interpolated		-
			1997	2	Australian Bureau of Statistics	AAI reported for year 1997 scaled with the GMIA v5 sub-national scale factor (ratio between AAI and AEI in 2006)	32
			1995	2	Australian Bureau of Statistics	AAI reported for year 1994 scaled with the GMIA v5 sub-national scale factor (ratio between AAI and AEI in 2006)	32
			1990	2	Australian Bureau of Statistics	AAI reported for year 1990 scaled with the GMIA v5 sub-national scale factor (ratio between AAI and AEI in 2006)	32
			1985	2	Australian Bureau of Statistics	AAI reported for year 1984 scaled with the GMIA v5 sub-national scale factor (ratio between AAI and AEI in 2006)	32
			1980		Interpolated		-
			1950-1976	1	Commonwealth Bureau of Census and Statistics (1950-1977)	AAI scaled with the GMIA v5 sub-national scale factor (ratio between AAI and AEI in 2006)	33

AUSTRIA	AUT	17	2010, 2015	1	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	31 2
			2005	2	EUROSTAT		35
			2000	1	EUROSTAT		35
			1995	1	EUROSTAT		35
			1990	0	FAOSTAT		3
			1967-1989		Interpolated		-
			1966	0	Framji et al. (1981-1983)		13
			1946-1967		Interpolated		-
			1945	0	Framji et al. (1981-1983)		13
			1900-1944	0	Estimate	Scaled based on relative changes of AEI in Germany	-
AZERBAIJAN	AZE	18	2010, 2015	1	Ministry of Economy (2021)		31 6
			2004-2005	0	Estimate	Assumed constant (2003 value)	-
			2003	0	GMIA v5, FAO (2009)		1, 36
			1998-2000	0	FAOSTAT		3
			1973-1997	0	AQUASTAT, FAO (1997)		27
			1970	0	Interpolated		-
			1925-1960	0	Estimate	Trend from Kyrgystan and Uzbekistan used to scale the value for year 1974 for each time step	-
			1914-1924	0	Estimate	Trend from Armenia for years 1910-1920 used to scale value for year 1913 to year 1920	-
			1913	0	AQUASTAT, FAO (1997)		27
			1900-1912		Estimate	Assumed constant (based on USSR data; Framji et al. 1983-1985)	-
BAHAMAS	BHS	26	1961-2015	0	FAOSTAT		3

			1900-1960	0	Estimate	Assumed no irrigation	-
BAHRAIN	BHR	25	2010, 2015	0	FAOSTAT		3
			2002-2005	0	Estimate	Assumed constant (2001 value)	-
			2001	0	GMIA v5, AOAD (2003)		1, 37
			1995-2000	0	AQUASTAT		11
			1961-1990	0	FAOSTAT		3
			1900-1961		Interpolated		-
			1900	0	Estimate		-
BANGLADESH	BGD	23	2017	1	BADC (2017)		318
			2015	0	BADC (2015)		317
			2010	0	FAOSTAT		3
			2008	0	GMIA v5, BADC (2008)		1, 38
			2001-2007		Interpolated		-
			2000	0	FAOSTAT		3
			1995	3	GMIA v4, FAO (1999), BBS (2004)		4, 39, 40
			1961-1990	0	FAOSTAT		3
			1948-1960		Interpolated		-
			1947	0	Estimate	1/2 of 1961	-
			1900-1946		*See India (Bangladesh was part of Indian Empire)*		-
BARBADOS	BRB	33	1961-2015	0	FAOSTAT		3
			1900-1950		Estimate	Assumed no irrigation	-
BELARUS	BLR	28	2015	1	National statistical committee of the Republic of Belarus (2020)		320

			2010	1	National statistical committee of the Republic of Belarus (2013)		31 9
			2006	0	GMIA v5, National statistical committee of the Republic of Belarus (2011)		1, 41
			2002-2005		Interpolated		-
			2001	0	National statistical committee of the Republic of Belarus (2011)		41
			1994-2000	0	Interpolated		-
			1993	0	FAO (1997)		27
			1980-1990	0	FAO (1997)		27
			1974	0	FAO (1997)		27
			1961-1973		Interpolated		-
			1926-1960	0	Estimate	Trend from Ukraine used to scale the value for year 1974 for each time step	-
			1914-1925	0	Estimate	Decline in irrigation due to war; USSR trend (Framji et al. 1981-1983) used for that	-
			1900-1913	0	Estimate	Trend from Ukraine used to scale the value for year 1974 for each time step	-
BELGIUM	BEL	20	2010, 2015	1	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	31 2
			2005	2	EUROSTAT		35
			1990-2000	1	EUROSTAT		35
			1966-1989		Interpolated		-

			1965	0	Framji et al. (1981-1983)		13
			1950-1964		Interpolated		-
			1949	0	Framji et al. (1981-1983)		13
			1900-1948	0	Estimate	Scaled based on districts of Düsseldorf and Aachen (see Germany)	-
BELIZE	BLZ	29	2010, 2015	0	FAOSTAT		3
			2005	0	GMIA v5, Ballestero et al. (2007)		1, 42
			1970-2000	0	FAOSTAT		3
			1900-1970		Estimate	Assumed no irrigation	-
BENIN	BEN	21	2010, 2015	0	FAOSTAT		3
			2003-2005	0	Estimate	Assumed constant (2002 value)	-
			2002	0	GMIA v5, FAO (2005)		1, 43
			1973-2000	0	AQUASTAT		11
			1961-1972	0	FAOSTAT		3
			1900-1960	0	Estimate	Assumed constant (1961 value)	-
BERMUDA	BMU	30	1900-2015	0	Estimate	Assumed no irrigation	-
BHUTAN	BTN	35	2010, 2016	1	NSB (2016)		321
			2007	0	GMIA v5, NSB (2009)		1, 44
			2001-2006		Interpolated		-
			1961-2000	0	FAOSTAT		3
			1900-1960	0	Estimate	Assumed constant (1961 value)	-
BOLIVIA	BOL	31	2015	3	INE (2015)		322
			2010	0	FAOSTAT		3
			2000-2005	0	Estimate	Assumed constant (1999 value)	-

			1999	0	GMIA v5, FAO (2000)		1, 45
			1961-1998	0	FAOSTAT		3
			1955-1960		Interpolated		-
			1954	0	Framji et al. (1981-1983)		13
			1949-1953		Interpolated		-
			1948	0	Framji et al. (1981-1983)		13
			1943-1947		Interpolated		-
			1942	0	Framji et al. (1981-1983)		13
			1901-1941		Interpolated		-
			1900	0	Estimate		-
BOSNIA AND HERZEGOVINA	BIH	27	2010, 2015	0	FAOSTAT		3
			2010	0	Federal Ministry of Agriculture, Water Management and Forestry (2010)		46
			2001-2009		Interpolated		-
			1995-2000	0	FAOSTAT		3
			1961-1990	0	Estimate	Scaled based on trend in AEI in former Yugoslavia derived from FAOSTAT	-
			1954-1960		Interpolated		-
			1953	0	Estimate	Derived from Freydank and Siebert (2008)	47
			1900-1952	0	Estimate	Assumed constant (1953 value)	-
BOTSWANA	BWA	37	2010, 2015	0	FAOSTAT		3
			2003-2005	0	Estimate	Assumed constant (2002 value)	-
			2002	0	GMIA v5, FAO (2003)		1, 48
			2000	0	AQUASTAT		11
			1991-1999		Interpolated		-

			1990	0	AQUASTAT		11
			1961-1989	0	FAOSTAT		3
			1900-1960	0	Estimate	Assumed no irrigation	-
BOUVET ISLAND	BVT	36	1900-2015	0	Estimate	Assumed no irrigation	-
BRAZIL	BRA	32	2017	2	IBGE (2017)		32 3
			2010	0	FAOSTAT	-	3
			2006	0	GMIA v5, IBGE (2006)		1, 49
			2002-2005		Interpolated		-
			2001	1	GMIA v4, ANA (2003)		4, 50
			1996-2000		Interpolated		-
			1995	1	IBGE (1996)		51
			1990	0	Christofidis (2002)		52
			1960-1985	1	ANA (2009)		53
			1950	0	FAO (2000)		18
			1931-1949		Interpolated		-
			1930	1	Sisson and Whitbeck (1933)		23
			1900-1929	1	Estimate	Assumed constant (1930 value)	-
BRITISH INDIAN OCEAN TERRITORY	IOT	10 6	1900-2015	0	Estimate	Assumed no irrigation	-
BRITISH VIRGIN ISLANDS	VGB	23 9	1900-2015	0	Estimate	Assumed no irrigation	-
BRUNEI DARUSSALAM	BRN	34	2010, 2015	0	FAOSTAT	-	3
			2000, 2005	0	Estimate	Assumed constant (1995 value), no more recent data available	-
			1995	0	GMIA v5, FAO (2011)		1, 54
			1980-1990	0	FAOSTAT		3

			1900-1980	0	Estimate	Assumed no irrigation	-
BULGARIA	BGR	24	2010, 2015	1	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	31 2
			2005	1	EUROSTAT		35
			2003	1	EUROSTAT		35
			1997-2002		Interpolated		-
			1996	0	Chehlarova-Simeonova et al. (2006)		55
			1990-1995		Interpolated		-
			1989	0	Chehlarova-Simeonova et al. (2006)		55
			1961-1988	0	FAOSTAT		3
			1950-1960		Interpolated		-
			1949	0	Framji et al. (1981-1983)		13
			1944	0	Framji et al. (1981-1983)		13
			1901-1943		Interpolated		-
			1900	0	Framji et al. (1981-1983)		13
BURKINA FASO	BFA	22	2010, 2015	0	FAOSTAT	-	3
			2005	0	GMIA v5, FAO (2005)		1, 56
			1961-2000	0	FAOSTAT		3
			1901-1960		Interpolated		-
			1900	0	Estimate		-
BURUNDI	BDI	19	2010, 2015	0	FAOSTAT		3
			2001-2005	0	Estimate	Assumed constant (2000 value), no more recent data available	-

			2000	0	GMIA v5, FAO (2005)		1, 57
			1961-1999	0	FAOSTAT		3
			1956-1960	0	Estimate	Scaled based on the trend of AEI in Uganda	-
			1900-1955	0	Estimate	Assumed no irrigation	-
CAMBODIA	KHM	121	2010, 2015	0	FAOSTAT		3
			2009	0	GMIA v5, MRC (2009)		1, 58
			2001-2008		Interpolated		-
			1993-2000	0	AQUASTAT		11
			1961-1992	0	FAOSTAT		3
			1900-1960	0	Estimate	Scaled based on the trend of AEI in Vietnam	-
CAMEROON	CMR	47	2010, 2015	0	FAOSTAT	-	3
			2001-2005	0	Estimate	Assumed constant (2000 value), no more recent data available	-
			2000	0	AQUASTAT		11
			1961-1995	0	FAOSTAT		3
			1957-1960	0	Estimate	Extrapolated based on trend of AEI in period 61-70	-
			1900-1956	0	Estimate	Assumed no irrigation	-
CANADA	CAN	41	2010, 2016	1	Statistics Canada (2016)	Scaled with the ratio AAI vs AEI from GMIA v5 at the province level	324
			2015	0	Interpolated		-
			2006	0	GMIA v5		1
			2002-2005		Interpolated		-
			2001	2	Statistics Canada (2001a, 2001b)	Scaled with the ratio AAI vs AEI from GMIA v5 at the province level	59, 60
			1995	1	Statistics Canada (1996)	Scaled with the ratio AAI vs AEI from GMIA v5 at the province level	61

			1990	1	Statistics Canada (1996)	Scaled with the ratio AAI vs AEI from GMIA v5 at the province level	61
			1970-1985	0	FAOSTAT	Scaled with the ratio AAI vs AEI from GMIA v5 at the national level	3
			1960	0	Framji et al. (1981-1983)		13
			1931-1959		Interpolated		-
			1930	0	Framji et al. (1981-1983)		13
			1916-1929		Interpolated		-
			1915	0	Framji et al. (1981-1983)		13
			1901-1914		Interpolated		-
			1900	1	Framji et al. (1981-1983)		13
CAPE VERDE	CPV	53	2010, 2015	0	FAOSTAT	-	3
			1998-2005	0	Estimate	Assumed constant (1997 value)	-
			1997	0	Ministère de l'agriculture de l'élevage et de la sylviculture (1997)		62
			1988-1996	0	AQUASTAT		11
			1961-1987	0	FAOSTAT		3
			1901-1960		Interpolated		-
			1900	0	Estimate	Assumed no irrigation	-
CAYMAN ISLANDS	CYM	57	1900-2015	0	Estimate	Assumed no irrigation	-
CENTRAL AFRICAN REPUBLIC	CAF	40	1988-2015	0	FAOSTAT		3
			1983-1987	0	AQUASTAT		11
			1961-1982	0	FAOSTAT		3
			1900-1960	0	Estimate	Assumed no irrigation	-

CHAD	TCD	216	2010, 2015	0	FAOSTAT	-	3
			2003-2005	0	Estimate	Assumed constant (2002 value)	-
			2002	0	GMIA v5, FAO (2005)		1, 63
			1961-2000	0	FAOSTAT		3
			1901-1960		Interpolated		-
			1900	0	Estimate		-
CHILE	CHL	44	1961-2015	0	FAOSTAT		3
			1930-1960		Interpolated		-
			1929	1	Sisson and Whitbeck (1933)		23
			1915-1928		Interpolated		-
			1914	0	Framji et al. (1981-1983)		13
			1900-1913	0	Estimate	Assumed constant (1914 value)	-
CHINA	CHN	45	2010, 2015	2	MARAC (2018)		359
			2010, 2015	0	FAOSTAT		3
			2005	0	GMIA v5, Ministry of Water Resources (2006), Agriculture, Fisheries and Conservation Department (2002)		1, 64, 65
			2000	1	National Bureau of Statistics (2001)	Effective irrigation area (EIA); GMIA scale factor for year 2005 used to scale EIA to AEI	66
			1989-1999	1	National Bureau of Statistics (1990-2000)	Effective irrigation area (EIA); GMIA scale factor for year 2005 used to scale EIA to AEI	67
			1980-1988	1	National Bureau of Statistics (1981-1989)	Effective irrigation area (EIA); GMIA scale factor for year 2005 used to scale EIA to AEI	68
			1966-1979		Interpolated		-

			1965	0	Feng et al. (1999)	Effective irrigation area (EIA); GMIA scale factor for year 2005 used to scale EIA to AEI; Value for Tibet is calculated based on rate of Qinghai and Xinjiang provinces	69
			1961-1964		Interpolated		-
			1960	1	SSRC (1969), Feng et al. (1999)	Data for year 1956 scaled to national data based on Feng et al. (1999), effective irrigation area (EIA); GMIA scale factor for year 2005 used to scale EIA to AEI; Value for Tibet is calculated based on rate of Qinghai and Xinjiang provinces	69, 70
			1950	1	SSRC (1969), Feng et al. (1999)	Data for year 1950 scaled to national data based on Feng et al. (1999), effective irrigation area (EIA); GMIA scale factor for year 2005 used to scale EIA to AEI; Value for Tibet is calculated based on rate of Qinghai and Xinjiang provinces	69, 70
			1940	1	Estimate	Scaled based on HYDE crop area and percentage of crop area irrigated (at province level) in year 1950, value for Tibet is calculated based on rate of Qinghai and Xinjiang provinces	24
			1932	0	Bennet (1934)		71
			1900-1920	1	Buck (1937), Feng et al. (1999)	Scaled based on HYDE crop area, the percentage of crop area irrigated in year 1950 (at province level) was scaled based on Buck (1937) in provinces where data was available, value for Tibet is calculated based on rate of Qinghai and Xinjiang provinces	24, 69, 72
CHRISTMAS ISLAND	CXR	56	1900-2015	0	Estimate	Assumed no irrigation	-

COCOS ISLANDS	CCK	42	1900-2015	0	Estimate	Assumed no irrigation	-
COLOMBIA	COL	51	1961-2015	0	FAOSTAT		3
			1960	0	Framji et al. (1981-1983)		13
			1950	0	Framji et al. (1981-1983)		13
			1940	0	Estimate		-
			1933	1	Sisson and Whitbeck (1933)		23
			1900-1932	0	Estimate	Assumed constant (1933 value)	-
COMOROS	COM	52	1988-2015	0	FAOSTAT		3
			1983-1987	0	AQUASTAT		11
			1900-1982	0	Estimate	Assumed no irrigation	-
DEMOCRATIC REPUBLIC OF CONGO	COD	48	2000-2015	0	FAOSTAT		3
			1995	0	GMIA v5, FAO (2004)		1, 73
			1961-1990	0	FAOSTAT		3
			1900-1960	0	Estimate	Assumed no irrigation	-
CONGO, REP.	COG	49	2004-2015	0	FAOSTAT		3
			2003	0	GMIA v5, UNECA (2003)		1, 74
			1970-2000	0	FAOSTAT		3
			1900-1969	0	Estimate	Assumed no irrigation	-
COOK ISLANDS	COK	50	1900-2015	0	Estimate	Assumed no irrigation	-
COSTA RICA	CRI	54	1961-2015	0	FAOSTAT		3
			1956-1960		Interpolated		-
			1955	0	FAO (2000)		75
			1921-1954		Interpolated		-

			1920	0	Freydank and Siebert (2008)	2/3 of AEI in 1955, based on the trend of AEI in Guatemala	47
			1900-1919	0	Estimate	Extrapolated based on 20-55 rate	-
COTE D'IVOIRE	CIV	46	1998-2015	0	FAOSTAT		3
			1993-1997	0	AQUASTAT		11
			1961-1992	0	FAOSTAT		3
			1901-1960		Interpolated		-
			1900	0	Estimate		-
CROATIA	HRV	100	2010, 2015	1	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	312
			1992-2005	0	FAOSTAT		3
			1991	0	Estimate	Assumed constant (1990 value)	-
			1961-1990	0	Estimate	Scaled based on trend in AEI for former Yugoslavia	-
			1954-1960		Interpolated		-
			1953	0	Estimate		-
			1900-1952	0	Estimate	Assumed constant (1953 value)	-
CUBA	CUB	55	1970-2015	0	FAOSTAT		3
			1959-1969		Interpolated		-
			1958	0	FAO (2000)		76
			1950-1957		Interpolated		-
			1949	0	Framji et al. (1981-1983)		13
			1901-1948		Interpolated		-
			1900	0	Freydank and Siebert (2008)	1/2 of AEI in 1949	47

CYPRUS	CYP	58	2010, 2015	0	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	31 2
			2005	0	EUROSTAT		35
			2003	0	GMIA v5, Republic of Cyprus (2006), Elkiran and Ergil (2006)		1, 77 , 78
			1998-2002		Interpolated		-
			1993-1997	0	AQUASTAT		11
			1961-1992	0	FAOSTAT		3
			1955-1960		Interpolated		-
			1954	0	Framji et al. (1981-1983)		13
			1901-1953		Interpolated		-
			1900	0	Freydank and Siebert (2008)	1/2 of AEI in 1954	47
CZECH REPUBLIC	CZE	59	2010, 2015	1	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	31 2
			2005	1	EUROSTAT		35
			2003	1	EUROSTAT		35
			1997-2002		Interpolated		-
			1996	1	Štastná et al. (2006)		79
			1990-1995		Interpolated		-
			1989	1	Štastná et al. (2006)		79
			1985-1988		Interpolated		-
			1984	1	Štastná et al. (2006)		79

			1980-1983		Interpolated		-
			1979	1	Štastná et al. (2006)		79
			1970-1978		Interpolated		-
			1969	1	Štastná et al. (2006)		79
			1941-1968		Interpolated		-
			1940	0	Šťastná et al. (2007)		80
			1900-1939	0	Estimate	Scaled based on trend in AEI for Germany	-
DENMARK	DNK	63	2010, 2015	1	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	31 2
			2005	1	EUROSTAT		35
			1961-2000	0	FAOSTAT		3
			1951-1960		Interpolated		-
			1950	1	Estimate		-
			1900-1940	1	Estimate	Assumed constant (1900 value)	-
			1900	1	Framji et al. (1981-1983)	Sub-national division based on Emanuelsson and Moeller (1990)	13 , 81
DJIBOUTI	DJI	61	2010, 2015	0	FAOSTAT		3
			2000-2005	0	GMIA v5, FAO (2005), FAOSTAT	AEI from year 1999 scaled with the trend from FAOSTAT	1, 82 , 3
			1999	0	GMIA v5, FAO (2005)		1, 82
			1961-1998	0	FAOSTAT		3
			1960	0	Estimate	Assumed constant (1961 value)	-
			1900-1960	0	Estimate	Assumed no irrigation	-
DOMINICA	DMA	62	2010, 2015	0	FAOSTAT		3

			2005	0	Estimate	Assumed no irrigation	-
			2000	0	FAO (2000)	No irrigation	83
			1900-1999	0	Estimate	Assumed no irrigation	-
DOMINICAN REPUBLIC	DOM	64	2010, 2015	0	FAOSTAT		3
			2010	0	GMIA v5, INDRHI (2010)		1, 84
			2001-2008		Interpolated		-
			2000	0	FAOSTAT		3
			1995-1999		Interpolated		-
			1994	0	GMIA v4, FAO (2000)		4, 85
			1981-1993		Interpolated		-
			1980	0	AQUASTAT, FAO (2000)		11, 85
			1955-1979		Interpolated		-
			1954	0	AQUASTAT, FAO (2000)		11, 85
			1942-1953		Interpolated		-
			1941	0	AQUASTAT, FAO (2000)		11, 85
			1931-1940		Interpolated		-
			1930	0	Framji et al. (1981-1983)		13
			1901-1929		Interpolated		-
			1900	0	Freydank and Siebert (2008)	Estimate	47
EAST TIMOR	TLS	222	2010, 2015	0	FAOSTAT		3
			2005	0	GMIA v5, Democratic Republic of Timor Leste (2010)		1, 86
			1990-2000	0	FAOSTAT		3
			1900-1989	0	Estimate	Scaled based on trend of AEI in Indonesia	-

ECUADOR	ECU	66	2010, 2015	0	Estimate	Assumed constant (2005 value)	-
			2005	2	GMIA v5, INEC (2008)		1, 87
			1961-2000	0	FAOSTAT		3
			1931-1960		Interpolated		-
			1930	0	Sisson and Whitbeck (1933)		23
			1900-1930	0	Estimate	Assumed constant (1930 value)	-
EGYPT	EGY	67	2010, 2015	0	FAOSTAT		3
			2003-2005	0	Estimate	Assumed constant (2002 value)	-
			2002	1	GMIA v5, Ministry of Agricultural and Land reclamation (2003)		1, 88
			1993	1	GMIA v2.1, Siebert et al. (2002)		89
			1980-1993		Interpolated		-
			1980	0	Framji et al. (1981-1983)		13
			1969-1979		Interpolated		
			1968	0	Framji et al. (1981-1983)		13
			1960-1967		Interpolated		
			1959	0	Framji et al. (1981-1983)		13
			1952	0	Meyer (1993)		90
			1901-1951		Interpolated		-
			1900	0	Framji et al. (1981-1983)		13
EL SALVADOR	SLV	201	2010, 2015	0	FAOSTAT		3
			2005	0	GMIA v5, Division de Riego y Drenaje (2007)		1, 91
			1961-2000	0	FAOSTAT		3
			1951-1960		Interpolated		-

			1950	0	AQUASTAT, FAO (2000)		11, 92
			1901-1949		Interpolated		-
			1900	0	Freydank and Siebert (2008)	Estimate	47
EQUATORIAL GUINEA	GNQ	89	2010, 2015	0	FAOSTAT	No irrigation	3
			2005	0	FAO (2005)	No irrigation	93
			1900-2004	0	Estimate	Assumed no irrigation	-
ERITREA	ERI	68	2010, 2015	0	FAOSTAT		3
			1994-2005	0	FAOSTAT	No change in AEI	3
			1993	0	GMIA v5, FAO (2005)		1, 94
			1963-1990	0	Framji et al. (1981-1983), interpolated	Ethiopia PDR (Framji et al. 1981-1983) * AEI Eritrea 1993 / (AEI Eritrea 1993 + AEI Ethiopia 1993)	13
			1900-1962	0	Estimate	Scaled based on trend of AEI for Ethiopia	-
ESTONIA	EST	71	2010, 2015	0	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	31 2
			2005	0	GMIA v5		1
			2000	0	Estimate	AEI set to value for year 2005	-
			1996	1	GMIA v4, FAO (1998)		4, 95
			1991-1995		Interpolated		-
			1973-1990	0	AQUASTAT, FAO (1997)		11, 27
			1961-1972		Interpolated		-
			1926-1960	0	Estimate	Trend in AEI from Ukraine used to scale year 1973 value to each time step	-

			1914-1925	0	Estimate	Decline in irrigation due to war; USSR trend in AEI used for that	-
			1900-1913	0	Estimate	Trend in AEI from Ukraine used to scale year 1973 value to each time step	-
ETHIOPIA	ETH	72	2010, 2015	0	Estimate	Assumed constant (2005 value)	-
			2002-2005	0	GMIA v5, FAOSTAT	Assumed constant (2001 value), AEI in FAOSTAT constant as well	1, 3
			2001	0	GMIA v5		1
			1996-2000		Interpolated		-
			1995	0	FAOSTAT		3
			1963-1990	0	Framji et al. (1981-1983), interpolated	Ethiopia PDR (Framji et al. 1981-1983) * AEI Ethiopia 1993 / (AEI Eritrea 1993 + AEI Ethiopia 1993)	13
			1901-1962		Interpolated		-
			1900	0	Freydank and Siebert (2008)	Estimate	47
FAROE ISLANDS	FRO	77	1900-2015	0	Estimate	Assumed no irrigation	-
FALKLAND ISLANDS	FLK	75	1900-2015	0	Estimate	Assumed no irrigation	-
MICRONESIA	FSM	78	2010, 2015	0	FAOSTAT		3
			1900-2005	0	Estimate	Assumed no irrigation	-
FIJI	FJI	74	1961-2015	0	FAOSTAT		3
			1900-1960	0	Estimate	Assumed no irrigation	-
FINLAND	FIN	73	2010, 2015	1	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	31 2
			2005	1	EUROSTAT		35

			2000	1	EUROSTAT		35
			1995	1	EUROSTAT		35
			1961-1990	0	FAOSTAT		3
			1959-1960		Extrapolated (based on 1961-64 rate)	AEI declines to 0 in year 1959	-
			1950	0	Estimate	Assumed no irrigation	-
			1901-1949	0	Interpolated		-
			1900	0	Estimate, Michelsen (1986); Emanuelsson & Möller (1990)	Estimated 10000 ha of irrigated pasture	81, 96
FRANCE	FRA	76	2010, 2015	1	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	312
			2005	1	EUROSTAT		35
			1990-2000	2	IFEN (2005)		97
			1988	2	IFEN (2005)		97
			1980-1987		Interpolated		-
			1979	2	IFEN (2005)		97
			1970	2	IFEN (2005)		97
			1961	0	FAOSTAT		3
			1899-1960		Interpolated	Elsaß-Lothringen area added to France statistics on 1919	-
			1898	0	Wilson (1898)		98
FRENCH GUIANA	GUF	94	2010, 2015	0	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	312
			2007	0	GMIA v5, MAAPAR (2010)		1, 99
			2001-2006		Interpolated		-
			1961-2000	0	FAOSTAT		3

			1960	0	Estimate	AEI set to value for year 1961	-
			1900-1959	0	Estimate	Assumed no irrigation	-
FRENCH POLYNESIA	PYF	186	1961-2015	0	FAOSTAT	No irrigation before 1988	3
			1900-1960	0	Estimate	Assumed no irrigation	-
GABON	GAB	79	1961-2015	0	FAOSTAT		3
			1951-1960	0	Estimate	AEI set to value for year 1961	-
			1900-1950	0	Estimate	Assumed no irrigation	-
GAMBIA	GMB	87	2010, 2015	0	FAOSTAT		3
			2000-2005	0	Estimate	Assumed constant (1999 value), AEI in FAOSTAT constant as well	1, 3
			1999	0	GMIA v5, ICDF (1999)		1, 100
			1995	0	FAOSTAT		2
			1990	0	AQUASTAT		11
			1961-1985	0	FAOSTAT		3
			1900-1960	0	Estimate	Assumed constant (1961 value)	-
GEORGIA	GEO	81	2010, 2015	0	FAOSTAT		3
			2006	0	GMIA v5, FAO (2011)		1, 101
			2001-2005		Interpolated		-
			1995-2000	0	FAOSTAT		3
			1990	0	AQUASTAT		11
			1925-1985	0	Estimate	Trend of Kyrgystan and Uzbekistan used to interpolate between 1925 and 1990	-
			1901-1924	0	Estimate	Trend of Armenia used to calculate the AEI by using year 1900 as a starting point	-
			1900	0	FAO (1997)		27

GERMANY	DEU	60	2010, 2015	1	EUROSTAT		31 2
			2009	1	DESTATIS (2011)		10 2
			2002-2008		Interpolated		-
			2001	1	Fricke and Heidorn (2004)		10 3
			1996-2000		Interpolated		-
			1995	1	Roth et al. (1995)		10 4
			1990-1994		Interpolated		-
			1989	1	Simon (2009)	For West Germany (FRG) average over year 1986 and 1994	10 5
			1986	1	Simon (2009)		10 5
			1984-985		Interpolated		-
			1983	1	Simon (2009)		10 5
			1976-1982		Interpolated		-
			1975	1	Simon (2009)	East Germany (GDR): year 1975 used; West Germany (FRG): year 1969 used	10 5
			1964-1974		Interpolated		-
			1963	1	Kappes (1990), Meissner (1991), Wolff et al. (1996)		10 6-10 8
			1953-1962		Interpolated		-
			1952	1	Kappes (1990), Meissner (1991), Wolff et al. (1996)		10 6-10 8
			1936-1951		Interpolated		-
			1935	1	Statistisches Reichsamt (1936)		10 9
			1928-1934		Interpolated		-
			1927	1	Statistisches Reichsamt (1930)		11 0
			1913-1926		Interpolated		-

			1912	1	Kaiserliches Statistisches Amt (1913)		11 1
			1900-1911	0	Estimate	Assumed constant (1912 value)	-
GHANA	GHA	83	2010, 2015	0	FAOSTAT	Added 26,000 on top of FAO 2010 and 2015 values	3
			2005	1	GMIA v5, Drechsel et al. (2006), FAO (2005)		1, 11 2, 11 3
			2000	0	GMIA v4, GIDA (2001), FAO (2005)		4, 11 4, 11 3
			1961-1995	0	FAOSTAT		3
			1954-1960		Interpolated		-
			1953	0	Freydank and Siebert (2008)	Estimate	47
			1901-1952		Interpolated		-
			1900	0	Freydank and Siebert (2008)	Estimate	47
GIBRALTAR	GIB	84	1900-2015	0	Estimate	Assumed no irrigation	-
GREECE	GRC	90	2010, 2015	1	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	31 2
			2005	1	EUROSTAT		35
			2000	1	EUROSTAT		35
			1995	1	EUROSTAT		35
			1991	2	National Statistical Service of Greece (1998)		11 5
			1986-1990		Interpolated		-
			1980-1985	0	FAOSTAT		3

			1971	2	National Statistical Service of Greece (1978)	AAI, scaled at province level to AEI based on the AAI/AEI ratio from the 1991 CENSUS data	116
			1962-1970		Interpolated		-
			1961	2	National Statistical Service of Greece (1965)	AAI, scaled at province level to AEI based on the AAI/AEI ratio from the 1991 CENSUS data	117
			1951-1960		Interpolated		-
			1950	2	National Statistical Service of Greece (1958)	AAI, scaled at province level to AEI based on the AAI/AEI ratio from the 1991 CENSUS data	118
			1930-1949		Interpolated		-
			1929	2	National Statistical Service of Greece (1934)	AAI, scaled at province level to AEI based on the AAI/AEI ratio from the 1991 CENSUS data	119
			1901-1928		Interpolated		-
			1900	0	Estimate		-
GREENLAND	GRL	92	1900-2015	0	Estimate	Assumed no irrigation	-
GRENADA	GRD	91	2010, 2015	0	FAOSTAT		3
			2005	0	GMIA v5		1
			1990-2000	0	FAOSTAT	No irrigation reported before 1990	3
			1900-1985	0	Estimate	Assumed no irrigation	-
GUADELOUPE	GLP	86	2010, 2015	0	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	312
			2007	0	GMIA v5, MAAPAR (2010)		1, 99
			2001-2006		Interpolated		-
			1961-2000	0	FAOSTAT		3

			1900-1960	0	Estimate	Extrapolated using trend in AEI 1961-1970, therefore no irrigation in 1950 and years before	-
GUAM	GUM	95	2010, 2015	0	FAOSTAT		3
			2007	0	GMIA v5, NASS (2004), NASS (2009)		1, 120, 121
			2001-2006		Interpolated		-
			2000	0	GMIA v4		4
			1989-1999	0	Freydank and Siebert (2008)	Estimate	47
			1900-1988	0	Estimate	Assumed no irrigation	-
GUATEMALA	GTM	93	2005, 2010, 2015	0	FAOSTAT		3
			2003	1	INECNA (2003)		325
			2004	0	GMIA v5, Ballestero et al. (2007)		1, 42
			2000	0	Estimate	AEI set to 130000 ha based on the data for years 1997 and 2004	-
			1997	0	GMIA v4, FAO (2005)		4, 122
			1961-1995	0	FAOSTAT		3
			1921-1960		Interpolated		-
			1920	0	FAO (2000)		18
			1900-1919	0	Estimate	Extrapolated based on 1920-61 rate	-
GUINEA	GIN	85	2010, 2015	0	FAOSTAT		3
			2002-2005	0	Estimate	AEI set to value for year 2001	-
			2001	0	GMIA v5, FAO (2005)		1, 123
			1995-2000	0	AQUASTAT		11

			1961-1990	0	FAOSTAT		3
			1901-1960		Interpolated		-
			1900	0	Freydank and Siebert (2008)	Estimate	47
GUINEA-BISSAU	GNB	88	1961-2015	0	FAOSTAT		3
			1901-1960		Interpolated		-
			1900	0	Freydank and Siebert (2008)	Estimate	47
GUYANA	GUY	96	1961-2015	0	FAOSTAT		3
			1960		Interpolated		-
			1959	0	Framji et al. (1981-1983)		13
			1950-1958		Interpolated		-
			1949	0	Framji et al. (1981-1983)		13
			1901-1948		Interpolated		-
			1900	0	Framji et al. (1981-1983)		13
HAITI	HTI	101	2010, 2015	0	FAOSTAT		3
			2001-2005	0	Estimate	AEI set to value for year 2000	-
			1961-2000	0	FAOSTAT		3
			1951-1960		Interpolated		-
			1950	0	Framji et al. (1981-1983)		13
			1911-1949		Interpolated		-
			1900-1910	0	Freydank and Siebert (2008)	Estimate	47
HEARD AND MCDONALD ISLANDS	HMD	98	1900-2015	0	Estimate	Assumed no irrigation	-
HONDURAS	HND	99	2010, 2015	0	FAOSTAT		3
			2009	1	DGRD (2009)		326

			2005	0	GMIA v5, Ballestero et al. (2007)		1, 42
			1995, 2000	0	FAOSTAT		3
			1991	0	GMIA v4, FAO (2000)		4, 124
			1986-1990		Interpolated		-
			1961-1985	0	FAOSTAT		3
			1960		Interpolated		-
			1959	0	Framji et al. (1981-1983)		13
			1950	0	Framji et al. (1981-1983)		13
			1921-1949		Interpolated		-
			1920	0	Freydank and Siebert (2008)	Estimate: 2/3 of 1950	47
			1900-1919	0	Estimate	Extrapolated based on 1920-1950 rate	-
HUNGARY	HUN	102	2010, 2015	1	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	312
			2005	1	EUROSTAT		35
			2001	1	Ligetvári et al. (2006)		125
			1979-2000		Interpolated		-
			1978	0	Framji et al. (1981-1983)		13
			1966-1977		Interpolated		-
			1967	0	Ligetvári et al. (2006)		125
			1960-1966		Interpolated		-
			1959	0	Framji et al. (1981-1983)		13
			1950-1958		Interpolated		-
			1949	0	Framji et al. (1981-1983)		13

			1901-1948		Interpolated		-
			1900	0	Framji et al. (1981-1983)		13
ICELAND	ISL	110	1900-2015	0	Estimate	Assumed no irrigation	-
INDIA	IND	105	2010, 2015	2	Ministry of Agriculture (2016a, 2016b)	District wise data scaled to FAOSTAT national AEI totals.	360, 361
			2010, 2015	0	FAOSTAT		3
			2005	0	Estimate	AEI set to value for year 2001	-
			2001	0	GMIA v5, Ministry of Agriculture (2009a, 2009b), Ministry of Water Resources (2005)		1, 126-128
			2000	1	CSO (1966-2005)	AAI: scaled to AEI based on the AAI/AEI ratio from GMIA v5 (year 2001)	129
			1996	1	CSO (1966-2005)	AAI: scaled to AEI based on the AAI/AEI ratio from GMIA v5 (year 2001)	129
			1990-1995		Interpolated		-
			1989	1	CSO (1966-2005)	AAI: scaled to AEI based on the AAI/AEI ratio from GMIA v5 (year 2001)	129
			1985-1988		Interpolated		-
			1984	1	CSO (1966-2005)	AAI: scaled to AEI based on the AAI/AEI ratio from GMIA v5 (year 2001)	129
			1981	1	CSO (1966-2005)	AAI: scaled to AEI based on the AAI/AEI ratio from GMIA v5 (year 2001)	129
			1971-1980		Interpolated		-
			1970	1	CSO (1966-2005)	AAI: scaled to AEI based on the AAI/AEI ratio from GMIA v5 (year 2001)	129

			1960	1	CSO (1966-2005)	AAI: scaled to AEI based on the AAI/AEI ratio from GMIA v5 (year 2001)	129
			1957-1959		Interpolated		-
			1956	0	Framji et al. (1981-1983)		13
			1952-1955		Interpolated		-
			1951	0	Framji et al. (1981-1983)		13
			1946-1950		Interpolated		-
			1945	0	Framji et al. (1981-1983)		13
			1940	1	CSO (1940-1945), Schwartzberg (1992)	Incl. India, Pakistan, Bangladesh and Myanmar; Administrative unit map digitized from Schwartzberg (1992)	130, 131
			1928-1939		Interpolated		-
			1927	1	Valkenburg (1933), Schwartzberg (1992)	Incl. India, Pakistan, Bangladesh and Myanmar; Administrative unit map digitized from Schwartzberg (1992)	130, 132
			1921-1926		Interpolated		-
			1920	1	H.M. Stationery Office (1922), Schwartzberg (1992)	Incl. India, Pakistan, Bangladesh and Myanmar; Administrative unit map digitized from Schwartzberg (1992)	130, 133
			1914-1919		Interpolated		-
			1913	1	H.M. Stationery Office (1915), Schwartzberg (1992)	Incl. India, Pakistan, Bangladesh and Myanmar; Administrative unit map digitized from Schwartzberg (1992)	130, 134
			1901-1912		Interpolated		-
			1900	1	H.M. Stationery Office (1905), Schwartzberg (1992)	Incl. India, Pakistan, Bangladesh and Myanmar; Administrative unit map digitized from Schwartzberg (1992)	130, 135
INDONESIA	IDN	103	2010, 2015	0	FAOSTAT		3

			2005	0	GMIA v5, Ministry of Public Works (2006)		1, 13 6
			1995-2000	0	FAOSTAT		3
			1990		Interpolated		-
			1989	1	FAO-CIDA-JALDA (1991)		13 7
			1961-1985	0	FAOSTAT		3
			1916-1960		Interpolated		-
			1915	0	AQUASTAT, FAO (2012)		13 8
			1881-1914		Interpolated		-
			1880	0	AQUASTAT, FAO (2012)		13 8
IRAN	IRN	10 8	2010, 2015	0	FAOSTAT		3
			2014	1	Statistical Centre of Iran (2015)		32 7
			2010	0	GMIA v5, Statistical Centre of Iran (2006), Ministry of Jihad-e-Agriculture (2007-2012)		1, 13 9, 14 0
			2001-2009		Interpolated		-
			2000	0	FAOSTAT		3
			1994-1999		Interpolated		-
			1993	1	FAOSTAT, Ministry of Jihad-e-Agriculture (2008)	Subnational max of year 1992 and 1993; National value scaled to FAOSTAT	3, 14 1
			1990	1	FAOSTAT, Ministry of Jihad-e-Agriculture (2008)	Subnational max of year 1988, 1990, 1991; National value scaled to FAOSTAT	3, 14 1
			1985	1	FAOSTAT, Ministry of Jihad-e-Agriculture (2008)	Subnational max of year 1984, 1985, 1986; National value scaled to FAOSTAT	3, 14 1
			1980	1	FAOSTAT, Statistical Centre of Iran (1962-1983)	Subnational max of year 1975, 1976, and 1982	3, 14 2

			1972	1	FAOSTAT, Statistical Centre of Iran (1962-1983)	Subnational max of year 1971, 1972 and 1973	3, 142
			1961-1971		Interpolated		-
			1960	1	Statistical Centre of Iran (1962-1983)	Subnational data for year 1960	142
			1901-1959		Interpolated		-
			1900	0	Zarei and Nasseri (2007)		143
IRAQ	IRQ	109	1961-2015	0	FAOSTAT		3
			1960	0	Estimate	Extrapolated based on trend in AEI between 1961-70	-
			1900-1959	0	Estimate	Scaled based on trend in AEI of Jordan	-
IRELAND	IRL	107	2010, 2015	0	Estimate	Assumed constant (2000 value)	-
			2001-2005	0	Estimate	Assumed constant (2000 value)	-
			2000	0	GMIA v5, Baldock et al. (2000)		1, 144
			1931-1995		Estimate	Assumed no irrigation	-
			1900-1930	0	Estimate	Estimate based on West-England meadow irrigation practises	-
ISRAEL	ISR	111	2010, 2015	0	FAOSTAT		3
			2005	0	GMIA v5, CBS (2003)		1, 145
			1995, 2000	0	FAOSTAT		3
			1948-1990	0	Eichenauer (1993)		146
			1901-1947		Interpolated		-
			1900	0	Freydank and Siebert (2008)	Estimate: 1/2 of AEI in 1948	47
ITALY	ITA	112	2010, 2015	1	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007,	312

						2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	
			2005	1	EUROSTAT		35
			2000	1	EUROSTAT		35
			1995	1	EUROSTAT		35
			1990	1	EUROSTAT		35
			1985		Interpolated		-
			1980	0	Framji et al. (1981-1983)		13
			1962-1979		Interpolated		-
			1961	2	Istituto Centrale di Statistica (1968)		147
			1940-1960		Interpolated		-
			1939	0	Framji et al. (1981-1983)		13
			1920-1938		Interpolated		-
			1919	0	Framji et al. (1981-1983)		13
			1906-1918		Interpolated		-
			1905	0	Framji et al. (1981-1983)		13
			1901-1904		Interpolated		-
			1900	0	Framji et al. (1981-1983)		13
JAMAICA	JAM	113	2000, 2005, 2010, 2015	0	FAOSTAT		3
			1995	0	AQUASTAT		11
			1961-1990	0	FAOSTAT		3
			1950-1960		Interpolated		-
			1949	0	Framji et al. (1981-1983)		13
			1903-1948		Interpolated		-
			1902	0	Framji et al. (1981-1983)		13
			1900-1901	0	Estimate	Assumed constant (1902 value)	-

JAPAN	JPN	116	2010, 2015	0	FAOSTAT		3
			2010	0	GMIA v5, Statistics Bureau (2011), MAFF (1994)		1, 148, 149
			2001-2009		Interpolated		-
			2000	0	Ministry of Internal Affairs Communications (2010)		150
			1995		Interpolated		-
			1985-1990	0	Ministry of Internal Affairs Communications (2010)		150
			1980	0	FAOSTAT		3
			1900-1970	1	MAFF (1901-1971)	AEI set to planted area of paddy rice	151
JORDAN	JOR	115	2017	1	Department of Statistics (2017)		328
			2015	0	Interpolated		
			2010	0	FAOSTAT		3
			2007	0	GMIA v5, Department of Statistics (2009a)		1, 152
			2001-2006		Interpolated		-
			2000	0	GMIA v4, Department of Statistics (2009b)		153
			1995		Interpolated		-
			1994	1	AOAD (1994)		12
			1961-1993	0	FAOSTAT		3
			1946-1960		Interpolated		-
			1945	0	Freydank and Siebert (2008)	Estimate: 1/2 of AEI in 1961	47
			1901-1944		Interpolated		-
			1900	0	Freydank and Siebert (2008)	Estimate	47
KAZAKHSTAN	KAZ	118	2010, 2015	1	Agency of Statistics of the		329

					Republic of Kazakstan (2015)		
			2006	0	GMIA v5, Agency of Statistics of the Republic of Kazakstan (2008, 2010)		1, 154, 155
			2001-2005		Interpolated		-
			2000	2	Aus der Beek et al. (2011), FAO (1997)	Subnational AEI from (156) scaled to national AEI from (27)	156, 27
			1995	2	Aus der Beek et al. (2011), FAO (1997)	Subnational AEI from (156) scaled to national AEI from (27)	156, 27
			1990	2	Aus der Beek et al. (2011), FAO (1997)	Subnational AEI from (156) scaled to national AEI from (27)	156, 27
			1985	2	Aus der Beek et al. (2011), FAO (1997)	Subnational AEI from (156) scaled to national AEI from (27)	156, 27
			1980	2	Aus der Beek et al. (2011), FAO (1997)	Subnational AEI from (156) scaled to national AEI from (27)	156, 27
			1970	2	Aus der Beek et al. (2011), FAO (1997)	Subnational AEI from (156) scaled to national AEI from (27)	156, 27
			1960	2	Aus der Beek et al. (2011), FAO (1997)	Subnational AEI from (156) scaled to national AEI from (27)	156, 27
			1900-1959	0	Estimate	Estimated by using trend of AEI in Kyrgystan and Uzbekistan	-
KENYA	KEN	119	2010, 2015	1	JICA (2013)		330
			2004-2005	0	Estimate	Assumed constant (2003 value)	-
			2003	0	GMIA v5, FAO (2006)		1, 157
			1961-2000	0	FAOSTAT		3
			1901-1960		Interpolated		-
			1900	0	Freydank and Siebert (2008)	Estimate	47
KIRIBATI	KIR	122	1900-2015		Estimate	Assumed no irrigation	-

KUWAIT	KWT	125	2010, 2015	0	FAOSTAT		3
			2006	0	GMIA v5, Central Statistics Office (2009)		1, 158
			2001-2005		Interpolated		-
			2000	0	GMIA v4, Ministry of Planning, Statistics and Information Sector (2002)		4, 159
			1993-1999	0	AQUASTAT		11
			1961-1992	0	FAOSTAT	No irrigation reported before 1969	3
			1900-1960	0	Estimate	Assumed no irrigation	-
KYRGYZSTAN	KGZ	120	2010, 2015	0	FAOSTAT		3
			2005	0	GMIA v5, Department of Water Resources (2005)		1, 160
			2000	0	FAOSTAT		3
			1995-1999		Interpolated		-
			1994	0	FAO (1997)		27
			1990	0	FAO (1997)		27
			1981-1989		Interpolated		-
			1980	0	FAO (1997)		27
			1970	0	FAO (1997)		27
			1960	0	FAO (1997)		27
			1950	0	FAO (1997)		27
			1945	0	FAO (1997)		27
			1931-1944		Interpolated		-
			1930	0	FAO (1997)		27
			1916-1929		Interpolated		-
			1915	0	FAO (1997)		27
			1900-1914	0	Estimate	Assumed constant (based on trend for USSR derived from Framji et al. (1981-1983)	13

LAOS	LAO	126	2010, 2015	0	FAOSTAT		3
			2005	0	GMIA v5, FAO (2008)		1, 161
			1993-2000	0	AQUASTAT		11
			1961-1992	0	FAOSTAT		3
			1900-1960	0	Estimate	Estimated by using trend of AEI in Vietnam	-
LATVIA	LVA	136	2010, 2015	1	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	312
			2000-2005	0	EUROSTAT		35
			1992-1999		Interpolated		-
			1973-1991	0	EUROSTAT		35
			1961-1972		Interpolated		-
			1926-1960	0	Estimate	Trend of AEI in Ukraine used to scale year 1973 value to each time step	-
			1914-1925	0	Estimate	Decline in irrigation due to war; trend of AEI in USSR (Framji et al., 1981-1983) used	13
			1900-1913	0	Estimate	Trend of AEI in Ukraine used to scale year 1973 value to each time step	-
LEBANON	LBN	127	2015	0	Extrapolated		
			2010	1	Ministry of Agriculture (2010)		331
			2000-2005	0	FAOSTAT	AEI constant at value for year 1999	3
			1999	0	GMIA v5, Ministry of Agriculture and FAO (2009)		1, 162

			1994-1998	0	Interpolated		-
			1961-1993	0	FAOSTAT		3
			1950-1960		Interpolated		-
			1949	0	Framji et al. (1981-1983)		13
			1901-1948		Interpolated		-
			1900	0	Framji et al. (1981-1983)		13
LESOTHO	LSO	133	2010, 2015	0	FAOSTAT		3
			2001-2005	0	FAOSTAT	AEI constant at value for year 2000	3
			1993-2000	0	AQUASTAT		11
			1961-1992	0	FAOSTAT	1000 ha of AEI in 1961 according to FAOSTAT	3
			1951-1960		Interpolated		-
			1900-1950	0	Estimate	Assumed no irrigation	-
LIBERIA	LBR	128	2010, 2015	0	FAOSTAT		3
			1988-2005	0	FAO (2005), FAOSTAT	AEI from year 1987 scaled by the trend in AEI from FAOSTAT	3, 163
			1987	0	GMIA v5, FAO (2005)		1, 163
			1983-1986	0	AQUASTAT		11
			1961-1982	0	FAOSTAT	No irrigation reported before 1970	3
			1900-1960	0	Estimate	Assumed no irrigation	-
LIBYA	LBY	129	2010, 2015	0	FAOSTAT		3
			2001-2005	0	FAO (2005), FAOSTAT	AEI constant at value for year 2000	3, 164
			2000	0	GMIA v5, FAO (2006)		1, 164
			1961-1995	0	FAOSTAT		3

			1901-1960		Interpolated		-
			1900	0	Estimate		-
LIECHTENSTEIN	LIE	131	1900-2015	0	Estimate	Assumed no irrigation	-
LITHUANIA	LTU	134	2010, 2015	0	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	312
			2005	0	EUROSTAT		35
			2000	0	FAOSTAT		3
			1973-1995	0	AQUASTAT		11
			1961-1972		Interpolated		-
			1926-1960	0	Estimate	Trend of AEI in Ukraine used to scale year 1973 value to each time step	-
			1914-1925	0	Estimate	Decline in irrigation due to war; trend of AEI in USSR (Framji et al., 1981-1983) used	13
			1900-1913	0	Estimate	Trend of AEI in Ukraine used to scale year 1973 value to each time step	-
LUXEMBOURG	LUX	135	2003-2015	0	Estimate	Assumed constant (2002 value)	-
			2002	0	GMIA v4		4
			1990-2001	0	Estimate	Assumed constant (2002 value)	-
			1960-1985	0	Estimate	Assumed no irrigation	-
			1900-1950	0	Estimate	Meadow irrigation was established in Luxembourg until 1945 (Commune de Kiischpelt, 2014). AEI was therefore assigned based on the trend in the district of Trier (Germany).	165
MACEDONIA	MKD	145	2010, 2015	0	FAOSTAT		3

			2000, 2005	0	Vukelic et al. (2006)		166
			1995-1999		Interpolated		-
			1994	0	Worldbank (1997)		167
			1991	0	Vukelic et al. (2006)		166
			1961-1990	0	Estimate	AEI from year 1991 scaled based on the trend in AEI for former Yugoslavia	-
			1900-1960	0	Estimate	AEI from year 1961 scaled based on the trend in AEI for Bulgaria	-
MADAGASCAR	MDG	141	2010, 2015	0	FAOSTAT		3
			2001-2005	0	AQUASTAT, FAOSTAT	AEI constant at value for year 2000	11, 3
			1998-2000	0	AQUASTAT		11
			1961-1997	0	FAOSTAT		3
			1901-1960		Interpolated		-
			1900	0	Estimate		-
MALAWI	MWI	157	2015	0	Estimate	Assumed constant (2010 value)	-
			2010	0	JICA (2014)		332
			2003-2005	0	Estimate	Assumed constant (2002 value)	-
			2002	0	GMIA v5, FAO (2006)		1, 168
			1961-2000	0	FAOSTAT	1000 ha of AEI in 1961 according to FAOSTAT	3
			1960	0	Estimate	Assumed constant (1961 value)	-
			1900-1950	0	Estimate	Assumed no irrigation	-
MALAYSIA	MYS	158	2010, 2015	0	AQUASTAT	Used Aquastat data for 2012 and 2017 (= 380,000 Ha), and interpolated for 2010 and 2015.	11
			1961-2005	0	FAOSTAT		3
			1960		Interpolated		-

			1959	0	Framji et al. (1981-1983)		13
			1901-1958		Interpolated		-
			1900	0	Estimate		-
MALDIVES	MDV	142	2010, 2015	0	FAOSTAT	No irrigation	3
			2011	0	FAO (2013)	No irrigation	169
			1900-2005	0	Estimate	Assumed no irrigation	-
MALI	MLI	146	2015	0	FAOSTAT		3
			2010	0	AQUASTAT	Used Aquastat 2012 value (= 371,031 Ha) for 2010	11
			2001-2005	0	FAO (2005), FAOSTAT	AEI constant at value for year 2000	170, 3
			2000	0	GMIA v5, FAO (2005)		1, 170
			1993-1999	0	AQUASTAT		11
			1961-1992	0	FAOSTAT		3
			1951-1960		Interpolated		-
			1950	0	Harrison Church (1951)		171
			1901-1949		Interpolated		-
			1900	0	Estimate		-
MALTA	MLT	147	2010, 2015	0	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	312
			2005	0	EUROSTAT		35
			1961-2000	0	FAOSTAT	1000 ha of AEI in 1961 according to FAOSTAT	3
			1945-1960	0	Estimate	500 ha AEI	-
			1900-1944	0	Estimate	200 ha AEI	-

MARSHALL ISLANDS	MHL	144	1900-2015	0	Estimate	Assumed no irrigation	-
MARTINIQUE	MTQ	155	2010, 2015	0	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	312
			2007	0	GMIA v5, MAAPAR (2010)		1, 99
			2001-2006		Interpolated		-
			1961-2000	0	FAOSTAT		3
			1900-1960		Estimate	Assumed constant (1961 value)	-
MAURITANIA	MRT	153	2010, 2015	0	FAOSTAT		3
			2005	0	Estimate	Assumed constant (2004 value)	-
			2004	0	AQUASTAT		11
			2000	0	Estimate	Assumed constant (2004 value)	-
			1961-1995	0	FAOSTAT		3
			1901-1960		Interpolated		-
			1900	0	Estimate		-
MAURITIUS	MUS	156	2010, 2015	1	Irrigation Authority (2021)		333
			2009	0	GMIA v5, Central Statistics Office (2009)		1, 172
			2001-2008		Interpolated		-
			1993-2000	0	GMIA v4, Central Statistics Office (2002)		4, 173
			1961-1992	0	FAOSTAT		3
			1900-1960	0	Estimate	Scaled based on trend of AEI for Madagascar	-
MEXICO	MEX	143	2010, 2015	0	FAOSTAT		3

	2007	0	GMIA v5, CONAGUA (2008)		1, 174
	2003-2006		Interpolated		-
	2002	1	CONAGUA (2003)	Scaled to FAOSTAT at national scale	3, 175
	1996-2001		Interpolated		-
	1995	1	INEGI (1997, 1994, 1984, 1983, 1981, 1980)	Scaled to FAOSTAT at national scale	176
	1993-1994	0	AQUASTAT		11
	1982-1992	0	FAOSTAT		3
	1981	1	INEGI (1997, 1994, 1984, 1983, 1981, 1980)	Scaled to FAOSTAT at national scale	176
	1972-1980		Interpolated		-
	1971	1	INEGI (1971, 1961, 1954, 1942, 1939)	Scaled to FAOSTAT at national scale	177
	1962-1970		Interpolated		-
	1961	1	INEGI (1971, 1961, 1954, 1942, 1939)	Scaled to FAOSTAT at national scale	177
	1955-1960		Interpolated		-
	1954	1	INEGI (1971, 1961, 1954, 1942, 1939)	Scaled with ratio of FAOSTAT over INEGI (1961)	177
	1941-1953		Interpolated		-
	1940	1	INEGI (1971, 1961, 1954, 1942, 1939)	Scaled with ratio of FAOSTAT over INEGI (1961)	177
	1931-1939		Interpolated		-
	1930	1	INEGI (1971, 1961, 1954, 1942, 1939)	Scaled with ratio of FAOSTAT over INEGI (1961)	177
	1911-1929		Interpolated		-
	1910	0	Framji et al. (1981-1983)		13
	1900-1909	0	Estimate	Assumed constant (1910 value)	-

MOLDOVA	MDA	140	2010, 2015	0	FAOSTAT		3
			1993-2005	0	FAOSTAT		3
			1978-1992	0	FAO (1997)		27
			1966-1977	0	Estimate	Scaled based on the trend of AEI in Russia	-
			1926-1965	0	Estimate	Trend of AEI in Ukraine used to scale year 1973 value to each time step	-
			1914-1925	0	Estimate	Decline in irrigation due to war; trend of AEI in USSR (Framji et al., 1981-1983) used	13
			1900-1913	0	Estimate	Trend of AEI in Ukraine used to scale year 1973 value to each time step	-
MONACO	MCO	139	1900-2015	0	Estimate	Assumed no irrigation	-
MONGOLIA	MNG	150	1961-2015	0	FAOSTAT		3
			1900-1960	0	Estimate	Assumed constant (1961 value, 5000 ha)	-
MONTSERRAT	MSR	154	1900-2015	0	Estimate	Assumed no irrigation	-
MONTENEGRO	MNE	251	2010, 2015	0	Eurostat	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	312
MOROCCO	MAR	138	2010, 2015	0	FAOSTAT		3
			2005	0	Estimate	Assumed constant (2004 value)	-
			2004	0	GMIA v5, FAO (2005)		1, 178
			1998-2000	0	AQUASTAT		11
			1993-1997		Interpolated		-

			1988-1992	0	AQUASTAT		11
			1961-1987	0	FAOSTAT		3
			1901-1960		Interpolated		-
			1900	0	Harabi (1983)	Extent of traditional irrigation estimated based on Harabi (1983)	179
MOZAMBIQUE	MOZ	152	2010, 2015	0	FAOSTAT		3
			2002-2005	0	Estimate	Assumed constant at value for year 2001, based on FAOSTAT	180, 3
			2001	0	GMIA v5, DNHA (2003)		1, 180
			1998-2000	0	AQUASTAT		11
			1981-1997		Interpolated		-
			1980	0	FAO (2005)		181
			1974-1979		Interpolated		-
			1973	0	FAO (2005)		181
			1969-1972		Interpolated		-
			1968	0	FAO (2005)		181
			1951-1967		Interpolated		-
			1950	0	Estimate	AEI in 1950 should be at least 20000 ha smaller than in 1960 (Ref. 182)	182
			1900-1940	0	Estimate	Assumed reduction of 5000 ha per decade starting with year 1950	-
MYANMAR	MMR	148	2016	1	CSO (2016)		334
			2015	0	Interpolated		
			2010	0	FAOSTAT		3
			2005	0	Estimate	Assumed constant (2004 value)	-
			2004	0	GMIA v5, Ministry of Agriculture and Irrigation (2013)		1, 183

			2000	0	Ministry of Agriculture and Irrigation (2013)		18 3
			1985-1995	0	AQUASTAT		11
			1961-1980	0	FAOSTAT		3
			1954-1960		Interpolated		-
			1953	0	Framji et al. (1981-1983)		13
			1941-1952		Interpolated		-
			1940	0	Framji et al. (1981-1983)	Only used for interpolation; the 1940 value for Myanmar is part of the Indian Empire	13
			1900-1940		See India (Myanmar was part of Indian Empire)		-
NAMIBIA	NAM	16 0	2010, 2015	0	FAOSTAT		3
			2003-2005	0	Estimate	Assumed constant (2002 value), based on FAOSTAT	3, 18 4
			2002	0	GMIA v5, FAO (2005)		1, 18 4
			1998-2001	0	Estimate	Set to AEI reported for year 2002	-
			1993-1997		Interpolated		-
			1992	0	AQUASTAT		11
			1990-1991	0	Estimate	Set to AEI reported for year 1992	-
			1961-1985	0	FAOSTAT		3
			1950-1960	0	Estimate		-
			1900-1949	0	Estimate	Assumed constant (1950 value)	-
NAURU	NRU	17 0	1900-2015	0	Estimate	Assumed no irrigation	-
NEPAL	NPL	16 9	2010, 2015	0	FAOSTAT		3
			2011	3	Central Bureau of Statistics (2011)		33 5

			2003-2005	0	Estimate	Assumed constant (2002 value)	-
			2002	0	GMIA v5, Central Bureau of Statistics (2013)		1, 185
			1992-2000	0	FAOSTAT		3
			1991	3	Central Bureau of Statistics (1993)	Data for season 1991/92; AAI scaled to FAOSTAT at national scale	3, 186
			1961-1990	0	FAOSTAT		3
			1948-1960		Interpolated		-
			1947	0	Framji et al. (1981-1983)		13
			1900-1946	0	Estimate	Assumed constant (1947 value)	-
NETHERLANDS	NLD	167	2010, 2015	1	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	312
			2005	2	EUROSTAT		35
			1990, 1995, 2000	1	EUROSTAT		35
			1961-1985	0	FAOSTAT		3
			1900-1960	0	Estimate	Trend in AEI assumed similar to NW Germany	-
NETHERLANDS ANTILLES	ANT	8	1900-2015	0	Estimate	Assumed no irrigation	-
NEW CALEDONIA	NCL	161	1961-2015	0	FAOSTAT		3
			1950-1960	0	Estimate	Assumed constant (1000 ha)	-
			1900-1949	0	Estimate	Assumed no irrigation	-
NEW ZEALAND	NZL	171	2012, 2017	2	Statistics New Zealand (2021)		336
			2015	0	Interpolated		-

			2010	0	FAOSTAT		3
			2007	0	GMIA v5, Statistics New Zealand (2009)		1, 187
			2001-2006		Interpolated		-
			2000	1	GMIA v4, MAF (2001)		4, 188
			1961-1999		FAOSTAT, MAF (2001), Department of Statistics (1963)	FAOSTAT scaled to meet AEI reported for years 2000 (Ref. 188) and 1960 (Ref. 189)	3, 188, 189
			1960	1	Department of Statistics (1963)		189
			1901-1959		Interpolated		-
			1900	0	Estimate	AEI estimated at 1/4 of 1960	-
NICARAGUA	NIC	165	2015	0	Estimate	Extrapolated and using data for years 2005 and 2011	
			2011	1	INIDE (2011)		337
			2010	0	Interpolated		
			2002-2005	0	Estimate	Assumed constant (2001 value)	-
			2001	0	GMIA v5, INIDE (2002)		1, 190
			1998-2000	0	FAOSTAT scaled to AQUASTAT		3, 11
			1997	0	AQUASTAT		11
			1961-1996	0	FAOSTAT		3
			1901-1960		Interpolated		-
			1900	0	Estimate		-
NIGER	NER	162	2015	0	FAOSTAT		3
			2010	0	AQUASTAT	Used Aquastat value for year 2011	11
			2005	0	GMIA v5, FAO (2005)		1, 191
			2000	0	AQUASTAT		11
			1961-1995	0	FAOSTAT		3

			1901-1960		Interpolated		-
			1900	0	Estimate		-
NIGERIA	NGA	164	2010, 2015	0	AQUASTAT	Used the 2010 value for both 2010 and 2015	11
			2005	0	Estimate	Assumed constant (2004 value)	-
			2004	0	GMIA v5, Enplan Group (2004)		1, 192
			2000	0	AQUASTAT		11
			1961-1995	0	FAOSTAT		3
			1900-1960	0	Estimate	Based on Metz (1991) decrease of 1000 ha per year assumed between 1961 and 1900	3, 193
NIUE	NIU	166	1900-2015	0	Estimate	Assumed no irrigation	-
NORFOLK ISLAND	NFK	163	1900-2015	0	Estimate	Assumed no irrigation	-
NORTH KOREA	PRK	182	2010, 2015	0	Estimate	Assumed constant (2005 value)	-
			1961-2005	0	FAOSTAT		3
			1942-1960		Interpolated		-
			1941	0	Framji et al. (1981-1983), FAOSTAT	Value reported for Korea in Framji et al. (1981-83) subdivided into North- and Southkorea based on AEI reported for year 1961	13, 3
			1936-1940		Interpolated		-
			1935	0	Framji et al. (1981-1983), FAOSTAT	Value reported for Korea in Framji et al. (1981-83) subdivided into North- and Southkorea based on AEI reported for year 1961	13, 3
			1901-1934		Interpolated		-
			1900-1934	0	Estimate	2/3 of AEI in 1935	-
NORWAY	NOR	168	2010, 2015	1	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007,	312

						2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	
			2000, 2005	1	EUROSTAT		35
			1961-1999	0	FAOSTAT		3
			1900-1960	0	Estimate	Based on trend described in Michelsen (1987) and Hatt (1915)	194, 195
OMAN	OMN	172	2010, 2015	0	FAOSTAT		3
			2005	0	Estimate	Assumed constant (2004 value)	-
			2004	0	GMIA v5, Ministry of Agriculture and Fisheries (2005)		1, 196
			2000	0	FAOSTAT		3
			1994-1999		Interpolated		-
			1993	0	AQUASTAT		11
			1961-1992	0	FAOSTAT		3
			1900-1960	0	Estimate	Assumed constant (1961 value)	-
PALAU	PLW	178	1900-2015	0	Estimate	Assumed no irrigation	-
PALESTINE (WEST BANK + GAZA STRIP)	PSE	185	2010, 2015	0	FAOSTAT		3
			2005	0	GMIA v5, PCBS (2003-2008), CBS (2003)		1, 197, 145
			1961-2000	0	FAOSTAT		3
			1960	0	Estimate	Extrapolated based on 1970 and 1961 values	-
			1900-1950	0	Estimate	Scaled based on the trend of AEI in Israel	-

PAKISTAN	PAK	173	2010, 2015	0	Estimate	Assumed constant (2005 value)	-
			2007	1	GMIA v5		1
			2001-2006		Interpolated		-
			2000	1	GMIA v5, Ministry of Food, Agriculture & Livestock (2003-2011)	AEI in year 2007 (Ref. 1) * irrigated area 2000 (Ref. 198) / irrigated area 2007 (Ref. 198)	1, 198
			1995	1	GMIA v5, Ministry of Food, Agriculture & Livestock (2003-2011)	AEI in year 2007 (Ref. 1) * irrigated area 1995 (Ref. 198) / irrigated area 2007 (Ref. 198)	1, 198
			1990	1	GMIA v5, Ministry of Food, Agriculture & Livestock (2003-2011)	AEI in year 2007 (Ref. 1) * irrigated area 1990 (Ref. 198) / irrigated area 2007 (Ref. 198)	1, 198
			1985	1	GMIA v5, Ministry of Food, Agriculture & Livestock (2003-2011)	AEI in year 2007 (Ref. 1) * irrigated area 1985 (Ref. 198) / irrigated area 2007 (Ref. 198)	1, 198
			1982	1	GMIA v5, Ministry of Food, Agriculture & Livestock (2003-2011)	AEI in year 2007 (Ref. 1) * irrigated area 1982 (Ref. 198) / irrigated area 2007 (Ref. 198)	1, 198
			1971-1981		Interpolated		-
			1961-1970	0	FAOSTAT		3
			1960		Interpolated		-
			1958-1959	0	Framji et al. (1981-1983)		13
			1949-1957		Interpolated		-
			1948	0	Framji et al. (1981-1983)		13
			1900-1947		See India (Pakistan was part of Indian Empire)		-
PANAMA	PAN	174	2010, 2015	0	FAOSTAT		3
			2001-2005	0	Estimate	Assumed constant (2004 value)	-
			1998-2000	0	FAOSTAT scaled to AQUASTAT		3, 11

			1997	0	GMIA v5, FAO (2000)		1, 199
			1961-1996	0	FAOSTAT		3
			1921-1960		Interpolated		-
			1920	0	Estimate	2/3 of AEI in year 1961 based on Guatemala	-
			1900-1919	0	Estimate	Trend in AEI 1961-1920 extrapolated to year 1900	-
PAPUA NEW GUINEA	PNG	179	1998-2015	0	Estimate	Assumed no irrigation	-
			1997	0	AQUASTAT	No irrigation in 1997	11
			1900-1996	0	Estimate	Assumed no irrigation	-
PARAGUAY	PRY	184	2010, 2015	0	FAOSTAT		3
			2004-2005	0	Estimate	Assumed constant (2003 value)	-
			1961-2003	0	FAOSTAT		3
			1901-1960		Interpolated		-
			1900	0	Estimate		-
PERU	PER	176	2010, 2015	0	FAOSTAT		3
			2012	1	INEI (2020)		338
			2001-2005	0	Estimate	Assumed constant (2000 value)	-
			2000	1	Ellis et al. (2010)		201
			1995-1999		Interpolated		-
			1994	0	GMIA v5, INEI (2009)		1, 200
			1961-1993	0	FAOSTAT scaled to AQUASTAT		3, 11
			1930-1960		Interpolated		-
			1929	0	Sisson and Whitbeck (1932)		23
			1901-1929		Interpolated		-

			1900	1	Ellis et al. (2010)	Estimate based on trend 1961-1929	201
PHILIPPINES	PHL	177	2015	1	National Irrigation Administration (2015)		339
			2010	1	National Irrigation Administration (2010)		340
			2006	0	GMIA v5, FAO (2013)		1, 202
			1994-2006		Interpolated		-
			1961-1993	0	FAOSTAT		3
			1960		Interpolated		-
			1959	0	Framji et al. (1981-1983)		13
			1950-1958		Interpolated		-
			1949	0	Framji et al. (1981-1983)		13
			1901-1948		Interpolated		-
			1900	0	National Irrigation Administration (1990)	Estimate	203
PITCAIRN ISLANDS	PCN	175	1900-2015		Estimate	Assumed no irrigation	-
POLAND	POL	180	2010, 2015	1	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	312
			2005	1	EUROSTAT		35
			2003	1	EUROSTAT		35
			1996-2002		Interpolated		-
			1995	0	Mioduszewski et al. (2006)		204
			1990	0	Mioduszewski et al. (2006)		204

			1981-1989		Interpolated		-
			1980	0	Mioduszewski et al. (2006)		204
			1975	0	Mioduszewski et al. (2006)		204
			1967-1974		Interpolated		-
			1966	0	Mioduszewski et al. (2006)		204
			1950-1965		Interpolated		-
			1949	0	Mioduszewski et al. (2006)		204
			1901-1948	0	Interpolated		-
			1900	0	Estimate	Percentage of irrigated land area adopted from German province Preussen	-
PORTUGAL	PRT	183	2010, 2015	1	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	312
			1990-2005	1	EUROSTAT		35
			1980-1989		Interpolated		-
			1979	2	INE (1982-1983)	AAI scaled to AEI with 1990 ratio from EUROSTAT data; well in line with FAOSTAT data	205
			1969-1978		Interpolated		-
			1968	2	INE (1971-1972)	AAI scaled to AEI with 1990 ratio from EUROSTAT data; well in line with FAOSTAT data	206
			1960-1967		Interpolated		-
			1959	0	Framji et al. (1981-1983)	Scaled with EUROSTAT ratio of AAI vs AEI	13
			1931-1958		Interpolated		-
			1930	0	Lautensach, 1932		207
			1901-1929		Interpolated		-

			1900	0	Estimate		-
PUERTO RICO	PRI	181	2015	1	NASS (2014), Dieter et al. (2018)	Max. of AAI reported in for each county in Agricultural Census 2012 and Water Census 2015	366, 364
			2010	1	Kenny et al. (2009), NASS (2009), Maupin et al. (2014)	Max. of AAI reported in for each county in Agricultural Census 2007 and Water Censuses 2005 and 2010	210, 208, 365
			2007	0	GMIA v5, NASS (2005, 2009), Kenny et al. (2009), Hutson et al. (2005)	AEI for each municipality set to max. of AAI reported in Refs. 208-211	1, 208-211
			2001-2006		Interpolated		-
			2000	1	GMIA v4, NASS (2005, 2000), Hutson et al. (2005), Solley et al. (1998)	AEI for each municipality set to max. of AAI reported in Refs. 209, 211-213	4, 209, 211-213
			1995	1	NASS (2000, 1994), Solley et al. (1998, 1993)	AEI for each municipality set to max. of AAI reported in Refs. 212-215	212-215
			1990	1	NASS (1989), Solley et al. (1993, 1988)	AEI for each municipality set to max. of AAI reported in Refs. 215-217	215-217
			1985	0	Lamm and Brown (2003)		218
			1980	0	Lamm and Brown (2003)		218
			1970	0	Lamm and Brown (2003)		218
			1960	0	MacKichan and Kammerer (1961)		219
			1949	0	Framji et al. (1981-1983)		13
			1936-1948		Interpolated		-
			1935	0	Framji et al. (1981-1983)		13
			1915-1934		Interpolated		-
			1914	0	Framji et al. (1981-1983)		13

			1901-1913		Interpolated		-
			1900	0	Estimate	2/3 of AEI in 1914	-
QATAR	QAT	187	2010, 2015	0	FAOSTAT		3
			2002-2005	0	Estimate	Assumed constant (2001 value)	-
			2001	0	GMIA v5, FAO (2013)		1, 220
			2000	0	FAOSTAT		3
			1995	0	Estimate	Assumed constant (1993 value)	-
			1993	0	AQUASTAT		11
			1990	0	AQUASTAT		11
			1961-1985	0	FAOSTAT	AEI in year 1961: 1000 ha	3
			1900-1960	0	Estimate	Assumed no irrigation	-
REUNION	REU	188	2010, 2015	0	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	312
			2007	0	GMIA v5, MAAPAR (2010)		1, 99
			2001-2006		Interpolated		-
			1961-2000	0	FAOSTAT		3
			1900-1960	0	Estimate	Scaled based on the trend of AEI in Madagascar	-
ROMANIA	ROU	189	2010, 2015	0	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	312
			2005	1	EUROSTAT		35
			2003	0	GMIA v5, Nicolaescu et al. (2006)		1, 221

			1996-2003		Interpolated		-
			1995	0	Nicolaescu et al. (2006)		221
			1990	1	CNPS (1990-1991)	AEI assumed similar to reported "Area arranged for irrigation"	223
			1985	1	DCS (1976-1986)	AEI assumed similar to reported "Area arranged for irrigation"	222
			1980	1	DCS (1976-1986)	AEI assumed similar to reported "Area arranged for irrigation"	222
			1975	1	DCS (1976-1986)	AEI assumed similar to reported "Area arranged for irrigation"	222
			1974	0	Framji et al. (1981-1983)		13
			1972-1973		Interpolated		-
			1971	0	Framji et al. (1981-1983)		13
			1970		Interpolated	Sub-national data from 1975 used for sub-national pattern; national data for national value	-
			1969	0	Framji et al. (1981-1983)		13
			1966-1968		Interpolated		-
			1965	0	Framji et al. (1981-1983)		13
			1962-1964		Interpolated		-
			1961	0	Framji et al. (1981-1983)		13
			1951-1960		Interpolated		-
			1950	0	Framji et al. (1981-1983)		13
			1946-1949		Interpolated		-
			1944	0	Framji et al. (1981-1983)		13
			1901-1943		Interpolated		-
			1900	0	Estimate	AEI in year 1900 estimated at 10000 ha	-
RUSSIAN FEDERATION	RUS	190	2016	1	Federal State Statistics Service (2018)		342

			2010, 2015		Interpolated	Interpolated between the AEI totals of sub-national data for years 2006 and 2016	
			2006	0	GMIA v5, Federal State Statistics Service (2008)		1, 224
			1991-2005		Interpolated		-
			1990	1	Stolbovoi and McCallum (2002)		225
			1987	1	Stolbovoi and McCallum (2002)		225
			1973-1986	0	FAO (1997)		27
			1961-1972		Interpolated		-
			1926-1960	0	Estimate	Scaled based on trend of AEI in Ukraine, values for year 1920 and 1970 of Russia used for interpolation	-
			1917-1925	0	Estimate	Scaled based on the trend of AEI in USSR (Framji et al. 1981-1983)	13
			1916	0	FAO (1997)		27
			1900-1915	0	Estimate	Assumed constant at the value reported for year 1916	-
RWANDA	RWA	191	2010, 2015	0	FAOSTAT		3
			2001-2005	0	Estimate	Assumed constant at the value for year 2000	-
			1998-2000	0	GMIA v5, FAO (2005)		1, 226
			1961-1997	0	FAOSTAT		3
			1956-1960	0	Estimate	Scaled based on Uganda, AEI declines to 0 ha in year 1956	-
			1900-1955	0	Estimate	Assumed no irrigation	-
SAINT HELENA	SHN	197	1900-2015	0	Estimate	Assumed no irrigation	-
SAINT KITTS AND NEVIS	KNA	123	2010, 2015	0	FAOSTAT		3

			1998-2005	0	Estimate	Assumed constant at the value for year 1997	-
			1997	0	GMIA v5, FAO (2000)		1, 227
			1900-1996	0	Estimate	Assumed constant at the value for year 1997 (18 ha)	-
SAINT LUCIA	LCA	130	2010, 2015	0	FAOSTAT		3
			2007	0	GMIA v5, Ministry of Agriculture Lands, Forestry and Fisheries (2007)		1, 228
			1995-2006	0	FAOSTAT	Assumed constant (similar to the trend of AEI in FAOSTAT)	3
			1961-1994	0	FAOSTAT		3
			1956-1960	0	Estimate	Scaled based on trend of AEI in Guadeloupe, AEI declines to 0 ha in year 1956	-
			1900-1955	0	Estimate	Assumed no irrigation	-
SAINT PIERRE AND MIQUELON	SPM	205	1900-2015	0	Estimate	Assumed no irrigation	-
SAINT VINCENT AND THE GRENADINES	VCT	237	2010, 2015	0	FAOSTAT		3
			1965-2005	0	FAOSTAT		3
			1900-1964	0	Estimate	Assumed no irrigation	-
SAMOA	WSM	244	1900-2015	0	Estimate	Assumed no irrigation	-
SAN MARINO	SMR	202	1900-2015	0	Estimate	Assumed no irrigation	-
SAO TOME AND PRINCIPE	STP	207	2010, 2015	0	FAOSTAT		3

			1992-2005	0	FAOSTAT	Assumed constant (similar to the trend of AEI in FAOSTAT)	3
			1991	0	GMIA v5, FAO (2005)		1, 229
			1961-1990	0	FAOSTAT	Assumed constant (similar to the trend of AEI in FAOSTAT)	3
			1901-1960		Interpolated		-
			1900	0	Estimate	AEI in year 1900 estimated at 2000 ha	-
SAUDI ARABIA	SAU	192	2010, 2015	0	Estimate	Assumed constant (2007 value)	-
			2007	0	GMIA v5, Central Department of Statistics and Information (2002-2008)		1, 230
			2001-2006		Interpolated		-
			2000	0	GMIA v4, AOAD (2003), Dabbagh and Abderrahman (1997)		4, 37, 231
			1961-1999	0	FAOSTAT		3
			1901-1960		Interpolated		-
			1900	0	Estimate	1/2 of AEI in 1961	-
SENEGAL	SEN	194	2010, 2015	0	FAOSTAT		3
			2003-2005	0	FAOSTAT	Assumed constant (similar to the trend of AEI in FAOSTAT)	3
			2002	0	GMIA v5, FAO (2005)		1, 232
			1995-2000		Interpolated		-
			1994	0	AQUASTAT		11
			1961-1993	0	FAOSTAT		3
			1901-1960		Interpolated		-
			1900	0	Estimate	AEI in year 1900 estimated at 35000 ha	-

SERBIA	255	SRB	2015	2	Estimate	Used the FAOSTAT total AEI for 2015 and used the proportions of 2012 sub-national data to obtain the subnaitonal data for 2015	3
			2012	2	Statistical Office of the Republic of Serbia (2021)		343
KOSOVO	256	KOS	2010, 2015	0	Estimate	Interpolated for natinal values for years 2010 and 2015 using the sub-national data of 2008 and 2013	-
			2013	1	SOK (2013)		344
			2008	2	SOK (2008)		345
SERBIA, MONTENEGRO, KOSOVO	SMK	400	2005	1	SOK (2005), Statistical Office of the Republic of Serbia (2008), MONSTAT (2011)		233-235
			2000	1	MONSTAT (2011), SOK (2001), Statistical Office of the Republic of Serbia (2005)		235-237
			1992-1999		Interpolated		-
			1991	0	GMIA v4, World Bank (2005), World Bank (2003)		4, 238, 239
			1961-1990	0	FAOSTAT	Scaled based on trend of AEI in former Yugoslavia (FAOSTAT)	3
			1900-1960	0	Estimate	Scaled based on trend of AEI in Bulgaria	-
SEYCHELLES	SYC	213	2010, 2015	0	FAOSTAT		3
			2004-2005	0	Estimate	Assumed constant at the value for year 2003	-

			2003	0	GMIA v5, FAO (2005)		1, 240
			2000	0	Estimate	Assumed constant at the value for year 2003	-
			1996-1999		Interpolated		-
			1995	0	Estimate	Assumed no irrigation	-
			1900-1994	0	Estimate	Assumed no irrigation	-
SIERRA LEONE	SLE	200	2010, 2015	0	FAOSTAT		3
			1993-2005	0	FAOSTAT, FAO (2005)	AEI from year 1992 scaled relatively to trend in AEI from FAOSTAT	3, 241
			1992	0	GMIA v5, FAO (2005)		1, 241
			1961-1991	0	FAOSTAT		3
			1900-1960	0	Estimate	Assumed constant at the value for year 1961 (1000 ha)	-
SINGAPORE	SGP	195	2001-2015	0	Estimate	Assumed no irrigation	-
			2000	0	GMIA v5	No irrigation	1
			1900-1999	0	Estimate	Assumed no irrigation	-
SLOVAKIA	SVK	209	2010, 2015	1	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	312
			2005	1	EUROSTAT		35
			2001	0	GMIA v5, Statistical Office of the Slovak Republic (2002)		1, 242
			2000	0	Estimate	Assumed constant at the value for year 2001	-
			1988-1999	0	Estimate	AEI from year 1988 scaled based on trend in AEI from Czech Republic	-

			1940-1988	0	Štastná et al. (2006), FAOSTAT, Framji et al. (1981-1983)	Difference between AEI reported for Czechoslovakia and Czech Republic	79, 3, 13
			1900-1939	0	Estimate	Scaled based on trend of AEI for Czechoslovakia, AEI for Czechoslovakia in 1900 as reported in Framji et al. (1981-1983)	13
SLOVENIA	SVN	210	2010, 2015	0	AIS (2020)		346
			2005	0	Maticic and Steinman (2006)		243
			2000	0	Maticic and Steinman (2006)		243
			1995	0	World Bank (1997)		244
			1992	0	FAOSTAT		3
			1961-1991	0	FAOSTAT	AEI from year 1992 scaled relatively to trend in AEI reported for Yugoslav SFR (FAOSTAT)	3
			1960	0	Estimate	Assumed constant at the value for year 1961	-
			1950	0	Estimate	AEI in year 1950 estimated at 2000 ha	-
			1900-1940	0	Estimate	AEI estimated at 1000 ha	-
SOLOMON ISLANDS	SLB	199	1900-2015	0	Estimate	Assumed no irrigation	-
SOMALIA	SOM	203	2010, 2015	0	FAOSTAT		3
			2004-2005	0	FAOSTAT		3
			2003	0	GMIA v5, FAO (2005)		1, 245
			1984-2002	0	AQUASTAT, FAO (2005)		11, 245
			1961-1983	0	FAOSTAT		3
			1901-1960		Interpolated		-

			1900	0	Estimate	1/2 of AEI in 1961	-
SOUTH AFRICA	ZAF	246	2015	3	DEA (2013)	Calculated AEI for 2015 by taking the maximum of AEI for years 2013 and 2018	347
			2018	3	DEA (2018)		348
			2001-2005	0	Estimate	Assumed constant at the value for year 2000	-
			2000	0	GMIA v5, FAO (2005), Thompson (1999)		1, 246, 247
			1961-1995	0	FAOSTAT		3
			1922-1960		Interpolated		-
			1921	0	Daryll Forde (1925)		248
			1901-1920		Interpolated		-
			1900	0	Estimate	1/5 of AEI in 1961	-
SOUTH KOREA	KOR	124	2010, 2015	0	AQUASTAT	Used Aquastat 2009 value for both 2010 and 2015	11
			2009	0	GMIA v5, MIFAFF (2010)		1, 249
			2001-2008		Interpolated		-
			1961-2000	0	FAOSTAT scaled to AQUASTAT		3, 11
			1956-1960		Interpolated		-
			1955	0	Framji et al. (1981-1983)		13
			1942-1954		Interpolated		-
			1941	0	Framji et al. (1981-1983)	AEI reported for Korea, split into North/South Korea based on the ratio in year 1955	13
			1936-1940		Interpolated		-
			1935	0	Framji et al. (1981-1983)	AEI reported for Korea, split into North/South Korea based on the ratio in year 1955	13

			1901-1934		Interpolated		-
			1900	0	Estimate	2/3 of AEI in 1935	-
SPAIN	ESP	70	2010, 2015	1	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable area for 2010, 2013 and 2015.	312
			2005	2	EUROSTAT		35
			1995, 2000	1	EUROSTAT		35
			1990-1994		Interpolated		-
			1989	2	INE (1995)	Scaled with EUROSTAT to AEI; original data for cultivated land, ratio from year 1972 used to estimate the non-cultivated land area under irrigation	250, 35
			1983-1988		Interpolated		-
			1982	2	INE (1989)	Scaled with EUROSTAT to AEI; original data for cultivated land, ratio from year 1972 used to estimate the non-cultivated land area under irrigation	251, 35
			1973-1981		Interpolated		-
			1972	2	INE (1975a), INE (1975b)	Scaled with EUROSTAT to AEI	252, 253, 35
			1963-1971		Interpolated		-
			1962	2	INE (1966)	Scaled with EUROSTAT to AEI; original data for cultivated land, ratio from year 1972 used to estimate the non-cultivated land area under irrigation	254, 35
			1950-1961		Interpolated		-
			1949	0	Framji et al. (1981-1983)		13
			1928-1948		Interpolated		-

			1927	0	Lautensach (1932)		207
			1919-1926		Interpolated		-
			1918	0	Houston (1950)		255
			1889-1918		Interpolated		-
			1888	2	INE (1888)		256
SRI LANKA	LKA	132	2010, 2015	0	FAOSTAT		3
			2013	1	Department of Census and Statistics (2021)		349
			2010	0	GMIA v5, Department of Census and Statistics (2013), Jayewardene et al. (1991)		1, 257, 258
			2001-2009		Interpolated		-
			1961-2000	0	FAOSTAT		3
			1948-1960		Extrapolated	Extrapolated based on the trend in AEI 1961-1970	-
			1901-1947		Interpolated		-
			1900	0	Estimate	AEI estimated at 100000 ha	-
SUDAN	SDN	193	2010, 2015	0	FAOSTAT		3
			2001-2005	0	Estimate	Assumed constant at the value for year 2000	-
			1961-2000	0	FAOSTAT		3
			1960		Interpolated		-
			1959	0	Framji et al. (1981-1983)	Scaled based on the ratio of AEI reported by Framji et al. (1981-1983) and FAOSTAT in 1969	13, 3
			1946-1958		Interpolated		-
			1945	0	Barbour (1959)		259
			1935-44		Interpolated		-
			1934	0	Barbour (1959)		259

			1901-1933		Interpolated		-
			1900	0	Estimate	AEI estimated at 200000 ha based on Barbour (1959)	-
SOUTH SUDAN	SSD	254	2015	0	FAOSTAT		3
SURINAME	SUR	208	2010, 2015	0	FAOSTAT		3
			1999-2005	0	Estimate	Assumed constant at the value for year 1998	-
			1998	0	GMIA v5, FAO (2000)		1, 260
			1961-1997	0	FAOSTAT		3
			1901-1960		Interpolated		-
			1900	0	Estimate	AEI estimated at 1000 ha	-
SVALBARD AND JAN MAYEN	SJM	198	1900-2015	0	Estimate	Assumed no irrigation	-
SWAZILAND	SWZ	212	2010, 2015	0	FAOSTAT		3
			2001-2005	0	GMIA v5, FAO (2005)		1, 261
			2000	0	Riddell and Manyatsi (2003)		262
			1961-1999	0	FAOSTAT		3
			1955-1960		Interpolated		-
			1954	0	Framji et al. (1981-1983)	AEI reported at 5100 ha	13
			1951-1953		Interpolated		-
			1950	0	Estimate	Assumed no irrigation	-
			1900-1949	0	Estimate	Assumed no irrigation	-
SWEDEN	SWE	211	2010, 2015	1	EUROSTAT	AEI 2010 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013. AEI 2015 was calculated by taking the maximum of irrigable	312

						area for 2010, 2013 and 2015.	
			2005	1	EUROSTAT		35
			2000	1	EUROSTAT		35
			1995	1	EUROSTAT		35
			1961-1990	0	FAOSTAT		3
			1946-1960		Interpolated		-
			1945	0	Estimate	Minimum AEI due to decline of pasture irrigation until 1945 and starting of cropland irrigation	-
			1901-1944		Interpolated		-
			1900	1	Estimate	AEI estimated at 85000 ha based on Emanuelsson and Möller (1990)	81
SWITZERLAND	CHE	43	2010, 2015	2	EUROSTAT	AEI 2010 and 2015 was calculated by taking the maximum of AAI of 2010, 2013, 2016 and Weber 2007	263, 312
			2005	0	Weber and Schild (2007)		263
			2000	0	Weber and Schild (2007)		263
			1981-1999		Interpolated		-
			1980	0	Reynard (1995)		264
			1956-1979		Interpolated		-
			1955	0	Reynard (1995)		264
			1941-1954		Interpolated		-
			1940	0	Reynard (1995)		264
			1930		Interpolated		-
			1920	0	Estimate	AEI estimated at 30000 ha based on the trend described in Reynard (1995)	264
			1910	0	Estimate	AEI estimated at 40000 ha based on the trend described in Reynard (1995)	264

			1900	0	Estimate	AEI estimated at 50000 ha based on the trend described in Reynard (1995)	26 4
SYRIA	SYR	21 4	2010, 2015	0	FAOSTAT		3
			2006	0	FAOSTAT		3
			2002-2005		Interpolated		-
			2001	1	AOAD (2003)		26 5
			1994-2000		Interpolated		-
			1993	1	AOAD (1994)		12
			1992	1	FAO (1992)		26 6
			1986-1991		Interpolated		-
			1961-1985	0	FAOSTAT		3
			1959-1960	0	Hopfinger (1993)		26 7
			1947-1958		Interpolated		-
			1946	0	Estimate	1/2 of AEI in 1959	-
			1934-1945		Interpolated		-
			1933	0	Estimate		-
			1901-1932		Interpolated		-
			1900	0	Framji et al. (1981-1983)		13
TAIWAN	TWN	22 8	2015	2	Directorate-General of Budget, Accounting and Statistics (2015)		35 0
			2010	0	Estimate	Assumed constant (2005 value)	-
			2005	0	GMIA v5, Directorate-General of Budget, Accounting and Statistics (2007)		1, 26 8
			1996-2004		Interpolated		-

			1995	0	Directorate-General of Budget, Accounting and Statistics (1997)		269
			1990	0	Directorate-General of Budget, Accounting and Statistics (1997)		269
			1977-1989		Estimate	Scaled based on trend of AEI in China	-
			1976	0	Framji et al. (1981-1983)		13
			1967-1975		Interpolated		-
			1966	0	Framji et al. (1981-1983)		13
			1960-1956		Interpolated		-
			1959	0	Framji et al. (1981-1983)		13
			1950-1958		Interpolated		-
			1949	0	Framji et al. (1981-1983)		13
			1946-1948		Interpolated		-
			1945	0	Framji et al. (1981-1983)		13
			1941-1944		Interpolated		-
			1940	0	Framji et al. (1981-1983)		13
			1901-1939		Interpolated		-
			1900	0	Framji et al. (1981-1983)		13
TAJIKISTAN	TJK	219	2010, 2015	0	AQUASTAT		11
			2008	0	GMIA v5, Agency on Land, Geodesy and Cartography (2008)		1, 270
			2001-2007		Interpolated		-
			2000	2	Aus der Beek et al. (2011)		156
			1995-1999		Interpolated		-
			1994	2	Aus der Beek et al. (2011)		156

			1992	2	Aus der Beek et al. (2011)		156
			1986-1991		Interpolated		-
			1985	2	Aus der Beek et al. (2011)		156
			1980	2	Aus der Beek et al. (2011)		156
			1970	2	Aus der Beek et al. (2011)		156
			1960	2	Aus der Beek et al. (2011)		156
			1900-1959	0	Estimate	Scaled based on trend of AEI in Kyrgystan and Uzbekistan	-
TANZANIA	TZA	229	2015	1	National Bureau of Statistics (2016)		351
			2010	0	FAOSTAT		3
			2003-2005	0	Estimate	Assumed constant at the value for year 2002	-
			2002	0	GMIA v5, MAFS and JICA (2002), National Bureau of Statistics (2006, 2007)		1, 271-273
			1993-2000	0	AQUASTAT		11
			1961-1992	0	FAOSTAT		3
			1900-1960	0	Sheridan (2002), Baumann (1891)	AEI assumed constant at the value for 1961 based on Sheridan (2002) and Baumann (1891)	274, 275
THAILAND	THA	218	2015	1	Office of Agricultural Economics (2018)	AEI for the year 2015 was calculated by taking the maximum of AAI for the years 2012, 2013, 2014, 2015, 2016 and 2017 at sub-national level	352
			2010	0	FAOSTAT		3
			2007	0	GMIA v5, FAO (2012)		1, 276
			2001-2006		Interpolated		-
			2000	1	FAO (2012), FAOSTAT	National AEI from FAOSTAT, subnational distribution according to FAO (2012)	11, 3

			1993-1999		Interpolated		-
			1992	1	Ministry of Agriculture and Co-operatives (1993), FAOSTAT	National AEI from FAOSTAT, subnational distribution according to Ministry of Agriculture and Co-operatives (1993)	277, 3
			1991		Interpolated		-
			1990	1	Ministry of Agriculture and Co-operatives (1993)		277
			1989		Interpolated		-
			1988	1	Ministry of Agriculture and Co-operatives (1993)		277
			1961-1985	0	FAOSTAT		3
			1960		Interpolated		-
			1959	0	Framji et al. (1981-1983)		13
			1911-1958		Interpolated		-
			1910	0	Framji et al. (1981-1983)		13
			1901-1909		Interpolated		-
			1900	0	Estimate		-
TOGO	TGO	217	2010, 2015	0	FAOSTAT		3
			2001-2005	0	Estimate	AEI assumed constant at the value for year 2000	-
			1998-2000	0	FAOSTAT, AQUASTAT	FAOSTAT scaled with ratio between AEI in AQUASTAT and FAOSTAT for year 1996	3, 11
			1983-1997	0	AQUASTAT		11
			1961-1982	0	FAOSTAT		3
			1900-1960	0	Estimate	AEI assumed constant at the value for 1961 (1000 ha)	-
TOKELAU	TKL	220	1900-2015	0	Estimate	Assumed no irrigation	-
TONGA	TON	223	1900-2015	0	Estimate	Assumed no irrigation	-

TRINIDAD AND TOBAGO	TTO	224	2010, 2015	0	FAOSTAT		3
			1998-2005	0	Estimate	AEI assumed constant at the value for 1997 (1000 ha)	-
			1997	0	GMIA v5, FAO (2000)		1, 277
			1993-1996	0	AQUASTAT		11
			1982-1992		Interpolated		-
			1981	0	AQUASTAT		11
			1976-1980		Interpolated		-
			1975	0	AQUASTAT		11
			1962-1974		Interpolated		-
			1961	0	AQUASTAT		11
			1905-1960		Extrapolated	Extrapolated based on trend in AEI in period 1961-1975	-
			1900-1904	0	Estimate	Assumed no irrigation	-
TUNISIA	TUN	225	2015	0	FAOSTAT		3
			2011	1	MAWF (2011)		353
			2006	0	GMIA v5, DGPDIA - S/D STAT (2000), Government of Tunisia (2008)		1, 279, 280
			2001-2005		Interpolated		-
			2000	0	GMIA v4, DGPDIA - S/D STAT (2000)		4, 279
			1995	1	Estimate	AEI assumed constant at the value for 1991	89
			1991	1	Siebert et al. (2002)	AEI per governorate derived from the FAO AQUASTAT library	89
			1961-1990	0	FAOSTAT		3
			1901-1960		Interpolated		-
			1900	0	Framji et al. (1981-1983)		13

TURKEY	TUR	226	2010, 2015	0	FAOSTAT		3
			2002-2005	1	Estimate	AEI assumed constant at the value for 2001	-
			2001	1	GMIA v5, DIE (2012)		1, 281
			1995-2000		Interpolated		-
			1994	0	GMIA v4, FAO (1997)		4, 282
			1992-1993	0	FAOSTAT		3
			1991	1	DIE (1992)		283
			1990		Interpolated		-
			1961-1985	0	FAOSTAT		3
			1960		Interpolated		-
			1959	0	Framji et al. (1981-1983)		13
			1952-1958		Interpolated		-
			1950, 1951	1	Central Statistical Office (1956)		284
			1901-1949		Interpolated		-
			1900	0	Estimate	2/3 of AEI in 1950	-
TURKMENISTAN	TKM	221	2010, 2015	0	FAOSTAT		3
			2006	0	GMIA v5, Ministry of Water Economy (2007)		1, 285
			2001-2005		Interpolated		-
			2000	1	Aus der Beek et al. (2011)		156
			1995-1999		Interpolated		-
			1994	1	Aus der Beek et al. (2011)		156
			1990	1	Aus der Beek et al. (2011)		156
			1985	1	Aus der Beek et al. (2011)		156
			1980	1	Aus der Beek et al. (2011)		156

			1970	1	Aus der Beek et al. (2011)		156
			1960	1	Aus der Beek et al. (2011)		156
			1900-1959	0	scaled based on Kyrgystan and Uzbekistan	Scaled based on trend in Kyrgystan and Uzbekistan, AEI of 1960 used for scaling	-
TURKS AND CAICOS ISLANDS	TCA	215	1900-2015	0	Estimate	Assumed no irrigation	-
TUVALU	TUV	227	1900-2015	0	Estimate	Assumed no irrigation	-
UGANDA	UGA	230	2010, 2015	0	FAOSTAT		3
			2001-2005	0	Estimate	AEI assumed constant at the value for 2000	-
			1999-2000	0	GMIA v5, FAO (2006), FAOSTAT	AEI assumed constant at the value for 1998, similar to the trend in AEI in FAOSTAT	1, 286, 3
			1998	0	GMIA v5, FAO (2006)		1, 286
			1988-1997		Interpolated		-
			1983-1987	0	AQUASTAT		11
			1961-1984	0	FAOSTAT		3
			1956-1960		Extrapolated	Based on the trend of AEI in period 1961-1966, AEI declines to 0 in year 1956	-
			1900-1955	0	Estimate	Assumed no irrigation	-
UKRAINE	UKR	231	2010, 2015	0	FAOSTAT		3
			2010, 2015	1	Estimate	Sub-national data for 2010 and 2015 was calculated by scaling the sub-national AEI data of 2006 to the national AEI values of FAOSTAT for years 2010 and 2015.	-
			2006	1	Nadtochy and Myslyva (2007)		287

			2001-2005	0	Estimate	AEI assumed constant at the value for 2000	-
			2000	0	Nadtochy and Myslyva (2007)		287
			1995	0	Nadtochy and Myslyva (2007)		287
			1987-1994		Interpolated		-
			1986	0	Nadtochy and Myslyva (2007)		287
			1977-1985		Interpolated		-
			1976	0	Nadtochy and Myslyva (2007)		287
			1967-1975		Interpolated		-
			1966	0	Nadtochy and Myslyva (2007)		287
			1941-1965		Interpolated		-
			1940	0	Nadtochy and Myslyva (2007)		287
			1918-1939		Interpolated		-
			1917	0	Nadtochy and Myslyva (2007)		287
			1900-1916	0	Estimate	Assumed constant, based on former USSR (Framji et al., 1981-1983))	-
UNITED ARAB EMIRATES	ARE	9	2016	1	MCCE (2016)		354
			2015	0	Interpolated		-
			2010	1	MCCE (2010)		355
			2004-2005	0	Estimate	AEI assumed constant at the value for 2003	-
			2003	0	GMIA v5, FAO (2013)		1, 288
			2001	0	GMIA v4, Ministry of Planning (2003)		4, 289
			1999-2000		Interpolated		-
			1998	0	GMIA v4, MAF (2004)		4, 290
			1993-1997		Interpolated		-

			1992	0	GMIA v4, MAF (2004)		4, 290
			1986-1991		Interpolated		-
			1961-1985	0	FAOSTAT		3
			1901-1960		Interpolated		-
			1900	0	HYDE	AEI set to cropland area reported in HYDE 3.1	291
UNITED KINGDOM	GBR	80	2010, 2015	1	EUROSTAT	AEI 2010 and AEI 2015 was calculated by taking the maximum of irrigable area for 2007, 2010 and 2013.	312
			2005	2	EUROSTAT		35
			2003	1	EUROSTAT		35
			1998-2002		Interpolated		-
			1997	1	EUROSTAT		35
			1993-1996		Interpolated		-
			1993	1	EUROSTAT		35
			1991-1992		Interpolated		-
			1990	1	EUROSTAT		35
			1961-1989	0	FAOSTAT		3
			1951-1960		Interpolated		-
			1945	0	Estimate	Based on the reported decline in meadow irrigation in the early 20th century (e.g. by Brown, 2003) a remaining AEI of 5000 ha was assumed	292
			1901-1944		Interpolated		-
			1900	0	Adkin (1933)		293
UNITED STATES	USA	234	2015	2	NASS (2014), Dieter et al. (2018), NASS (2019),	Max. of AAI reported in for each county in Agricultural Censuses 2012 and 2017 and Water Census 2015	362, 364, 363

		2010	2	Kenny et al. (2009), NASS (2009), Maupin et al. (2014)	Max. of AAI reported in for each county in Agricultural Census 2007 and Water Censuses 2005 and 2010	295, 294, 365
		2007	0	GMIA v5, NASS (2005, 2009), Kenny et al. (2009), Hutson et al. (2005)	Max. of AAI reported in for each county in Agricultural Censuses 2007 and 2002 and Water Censuses 2005 and 2000	1, 294, 295, 210, 211
		2001-2006		Interpolated		-
		2000	2	NASS (2005, 2000), Hutson et al. (2005), Solley et al. (1998)	Max. of AAI reported in Agricultural Censuses 2002 and 1997 and Water Censuses 2000 and 1995	295, 296, 211, 213
		1995	2	NASS (2000, 1994), Solley et al. (1998, 1993)	Max. of AAI reported in Agricultural Censuses 1997 and 1992 and Water Censuses 1995 and 1990	296, 297, 213, 215
		1990	2	NASS (1989), Solley et al. (1993, 1988)	Max. of AAI reported in Agricultural Census 1987 and Water Censuses 1990 and 1985	298, 215, 217
		1985	1	Lamm and Brown (2003)		218
		1980	1	Lamm and Brown (2003)		218
		1970	1	Lamm and Brown (2003)		218
		1960	1	MacKichan and Kammerer (1961)		219
		1950-1959		Interpolated		-
		1949	1	US Bureau of the Census (1961)		299

			1940	2	United States Department of Commerce (1942)		300
			1930	2	United States Department of Commerce (1932)		301
			1920	2	United States Department of Commerce (1922)		302
			1910	1	United States Department of Commerce (1942)		299
			1900	1	United States Department of Commerce (1942)		299
URUGUAY	URY	233	2010, 2015	0	Estimate	Assumed constant (2000 value)	
			2001-2005	0	Estimate	AEI assumed constant at the value for 2000	-
			2000	0	GMIA v5, Ministerio de Ganadería, Agricultura y Pesca (2001)		1, 303
			1980-1995	0	FAOSTAT		3
			1961-1979	0	FAOSTAT scaled to AQUASTAT		3, 11
			1960		Interpolated		-
			1959	0	Framji et al. (1981-1983)		13
			1957-1958		Interpolated		-
			1956	0	Framji et al. (1981-1983)		13
			1952-1955		Interpolated		-
			1951	0	Framji et al. (1981-1983)		13
			1940-1950		Extrapolated	Based on trend in AEI for period 1951-1961, declines to 0 in 1940	-
			1900-1939	0	Estimate	Assumed no irrigation	-
VIRGIN ISLANDS, U.S.	VIR	240	2010, 2015	0	FAOSTAT		3
			2007	0	GMIA v5, NASS (2005, 2009)		1, 304,

							30 5
			2001-2006		Interpolated		-
			2000	0	GMIA v4, NASS (2005)		4, 30 5
			1956-1999	0	Estimate	Scaled based on the trend of AEI in Guadeloupe, declines to 0 in year 1956	-
			1900-1955	0	Estimate	Assumed no irrigation	-
UZBEKISTAN	UZB	23 5	2015	1	MWR (2016)		35 6
			2010	0	FAOSTAT		3
			2005	0	FAO (2013)		30 6
			2000	1	Aus der Beek et al. (2011), FAOSTAT	AEI at national scale from FAOSTAT, subnational partitioning according to Aus der Beek et al. (2011)	3, 15 6
			1995	1	Aus der Beek et al. (2011), FAOSTAT	AEI at national scale from FAOSTAT, subnational partitioning according to Aus der Beek et al. (2011)	3, 15 6
			1990	1	Aus der Beek et al. (2011)		15 6
			1985	1	Aus der Beek et al. (2011)		15 6
			1980	1	Aus der Beek et al. (2011)		15 6
			1970	1	Aus der Beek et al. (2011)		15 6
			1960	1	Aus der Beek et al. (2011)		15 6
			1950	0	FAO (1997)		27
			1945	0	FAO (1997)		27
			1929-1944		Interpolated		-
			1928	0	FAO (1997)		27
			1914-1927		Interpolated		-
			1913	0	FAO (1997)		27
			1900-1912	0	Estimate	AEI assumed constant (based on trend of AEI in Russia reported by Framji et al. 1981-1983)	13

VANUATU	VUT	242	1900-2015	0	Estimate	Assumed no irrigation	-
VENEZUELA	VEN	238	2010, 2015	3	FAOSTAT, Estimate	AEI 2010 and 2015 was calculated by taking a sum of irrigated pasture and irrigated area at sub-national level. Sub-national data of year 2008 was used and was scaled to the FAOSTAT 2010 and 2015 national totals.	3
			2008	3	GMIA v5, Ministerio del Poder Popular para la Agricultura y Tierras (2010)		1, 307
			1999-2007		Interpolated		-
			1961-1998	0	FAOSTAT		3
			1951-1960		Interpolated		-
			1950	0	Estimate		-
			1901-1949		Interpolated		-
			1900	0	Estimate		-
VIETNAM	VNM	241	2010, 2015	0	FAOSTAT		3
			2005	0	GMIA v5, FAO (2012)		1, 308
			1961-2000	0	FAOSTAT		3
			1901-1960		Interpolated		-
			1900	0	Estimate	30% of AEI in 1961	-
WALLIS AND FUTUNA	WLF	243	1900-2015	0	Estimate	Assumed no irrigation	-
WESTERN SAHARA	ESH	69	1900-2015	0	Estimate	Assumed no irrigation	-
YEMEN	YEM	245	2015	1	Central Statistics Office (2016)		357
			2010	0	FAOSTAT		3

			2009	0	GMIA v5, Central Statistics Office (2006-2010)		1, 309
			2001-2008		Interpolated		-
			1961-2000	0	FAOSTAT		3
			1901-1960		Interpolated		-
			1900	0	Estimate	AEI estimated at 100000 ha	-
ZAMBIA	ZMB	247	2010, 2015	0	Estimate	Assumed constant (2005 AEI value)	-
			2003-2005	0	FAOSTAT		3
			2002	0	GMIA v5, Ministry of Agriculture and Cooperatives (2002)		1, 310
			1998-2000	0	AQUASTAT		11
			1993-1997		Interpolated		-
			1988-1992	0	AQUASTAT		11
			1961-1987	0	FAOSTAT	AEI reported at 2000 ha in 1961	3
			1951-1960		Interpolated		-
			1950	0	Estimate	AEI estimated at 1000 ha	-
			1900-1949	0	Estimate	Assumed no irrigation	-
ZIMBABWE	ZWE	248	2010, 2015	0	FAOSTAT		3
			2001-2005	0	FAOSTAT		3
			1999	0	GMIA v5, FAO (2005)		1, 311
			1988-2000	0	AQUASTAT		11
			1961-1987	0	FAOSTAT		3
			1960	0	Framji et al. (1981-1983)		13
			1951-1959		Interpolated		-
			1950	0	Framji et al. (1981-1983)		13

	1921-1949		Interpolated		-
	1900-1920	0	Estimate	Assumed no irrigation	-

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SOURCE NO.	SOURCE	FULL REFERENCE
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