

# Package: mrvalidation (via r-universe)

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**Title** madrat data preparation for validation purposes

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**Description** Package contains routines to prepare data for validation exercises.

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**BugReports** <https://github.com/pik-piam/mrvalidation/issues>

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---

mrvalidation-package    *mrvalidation: madrat data preparation for validation purposes*

---

## Description

Package contains routines to prepare data for validation exercises.

## Author(s)

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## See Also

Useful links:

- <https://github.com/pik-piam/mrvalidation>
- [doi:10.5281/zenodo.4317826](https://doi.org/10.5281/zenodo.4317826)
- Report bugs at <https://github.com/pik-piam/mrvalidation/issues>

---

calcGMIA

*calcGMIA*


---

### Description

Filling gaps in the Historical area equipped for irrigation from GMIA.

### Usage

```
calcGMIA()
```

### Value

list of magpie object with data and weight

### Author(s)

Stephen Wirth, Anne Biewald

### Examples

```
## Not run:
a <- calcOutput("GMIA", aggregate = "regglo")

## End(Not run)
```

---

calcNitrogenSurplusByCrop

*calcNitrogenSurplusByCrop*


---

### Description

calculates the crop-specific nitrogen losses and the balanceflow for countries with unrealistically high nitrogen uptake efficiencies

### Usage

```
calcNitrogenSurplusByCrop(
  indicator = "total",
  deposition = "Nsurplus2",
  cellular = FALSE
)
```

**Arguments**

|            |                                                                                                                       |
|------------|-----------------------------------------------------------------------------------------------------------------------|
| indicator  | total: estimates the inputs per total crop production; by_area estimates the inputs per area harvested                |
| deposition | if FALSE, deposition is not accounted for in the distribution. Use FALSE to avoid circularities in calcNitrogenBudget |
| cellular   | cellular disaggregation or national values                                                                            |

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Benjamin Leon Bodirsky

**See Also**

[calcNitrogenBudgetCropland](#)

**Examples**

```
## Not run:  
calcOutput("NitrogenSurplusByCrop")  
  
## End(Not run)
```

---

calcValidAAI

*calcValidAAI*

---

**Description**

Returns historical area actually irrigated.

**Usage**

```
calcValidAAI(datasource = "LUH3")
```

**Arguments**

|            |                                                   |
|------------|---------------------------------------------------|
| datasource | Currently available: "LUH3", "LUH2v2", and "GMIA" |
|------------|---------------------------------------------------|

**Value**

list of magpie object with data and weight

**Author(s)**

Stephen Wirth, Anne Biewald

---

calcValidAEI

*calcValidAEI*


---

**Description**

Returns historical area equipped for irrigation.

**Usage**

```
calcValidAEI(datasource = "LUH3")
```

**Arguments**

datasource      Currently available: "LUH3", "HID", "GMIA", and "Mehta2022"

**Value**

list of magpie object with data and weight

**Author(s)**

Stephen Wirth, Anne Biewald, Felicitas Beier

---

calcValidAgEmployment    *calcValidAgEmployment*


---

**Description**

number of people employed in agriculture (crop+livestock production)

**Usage**

```
calcValidAgEmployment(datasource = "ILO", dataVersionILO = "Aug24")
```

**Arguments**

datasource      ILO for reporting aggregated employment in crop+livestock production, or ILO\_FAO, which uses the same aggregated employment data from ILO, but applies FAO value of production shares to disaggregated between employment in crop and in livestock production.

dataVersionILO    "" for the oldest version, or "monthYear" (e.g. "Aug23") for a newer version

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Debbora Leip

**Examples**

```
## Not run:  
calcOutput("ValidAgEmployment", datasource="ILO")  
  
## End(Not run)
```

---

|                         |                         |
|-------------------------|-------------------------|
| <i>calcValidAgFFGDP</i> | <i>calcValidAgFFGDP</i> |
|-------------------------|-------------------------|

---

**Description**

validation for agricultural, fisheries, forestry value added gdp (Million 17USD)

**Usage**

```
calcValidAgFFGDP(datasource = "WDI")
```

**Arguments**

datasource      datasource for validation (WDI)

**Value**

List of magpie object with results on country level, no weight, unit and description.

**Author(s)**

David Chen

**Examples**

```
## Not run:  
calcOutput("ValidAgFFGDP")  
  
## End(Not run)
```

---

calcValidAgGDP

*calcValidAgGDP*


---

**Description**

Validation for agricultural value added gdp (Million 05USD)

**Usage**

```
calcValidAgGDP(datasource = "FA0")
```

**Arguments**

datasource      datasource for validation. Options FAO and FAO-consum

**Value**

List of magpie object with results on country level, no weight, unit and description.

**Author(s)**

Edna J. Molina Bacca

**Examples**

```
## Not run:
calcOutput("ValidAgGDP")

## End(Not run)
```

---

calcValidAgriResearchIntensity

*calcValidAgriResearchIntensity*


---

**Description**

calculates the validation data for TC as Ag R&D investments

**Usage**

```
calcValidAgriResearchIntensity(datasource = "Pardey")
```

**Arguments**

datasource      Datasource of validation data.

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

David Chen

**Examples**

```
## Not run:  
calcOutput("calcValidAgriResearchIntensity")  
  
## End(Not run)
```

---

```
calcValidAnnualCarbonLTS  
      calcValidAnnualCarbonLTS
```

---

**Description**

Returns historical Emissions stored in wood products

**Usage**

```
calcValidAnnualCarbonLTS(datasource = "Lauk_et_al")
```

**Arguments**

|            |                                                                                                      |
|------------|------------------------------------------------------------------------------------------------------|
| datasource | Currently available "Lauk_et_al" or "Johnston_Radeloff" or "Johnston_Radeloff_P"<br>(p = projection) |
|------------|------------------------------------------------------------------------------------------------------|

**Value**

List of magpie object with Emissions in wood products

**Author(s)**

Abhijeet Mishra

calcValidBII

*calcValidBII***Description**

Validation for the Biodiversity Intactness Index (BII) from one NHM source, selected via `datasource`:  
 \* "Phillips" – Phillips et al. 2021 (BII-BTE, DOI 10.5519/he1eqmg1), country-level 1970-2014. \*  
 "DePalma" – De Palma et al. 2024 NHM v2.1.1 (DOI 10.5519/k33reyb6), cellular 5-yearly 2000-2020, aggregated to ISO here.

De Palma et al. 2024 differs from Phillips et al. 2021 in three steps: stricter primary-vegetation baseline (minimally/lightly-used primary only, vs Phillips's all-primary including intensely-used sites), logit (not log) transform, and balanced Bray-Curtis (abundance-weighted) compositional similarity in place of Phillips's asymmetric Jaccard (species-identity only). De Palma's absolute BII is markedly lower, with a non-uniform gap that depends on land-use intensity, so the two series are NOT splice-compatible and are kept as separate model labels.

MAGPIE's own BII output (`modules/44_biodiversity`, coefficients from Leclère et al. 2020 "Bending the Curve" via PREDICTS) is on the Phillips scale, so it is close to Phillips et al. 2021 (~0.03 above) but sits markedly above De Palma et al. 2024. For absolute-level validation use Phillips; for harmonized (change-from-baseline) plots either series works, but mixing MAGPIE projections with De Palma historical on a non-harmonized axis is misleading. Two things drive the MAGPIE-vs-De Palma gap: the PREDICTS coefficient version (Phillips vs De Palma), and land-use allocation – MAGPIE land use is LUH3-initialised with FAO/FRA forest correction (`mr-landcore::calcForestArea`), vs the LUH2 underlying De Palma's v2.1.1. A 2010 decomposition shows the coefficient change dominates the gap (~0.17 of the ~0.20 total globally, and larger than the land-use term in every H12 region); the land-use/forest difference is real but secondary (~0.03 globally).

**Usage**

```
calcValidBII(datasource = "Phillips")
```

**Arguments**

`datasource` "Phillips" (default) or "DePalma".

**Value**

Country-level MAGPIE object for the selected source under variable "Biodiversity|BII".

**Author(s)**

Michael Crawford, Florian Humpenoeder

**See Also**

[readBII](#), [downloadBII](#)

**Examples**

```
## Not run:
  calcOutput("ValidBII", datasource = "Phillips")
  calcOutput("ValidBII", datasource = "DePalma")

## End(Not run)
```

---

`calcValidCarbon`*calcValidCarbon*

---

**Description**

calculates the validation data for carbon pools

**Usage**

```
calcValidCarbon(
  datasource = "LPJmL4_for_MAgPIE_44ac93de:GSWP3-W5E5:historical"
)
```

**Arguments**

`datasource`      Datasources for validation data

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Kristine Karstens

**Examples**

```
## Not run:
  calcOutput("ValidCarbon")

## End(Not run)
```

---

|                |                       |
|----------------|-----------------------|
| calcValidCMIP6 | <i>calcValidCMIP6</i> |
|----------------|-----------------------|

---

**Description**

validation for the MAGICC warming output, showing average temperature for the different RCPs

**Usage**

```
calcValidCMIP6()
```

**Value**

GLO MAgPIE object containing average warming per RCP

**Author(s)**

Michael Crawford

**Examples**

```
## Not run:
  calcOutput("calcValidCMIP6")

## End(Not run)
```

---

|                           |                                  |
|---------------------------|----------------------------------|
| calcValidConsumptionValue | <i>calcValidConsumptionValue</i> |
|---------------------------|----------------------------------|

---

**Description**

Validation for consumption Value

**Usage**

```
calcValidConsumptionValue(datasource = "FAO")
```

**Arguments**

datasource      datasource for validation (FAO, FAOpred2010, FAOpred2010)

**Value**

List of magpie object with results on country level, no weight, unit and description.

**Author(s)**

Edna J. Molina Bacca

**Examples**

```
## Not run:  
calcOutput("ValidConsumptionValue")  
  
## End(Not run)
```

---

|                   |                          |
|-------------------|--------------------------|
| calcValidCostsAEI | <i>calcValidCostsAEI</i> |
|-------------------|--------------------------|

---

**Description**

provides the validation data for irrigation investment costs

**Usage**

```
calcValidCostsAEI(datasource = "IMPACT")
```

**Arguments**

datasource      Datasource of validation data

**Value**

magpie object on country level, unit and description

**Author(s)**

Felicitas Beier

**Examples**

```
## Not run:  
calcOutput("ValidCostsAEI")  
  
## End(Not run)
```

---

```
calcValidCostsCapStocks  
    calcValidCostsCapStocks
```

---

**Description**

Returns historical values for capital related costs

**Usage**

```
calcValidCostsCapStocks(datasource = "FAO")
```

**Arguments**

datasource      datasource for validation. FAO Value of Production dataset.

**Value**

List of magpie object with results on country level, no weight, unit and description.

**Author(s)**

Edna J. Molina Bacca

**Examples**

```
## Not run:  
calcOutput("calcValidCostsCapStocks")  
  
## End(Not run)
```

---

```
calcValidCostsFertilizer  
    calcValidCostsFertilizer
```

---

**Description**

calculates validation data for fertilizer costs

**Usage**

```
calcValidCostsFertilizer(datasource = "FAO")
```

**Arguments**

datasource      Source of validation data.

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Debbora Leip

**Examples**

```
## Not run:  
calcOutput("ValidCostsFertilizer", datasource = "FAO")  
  
## End(Not run)
```

---

|                     |                            |
|---------------------|----------------------------|
| calcValidCostsLabor | <i>calcValidCostsLabor</i> |
|---------------------|----------------------------|

---

**Description**

calculates validation data for labor costs

**Usage**

```
calcValidCostsLabor(datasource = "Vittis")
```

**Arguments**

datasource      Datasource of validation data.

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Debbora Leip

**Examples**

```
## Not run:  
calcOutput("ValidCostsLabor")  
  
## End(Not run)
```

---

calcValidCostsOverall    *calcValidCostsOverall*

---

### Description

Returns historical values of the overall value of production for the Agricultural, Forestry sectors, and fisheries (mio.17USD)

### Usage

```
calcValidCostsOverall(datasource = "FAO")
```

### Arguments

datasource          datasource for validation. FAO Value of Production dataset.

### Value

List of magpie object with results on country level, no weight, unit and description.

### Author(s)

Edna J. Molina Bacca

### Examples

```
## Not run:
calcOutput("calcValidCostsOverall")

## End(Not run)
```

---

calcValidCostsTC          *calcValidCostsTC*

---

### Description

calculates the validation data for TC as Ag R&D investments

### Usage

```
calcValidCostsTC(datasource = "Pardey")
```

### Arguments

datasource          Datasource of validation data.

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

David Chen

**Examples**

```
## Not run:  
calcOutput("ValidCostsTC")  
  
## End(Not run)
```

---

|                                |
|--------------------------------|
| calcValidCostsTransport        |
| <i>calcValidCostsTransport</i> |

---

**Description**

calculates the validation data for transport costs

**Usage**

```
calcValidCostsTransport(datasource = "GTAPtransport")
```

**Arguments**

|            |                               |
|------------|-------------------------------|
| datasource | Datasource of validation data |
|------------|-------------------------------|

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

David Chen

**Examples**

```
## Not run:  
calcOutput("ValidCostsTransport")  
  
## End(Not run)
```

---

|                   |                          |
|-------------------|--------------------------|
| calcValidCroparea | <i>calcValidCroparea</i> |
|-------------------|--------------------------|

---

### Description

Returns historical areas of individual crops. These are derived by correcting harvested areas to match to physical cropland areas. Both these datasets are from FAO. Output is meant to be used for model validation. Ostberg2023 is a slightly modified version of <https://gmd.copernicus.org/articles/16/3375/2023/gmd-16-3375-2023-assets.html>

### Usage

```
calcValidCroparea(datasource = "FAO", detail = FALSE)
```

### Arguments

|            |                                                                                                                                                                              |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| datasource | "FAO": croparea according to FAOSTAT, "ostberg2023": croparea according to LandInG data harmonization by Ostberg et al. (2023) "FAOfallow": fallow land according to FAOSTAT |
| detail     | TRUE: data provided for different crop types, FALSE: aggregated data                                                                                                         |

### Value

magpie object

### Author(s)

Benjamin Bodirsky, Ulrich Kreidenweis, Felicitas Beier

---

|                            |                                   |
|----------------------------|-----------------------------------|
| calcValidCropareaDiversity | <i>calcValidCropareaDiversity</i> |
|----------------------------|-----------------------------------|

---

### Description

calculates validation for croparea diversity index. As opposed to CropareaDiversityIndex from magpie4 due to lack of data fallow land is not considered

### Usage

```
calcValidCropareaDiversity(index = "shannon", groupdiv = "agg1")
```

### Arguments

|          |                                                                                                                                               |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| index    | can be "shannon", "gini" or "invsimpson" for different types of diversity indices                                                             |
| groupdiv | should crop groups be split up into several individual items or not? Choose either FALSE or different (dis)aggregation methods "agg1", "agg2" |

**Value**

MAGPIE object (unit depends on attributes)

**Author(s)**

Patrick v. Jeetze, Benjamin Leon Bodirsky

**Examples**

```
## Not run:  
x <- calcOutput("ValidCropareaDiversity", index = "shannon", groupdiv = "agg1", aggregate = FALSE)  
  
## End(Not run)
```

---

```
calcValidCumulativeCarbonLTS  
  calcValidCumulativeCarbonLTS
```

---

**Description**

Returns historical Emissions stored in wood products

**Usage**

```
calcValidCumulativeCarbonLTS(datasource = "Johnston_Radeloff")
```

**Arguments**

datasource      Currently available "Johnston\_Radeloff"

**Value**

List of magpie object with Emissions in wood products

**Author(s)**

Abhijeet Mishra

---

|                 |                        |
|-----------------|------------------------|
| calcValidDemand | <i>calcValidDemand</i> |
|-----------------|------------------------|

---

### Description

calculates the validation data for the utilization of agricultural products for food, feed, bioenergy, seed, material, processing, or waste

### Usage

```
calcValidDemand(datasource = "FAO", detail = TRUE, nutrient = "dm")
```

### Arguments

|            |                                                       |
|------------|-------------------------------------------------------|
| datasource | Datasource of validation data.                        |
| detail     | if FALSE, only larger product categories are reported |
| nutrient   | The nutrient in which the results shall be reported.  |

### Value

List of magpie objects with results on country level, weight on country level, unit and description.

### Author(s)

Benjamin Leon Bodirsky, Isabelle Weindl

### See Also

[calcFoodSupplyPast](#), [calcValidLivestockShare](#)

### Examples

```
## Not run:
calcOutput("ValidDemand")

## End(Not run)
```

---

```
calcValidDemandBioenergy  
  calcValidDemandBioenergy
```

---

**Description**

Returns future projections of bioenergy demand

**Usage**

```
calcValidDemandBioenergy()
```

**Value**

list of magpie object with data and weight

**Author(s)**

Florian Humpenoeder

---

```
calcValidEmisLucGasser  
  calcValidEmisLucGasser
```

---

**Description**

Returns historical LUC emissions

**Usage**

```
calcValidEmisLucGasser(subtype = "bookkeeping")
```

**Arguments**

|         |                                                                                                                                                                                   |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| subtype | Available subtypes are:                                                                                                                                                           |
|         | <ul style="list-style-type: none"><li>historical:<ul style="list-style-type: none"><li>Gasser_2020</li><li>LUH2_GCB_2019</li><li>FRA_2015</li><li>bookkeeping</li></ul></li></ul> |

**Value**

list of magpie object with data and weight

**Author(s)**

Abhijeet Mishra

---

|                     |                            |
|---------------------|----------------------------|
| calcValidEmisLucGlo | <i>calcValidEmisLucGlo</i> |
|---------------------|----------------------------|

---

**Description**

Returns historical and projected water usage from different sources

**Usage**

```
calcValidEmisLucGlo(subtype = "Canadell_2007")
```

**Arguments**

|         |                                                                                                                                                                                                                                                |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| subtype | Available subtypes are: <ul style="list-style-type: none"><li>• historical:<ul style="list-style-type: none"><li>– Canadell_2007</li><li>– Friedlingstein_2010</li><li>– Harris_2013</li><li>– Houghton_2012</li><li>– RCP</li></ul></li></ul> |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Value**

list of magpie object with data and weight

**Author(s)**

Florian Humpenoeder

---

|                           |                                  |
|---------------------------|----------------------------------|
| calcValidEmisLucGloGasser | <i>calcValidEmisLucGloGasser</i> |
|---------------------------|----------------------------------|

---

**Description**

Returns historical LUC emissions

**Usage**

```
calcValidEmisLucGloGasser(subtype = "Gasser_2020")
```

**Arguments**

subtype      Available subtypes are:

- historical:
  - Gasser\_2020
  - LUH2\_GCB\_2019
  - FRA\_2015

**Value**

list of magpie object with data and weight

**Author(s)**

Abhijeet Mishra

---

calcValidEmissions      *calcValidEmissions*

---

**Description**

validation fo emissions

**Usage**

```
calcValidEmissions(datasource = "CEDS")
```

**Arguments**

datasource      The Emission Inventory that shall be used. For futher information, best see mrcommons function calcEmissionInventory. Options are e.g. CEDS, combined\_CEDS\_IPCC (including own estimates where available), IPCC(own estimates), Nsurplus (own estimates)

**Value**

List of magpie object with results on country level, weight on country level, unit and description.

**Author(s)**

Benjamin Leon Bodirsky

**Examples**

```
## Not run:  
calcOutput("ValidEmissions")  
  
## End(Not run)
```

---

```
calcValidEmissionsAFOLU
ValidEmissionsAFOLU
```

---

**Description**

validation for total and cumulative AFOLU emissions in CO2eq

**Usage**

```
calcValidEmissionsAFOLU(datasource = "FAO", cumulative = FALSE)
```

**Arguments**

|            |                                          |
|------------|------------------------------------------|
| datasource | current options are "FAO" and "EDGAR_LU" |
| cumulative | cumulative from y2000                    |

**Value**

MAgPIE object with emissions in CO2eq

**Author(s)**

Michael Crawford

**Examples**

```
## Not run:
calcOutput("ValidEmissionsAFOLU")

## End(Not run)
```

---

```
calcValidEmissionsPeatland
calcValidEmissionsPeatland
```

---

**Description**

Validation data for peatland emissions in CO2eq, taken from the article: Leifeld, J., Menichetti, L. The underappreciated potential of peatlands in global climate change mitigation strategies. Nat Commun 9, 1071 (2018). <https://doi.org/10.1038/s41467-018-03406-6>

**Usage**

```
calcValidEmissionsPeatland()
```

**Value**

Global-level MAgPIE object with peatlands emissions in CO2eq for the year 2015

**Author(s)**

Michael Crawford

**Examples**

```
## Not run:  
  calcOutput("ValidEmissionsPeatland")  
  
## End(Not run)
```

---

calcValidFactorReqShares

*calcValidFactorReqShares*

---

**Description**

calculates the validation data for labor and capital requirement shares in agriculture (currently the same shares for crop and livestock production based on USDA data)

**Usage**

```
calcValidFactorReqShares(subtype = "crop")
```

**Arguments**

subtype                    for which to report requirement shares, either "crop" or "livestock"

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Debbora Leip

**Examples**

```
## Not run:  
  calcOutput("ValidFactorReqShares")  
  
## End(Not run)
```

---

|               |                      |
|---------------|----------------------|
| calcValidFeed | <i>calcValidFeed</i> |
|---------------|----------------------|

---

### Description

calculates the validation data for feed demand by animal type

### Usage

```
calcValidFeed(datasource = "FAO", detail = TRUE, nutrient = "dm")
```

### Arguments

|            |                                                       |
|------------|-------------------------------------------------------|
| datasource | Datasource of validation data.                        |
| detail     | if FALSE, only larger product categories are reported |
| nutrient   | The nutrient in which the results shall be reported.  |

### Value

List of magpie objects with results on country level, weight on country level, unit and description.

### Author(s)

Benjamin Leon Bodirsky

### See Also

[calcFoodSupplyPast](#), [calcValidLivestockShare](#)

### Examples

```
## Not run:
calcOutput("ValidFeed")

## End(Not run)
```

---

calcValidFeedConversion  
*calcValidFeedConversion*

---

**Description**

calculates various feed indicators

**Usage**

```
calcValidFeedConversion(livestockSystem = TRUE, subtractBalanceflow = FALSE)
```

**Arguments**

livestockSystem  
if TRUE, ruminant meat and milk are aggregated, and poultry meat and egg are aggregated

subtractBalanceflow  
if TRUE, balanceflow is subtracted so that the feed conversion reflects our feed-basket calculations. If FALSE, it reflects the FAO values and the pasture demand

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Benjamin Leon Bodirsky, github Copilot

**See Also**

[calcFoodSupplyPast](#), [calcValidLivestockShare](#)

**Examples**

```
## Not run:  
calcOutput("ValidFeed")  
  
## End(Not run)
```

---

```
calcValidFoodExpenditure
      calcValidFoodExpenditure
```

---

## Description

validation for food expenditure

## Usage

```
calcValidFoodExpenditure(
  detail = FALSE,
  datasource = "FAO",
  expenditureType = "agPrimary"
)
```

## Arguments

|                 |                                                                                                                                                                                                        |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| detail          | if FALSE, only major food commodity groups are shown.                                                                                                                                                  |
| datasource      | Datasource for demand (FAO, FAOpres2010, FAOpres2010)                                                                                                                                                  |
| expenditureType | Either "agPrimary" for agricultural primary products (demand * prices), or "food" for total food expenditure including value-added marketing margins based on Chen et al. 2025 regression coefficients |

## Value

List of magpie object with results on country level, weight on country level, unit and description.

## Author(s)

Benjamin Leon Bodirsky, David M Chen

## Examples

```
## Not run:
calcOutput("ValidFoodExpenditure")

## End(Not run)
```

---

|                               |                                      |
|-------------------------------|--------------------------------------|
| calcValidFoodExpenditureShare |                                      |
|                               | <i>calcValidFoodExpenditureShare</i> |

---

**Description**

validation for food expenditure share

**Usage**

calcValidFoodExpenditureShare(detail = FALSE, expenditureType = "agPrimary")

**Arguments**

|                 |                                                                                                                                                |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| detail          | if FALSE, only major food commoditiy groups are shown.                                                                                         |
| expenditureType | Either "agPrimary" for agricultural primary products share, or "food" for total food expenditure share including value-added marketing margins |

**Value**

List of magpie object with results on country level, weight on country level, unit and description.

**Author(s)**

Benjamin Leon Bodirsky, David M Chen

**Examples**

```
## Not run:
calcOutput("ValidFoodExpenditureShare")

## End(Not run)
```

---

|                     |                            |
|---------------------|----------------------------|
| calcValidGCBcountry | <i>calcValidGCBcountry</i> |
|---------------------|----------------------------|

---

**Description**

Regional bookkeeping land-use-change CO2 validation band (BLUE, OSCAR, Houghton & Nasikas) from the Obermeier et al. (2024) country-level compilation. It gives every region a book-keeping band where previously only Gasser (OSCAR) existed regionally and the GCB workbook ensemble was World-only.

**Usage**

calcValidGCBcountry()

**Details**

The three bookkeeping models are native ex-peatland (they do not represent peat), so the net flux is reported as Emissions|CO2|Land|Land-use Change|Excl Peatland - the like-for-like counterpart to MAgPIE’s Excl-Peatland line and to the ex-peat Gasser band (see [calcValidEmisLucGasser](#)). Gross source and sink are reported as ... |Land-use Change|Gross Positive / Gross Negative, matching the magpie4 LUC-CO2 memos (net = Gross Positive + Gross Negative). Returned at ISO level with weight NULL so calcOutput sums to the requested regions; fullVALIDATION requests regions only, since the World bookkeeping cloud is already covered by [calcValidGlobalCarbonBudget](#).

**Value**

list with a magpie object (Mt CO2/yr) and metadata

**Author(s)**

Florian Humpenoeder

**See Also**

[calcValidEmisLucGasser](#), [calcValidGlobalCarbonBudget](#)

---

|               |                      |
|---------------|----------------------|
| calcValidGini | <i>calcValidGini</i> |
|---------------|----------------------|

---

**Description**

Returns historical development of Gini Coefficient

**Usage**

calcValidGini()

**Value**

list of magpie object with data and weight.

**Author(s)**

David M Chen

---

|                                |
|--------------------------------|
| calcValidGlobalCarbonBudget    |
| <i>ValidGlobalCarbonBudget</i> |

---

**Description**

validation for total and cumulative land emissions from the Global Carbon Budget, including all bookkeeping models

**Usage**

calcValidGlobalCarbonBudget(cumulative = FALSE)

**Arguments**

cumulative          cumulative from y2000

**Details**

The historical series pooled under Emissions|CO2|Land|+|Land-use Change are all LUC-scale CO2 SOURCES and are broadly comparable to MAgPIE's +|Land-use Change. Verified against the ingested validation data (not the parent publications), they form a single positive cloud (Mt CO2/yr, World, 2000-2010): bookkeeping BLUE/OSCAR/GCB/H&C ~2600-6600 and the national-statistics series FAO\_EmisLUC/EDGAR\_LU/PRIMAPHist ~2800-5400 - the latter numerically indistinguishable from the bookkeeping cloud. They differ mainly on PEAT; a second, conceptual axis (INDIRECT/Grassi) matters in principle but is NOT represented in the ingested data (see Axis 2):

| source               | peat | nature (as ingested)                               |
|----------------------|------|----------------------------------------------------|
| BLUE, OSCAR, H&C2023 | incl | net has GCB's peat folded in (see PEAT below)      |
| GCB (this fn)        | incl | published GCB net (own net column, peat folded in) |
| Gasser et al 2020    | excl | OSCAR bookkeeping (separate fn)                    |
| FAO_EmisLUC          | incl | FAOSTAT net LULUCF ("Land Use total"), a source    |
| EDGAR_LU             | incl | EDGAR LULUCF CO2, a source                         |
| PRIMAPHist           | incl | PRIMAP-hist CAT5 (LUCF) CO2, a source              |

Axis 1 - PEAT. GCB folds a common peat drainage & fires term (~0.7-1.7 Gt CO2/yr) into EVERY bookkeeping model's net, though only GCB's block breaks it out as a column (verified: each model's net exceeds the sum of its ex-peat components by exactly that peat). So +|Land-use Change is already consistently incl-peat across all four models, matching MAgPIE's +|Land-use Change (which also includes peat). The function reads GCB's peat column and adds, for all four models, a matching ... |+|Peatland child (closing the net-vs-components gap) and ... |Land-use Change|Excl Peatland (net of peat, matching MAgPIE's peat-excluded line). Gasser and the national-statistics series are handled elsewhere.

Axis 2 - INDIRECT (Grassi) - NOT represented in the ingested data. In principle the bookkeeping-vs-NGHGI gap (~5 Gt CO<sub>2</sub>/yr; Grassi et al. 2021, doi:10.1038/s41558-021-01033-6) arises because country inventories, reporting the sink-inclusive NET LULUCF over a large managed-land area, embed the environmental sink and sit far BELOW bookkeeping ELUC - which would make net Emissions|CO<sub>2</sub>|Land the matching counterpart. BUT none of the FAO\_EmisLUC/EDGAR\_LU/PRIMAPHist series ingested here is that Grassi-adjusted NGHGI net: FAO is FAOSTAT's net "Land Use total" (its forest sink included but modest, so still a ~4 Gt SOURCE), EDGAR/PRIMAP are LULUCF CO<sub>2</sub> series - all positive, LUC-scale, none carrying a net-flux or Indirect sink series. They must therefore be compared to MAgPIE's +|Land-use Change like the bookkeeping sources, NOT to net Land. The sink-inclusive NGHGI-net quantity Grassi contrasts with bookkeeping is absent from this validation cloud, so MAgPIE's own +|Indirect (its Grassi managed-land sink ~-5.6 Gt CO<sub>2</sub>/yr, i52\_land\_carbon\_sink) has no inventory counterpart here to validate against.

GCB note - every workbook model's net INCLUDES the common peat drainage & fires (verified: World 2010, GCB 5181 / BLUE 6156 / OSCAR 5775 / H&C 3612, each = its ex-peat components + ~943 peat). GCB's block is the only one that lists peat as a separate column. That peat column is now read and attached as a +|Peatland child to all four, so net = components + peat holds and the Excl Peatland variant matches MAgPIE's line.

Do NOT benchmark net Land against GCB: the only Indirect / net Emissions|CO<sub>2</sub>|Land series here is GCB's, where Indirect = the GCB terrestrial sink S\_LAND over ALL land (World 2020: -11403 Mt CO<sub>2</sub>/yr, ~the whole-biosphere sink), NOT the managed-land Grassi quantity MAgPIE reports.

## Value

a MAgPIE object

## Author(s)

Michael Crawford, Florian Humpenoeder

## Examples

```
## Not run:
calcOutput("ValidGlobalCarbonBudget")

## End(Not run)
```

---

```
calcValidGlobalSurfaceTemp
      calcValidGlobalSurfaceTemp
```

---

## Description

validation for the global surface temperature anomaly

## Usage

```
calcValidGlobalSurfaceTemp()
```

**Value**

global MAgPIE object

**Author(s)**

Michael Crawford

**Examples**

```
## Not run:  
  calcOutput("ValidGlobalSurfaceTemp", aggregate = FALSE)  
  
## End(Not run)
```

---

|                     |                            |
|---------------------|----------------------------|
| calcValidGrassLSUha | <i>calcValidGrassLSUha</i> |
|---------------------|----------------------------|

---

**Description**

calculates the validation data for production of grass from managed pastures and rangelands separately

**Usage**

```
calcValidGrassLSUha(datasource = "MAgPIEown")
```

**Arguments**

datasource      Currently available: "MAgPIEown"

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Marcos Alves

**See Also**

[calcFA0massbalance](#),

**Examples**

```
## Not run:  
  calcOutput("ValidGrassLSUha")  
  
## End(Not run)
```

---

calcValidGridCroparea    *calcValidGridCroparea*

---

**Description**

reports Croparea by crops on 0.5 degree grid in physical area

**Usage**

```
calcValidGridCroparea(physical = TRUE)
```

**Arguments**

physical                    if true (default) physical area; if false harvested area

**Value**

List of magpie objects with results on cellular level, weight on cellular level, unit and description.

**Author(s)**

Benjamin Leon Bodirsky

**See Also**

[fullMADRATTOLPJML](#)

**Examples**

```
## Not run:
calcOutput("ValidGridCroparea")

## End(Not run)
```

---

calcValidGridCroplandNitrogenInputs  
                                   *calcValidGridCroplandNitrogenInputs*

---

**Description**

reports Nitrogen Inputs by crop type on 0.5 degree grid

**Usage**

```
calcValidGridCroplandNitrogenInputs()
```

**Value**

List of magpie objects with results on cellular level, weight on cellular level, unit and description.

**Author(s)**

Benjamin Leon Bodirsky

**See Also**

[fullMADRATTOLPJML](#)

**Examples**

```
## Not run:  
calcOutput("ValidGridCroplandNitrogenInputs")  
  
## End(Not run)
```

---

*calcValidGridCroplandNitrogenSurplus*  
*calcValidGrid*

---

**Description**

reports Cropland Nitrogen Surplus and a Balanceflow that balances for unrealistically high nitrogen use efficiencies on 0.5 degree grid

**Usage**

```
calcValidGridCroplandNitrogenSurplus()
```

**Value**

List of magpie objects with results on cellular level, weight on cellular level, unit and description.

**Author(s)**

Benjamin Leon Bodirsky

**See Also**

[fullMADRATTOLPJML](#)

**Examples**

```
## Not run:  
calcOutput("ValidGridCroplandNitrogenSurplus")  
  
## End(Not run)
```

---

```
calcValidGridCroplandNitrogenWithdrawals  
  calcValidGridCroplandNitrogenWithdrawals
```

---

**Description**

reports Cropland Nitrogen Withdrawals from soils on 0.5 degree grid

**Usage**

```
calcValidGridCroplandNitrogenWithdrawals(irrigation = FALSE)
```

**Arguments**

|            |                                                                                                                            |
|------------|----------------------------------------------------------------------------------------------------------------------------|
| irrigation | FALSE for the sum of irrigated and rainfed, FALSE for seperated categories, 'rainfed' or 'irrigated' for single categories |
|------------|----------------------------------------------------------------------------------------------------------------------------|

**Value**

List of magpie objects with results on cellular level, weight on cellular level, unit and description.

**Author(s)**

Benjamin Leon Bodirsky

**See Also**

[fullMADRATTOLPJML](#)

**Examples**

```
## Not run:  
calcOutput("ValidGridCroplandNitrogenWithdrawals")  
  
## End(Not run)
```

---

|                   |                          |
|-------------------|--------------------------|
| calcValidGridLand | <i>calcValidGridLand</i> |
|-------------------|--------------------------|

---

**Description**

reports the main Land types on 0.5 degree grid

**Usage**

```
calcValidGridLand()
```

**Value**

List of magpie objects with results on cellular level, weight on cellular level, unit and description.

**Author(s)**

Benjamin Leon Bodirsky

**See Also**

[fullMADRATTOLPJML](#)

**Examples**

```
## Not run:  
calcOutput("ValidGridLand")  
  
## End(Not run)
```

---

|                                     |                                            |
|-------------------------------------|--------------------------------------------|
| calcValidGridNitrogenBudgetCropland | <i>calcValidGridNitrogenBudgetCropland</i> |
|-------------------------------------|--------------------------------------------|

---

**Description**

reports Nitrogen Budget for Croplands on 0.5 degree grid

**Usage**

```
calcValidGridNitrogenBudgetCropland()
```

**Value**

List of magpie objects with results on cellular level, weight on cellular level, unit and description.

**Author(s)**

Benjamin Leon Bodirsky

**See Also**

[fullMADRATTOLPJML](#)

**Examples**

```
## Not run:  
calcOutput("ValidGridNitrogenBudgetCropland")  
  
## End(Not run)
```

---

```
calcValidGridNitrogenBudgetNonagland  
    calcValidGridNitrogenBudgetNonagland
```

---

**Description**

reports Nitrogen Budget for non-agricultural land types on 0.5 degree grid

**Usage**

```
calcValidGridNitrogenBudgetNonagland()
```

**Value**

List of magpie objects with results on cellular level, weight on cellular level, unit and description.

**Author(s)**

Benjamin Leon Bodirsky

**See Also**

[fullMADRATTOLPJML](#)

**Examples**

```
## Not run:  
calcOutput("ValidGridNitrogenBudgetNonagland")  
  
## End(Not run)
```

---

```
calcValidGridNitrogenBudgetPasture  
  calcValidGridNitrogenBudgetPasture
```

---

**Description**

reports Nitrogen Budgets for Pastures on 0.5 degree grid

**Usage**

```
calcValidGridNitrogenBudgetPasture()
```

**Value**

List of magpie objects with results on cellular level, weight on cellular level, unit and description.

**Author(s)**

Benjamin Leon Bodirsky

**See Also**

[fullMADRATTOLPJML](#)

**Examples**

```
## Not run:  
calcOutput("ValidGridNitrogenBudgetPasture")  
  
## End(Not run)
```

---

```
calcValidGridNutrientAWMS  
  calcValidGridNutrientAWMS
```

---

**Description**

reports Nutrient load in animal waste management on 0.5 degree grid

**Usage**

```
calcValidGridNutrientAWMS(nutrient = c("nr", "c"))
```

**Arguments**

nutrient                    can be c, nr, p, k. For p and k, no losses are assumed in confinements.

**Value**

List of magpie objects with results on cellular level, weight on cellular level, unit and description.

**Author(s)**

Kristine Karstens, Benjamin Leon Bodirsky

**See Also**

[fullMADRATTOLPJML](#)

**Examples**

```
## Not run:
calcOutput("ValidGridNitrogenBudgetCropland")

## End(Not run)
```

---

`calcValidGridNutrientLossesAWMS`

*calcValidGridNutrientLossesAWMS*

---

**Description**

reports Nutrient Losses in animal waste management on 0.5 degree grid

**Usage**

```
calcValidGridNutrientLossesAWMS(nutrient = c("nr", "c"))
```

**Arguments**

`nutrient` can be c, nr, p, k. For p and k, no losses are assumed in confinements.

**Value**

List of magpie objects with results on cellular level, weight on cellular level, unit and description.

**Author(s)**

Benjamin Leon Bodirsky

**Examples**

```
## Not run:
calcOutput("ValidGridNitrogenBudgetCropland")

## End(Not run)
```

---

```
calcValidGridResidueDemand  
    calcValidGridResidueDemand
```

---

**Description**

reports aboveground Crop Residue Demand on 0.5 degree grid

**Usage**

```
calcValidGridResidueDemand()
```

**Value**

List of magpie objects with results on cellular level, weight on cellular level, unit and description.

**Author(s)**

Benjamin Leon Bodirsky

**See Also**

[fullMADRATTOLPJML](#)

**Examples**

```
## Not run:  
calcOutput("ValidGridResidueDemand")  
  
## End(Not run)
```

---

```
calcValidGridSOCStocks  
    calcValidGridSOCStocks
```

---

**Description**

calculates the validation data for the gridded soil carbon pools

**Usage**

```
calcValidGridSOCStocks(  
  datasource = "LPJ_IPCC2006",  
  baseyear = 1995,  
  intensive = FALSE  
)
```

**Arguments**

|            |                                                                                      |
|------------|--------------------------------------------------------------------------------------|
| datasource | Datasources for validation data, e.g. LPJ_IPCC2006, LPJmL_natural, ...               |
| baseyear   | baseyear for calculating soil carbon stock change (for LPJ_IPCC2006 only)            |
| intensive  | If FALSE (default) total stocks will be returned; otherwise (TRUE) carbon densities. |

**Value**

List of magpie objects with results on cellular level, weight on cellular level, unit and description.

**Author(s)**

Kristine Karstens

**Examples**

```
## Not run:
calcOutput("ValidGridSOCStocks")

## End(Not run)
```

---

|                     |                            |
|---------------------|----------------------------|
| calcValidGridYields | <i>calcValidGridYields</i> |
|---------------------|----------------------------|

---

**Description**

reports Yields on 0.5 degree grid

**Usage**

```
calcValidGridYields(
  datasource = "downscaledFAO",
  future = NULL,
  physical = TRUE
)
```

**Arguments**

|            |                                                                                                                           |
|------------|---------------------------------------------------------------------------------------------------------------------------|
| datasource | downscaledFAO or calibratedFAO                                                                                            |
| future     | if NULL no future values are returned (default). specify climate scenario (gcm:rcp), if future is needed                  |
| physical   | if true (default) physical area (croparea) used for yield calculation; if false harvested area used for yield calculation |

**Value**

List of magpie objects with results on cellular level, weight on cellular level, unit and description.

**Author(s)**

Benjamin Leon Bodirsky

**See Also**

[fullMADRATTOLPJML](#)

**Examples**

```
## Not run:  
calcOutput("ValidGridYields")  
  
## End(Not run)
```

---

`calcValidGrowingStock` *calcValidGrowingStock*

---

**Description**

Returns historical FRA 2015 growing stock in mio m3 per ha

**Usage**

```
calcValidGrowingStock(datasource = "FAO")
```

**Arguments**

`datasource`      Currently only available for the "FAO" source

**Value**

List of magpie object with growing stock

**Author(s)**

Abhijeet Mishra

---

 calcValidGS

*calcValidGS*


---

**Description**

Returns historical FRA 2025 growing stock in million m3

**Usage**

```
calcValidGS(datasource = "FRA2025", indicator = "relative")
```

**Arguments**

|            |                                               |
|------------|-----------------------------------------------|
| datasource | Currently only available for the "FAO" source |
| indicator  | type of indicator (relative or absolute)      |

**Value**

List of magpie object with growing stock

**Author(s)**

Abhijeet Mishra

---

 calcValidHourlyLaborCosts

*calcValidHourlyLaborCosts*


---

**Description**

hourly labor costs in crop+livestock production

**Usage**

```
calcValidHourlyLaborCosts(
  datasource = "ILO_completed",
  dataVersionILO = "Aug24"
)
```

**Arguments**

datasource      Available datasources are:

- ILO\_raw : ILO hourly labor costs data
- ILO\_completed : ILO hourly labor costs data completed with a regression with GDP pc MER
- USDA\_FA0\_raw : USDA/FAO hourly labor costs data
- USDA\_FA0\_completed : USDA/FAO hourly labor costs data completed with a regression with GDP pc MER

dataVersionILO    "" for the oldest version, or "monthYear" (e.g. "Aug23") for a newer version

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Debbora Leip

**Examples**

```
## Not run:
calcOutput("ValidHourlyLaborCosts", datasource = "ILO_completed")

## End(Not run)
```

---

calcValidIncome

*calcValidIncome*


---

**Description**

Returns historical development of income and future projections of income dynamics

**Usage**

```
calcValidIncome(datasource = "WDI_SSps")
```

**Arguments**

datasource      "WDI\_SSps", the only one option at the moment.

**Value**

list of magpie object with data and weight. Since intensive and extensive variables are mixed please keep the mixed\_aggregation

**Author(s)**

Florian Humpenoeder, Abhijeet Mishra, Kristine Karstens

---

|               |                      |
|---------------|----------------------|
| calcValidKcal | <i>calcValidKcal</i> |
|---------------|----------------------|

---

### Description

calculates the validation data for calorie food supply

### Usage

```
calcValidKcal(datasource = "FAO", nutrient = "kcal", detail = TRUE)
```

### Arguments

|            |                                                                                                                                                                                                                                                                                                                         |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| datasource | Datasource of validation data. If "FAO", we use FAO calories with FAO population data (slightly diverges from original data as the convert script for example splits up countries for the past). If "FAOmassbalance" we use calories from the FAO massbalance calculations, and divide them by our standard population. |
| nutrient   | kcal or protein                                                                                                                                                                                                                                                                                                         |
| detail     | if FALSE, only larger product categories are reported                                                                                                                                                                                                                                                                   |

### Value

List of magpie objects with results on country level, weight on country level, unit and description.

### Author(s)

Benjamin Leon Bodirsky, Kristine Karstens

### See Also

[calcFoodSupplyPast](#), [calcValidLivestockShare](#)

### Examples

```
## Not run:
calcOutput("ValidKcal")

## End(Not run)
```

---

`calcValidLand`*calcValidLand*

---

**Description**

Returns historical cropland, pasture and forest area from FAOSTAT that can be used for model validation.

**Usage**

```
calcValidLand(datasource = "MAgPIEown")
```

**Arguments**

`datasource`      Currently available: "FAO", "LUH2v2", "LUH3", "MAgPIEown" and "SSPResults"

**Value**

list of magpie object with data and weight

**Author(s)**

Ulrich Kreidenweis, Benjamin Bodirsky, Abhijeet Mishra, Mishko Stevanovic, Kristine Karstens

---

`calcValidLandChange`*calcValidLandChange*

---

**Description**

Returns historical changes of cropland, pasture and forest area from LUH2 and FAOSTAT that can be used for model validation.

**Usage**

```
calcValidLandChange(baseyear = 1995, datasource = "MAgPIEown")
```

**Arguments**

`baseyear`      baseyear for calculating land-use change  
`datasource`      Currently available: "FAO", "LUH2v2", "LUH3", "MAgPIEown" and "SSPResults"

**Value**

list of magpie object with data and weight

**Author(s)**

Florian Humpenoeder

---

|                                |                                       |
|--------------------------------|---------------------------------------|
| calcValidLivestockDemStructure |                                       |
|                                | <i>calcValidLivestockDemStructure</i> |

---

**Description**

calculates the validation data for the share of different livestock products (excluding fish) in total livestock calorie food supply

**Usage**

```
calcValidLivestockDemStructure(datasource = "FAO")
```

**Arguments**

|            |                                                                                                                                                                                                  |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| datasource | Datasource of validation data. If "FAO", we use FAO calories with FAO population data (slightly diverges from original data as the convert script for example splits up countries for the past). |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Isabelle Weindl

**See Also**

[calcFoodSupplyPast](#), [calcValidLivestockShare](#)

**Examples**

```
## Not run:  
calcOutput("ValidLivestockDemStructure")  
  
## End(Not run)
```

---

calcValidLivestockShare  
*calcValidLivestockShare*

---

### Description

calculates the validation data for the share of livestock products (including fish) in total calorie food supply

### Usage

```
calcValidLivestockShare(datasource = "FAO")
```

### Arguments

|            |                                                                                                                                                                                                                                                                                                              |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| datasource | Datasource of validation data. If "FAO", we use FAO calories with FAO population data (slightly diverges from original data as the convert script for example splits up countries for the past). In the case of "PopulationPast", we also use FAO calorie values, but divide them by our standard population |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Value

List of magpie objects with results on country level, weight on country level, unit and description.

### Author(s)

Benjamin Leon Bodirsky

### See Also

[calcFoodSupplyPast](#), [calcValidKcal](#)

### Examples

```
## Not run:  
calcOutput("ValidLivestockShare")  
  
## End(Not run)
```

---

|                     |                            |
|---------------------|----------------------------|
| calcValidLSUdensity | <i>calcValidLSUdensity</i> |
|---------------------|----------------------------|

---

**Description**

Calculates historical rangelands intensity use.

**Usage**

```
calcValidLSUdensity(luhversion = "LUH3")
```

**Arguments**

|            |                                                 |
|------------|-------------------------------------------------|
| luhversion | The LUH version to be used ("LUH3" or "LUH2v2") |
|------------|-------------------------------------------------|

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Marcos Alves

**Examples**

```
## Not run:
calcOutput("ValidLSUdensity")

## End(Not run)
```

---

|                 |                        |
|-----------------|------------------------|
| calcValidManure | <i>calcValidManure</i> |
|-----------------|------------------------|

---

**Description**

Validates the estimates on excretion and manure management

**Usage**

```
calcValidManure(datasource = "Bodirsky")
```

**Arguments**

|            |                                                                                                             |
|------------|-------------------------------------------------------------------------------------------------------------|
| datasource | own: own estimation for the past based on feed intake, IPCC: standard excretion factors, FAO: FAO estimates |
|------------|-------------------------------------------------------------------------------------------------------------|

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Benjamin Leon Bodirsky

**See Also**

[calcExcretion](#), [calcExcretionIPCC](#)

**Examples**

```
## Not run:
calcOutput("ValidManure")

## End(Not run)
```

---

```
calcValidNitrogenBudgetCropland
      calcValidNitrogenBudgetCropland
```

---

**Description**

Validation Script for Nitrogen Budgets on Croplands

**Usage**

```
calcValidNitrogenBudgetCropland(datasource = "Bodirsky")
```

**Arguments**

|            |                                                                                                                                                                                                                                                                                                                                                                                 |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| datasource | Bodirsky for own calculations, Lassaletta2014 for a country dataset from Lassaletta, L., G. Billen, B. Grizzetti, J. Angalde, and J. Garnier. 2014. 50 Year Trends in Nitrogen Use Efficiency of World Cropping Systems: The Relationship between Yield and Nitrogen Input to Cropland. Environmental Research Letters. FAO for some N related parameters published in FAOSTAT. |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Benjamin Leon Bodirsky

**See Also**[calcNitrogenBudgetCropland](#)**Examples**

```
## Not run:  
calcOutput("ValidNitrogenBudgetCropland")  
  
## End(Not run)
```

---

```
calcValidNitrogenBudgetNonagland  
  calcValidNitrogenBudgetNonagland
```

---

**Description**

reports nitrogen budget for non-agricultural land types

**Usage**

```
calcValidNitrogenBudgetNonagland()
```

**Value**

MAGPIE object with results on the iso level, unweighted, unit, and description

**Author(s)**

Michael Crawford

**Examples**

```
## Not run:  
calcOutput("calcValidNitrogenBudgetNonagland")  
  
## End(Not run)
```

---

```
calcValidNitrogenBudgetPasture  
  calcValidNitrogenBudgetPasture
```

---

**Description**

Validation Script for Nitrogen Budgets on Pastures

**Usage**

```
calcValidNitrogenBudgetPasture(datasource = "Bodirsky")
```

**Arguments**

|            |                                                                                                                                                                                                                                                                                                                                                                                |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| datasource | Bodirsky for own calculations, Lassaletta2014 for a country dataset from Lassaletta, L., G. Billen, B. Grizzetti, J. Angalde, and J. Garnier. 2014. 50 Year Trends in Nitrogen Use Efficiency of World Cropping Systems: The Relationship between Yield and Nitrogen Input to Pasture. Environmental Research Letters. FAO for some N related parameters published in FAOSTAT. |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Benjamin Leon Bodirsky

**See Also**

[calcNitrogenBudgetCropland](#)

**Examples**

```
## Not run:  
calcOutput("ValidNitrogenBudgetPasture")  
  
## End(Not run)
```

---

```
calcValidNitrogenSurplus
      calcValidNitrogenSurplus
```

---

**Description**

reports nutrient surplus for all land types

**Usage**

```
calcValidNitrogenSurplus()
```

**Value**

MAGPIE object with results on the iso level, unweighted, unit, and description

**Author(s)**

Michael Crawford

**Examples**

```
## Not run:
calcOutput("calcValidNitrogenSurplus")

## End(Not run)
```

---

```
calcValidPopulation      calcValidPopulation
```

---

**Description**

Returns historical development of population and future projections of population dynamics

**Usage**

```
calcValidPopulation(
  pastData = "WDI-UN_PopDiv-MI",
  futureData = "SSPs-UN_PopDiv"
)
```

**Arguments**

|            |                               |
|------------|-------------------------------|
| pastData   | population past data source   |
| futureData | population future data source |

**Value**

list of magpie object with data and weight

**Author(s)**

Florian Humpenöeder, Jan Philipp Dietrich, David Chen

---

calcValidPovertyLine    *calcValidPovertyLine*

---

**Description**

Validation of poverty (head-count)

**Usage**

```
calcValidPovertyLine(datasource = "WBPoverty", subtype = "320PovertyLine")
```

**Arguments**

|            |                                                                                                   |
|------------|---------------------------------------------------------------------------------------------------|
| datasource | datasource for validation. Option: "WBPoverty" (world bank).                                      |
| subtype    | Poverty line criteria. Options: "320PovertyLine" (default), "550PovertyLine", "1p90 USDppp11/day" |

**Value**

List of magpie object with results on country level, no weight, unit and description.

**Author(s)**

Edna J. Molina Bacca

**Examples**

```
## Not run:  
calcOutput("ValidPovertyLine")  
  
## End(Not run)
```

---

```
calcValidPriceAgriculture  
    calcValidPriceAgriculture
```

---

**Description**

provides global prices from the IMPACT model projections, World Bank observations, and FAO observations for MAgPIE commodities in \$2017/tDM

**Usage**

```
calcValidPriceAgriculture(datasource = "FAO")
```

**Arguments**

datasource      Options of the source of data: IMPACT3.2.2World\_Price, FAO, FAOp and WBGEM.

**Value**

List with a magpie object with commodity prices on global and country level.

**Author(s)**

Mishko Stevanovic

**See Also**

[readIMPACT3.2.2World\\_Price](#)

**Examples**

```
## Not run:  
calcOutput("ValidPriceAgriculture", datasource="IMPACT3.2.2World_Price", aggregate=FALSE)  
calcOutput("ValidPriceAgriculture", datasource="FAO")  
  
## End(Not run)
```

---

```
calcValidPriceBioenergy  
    calcValidPriceBioenergy
```

---

**Description**

Returns future projections of biomass prices

**Usage**

```
calcValidPriceBioenergy()
```

**Value**

list of magpie object with data and weight

**Author(s)**

Florian Humpenoeder

---

```
calcValidPriceGHG    calcValidPriceGHG
```

---

**Description**

Validates MAgPIE GHG emission price input against SSP GHG emission price projections

**Usage**

```
calcValidPriceGHG(datasource = "SSPResults")
```

**Arguments**

datasource      Currently available: "SSPResults"

**Author(s)**

Amsalu W. Yalew, Benjamin Leon Bodirsky, Florian Humpenoeder

**Examples**

```
## Not run:  
calcOutput("ValidPriceGHG")  
  
## End(Not run)
```

---

|                     |                            |
|---------------------|----------------------------|
| calcValidPriceIndex | <i>calcValidPriceIndex</i> |
|---------------------|----------------------------|

---

**Description**

provides global producer price index from FAO

**Usage**

```
calcValidPriceIndex(  
  datasource = "FAO",  
  value = "real",  
  baseyear = "y2005",  
  round = TRUE  
)
```

**Arguments**

|            |                                                           |
|------------|-----------------------------------------------------------|
| datasource | Options of the source of data: FAO.                       |
| value      | real and nominal                                          |
| baseyear   | Baseyear for normalizing of price index.                  |
| round      | Rounding of price index to intiger numbers. Default TRUE. |

**Value**

List with a magpie object with global nominal and real price index.

**Author(s)**

Mishko Stevanovic

**See Also**

[readProdPrIndex](#)

**Examples**

```
## Not run:  
a <- calcOutput("ValidPriceIndex", value = "real", aggregate = FALSE)  
  
## End(Not run)
```

---

|                    |                           |
|--------------------|---------------------------|
| calcValidPriceLand | <i>calcValidPriceLand</i> |
|--------------------|---------------------------|

---

**Description**

Validates MAgPIE (crop) Land prices

Validates MAgPIE (crop) Land prices

**Usage**

```
calcValidPriceLand(datasource = "FAO_USDA")
```

```
calcValidPriceLand(datasource = "FAO_USDA")
```

**Arguments**

|            |          |
|------------|----------|
| datasource | FAO_USDA |
|------------|----------|

**Author(s)**

Edna J. Molina Bacca

**Examples**

```
## Not run:  
calcOutput("ValidPriceGHG")
```

```
## End(Not run)
```

```
## Not run:  
calcOutput("ValidPriceLand")
```

```
## End(Not run)
```

---

|                     |                            |
|---------------------|----------------------------|
| calcValidProcessing | <i>calcValidProcessing</i> |
|---------------------|----------------------------|

---

**Description**

calculates the validation data for the share of inputs that go into processing processes, and the share of inputs that secondary products are composed of

**Usage**

```
calcValidProcessing(
  datasource = "FAO",
  detail = TRUE,
  nutrient = "dm",
  indicator = "primary_to_process"
)
```

**Arguments**

|            |                                                                                                                                               |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| datasource | Datasource of validation data.                                                                                                                |
| detail     | if FALSE, only larger product categories are reported                                                                                         |
| nutrient   | The nutrient in which the results shall be reported.                                                                                          |
| indicator  | if "primary_to_process", returns the amount of primary product into processing.<br>if "secondary_from_primary", gives primary into secondary. |

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

David Chen, Benjamin Leon Bodirsky

**See Also**

[calcFoodSupplyPast](#), [calcValidLivestockShare](#)

**Examples**

```
## Not run:
calcOutput("ValidProcessing", indicator = "secondary_from_primary")

## End(Not run)
```

---

|                     |                            |
|---------------------|----------------------------|
| calcValidProduction | <i>calcValidProduction</i> |
|---------------------|----------------------------|

---

**Description**

calculates the validation data for production of agricultural products

**Usage**

```
calcValidProduction(datasource = "FAO", detail = TRUE, nutrient = "dm")
```

**Arguments**

|            |                                                       |
|------------|-------------------------------------------------------|
| datasource | Datasource of validation data.                        |
| detail     | if FALSE, only larger product categories are reported |
| nutrient   | The nutrient in which the results shall be reported.  |

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Benjamin Leon Bodirsky

**See Also**

[calcFAOmassbalance](#), [calcValidDemand](#)

**Examples**

```
## Not run:
calcOutput("ValidProduction")

## End(Not run)
```

---

|                   |                          |
|-------------------|--------------------------|
| calcValidResidues | <i>calcValidResidues</i> |
|-------------------|--------------------------|

---

**Description**

calculates the validation data for residues (biomass, field balance, demands)

**Usage**

```
calcValidResidues()
```

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Kristine Karstens

**Examples**

```
## Not run:  
calcOutput("ValidResidues")  
  
## End(Not run)
```

---

```
calcValidRotationLength  
    calcValidRotationLength
```

---

**Description**

calculates the validation data for MAgPIE rotation lengths in plantations

**Usage**

```
calcValidRotationLength(datasource = "FAO 2006")
```

**Arguments**

datasource      Datasources for validation data

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Abhijeet Mishra

**Examples**

```
## Not run:  
calcOutput("ValidRotationLength")  
  
## End(Not run)
```

---

`calcValidSDG1`*calcValidSDG1*

---

**Description**

Returns historical SDG1 INDICATOR\_POVERTY IN USD05/cap/yr

**Usage**

```
calcValidSDG1(datasource = "James")
```

**Arguments**

datasource      Currently only available for the "James" source

**Value**

List of magpie object with data and population

**Author(s)**

Edna J. Molina Bacca

---

`calcValidSDG12`*calcValidSDG12*

---

**Description**

Returns historical SDG12 Indicators\_Sustainable Production and Consumption

**Usage**

```
calcValidSDG12(datasource = "FAO")
```

**Arguments**

datasource      FAO

**Value**

List of magpie object with data and population

**Author(s)**

Edna J. Molina Bacca

---

|                   |                          |
|-------------------|--------------------------|
| calcValidSelfsuff | <i>calcValidSelfsuff</i> |
|-------------------|--------------------------|

---

**Description**

Validates self-sufficiency ration

**Usage**

```
calcValidSelfsuff(datasource = "FAO", detail = TRUE)
```

**Arguments**

|            |                                                                                                             |
|------------|-------------------------------------------------------------------------------------------------------------|
| datasource | Options of the source of data: FAO, FAOpre2010, FAOpost2010.                                                |
| detail     | Default is TRUE. If FALSE, the subcategories of groups are not reported (e.g. "soy-bean" within "oilcrops") |

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Benjamin Leon Bodirsky, Mishko Stevanovic

**Examples**

```
## Not run:
calcOutput("ValidSelfsuff")

## End(Not run)
```

---

|                     |                            |
|---------------------|----------------------------|
| calcValidSOCDensity | <i>calcValidSOCDensity</i> |
|---------------------|----------------------------|

---

**Description**

calculates the validation data for the soil carbon densities (including weights for aggregation)

**Usage**

```
calcValidSOCDensity(datasource = "GSOC")
```

**Arguments**

|            |                                 |
|------------|---------------------------------|
| datasource | Datasources for validation data |
|------------|---------------------------------|

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Kristine Karstens

**See Also**

[calcSOM](#) [calcValidSOCStocks](#)

**Examples**

```
## Not run:  
calcOutput("ValidSOCDensity")  
  
## End(Not run)
```

---

|                   |                          |
|-------------------|--------------------------|
| calcValidSOCShare | <i>calcValidSOCShare</i> |
|-------------------|--------------------------|

---

**Description**

calculates the validation data for the soil carbon shares

**Usage**

```
calcValidSOCShare(datasource = "histSOCbudget")
```

**Arguments**

datasource      Datasources only "histSOCbudget"

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Kristine Karstens

**Examples**

```
## Not run:  
calcOutput("ValidSOCShare")  
  
## End(Not run)
```

---

|                    |                           |
|--------------------|---------------------------|
| calcValidSOCStocks | <i>calcValidSOCStocks</i> |
|--------------------|---------------------------|

---

**Description**

calculates the validation data for the soil carbon pools

**Usage**

```
calcValidSOCStocks(datasource = "histSOCbudget", baseyear = 1995)
```

**Arguments**

|            |                                                                   |
|------------|-------------------------------------------------------------------|
| datasource | Datasources for validation data, e.g. LPJ_IPCC2006, LPJmL_natural |
| baseyear   | baseyear for calculating soil carbon stock change                 |

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Benjamin Leon Bodirsky, Kristine Karstens

**See Also**

[calcFoodSupplyPast](#), [calcValidLivestockShare](#)

**Examples**

```
## Not run:
calcOutput("ValidSOCStocks")

## End(Not run)
```

---

|                     |                            |
|---------------------|----------------------------|
| calcValidSSPResults | <i>calcValidSSPResults</i> |
|---------------------|----------------------------|

---

**Description**

Convert SSPResults to reporting format

**Usage**

```
calcValidSSPResults()
```

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Kristine Karstens

**See Also**

[convertSSPResults](#)

**Examples**

```
## Not run:  
  calcOutput("ValidSSPResults")  
  
## End(Not run)
```

---

calcValidTau

*calcValidTau*

---

**Description**

Returns historical land use intensity estimates (tau).

**Usage**

```
calcValidTau(datasource = "FAO2012")
```

**Arguments**

|            |                                                                                                                                                |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| datasource | Currently available: "FAO2012" (original data set) and "FAOonline" (projection of tau values from 1995 based on recent FAO yield projections.) |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------|

**Value**

tau time series

**Author(s)**

Jan Philipp Dietrich

---

|                   |                      |
|-------------------|----------------------|
| calcValidTauPastr | <i>ValidTauPastr</i> |
|-------------------|----------------------|

---

**Description**

Calculates managed pastures Tau based on FAO yield trends for 1995.

**Usage**

```
calcValidTauPastr()
```

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Marcos Alves

**Examples**

```
## Not run:  
calcOutput("ValidTauPastr")  
  
## End(Not run)
```

---

|                 |                        |
|-----------------|------------------------|
| calcValidTimber | <i>calcValidTimber</i> |
|-----------------|------------------------|

---

**Description**

Returns historical timber demand and production from FAO in volumetric units (Mm3/yr). Variable names match reportTimber.

**Usage**

```
calcValidTimber(datasource = "FAO")
```

**Arguments**

datasource      Currently only available for the "FAO" source

**Value**

List of magpie object with data and population

**Author(s)**

Abhijeet Mishra, Florian Humpenoeder

---

|                          |                                 |
|--------------------------|---------------------------------|
| calcValidTotalLaborCosts |                                 |
|                          | <i>calcValidTotalLaborCosts</i> |

---

**Description**

total labor costs in crop and livestock production

**Usage**

```
calcValidTotalLaborCosts(datasource = "USDA", dataVersionILO = "Aug24")
```

**Arguments**

|                |                                                                                                                                                                                                      |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| datasource     | "USDA" (which uses FAO VoP and USDA cost shares) or "ILO" (which is based on ILO datasets and calibrated to the USDA/FAO approach, but includes costs for some countries without VoP data) or "GTAP" |
| dataVersionILO | "" for the oldest version, or "monthYear" (e.g. "Aug23") for a newer version                                                                                                                         |

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Debbora Leip

**Examples**

```
## Not run:
calcOutput("ValidTotalLaborCosts", datasource = "USDA")

## End(Not run)
```

---

calcValidTrade

*calcValidTrade*


---

### Description

calculates the validation data for trade of agricultural products

### Usage

```
calcValidTrade(
  datasource = "FAO",
  detail = TRUE,
  nutrient = "dm",
  net_trade = TRUE,
  equalized = FALSE
)
```

### Arguments

|            |                                                                                                                                        |
|------------|----------------------------------------------------------------------------------------------------------------------------------------|
| datasource | Datasource of validation data.                                                                                                         |
| detail     | if FALSE, only larger product categories are reported                                                                                  |
| nutrient   | The nutrient in which the results shall be reported.                                                                                   |
| net_trade  | Net trade flows or total trade                                                                                                         |
| equalized  | numbers changed so that global production meets global demand (in reality different because of time-delay between exports and imports) |

### Value

List of magpie objects with results on country level, weight on country level, unit and description.

### Author(s)

Benjamin Leon Bodirsky, Xiaoxi Wang, David M Chen

### See Also

[calcFAOmassbalance](#), [calcValidDemand](#)

### Examples

```
## Not run:
calcOutput("ValidTrade")

## End(Not run)
```

---

|                        |                               |
|------------------------|-------------------------------|
| calcValidVegfruitShare |                               |
|                        | <i>calcValidVegfruitShare</i> |

---

**Description**

calculates the validation data for the share of vegetables, fruit and nuts products (including fish) in total calorie food supply

**Usage**

```
calcValidVegfruitShare(datasource = "FAO")
```

**Arguments**

|            |                                                                                                                                                                                                                                                                                                              |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| datasource | Datasource of validation data. If "FAO", we use FAO calories with FAO population data (slightly diverges from original data as the convert script for example splits up countries for the past). In the case of "PopulationPast", we also use FAO calorie values, but divide them by our standard population |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Value**

List of magpie objects with results on country level, weight on country level, unit and description.

**Author(s)**

Benjamin Leon Bodirsky

**See Also**

[calcFoodSupplyPast](#), [calcValidKcal](#)

**Examples**

```
## Not run:  
calcOutput("ValidVegfruitShare")  
  
## End(Not run)
```

---

```
calcValidWageDevelopment
      calcValidWageDevelopment
```

---

### Description

wage index: hourly labor costs in crop+livestock production relative to a baseyear

### Usage

```
calcValidWageDevelopment(
  datasource = "ILO_completed",
  baseYear = 2000,
  dataVersionILO = "Aug24"
)
```

### Arguments

|                |                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| datasource     | <p>Available datasources are:</p> <ul style="list-style-type: none"> <li>• ILO_raw : based on ILO hourly labor costs data</li> <li>• ILO_completed : based on ILO hourly labor costs data completed with a regression with GDP pc MER</li> <li>• USDA_FA0_raw : based on USDA/FAO hourly labor costs data</li> <li>• USDA_FA0_completed : based on USDA/FAO hourly labor costs data completed with a regression with GDP pc MER</li> </ul> |
| baseYear       | year relative to which the wage development should be calculated                                                                                                                                                                                                                                                                                                                                                                           |
| dataVersionILO | "" for the oldest version, or "monthYear" (e.g. "Aug23") for a newer version                                                                                                                                                                                                                                                                                                                                                               |

### Value

List of magpie objects with results on country level, weight on country level, unit and description.

### Author(s)

Debbora Leip

### Examples

```
## Not run:
calcOutput("ValidWageDevelopment", datasource = "ILO_completed")

## End(Not run)
```

---

|                     |                            |
|---------------------|----------------------------|
| calcValidWaterUsage | <i>calcValidWaterUsage</i> |
|---------------------|----------------------------|

---

### Description

Returns historical and projected water withdrawal from different data sources

### Usage

```
calcValidWaterUsage(datasource = "shiklomanov_2000")
```

### Arguments

|            |                      |
|------------|----------------------|
| datasource | Currently available: |
|------------|----------------------|

- historical:
  - "foley\_2011"
  - "shiklomanov\_2000"
  - "wada\_2011"
  - "wisser\_2008"
  - "CWatM:ips1-cm5a-1r"
  - "CWatM:gfdl-esm2m"
  - "CWatM:miroc5"
  - "CWatM:hadgem2-es"
  - "LPJmL:ips1-cm5a-1r"
  - "LPJmL:gfdl-esm2m"
  - "LPJmL:miroc5"
  - "LPJmL:hadgem2-es"
  - "H08:ips1-cm5a-1r"
  - "H08:gfdl-esm2m"
  - "H08:miroc5"
  - "H08:hadgem2-es"
  - "MATSIRO:ips1-cm5a-1r"
  - "MATSIRO:gfdl-esm2m"
  - "MATSIRO:miroc5"
  - "MATSIRO:hadgem2-es"
  - "MPI-HM:ips1-cm5a-1r"
  - "MPI-HM:gfdl-esm2m"
  - "MPI-HM:miroc5"
  - "PCR-GLOBWB:ips1-cm5a-1r"
  - "PCR-GLOBWB:gfdl-esm2m"
  - "PCR-GLOBWB:miroc5"
  - "PCR-GLOBWB:hadgem2-es"

- projections:
  - "fischer\_IIASA"
  - "hejazi\_2013"
  - molden\_IWMI
  - seckler\_IWMI
  - shiklomanov

### Value

list of magpie object, weight, unit, and description

### Author(s)

Stephen Wirth, Anne Biewald, Felicitas Beier

---

|                |                       |
|----------------|-----------------------|
| calcValidYield | <i>calcValidYield</i> |
|----------------|-----------------------|

---

### Description

Calculates a dataset of agricultural production out of the combined data of calcFAOharmonized(). Covers dry matter (DM) production. Also returns areas of individual crops from FAOSTAT. Total area can be lower or higher than arable land because of multicropping or fallow land. Returns yield as calculated from area area and production.

### Usage

```
calcValidYield(
  datasource = "FAO",
  faoVersion = "join2010",
  future = NULL,
  physical = TRUE
)
```

### Arguments

|            |                                                                                                                           |
|------------|---------------------------------------------------------------------------------------------------------------------------|
| datasource | Specify which datasource needs to be used. Currently only "FAO" and "calibratedLPJmL" is available.                       |
| faoVersion | which FAO version to use (pre, post or joined 2010 data)                                                                  |
| future     | if NULL no future values are returned (default). specify climate scenario (gcm:rcp), if future is needed                  |
| physical   | if true (default) physical area (croparea) used for yield calculation; if false harvested area used for yield calculation |

**Value**

List of magpie objects with results on country level, weight on country level, unit, Max.&Min. values alongwith description.

**Author(s)**

Abhijeet Mishra, Isabelle Weindl, Florian Humpenoeder

**See Also**

[calcFA0massbalance](#), [calcCroparea](#)

**Examples**

```
## Not run:  
calcOutput("ValidYield")  
  
## End(Not run)
```

---

convertGasser

*convertGasser*

---

**Description**

Convert subtypes on ISO country level.

**Usage**

```
convertGasser(x)
```

**Arguments**

x                      MAgPIE object containing Gasser emissions data

**Details**

Convert Gasser Data

**Value**

Historical LUC emission data

**Author(s)**

Abhijeet Mishra

**See Also**

[readSource](#)

---

|                   |                          |
|-------------------|--------------------------|
| convertGCBcountry | <i>convertGCBcountry</i> |
|-------------------|--------------------------|

---

**Description**

Fill the country-level GCB bookkeeping fluxes to the standard ISO country list.

**Usage**

convertGCBcountry(x)

**Arguments**

x                      magpie object returned by readGCBcountry

**Value**

magpie object on the 249 ISO countries

**Author(s)**

Florian Humpenoeder

**See Also**

[readSource](#)

---

|             |                    |
|-------------|--------------------|
| convertGMIA | <i>convertGMIA</i> |
|-------------|--------------------|

---

**Description**

Convert Global Map on Irrigated Area Data  
Convert subtypes on ISO country level.

**Usage**

convertGMIA(x, subtype)

**Arguments**

x                      MAgPIE object containing IrrigatedArea data on Country level  
subtype                : No subtype needed

**Value**

Global Map on Irrigation data as MAgPIE object on country level Missing values are added as NA

**Author(s)**

Stephen Wirth

**See Also**

[readSource](#)

**Examples**

```
## Not run:
a <- readSource("GlobalIrrigationMap", "all_data_national")
a <- readSource ("GMIA", "aei_pct", convert = FALSE)
a <- readSource ("GMIA", "aei_pct", convert = "correctonly")

## End(Not run)
```

---

convertHID

*convertHID*

---

**Description**

Convert subtypes on ISO country level.

**Usage**

```
convertHID(x, subtype)
```

**Arguments**

|         |                                                              |
|---------|--------------------------------------------------------------|
| x       | MAGPIE object containing IrrigatedArea data on Country level |
| subtype | : No subtype needed                                          |

**Details**

Convert Historic Irrigation Data

**Value**

Irrigated Area data as MAGPIE object on country level Missing values are added as NA

**Author(s)**

Stephen Wirth

**See Also**

[readSource](#)

**Examples**

```
## Not run:  
a <- readSource("HID", "national_1900_2005")  
  
## End(Not run)
```

---

```
convertIMPACTIrrigInvCosts  
      convertIMPACTIrrigInvCosts
```

---

**Description**

converts units and dimensions of average annual baseline water-related investment cost data from readIMPACTIrrigInvCosts

**Usage**

```
convertIMPACTIrrigInvCosts(x)
```

**Arguments**

x                      MAgPIE object containing irrigation investment cost data on region level

**Value**

magpie object containing average annual baseline water-related investment cost on country-level (in million 2017 USD per year)

**Author(s)**

Felicitas Beier

**See Also**

[readSource](#)

**Examples**

```
## Not run:  
a <- readSource("IMPACTIrrigInvCosts", convert = TRUE)  
  
## End(Not run)
```

---

|                   |                          |
|-------------------|--------------------------|
| convertPardeyAgRD | <i>convertPardeyAgRD</i> |
|-------------------|--------------------------|

---

## Description

Agricultural R&D investment data read from <https://www.nature.com/news/agricultural-rd-is-on-the-move-1.20571> 3 tables are read in: AgRD\_Pardey is public Ag expenditure in 1960 and 2011, extracted from the interactive figure in the article that has more complete countries agGERD and agPERD are total and public expenditures respectively, for less countries but more years

## Usage

```
convertPardeyAgRD(x)
```

## Arguments

|   |                                        |
|---|----------------------------------------|
| x | MAGPIE object containing PardeyRD data |
|---|----------------------------------------|

## Value

magpie object containing expenditure in Ag R&D, 2009 USD PPP

## Author(s)

David Chen

## See Also

[readSource](#)

## Examples

```
## Not run:  
a <- convertSource("PardeyAgRD")  
  
## End(Not run)
```

---

|                   |                          |
|-------------------|--------------------------|
| convertWaterUsage | <i>convertWaterUsage</i> |
|-------------------|--------------------------|

---

### Description

Convert data on agricultural water use Convert subtypes on ISO country level.

### Usage

```
convertWaterUsage(x, subtype)
```

### Arguments

|         |                                                              |
|---------|--------------------------------------------------------------|
| x       | MAGPIE object containing IrrigatedArea data on Country level |
| subtype | : No subtype needed                                          |

### Value

Data on water use as MAGPIE object on country level Missing values are added as NA

### Author(s)

Stephen Wirth

### See Also

[readSource](#)

### Examples

```
## Not run:
a <- readSource("WaterUsage", "aquastat_2008_12")

## End(Not run)
```

---

|                   |                          |
|-------------------|--------------------------|
| correctGCBcountry | <i>correctGCBcountry</i> |
|-------------------|--------------------------|

---

### Description

Set the structural NAs from the net-vs-gross country-coverage mismatch to zero. A few countries are reported in only one of the two source files (e.g. net but no gross split); an unreported flux contributes zero to a regional sum. Values already reported are left untouched.

**Usage**

correctGCBcountry(x)

**Arguments**

x                      magpie object returned by readGCBcountry

**Value**

magpie object without NAs

**Author(s)**

Florian Humpenoeder

**See Also**

[readSource](#)

---

|             |                    |
|-------------|--------------------|
| correctGMIA | <i>correctGMIA</i> |
|-------------|--------------------|

---

**Description**

Correct Irrigated Area  
Correct Irrigated Area to 0.5 Degree x 0.5 Degree Grid. Change resolution from 5 arcmin to 0.5 Degree by aggregating. Values in ha are summed up, Values in percent are calculated using mean.

**Usage**

correctGMIA(x, subtype)

**Arguments**

x                      MAgPIE object containing Global Map on Irrigation data at 0.5 Degree resolution  
subtype                : subtypes are the same as in readGMIA

**Value**

Global Map on Irrigation data as MAgPIE object at a 0.5 Degree resolution.

**Author(s)**

Stephen Wirth

**See Also**[readSource](#)**Examples**

```
## Not run:
a <- readSource("IrrigatedArea")

## End(Not run)
```

correctHID

*correctHID***Description**

Correct Irrigated Area

Correct Irrigated Area to 0.5 Degree x 0.5 Degree Grid. Change resolution from 5 arcmin to 0.5 Degree by aggregating. Values in ha are summed up, Values in percent are calculated using mean.

**Usage**

```
correctHID(x, subtype)
```

**Arguments**

|         |                                                                                 |
|---------|---------------------------------------------------------------------------------|
| x       | MAGPIE object containing Global Map on Irrigation data at 0.5 Degree resolution |
| subtype | : subtypes are the same as in readGMIA                                          |

**Value**

Global Map on Irrigation data as MAGPIE object at a 0.5 Degree resolution.

**Author(s)**

Stephen Wirth

**See Also**[readSource](#)**Examples**

```
## Not run:
a <- readSource("IrrigatedArea")

## End(Not run)
```

---

`correctSoilCarbonDebt` *correctSoilCarbonDebt*

---

**Description**

Correct data from Soil Carbon Debt Paper (<https://github.com/whrc/Soil-Carbon-Debt/>)

**Usage**

```
correctSoilCarbonDebt(x)
```

**Arguments**

`x` magpie object provided by the read function

**Value**

List of magpie objects

**Author(s)**

Kristine Karstens

**Examples**

```
## Not run:  
  readSource("SoilCarbonDebt", convert="onlycorrect")  
  
## End(Not run)
```

---

`downloadAR6SPMFig1` *downloadAR6SPMFig1*

---

**Description**

download IPCC AR6 Summary for Policymakers Figure 1, global surface temperature change relative to 1850-1900 from observations and CMIP6 models (human and natural forcings simulations)

**Usage**

```
downloadAR6SPMFig1()
```

**Value**

Metadata on downloaded dataset

Author(s)

Michael Crawford

See Also

[https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC\\_AR6\\_WGI\\_SPM.pdf](https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf)

Examples

```
## Not run:
  downloadSource("AR6SPMfig1")

## End(Not run)
```

|             |                    |
|-------------|--------------------|
| downloadBII | <i>downloadBII</i> |
|-------------|--------------------|

Description

Download a Biodiversity Intactness Index dataset from the Natural History Museum. Two subtypes:  
\* "Phillips" (default) – Phillips et al. 2021 BII-BTE ([doi:10.5519/he1eqmg1](#)); country/region tables, 1970-2050 incl. SSPs. \* "DePalma" – De Palma et al. 2024 NHM v2.1.1 ([doi:10.5519/k33reyb6](#)); global 5 arc-minute GeoTIFFs for 2000, 2005, 2010, 2015, 2020.

Usage

```
downloadBII(subtype = "Phillips")
```

Arguments

subtype                "Phillips" (default) or "DePalma".

Details

Both NHM resource URLs are behind Cloudflare and return HTTP 403 to non-browser clients, so both downloads use the portal’s content-addressable /downloads/direct/<sha>.zip endpoint, which bypasses the challenge. Phillips uses the CSV resource (the .rds resource has no working direct URL); De Palma uses the v2.1.1 raster ZIP. If a URL becomes unreachable, download via a browser and place the file in this source folder.

Value

Metadata on the downloaded BII data.

Author(s)

Michael Crawford, Florian Humpenoeder

**See Also**

<https://data.nhm.ac.uk/dataset/bii-bte>, [readBII](#)

**Examples**

```
## Not run:
downloadSource("BII")
downloadSource("BII", subtype = "DePalma")

## End(Not run)
```

---

downloadCMIP6

*downloadCMIP6*

---

**Description**

Download near-surface air temperature projection from CMIP6 for the following scenarios: SSP1-1.9, SSP1-2.6, SSP2-4.5, SSP3-7.0, SSP4-3.4, SSP4-6.0, SSP5-8.5, SSP5-3.4-over

**Usage**

```
downloadCMIP6()
```

**Value**

Metadata on downloaded CMIP near-surface air temperature data

**Author(s)**

Michael Crawford

**See Also**

<https://cmip6.science.unimelb.edu.au/>

**Examples**

```
## Not run:
downloadSource("CMIP6")

## End(Not run)
```

---

|                    |                           |
|--------------------|---------------------------|
| downloadGCBcountry | <i>downloadGCBcountry</i> |
|--------------------|---------------------------|

---

### Description

Download the Obermeier et al. (2024) country-level LULUCF carbon flux dataset (net and gross fluxes of the GCB bookkeeping models), archived on Zenodo (8144174).

### Usage

```
downloadGCBcountry()
```

### Author(s)

Florian Humpenoeder

### See Also

[downloadSource](#)

### Examples

```
## Not run:
downloadSource("GCBcountry")

## End(Not run)
```

---

|                            |                                   |
|----------------------------|-----------------------------------|
| downloadGlobalCarbonBudget | <i>downloadGlobalCarbonBudget</i> |
|----------------------------|-----------------------------------|

---

### Description

download the most current Global Carbon Budget dataset

### Usage

```
downloadGlobalCarbonBudget()
```

### Value

Metadata from the Global Carbon Budget 2023 dataset

### Author(s)

Michael Crawford

**Examples**

```
## Not run:  
downloadSource("GlobalCarbonBudget")  
  
## End(Not run)
```

---

|                        |                          |
|------------------------|--------------------------|
| downloadSoilCarbonDebt |                          |
|                        | <i>downloadSanderman</i> |

---

**Description**

Download data from Soil Carbon Debt Paper (<https://github.com/whrc/Soil-Carbon-Debt/>)

**Usage**

```
downloadSoilCarbonDebt()
```

**Value**

Meta information on downloaded data

**Author(s)**

Kristine Karstens

**Examples**

```
## Not run:  
readSource("SoilCarbonDebt", subtype = "SOCS_2010")  
  
## End(Not run)
```

---

|            |                   |
|------------|-------------------|
| fullENGAGE | <i>fullENGAGE</i> |
|------------|-------------------|

---

**Description**

retrieves validation data from mrcommons for the ENGAGE project

**Usage**

```
fullENGAGE()
```

**Value**

validation data in IAMC reporting format

**Author(s)**

Florian Humpenoeder

---

|                   |                          |
|-------------------|--------------------------|
| fullMADRATTOLPJML | <i>fullMADRATTOLPJML</i> |
|-------------------|--------------------------|

---

**Description**

creates historical outputs to be used by LPJml or other models that require gridded inputs

**Usage**

```
fullMADRATTOLPJML()
```

**Value**

No return; the function writes a number of netcdf files into the output folder of MADRAT

**Author(s)**

Benjamin Leon Bodirsky

**See Also**

[fullVALIDATION](#)

**Examples**

```
## Not run:  
fullMADRATTOLPJML()  
  
## End(Not run)
```

---

|                |                       |
|----------------|-----------------------|
| fullVALIDATION | <i>fullValidation</i> |
|----------------|-----------------------|

---

**Description**

Function that produces the complete validation data set used for evaluation of MAgPIE outputs

**Usage**

```
fullVALIDATION(rev = 0.1, aggregate = "region+global")
```

**Arguments**

|           |                                                                                                                                                  |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| rev       | data revision which should be used as input. Will be converted to <a href="#">numeric_version</a> when called via <a href="#">retrieveData</a> . |
| aggregate | an aggregation level, such as "region+global", to be used for all outputs that are being aggregated.                                             |

**Author(s)**

Jan Philipp Dietrich, Benjamin Leon Bodirsky

**See Also**

[readSource](#), [getCalculations](#), [calcOutput](#)

**Examples**

```
## Not run:  
retrieveData("Validation")  
  
## End(Not run)
```

---

|                |                       |
|----------------|-----------------------|
| readAR6SPMFig1 | <i>readAR6SPMFig1</i> |
|----------------|-----------------------|

---

**Description**

download IPCC AR6 Summary for Policymakers Fig 1, global surface temperature change relative to 1850-1900 from observations. This dataset also includes the CMIP6 models (human and natural forcings simulations), but are so far excluded here.

**Usage**

```
readAR6SPMFig1()
```

Value

magclass object

Author(s)

Michael Crawford

See Also

[https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC\\_AR6\\_WGI\\_SPM.pdf](https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf)

Examples

```
## Not run:
  readSource("AR6SPMFig1")

## End(Not run)
```

---

|         |                |
|---------|----------------|
| readBII | <i>readBII</i> |
|---------|----------------|

---

Description

Read the Biodiversity Intactness Index from the Natural History Museum. Two dataset subtypes: \* "Phillips" (default) – Phillips et al. 2021 BII-BTE, historical scenario, country-level, returned as ISO x year x scenario.variable. \* "DePalma" – De Palma et al. 2024 NHM v2.1.1 – cellular x.y.iso on the 67420-cell lpjcell grid, fraction (0-1). Country aggregation is left to the consumer (calcValidBII).

Usage

```
readBII(subtype = "Phillips", subset = "bii")
```

Arguments

|         |                                                                                                                                                                          |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| subtype | Dataset: "Phillips" (default, Phillips et al. 2021 historical BII) or "DePalma" (De Palma et al. 2024 v2.1.1 rasters).                                                   |
| subset  | Phillips variable selection ("bii", "crops", "highintensityag", "hpd", "pastureland", "qualitynatural", "urbanextent"; lists accepted). Ignored for subtype = "DePalma". |

Details

The De Palma rasters are 5 arc-minute WGS84 GeoTIFFs. terra::aggregate (fact = 6, fun = "mean") brings them to 30 arc-minute (unweighted mean is fine within a 6x6 block); terra::project pins to the canonical 0.5-deg grid; terra::extract samples the 67420 lpjcell coordinates. Source is percent (0-100), divided by 100 for unit-parity with Phillips. The data sub-dim is named "variable" so calcValidBII can use getNames(x, dim = "variable") <- ... on both subtypes.

**Value**

magclass object. Phillips: ISO x year x scenario.variable. DePalma: x.y.iso x year x "bii" (fraction 0-1).

**Author(s)**

Michael Crawford, Florian Humpenoeder

**See Also**

<https://data.nhm.ac.uk/dataset/bii-bte>, <https://data.nhm.ac.uk/dataset/bii-developed-by-nhm-v2-1-1-limited-release>, [downloadBII](#), [calcValidBII](#)

**Examples**

```
## Not run:
readSource("BII")                # Phillips historical
readSource("BII", subtype = "DePalma") # De Palma 2024 v2.1.1

## End(Not run)
```

---

```
readChenFoodPrices2025
```

```
  readChenFoodPrices2025
```

---

**Description**

Read regression coefficients for food price markup and food-away-from-home share from Chen et al. 2025 Nature Food paper.

**Usage**

```
readChenFoodPrices2025(subtype = "MarkupCoef")
```

**Arguments**

|         |                                                                                                                                           |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------|
| subtype | Either "FafhCoef" for food-away-from-home share coefficients, or "MarkupCoef" for the markup coefficients by product and consumption type |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------|

**Value**

magpie object with regression coefficients

**Author(s)**

David M Chen

**Examples**

```
## Not run:
readSource("ChenFoodPrices2025", subtype = "MarkupCoef")

## End(Not run)
```

---

readCMIP6

*readCMIP6*

---

**Description**

Read near-surface air temperature projection from CMIP6 for the following scenarios: SSP1-1.9, SSP1-2.6, SSP2-4.5, SSP3-7.0, SSP4-3.4, SSP4-6.0, SSP5-8.5, SSP5-3.4-over

**Usage**

```
readCMIP6()
```

**Value**

a magclass object

**Author(s)**

Michael Crawford

**See Also**

<https://cmip6.science.unimelb.edu.au/>

**Examples**

```
## Not run:
readSource("CMIP6")

## End(Not run)
```

---

|                |                   |
|----------------|-------------------|
| readEmisLucGlo | <i>EmisLucGlo</i> |
|----------------|-------------------|

---

## Description

Read historic land-use change CO2 emissions

## Usage

```
readEmisLucGlo(subtype = NULL)
```

## Arguments

subtype            Available subtypes are:

- historical:
  - Canadell\_2007
  - Friedlingstein\_2010
  - Harris\_2013
  - Houghton\_2012
  - RCP

## Value

magpie object containing data land-use change CO2 emissions

## Author(s)

Florian Humpenoeder

## See Also

[readSource](#)

## Examples

```
## Not run:  
a <- readSource("EmisLucGlo", subtype="Canadell_2007")  
a <- readSource("EmisLucGlo", subtype="Friedlingstein_2010")  
  
## End(Not run)  
#'@importFrom reshape2 dcast
```

---

|                 |                    |
|-----------------|--------------------|
| readFAOrotation | <i>FAOrotation</i> |
|-----------------|--------------------|

---

**Description**

Read Rotation lengths reported by Global planted forests thematic study: Results and analysis (2006)

**Usage**

```
readFAOrotation(subtype = "FAO")
```

**Arguments**

|         |                              |
|---------|------------------------------|
| subtype | subtype - only FAO supported |
|---------|------------------------------|

**Value**

magpie object containing rotation length data

**Author(s)**

Abhijeet Mishra

**See Also**

[readSource](#)

**Examples**

```
## Not run:
a <- readSource("FAOrotation")

## End(Not run)
```

---

|            |               |
|------------|---------------|
| readGasser | <i>Gasser</i> |
|------------|---------------|

---

**Description**

Read historic land-use change CARBON emissions

**Usage**

```
readGasser(subtype = "bookkeeping")
```

**Arguments**

subtype                      subtype

**Value**

magpie object containing data land-use change CARBON emissions

**Author(s)**

Abhijeet Mishra

**See Also**

[readSource](#)

**Examples**

```
## Not run:  
a <- readSource("Gasser")  
  
## End(Not run)
```

---

|                |                       |
|----------------|-----------------------|
| readGCBcountry | <i>readGCBcountry</i> |
|----------------|-----------------------|

---

**Description**

Read country-level bookkeeping land-use-change CO2 fluxes for the three GCB bookkeeping models (BLUE, OSCAR, Houghton & Nassikas) from the Obermeier et al. (2024) compilation. Net, gross source and gross sink are read for each model, 1950-2021, in Mt C per year. The bookkeeping models do not represent peat, so the fluxes are native ex-peatland (net = source + sink, no peat term).

**Usage**

```
readGCBcountry()
```

**Value**

magpie object (ISO3 x year x model.component), Mt C/yr

**Author(s)**

Florian Humpenoeder

**See Also**

[readSource](#)

**Examples**

```
## Not run:  
readSource("GCBcountry")  
  
## End(Not run)
```

---

```
readGlobalCarbonBudget
```

```
readGlobalCarbonBudget
```

---

**Description**

read the Global Carbon Budget, selecting the models GCB, BLUE, H&C2023, OSCAR and their sub-components Net, Deforestation, Forest regrowth, Other transitions, Wood harvest and other forest management, plus GCB's peat drainage & peat fires (the only model reporting peat) as a common peat term

**Usage**

```
readGlobalCarbonBudget()
```

**Value**

a magpie object in Mt CO2 per year

**Author(s)**

Michael Crawford, Florian Humpenoeder

**Examples**

```
## Not run:  
readSource("GlobalCarbonBudget")  
  
## End(Not run)
```

---

readGMIA

---

readGMIA

---

## Description

Read Global Irrigation Map

Read the Data from Siebert et.al on Irrigated Areas for each Country. Data contains total values as well as values from groundwater, surface water and non conventional water sources for the following Categories:

- Area equipped for Irrigation (AEI)
- Area acutally irrigated (AAI)
- Consumption Irrigatoin Water use (ICU)

The following Data is also available spatially explicit with a resolution of 5 arcmin:

- AEI in Percent
- AEI in Ha
- AAI as percent of AEI
- AEI from groundwater sources as percent of total AEI
- AEI from surface water sources as percent of total AEI
- AEI from non conventional sources as percent of total AEI

There also exists a correct function to aggregate the data to 0.5 degree resolution, set convert="correctonly" to run.

## Usage

```
readGMIA(subtype = NULL)
```

## Arguments

subtype : Available subtypes are:

- all\_data\_national : National Data on AEI (including differentiation by source (Groundwater, Surface water and nonconventional)), AAI
- aei\_pct : AEI in Percent
- aei\_ha : AEI in ha
- aai\_pct\_aei : AAI as percentage of AEI
- aei\_gw\_pct\_aei : AEI from Groundwater sources as Percentage of total AEI
- aei\_sw\_pct\_aei : AEI from Surface water sources as Percentage of total AEI
- aei\_nc\_pct\_aei : AEI from nonconventional sources as Percentage total AEI

## Value

magpie object of the Irrigated Area data

**Author(s)**

Stephen Wirth

**See Also**

[readSource](#)

**Examples**

```
## Not run:  
a <- readSource("GlobalIrrigationMap", "all_data_national")  
a <- readSource ("GMIA", "aei_pct", convert = FALSE)  
a <- readSource ("GMIA", "aei_pct", convert = "correctonly")  
  
## End(Not run)
```

---

readGSOC

*readGSOC*

---

**Description**

This function reads the raw GSOC data (available at <http://54.229.242.119/GSOCmap/>) or if available the preprocessed raster layers.

**Usage**

```
readGSOC()
```

**Value**

magpie object in cellular resolution

**Author(s)**

Kristine Karstens

**Examples**

```
## Not run:  
readSource("GSOC")  
  
## End(Not run)
```

---

readHID

*readHID*


---

## Description

Read Historic Irrigation Data

Read the Data from Siebert et.al on Historic Irrigation for each Country. Data contains Area equipped for Irrigation (AEI) from 1900 to 2005 in ten or five year timesteps

The Data is also available spatially explicit with a resolution of 5 arcmin:

## Usage

```
readHID(subtype = NULL)
```

## Arguments

subtype : Available subtypes are:

- national\_1900\_2005 : National Data on AEI
- AEI\_EARTHSTAT\_CP : Data in 5armin gridded resolution based on Earthstat LU scenario and maximum consistency with pasture extent
- AEI\_EARTHSTAT\_IR : Data in 5armin gridded resolution based on Earthstat LU scenario and maximum consistency with AEI from subnationals regions
- AEI\_HYDE\_LOWER\_CP : Data in 5armin gridded resolution based on Hyde LU scenario from the lower end of the uncertainty band and maximum consistency with pasture extent
- AEI\_HYDE\_LOWER\_IR : Data in 5armin gridded resolution based on Hyde LU scenario from the lower end of the uncertainty band and maximum consistency with AEI from subnational regions
- AEI\_HYDE\_FINAL\_CP : Data in 5armin gridded resolution based on Hyde LU scenario final version and maximum consistency with pasture extent
- AEI\_HYDE\_FINAL\_IR : Data in 5armin gridded resolution based on Hyde LU scenario final version and maximum consistency with AEI from subnational regions
- AEI\_HYDE\_UPPER\_CP : Data in 5armin gridded resolution based on Hyde LU scenario from the upper end of the uncertainty band and maximum consistency with pasture extent
- AEI\_HYDE\_UPPER\_IR : Data in 5armin gridded resolution based on Hyde LU scenario from the upper end of the uncertainty band and maximum consistency with AEI from subnational regions

## Details

Further information:

- S. Siebert, M. Kummu, M. Porkka, P. D??ll, N. Ramankutty, and B.R. Scanlon. 2015. A global data set of the extent of irrigated land from 1900 to 2005. *Hydrology and Earth System Sciences*. Vol. 19. p. 1521-1545.
- K. K. Goldwijk, A. Beusen, G. van Drecht, and M. de Vos. 2011. The HYDE 3.1 spatially explicit database of human-induced global land-use change over the past 12,000 years. *Global Ecology and Biogeography*. Vol. 20. p. 73-86

**Value**

magpie object of the Irrigated Area data

**Author(s)**

Stephen Wirth

**See Also**

[readSource](#)

**Examples**

```
## Not run:
a <- readSource("HID", "national_1900_2005")

## End(Not run)
```

---

```
readIMPACTIrrigInvCosts
      readIMPACTIrrigInvCosts
```

---

**Description**

Average annual baseline water-related investment cost data (2016-2030) read from Rosegrant et al. (2017) "Quantitative Foresight Modeling to Inform the CGIAR Research Portfolio"

**Usage**

```
readIMPACTIrrigInvCosts()
```

**Value**

magpie object containing average annual baseline water-related investment cost on IMPACT-region level (in billion 2000 USD per year)

**Author(s)**

Felicitas Beier

**See Also**[readSource](#)**Examples**

```
## Not run:  
a <- readSource("IMPACTIrrigInvCosts", convert = TRUE)  
  
## End(Not run)
```

---

`readPardeyAgRD`*readPardeyAgRD*

---

**Description**

Agricultural R&D investment data read from <https://www.nature.com/news/agricultural-rd-is-on-the-move-1.20571> 3 tables are read in: AgRD\_Pardey is public Ag expenditure in 1960 and 2011, extracted from the interactive figure in the article that has more complete countries agGERD and agPERD are total and public expenditures respectively, for less countries but more years

**Usage**

```
readPardeyAgRD()
```

**Value**

magpie object containing expenditure in Ag R&D, 2009 USD PPP

**Author(s)**

David Chen

**See Also**[readSource](#)**Examples**

```
## Not run:  
a <- readSource("PardeyAgRD")  
  
## End(Not run)
```

---

|                 |                                      |
|-----------------|--------------------------------------|
| readProdPrIndex | <i>Read FAO producer price index</i> |
|-----------------|--------------------------------------|

---

**Description**

Read-in world producer price index as magclass object

**Usage**

```
readProdPrIndex()
```

**Value**

magpie object of the world producer index from FAO

**Author(s)**

Mishko Stevanovic

**See Also**

[readSource](#)

**Examples**

```
## Not run: a <- readSource(type="ProdPrIndex")
```

---

|                    |                           |
|--------------------|---------------------------|
| readSoilCarbonDebt | <i>readSoilCarbonDebt</i> |
|--------------------|---------------------------|

---

**Description**

Read data from Soil Carbon Debt Paper (<https://github.com/whrc/Soil-Carbon-Debt/>)

**Usage**

```
readSoilCarbonDebt()
```

**Value**

List of magpie objects with results on cellular level, weight, unit and description.

**Author(s)**

Kristine Karstens

**Examples**

```
## Not run:  
readSource("SoilCarbonDebt", subtype = "SOCS_2010")  
  
## End(Not run)
```

---

|                |                       |
|----------------|-----------------------|
| readWaterUsage | <i>readWaterUsage</i> |
|----------------|-----------------------|

---

**Description**

Read Historic and projected Agricultural water consumption

**Usage**

```
readWaterUsage(subtype = NULL)
```

**Arguments**

|         |                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| subtype | Available subtypes are: <ul style="list-style-type: none"><li>• historical:<ul style="list-style-type: none"><li>– foley_2011</li><li>– shiklomanov_2000</li><li>– wada_2011</li><li>– wisser_2008</li></ul></li><li>• projections<ul style="list-style-type: none"><li>– fischer_IIASA</li><li>– hejazi_2013</li><li>– molden_IWMI</li><li>– seckler_IWMI</li><li>– shiklomanov</li><li>– aquastat_2008_12</li></ul></li></ul> |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Value**

magpie object containing data on water usage

**Author(s)**

Stephen Wirth

**See Also**

[readSource](#)

**Examples**

```
## Not run:
a <- readSource("foley_2011")
a <- readSource("aquastat_2008_12")

## End(Not run)
#' @importFrom reshape2 dcast
```

---

|               |                      |
|---------------|----------------------|
| readWBPoverty | <i>readWBPoverty</i> |
|---------------|----------------------|

---

**Description**

read World Bank poverty percentage of population under poverty line, and gini coef data No download function from WDI API yet, as the older versions (2011PPP as opposed to 2017PPP online) are currently most relevant for validating Soergel poverty model results and must be downloaded manually

**Usage**

```
readWBPoverty(subtype = "320PovertyLine")
```

**Arguments**

|         |                                                                                                           |
|---------|-----------------------------------------------------------------------------------------------------------|
| subtype | either "Gini", or the three poverty line thresholds: "190PovertyLine", "320PovertyLine", "550PovertyLine" |
|---------|-----------------------------------------------------------------------------------------------------------|

**Value**

magclass object

**Author(s)**

David M Chen

**Examples**

```
## Not run:
readSource("readWBPoverty", subtype = "320PovertyLine")

## End(Not run)
```

---

`readWISE`*readWISE*

---

**Description**

This function reads the preprocessed data from WISE\_30sec

**Usage**

```
readWISE()
```

**Value**

magpie object in cellular resolution

**Author(s)**

Kristine Karstens

**Examples**

```
## Not run: readSource("WISE")
```

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