Short name	**Cultivated terrestrial plants for nutrition**
CICES class name	Cultivated terrestrial plants (including fungi, algae) grown for nutritional purposes
CICES Section	Provisioning (Biotic)
CICES Class code	1.1.1.1

Sample Indicators

Indicator values from			
Experiment or direct measurement		Survey	
Expert assessment		Statistical- or census data	
Model or GIS		Literature values	
Stakeholder participation		Not provided	

Table 1: Field Scale

Indicator	**Unit**	**Indicator values from**
[35, 48] Yield	Not provided	 , 
[49] Yield	Mg * ha^{-1}	
[13] Yield	kg * ha^{-1} * yr^{-1}	
[26, 27] Yield	Mg * ha^{-1}	
[1, 23] Grain yield	Mg * ha^{-1} * yr^{-1}	
[38] Yield (maize, beans)	kg * ha^{-1} * harvest^{-1}	
[59] Annual total crop yield (corn, soybean, wheat)	bushel * acre^{-1}	
[37] Production of food	kg fresh weigh * m^{-2} * yr^{-1}	
[1] Average grain yield over the last 50 years, applying a factor to account for changes in technology over time	t * ha^{-1}	
[62] Total grass yield	t * ha^{-1}	

[47] Forage: herbaceous biomass production	Not provided	
[47] Forage: herbaceous biomass cover	Not provided	
[59] Annual total forage crops and perennial grass yield (alfalfa, hay, pasture)	kg * ha^{-1}	
[13] Production value of crop-pasture sequence	$ * ha^{-1} * yr^{-1}	
[45] Yield potential: Effect of organic and conventional farming are accounted for by using residuals of crop yields (after fitting farming system (conventional or organic) to yield quantities in t ha−1, instead of reported yields.	t * ha^{-1}	
[61] Biotic production	kg * m^{-2} * yr^{-1}	
[24] Plant dry biomass per experimental pot	g	
[61] Net primary production (NPP)	kg dm * m^{-2} * yr^{-1}	
[35] Land equivalent ratio	Not provided	,
[33] Fruit yield	Mg * ha^{-1}	,
[38] Fruit yield	# * ha^{-1} * harvest^{-1}	
[2] Coffee: number of fruiting nodes per hectare	# * ha^{-1}	
[46] Grape yield: bunches per vine	#	
[46] Grape yield: bunch weight	g	
[46] Grape yield: yield per vine	kg	
[46] Grape yield: 100 berries weight	g	
[35] Quality: Level of mycotoxins in crops	Not provided	,
[37] Concentration of trace metal elements relative to food quality standards	mg * kg of fresh matter^{-1}	
[35] Percentage of polyunsaturated fatty acids in milk from cows (for fodder quality)	Not provided	,

[62] Total crude protein in yield	t * ha^{-1}	,
[1] Grain protein content (winter wheat)	%	
[62] Crude protein concentration in grass yield (first cut, regrowth)	%	,
[33] Fruit quality: Fruit mass	g	,
[33] Fruit quality: Fruit size	mm	,
[33] Fruit quality: Fruit colour grade	Not provided	,
[33] Fruit quality: Titratable acidity	% of malic acid	,
[33] Fruit quality: Soluble solids concentration	%	,
[33] Fruit quality: Firmness	Newton or kg * cm^{-2}	,
[46] Grape quality: total soluble solids (sugar)	°Bx	
[46] Grape quality: titratable acidity	g * l^{-1}	
[46] Grape quality	pH [-]	
[49] Mean individual fresh fruit mass (quality criterion for the market)	g * $fruit^{-1}$	
[42] Combination of the following indicators to assess relative economic benefits of Forage Production: Site quality: *animal units supported per month and hectare, scaled to [0 -1]* Site opportunity: *distance to markets, scaled to [0 -1]* Complimentary inputs: *availability of water sources, scaled to [0 -1]* Reliability: *Risk of future service loss through urban development within a 3-mile radius, scaled to [0 -1]*		,
[45] Use of bundles of indicator species that indicate agricultural landscapes with high value for crop yields identified for a certain region. Species may belong to different taxonomic groups	Not provided	

Table 2: Farm Scale

Indicator	**Unit**	**Indicator values from**
[20] Index for average yield of common crops (e.g. corn, soybean and wheat). The index is calculated by dividing the observed value by a target value. Target values may be average or maximum values found in the region or empirical values from the literature. If the calculated index is higher than 1, it is set to one.	Index 0-1	
[20] Index for alternate income opportunities provided by speciality (food) products. The index is calculated by dividing the observed value by a target value. Target values may be average or maximum values found in the region or empirical values from the literature. If the calculated index is higher than 1, it is set to one.	Index 0-1	
[29] Accessibility: Share of land surface within 100 meters from road. Values were scaled [0-1]	%	
[29] Share of farmers with the expressed motivation of achieving a high economic value of the farm that indicates their production intensity. Values were scaled to [0-1]	%	
[29] Crop yield	$t * ha^{-1} * yr^{-1}$	
[45] Yield potential: Effect of organic and conventional farming are accounted for by using residuals of crop yields (after fitting farming system (conventional or organic) to yield quantities in $t * ha^{-1}$, instead of reported yields.	$t * ha^{-1}$	
[45] Use of bundles of indicator species that indicate agricultural landscapes with high value for crop yields identified for a certain region. Species may belong to different taxonomic groups.	Not provided	
[56] Forage provision by pastures: calculated by a formula derived from expert assessment. Experts determined maximal DM yield, the selected up to 7 variables relevant for yield levels (soil pH, mean depth of a soil series, soil type, amount of phosphorous fertilizer applied, amount of lime applied, irrigation, altitude) and weighed them according to their importance.	$t\ dm * ha^{-1} * a^{-1}$	

Table 3: Regional Scale

Indicator	**Unit**	**Indicator values from**
[3] Production of edible crops	$kg * ha^{-1} * yr^{-1}$	

[6] Food and fodder from plants	t * ha^{-1} * yr^{-1}	
[10] Food crops output per unit sown area	kg * ha^{-1}	
[52] Average annual yield of all food crops in the region	t * ha^{-1}	
[51] Food production value: expert based index for ES provision by land cover class [1-5] multiplied by the area of land cover class [km^2] and literature-based monetary value of ES	$ * ha^{-1} * yr^{-1}	
[51] Food production: expert based index for ES provision by land cover class [1-5] multiplied by the area of land cover class [km^2]	Index 1-5 * km^{-2}	
[55] Grain production: total yield of rice, wheat, corn and soy	t * ha^{-1}	
[58] Grain output: total grain output from statistics, spatial allocation to grid cells of cultivated land based on the ratio of the cells' NDVI value relative to the NDVI of all cultivated land	t * area^{-1} *yr^{-1}	
[59] Annual total crop yield (corn, soybean, wheat)	bushel * acre^{-1}	
[5] Average yield	kg * ha^{-1}	
[12] Yield	kg * ha^{-1} * yr^{-1}	
[12] Agricultural harvest/yield	100 kg grain equivalent unit (GEU) * ha^{-1} *yr^{-1}	
[43] Agricultural yields	t * ha^{-1}	
[41] Agricultural production; values were normalized [0-1] using benchmark values where available and observed values otherwise.	t * ha^{-1}	
[60] Total crop production per area (including agricultural and non-agricultural areas)	t * ha^{-1} * yr^{-1}	
[28] Crop production: values assigned are based on the land cover class. The matrix defined by Burkhard et al., 2012 (DOI:10.1016/j.ecolind.2011.06.019) is adapted to the GlobCover dataset and used in this study.	Index 0-5	
[29] Crop yield (autumn wheat). Values were scaled [0-1]	t * ha^{-1} * yr^{-1}	

[44] Winter wheat yields	t * ha^{-1}	
[55] Oil crop production: oil yield	t * ha^{-1}	
[25] Amount of forage	Mg dm * ha^{-1}	
[59] Annual total forage crops and perennial grass yield (alfalfa, hay, pasture)	kg * ha^{-1}	
[15] Feed: Percentage of the area used for grazing	%	
[28] Fodder production: values assigned are based on land cover class. The matrix defined by Burkhard et al., 2012 (DOI:10.1016/j.ecolind.2011.06.019) is adapted and used in this study.	Index 0-5	
[40] Fodder quantity: Above-ground biomass in mown grasslands	Not specified	
[40] Fodder quantity: Sward height	Not specified	
[40] Fodder quality: Lower Leaf tensile strength (Feed quality)	Not specified	
[40] Fodder quality: Abundance of legumes	Not specified	
[40] Fodder quality: Leaf crude protein content	Not specified	
[11] Total biomass production on agricultural land	t DM	
[53] Annual biomass yield	t DM * ha^{-1} * yr^{-1}	
[53] Biomass stock in the landscape (crops and trees) at any one time	t DM * ha^{-1}	
[14] Sum of arable land cells (GIS: 10m x 10m cells) within the two highest soil fertility classes	m^2	
[21] Share of arable land use within a region	%	
[43] Acreage of farmland	ha	
[50] Food production potential: total farmland area	ha * grid $cell^{-1}$	
[31] Yield potential	1: very low - 5: very high	

[45] Yield potential: Effect of organic and conventional farming are accounted for by using residuals of crop yields (after fitting farming system (conventional or organic) to yield quantities in t ha−1), instead of reported yields.	t * ha^{-1}	
[36] Soil fertility of arable fields: index based on water holding capacity, soil moisture and carbonate content.	Index 1-5	
[4] Area of agricultural ecosystems under sustainable management	Not provided	
[4] Organic farming	Not provided	
[7] Market value of products per hectare	$ * ha^{-1} * yr^{-1}	
[10] Gross farming output value per rural chemical fertilizer use	$ * kg^{-1}	
[10] Agricultural labor productivity [monetary agricultural output value/ agricultural labourer]	$ * capita^{-1}	
[19] Gross output of agricultural production (crops & livestock)	$ * ha^{-1} * yr^{-1}	,
[19] Net margin of agricultural production (including subsidies)	$ * ha^{-1} * yr^{-1}	,
[25] (Historical Analysis) Value of production: Sum of working hours needed to buy basic agric. commodities of 1 ha of land	h * ha-1	,
[29] Accessibility: Share of land surface within 100 meters from road that affects the level of agricultural production intensity. Values were scaled [0-1]	%	
[16] "Energy" of harvested crops	solar equivalent J	
[17] Biomass: Energy output from agricultural biomass	MJ * ha^{-1}	
[18] Spatial mapping by stakeholders: stakeholders could place green stickers on a map to mark supply hotspots of this ecosystem service. Red stickers were used to mark locations where the supply of this service is declining. Two different sizes of stickers were used to represent a radius of 0.75 km or 1 km, respectively.	Index 0-5	
[29] Share of farmers with the expressed motivation of achieving a high economic value of the farm. Values were scaled to [0-1]	%	

[30] Direct goods provision (meat & grain): NPP x H x Qf x 1.5; where NPP: Net primary production (0-1000), H: Harvest index by men (0-1), Qf: quality factor of primary outputs	Not provided	
[45] Use of bundles of indicator species that indicate agricultural landscapes with high value for crop yields identified for a certain region. Species may belong to different taxonomic groups.	Not provided	
[54] Percentage of the products of a land use class that is consumed by households as food	%	
[54] Percentage of the products of a land use class that is used for animal feed	%	
[54] Rating of current service provision per land use class by expert-stakeholders	Rating 0-10	
[54] Rating of increases/decreases of service provision in scenarios, relative to the status quo	%	

Table 4: National Scale

Indicator	**Unit**	**Indicator values from**
[11] Total biomass production on agricultural land	dm t	
[57] Yield	$t * district^{-1}$ or $t * nation^{-1}$	
[39] Yields of food and feed crops	$t * ha^{-1}$, $t\ dm * ha^{-1}$, $MJ * ha^{-1}$	
[39] Grassland yields	$t * ha^{-1}$, $t\ dm * ha^{-1}$, $MJ * ha^{-1}$	
[39] Food and feed crop area	ha	
[39] Grassland area	ha	
[21] Share of arable land use within a region	%	
[4] Area of agricultural ecosystems under sustainable management	Not provided	

[4] Organic farming	Not provided	
[8] Expert assessment for each land use, based on the indicators: yield/hectare; light, water, nutrient, warmth availability; disturbances, climate change (units not given)	very negative (−3) to very positive (+3)	
[9] Summed gross margin of production (area of crop multiplied by the gross margin per unit area)	$	,
[34] Historical analysis: Production of "ecosystem service products" in a region: cereal crops, vegetables, hop, wine	Not provided	,
[34] Historical analysis: Occurrence of specific production areas in a region: orchards, orchard meadows, vineyards	Not provided	,
[34] Historical analysis: fodder or fodder used in a region: fodder-hay, fodder-oak	Not provided	,
[34] Historical analysis: Occurrence of specific livestock feeding system in a region: grazing, grazing/fodder-hay	Not provided	,
[22] Maximum stocking rate supported by pastures	Livestock units * ha^{-1}	
[57] Quality: alpha-diversity of agricultural goods calculated as Pielou's (1969) J-index (evenness index): J = (sum of (P_it * ln(p_it))/ ln (St); where St is the number of crops recorded during year t, while p_it refers to the relative abundance of crop i [based on the crop's yield (weight)] during year t	[-]	
[57] Quality: beta-diversity of agricultural goods calculated as Margalef's (1958) index of diversity (D): D= S-1 / ln(N); where S is the number of species, and N represents the total yield (weight)	[-]	
[57] Quality: gamma-diversity calculated from alpha- and beta diversity	[-]	

Table 5: Multinational Scale

Indicator	**Unit**	**Indicator values from**
[17] Biomass: Energy output from agricultural biomass	MJ * ha^{-1}	
[32] Crops: values assigned are based on Corine land cover classes. The matrix defined by Burkhard et al. (2009; DOI: 10.3097/LO.200915) was used and modified for the context of riparian zones.	Index 0-5	

[32] Fodder: Values assigned are based on Corine land cover classes. The matrix defined by Burkhard et al. (2009; DOI: 10.3097/LO.200915) was used and modified for the context of riparian zones.	Index 0-5	
[21] Share of arable land use within a region	%	
[4] Area of agricultural ecosystems under sustainable management	Not provided	
[4] Organic farming	Not provided	

Table 6: Global Scale

Indicator	**Unit**	**Indicator values from**
[4] Area of agricultural ecosystems under sustainable management	Not provided	
[4] Organic farming	Not provided	

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