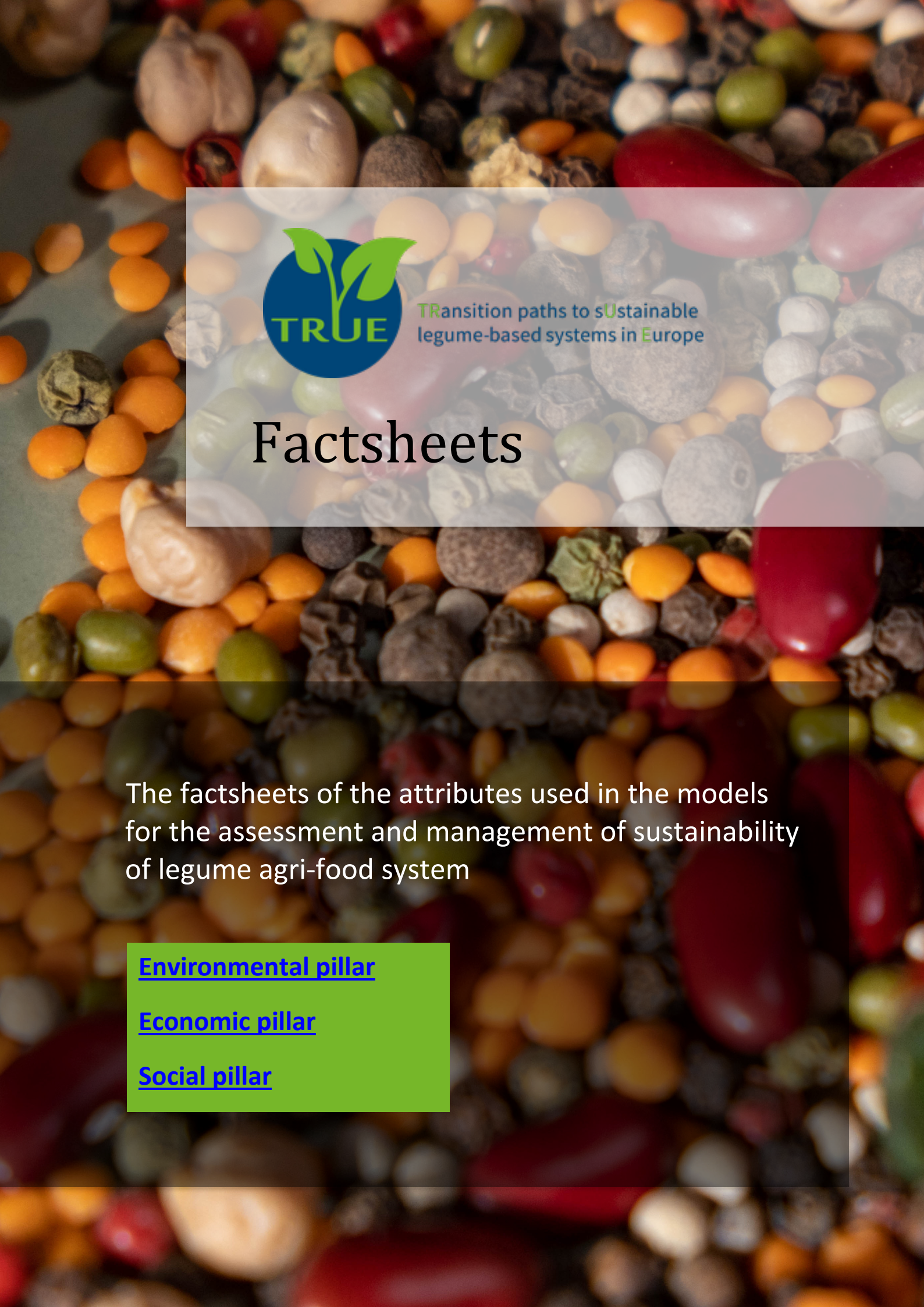

TRansition paths to sUstainable legume-based systems in Europe

Factsheets

The factsheets of the attributes used in the models for the assessment and management of sustainability of legume agri-food system

TRansition paths to sUstainable legume-based systems in Europe

Environmental Pillar

Description and metrics of indicators

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Indicator Structure and Theme ratings for the Environmental sustainability pillars

PRODUCTION (En1)
Scale: Low(-); Medium; High(+)

THEME	SUB-THEME	Sub-sub theme	Sub-sub-sub-theme	INDICATOR
Abiotic Scale: Low(-); Medium; High(+)	Atmosphere emissions Scale: High(-);Medium; Low(+)			GHG Balance
				Emission of Air Pollutants
	Emission of Water Pollutants Scale: High(-);Medium; Low(+)			P balance
				N balance
	Resource depletion Scale: High(-);Medium; Low(+)	Resource use Scale: High(-);Medium; Low(+)	SynFertilisers Scale: High(-);Medium; Low(+)	SynP fertilisers
				SynN fertilisers
				Ground and Surface Water Withdrawals
		Energy Efficiency Scale: Low(-); Medium; High(+)		SynN fertilisers
				Diesel consumption
Ecosystem impact Scale: High(-);Medium; Low(+)				Land use
				Land sharing/habitat provision
				Soil Organic Matter

PROCESSING (En2)
Scale: Low(-); Medium; High(+)

THEME	SUB-TEME	INDICATOR
Energy Scale: High(-);Medium; Low(+)	Energy Efficiency Scale: Low(-); Medium; High(+)	Electricity
		Other fuels
	Renewable Energy % Scale: Low(-); Medium; High(+)	Renewable electricity
		Renewable other sources
	Atmosphere emissions Scale: High(-);Medium; Low(+)	GHG Balance
		Emission of Air Pollutants
Waste generation Scale: High(-);Medium; Low(+)		Food Loss and Waste Reduction
		Waste Disposal
Resource use Scale: High(-);Medium; Low(+)		Renewable and Recycled packaging
		Ground and Surface Water Withdrawals

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TRANSPORT AND DISTRIBUTION (En3) Scale: Low(-); Medium; High(+)	
THEME	**INDICATOR**
Environmental sustainability-Transportation Scale: Low(-); Medium; High(+)	Transport intensity
	Atmosphere emissions
	Loss of products

MARKETS AND RETAILERS (En4) Scale: Low(-); Medium; High(+)	
THEME	**INDICATOR**
Waste Scale: High(-);Medium; Low(+)	Food Loss and Waste Reduction
	Waste Disposal
Energy Scale: High(-);Medium; Low(+)	Energy Efficiency
	Renewable Energy %
	Emission of Air Pollutants
Resource use Scale: High(-);Medium; Low(+)	Renewable and Recycled Materials
	Packaging specification

CONSUMERS (En5) Scale: Low(-); Medium; High(+)	
THEME	**INDICATOR**
Waste Scale: High(-);Medium; Low(+)	Food Loss and Waste Reduction
	Waste Disposal
Energy Scale: High(-);Medium; Low(+)	Cooking intensity
	Renewable Energy %
Water use	

Table of Indicators for the Environmental sustainability pillars

LEGEND:	
En	Environmental Pillar for the Agri-food Chain
1	Production link
2	Processing link
3	Transport and Distribution link
4	Markets and Retailers link
5	Consumers link

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TRansition paths to sUstainable legume-based systems in Europe

DESCRIPTION AND METRICS OF ENVIRONMENTAL INDICATORS

INDICATOR NAME: GHG Balance
SUB-THEME: Atmosphere emissions
THEME: Abiotic
LINK: Production (En1)

DESCRIPTION

Crop production contributes to climate change via the emission of greenhouse gases (GHGs), primarily from use of synthetic nitrogen fertilisers (SNF) that require considerable amount of fossil energy to produce, and that give rise to soil emissions of nitrous oxide following application. Meanwhile, depletion or enhancement of soil carbon (C) stocks can results in significant emission to, or sequestration from, the atmospheric pool of carbon dioxide (CO_2) that influences temperature forcing (and thus climate change).

The primary metric proposed for this environmental aspect of crop production is GHG emissions per tonne (Mg) of produce. GHG emissions intensities can be: (i) derived through application of a life cycle assessment (LCA) to specific crop cultivation stages, most simply by using an open source footprint calculator such as the Cool farm Tool (https://coolfarmtool.org/) or AgreCalc (https://www.agrecalc.com/); (ii) obtained from secondary sources, including LCA (e.g. Ecoinvent & AgriFootprint) databases and published food LCA studies (e.g. Poore and Nemecek 2018).

Results should be expressed per tonne (Mg) of dry matter (DM) of the main product, to ensure standardized units. This may require knowledge of moisture content at harvest, and possibly also allocation of crop cultivation burdens across multiple co-products (e.g. grain and straw) based on relative economic values. GHG emissions should be aggregated as kg CO_2 equivalent based on IPCC (2013) global warming potentials over a 100-year timeframe (GWP_{100}). Changes in soil C stocks may be included in net emissions balances, as per standard reporting guidelines for land use and land use change emissions (BSI 2011; IPCC 2006b).

Note that for this and all subsequent environment metrics, harvested products include co-products (e.g. straw) alongside the main product (e.g. grain) harvested from the cropping system.

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METRICS

The use of an appropriate carbon calculator such as Cool Farm Tool is the 'gold standard' approach to represent GHG emission performance in primary production as per the thresholds set out below, and is necessary for animal systems. However, for cropping systems, where it is not feasible to enter data into a carbon calculator, an alternative approach is to use nitrogen fertiliser application rate as a proxy of GHG emissions. Approximately 80% of crop emissions (up to the farm gate) originate from nitrogen fertiliser manufacture and nitrous oxide emissions that arise in proportion to nitrogen application rates. Thus, it is the single most relevant proxy for pre farm gate GHG emissions. The same thresholds are proposed for this metric as for the energy intensity of primary production indicator. The following scales are provisionally suggested based on range of crop footprint values (Wernet et al. 2016), and may need calibrating.

RATINGS

The following scales are provisionally suggested based on range of crop footprint values (Wernet et al. 2016), and may need calibrating.

Low:	Less than 250 kg CO_2 eq. Mg^{-1} DM harvested product
Medium:	Between 250 and 500 kg CO_2 eq. Mg^{-1} DM harvested product
High:	Over 500 kg CO_2 eq. Mg^{-1} DM harvested product

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Emission of Air Pollutants**
SUB-THEME: Atmosphere emissions
THEME: Abiotic
LINK: Production (En1)

DESCRIPTION

The application of SNF, especially in urea format, and organic fertilisers, also give rise to emissions of ammonia (NH_3), which contributes to air pollution, human health and ecosystem damage. Through a reduction in requirements for SNF and organic fertilisers, legumes may be associated with lower atmospheric emissions than conventional crops.

Given the difficulty of obtaining precise data for the ideal metric of NH_3 emission per Mg DM, the primary metric proposed for this environmental aspect of crop production is based on the intensity of activities giving rise to ammonia emissions – primarily mineral and organic fertilizer applications. Information on typical rates of fertilizer application (e.g. fertilizer recommendations) and yields for particular crops (e.g. EuroStat and FAO Stat) can provide a strong indication of the overall GHG- and ammonia- intensities of production. The application of urea and manure provide simpler metrics relating to the likely intensities of ammonia emissions.

METRICS

Applications of SNF and organic fertilisers, in abated or unabated forms, expressed per Mg DM of harvested product (Misselbrook, TH; Gilhespy, SL; Cardenas, LM; Williams, J; Dragosits 2015; Webb and Misselbrook 2004).

RATINGS

Low:	No SNF, animal manures nor biogas digestate applied.
Medium:	SNF or organic N fertilisers applied, at rates less than 10 kg N Mg^{-1} DM in non-abated urea, manure or biogas digestate form.
High:	Over 10 kg N Mg^{-1} DM applied in non-abated urea, manure or biogas digestate form.

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **P balance**
SUB-THEME: Emission of Water Pollutants
THEME: Abiotic
LINK: Production (En1)

DESCRIPTION

Phosphorus (P) is a limiting nutrient in many freshwater systems. Loss of P from cropping systems into water courses is a major cause of eutrophication (excessive nutrient enrichment) and associated algal blooms and biodiversity loss in freshwater bodies. It is related to the application of P in mineral and organic fertilisers, and soil erosion. A useful indicator of risk of P loss to water is P surplus. Usually, this is expressed as kg surplus (kg P in outputs minus kg P in inputs) per hectare.

METRICS

[kg ha-1 P in outputs minus kg P ha-1 in inputs)/ kg P ha-1 in inputs] x 100%. Determine and quantify all types of crops (by area and yield) and animals (by heads or places and performance) in the operation. Quantify all imports and exports of nutrient-containing materials, such as fertilizers, feed and agricultural produce. Using an established method and recognized standard values, calculate the nitrogen and phosphorus supply and demand of the operation. Correct the nitrogen balance for volatile and, if possible, for liquid losses (leaching). Rate the nitrogen and the phosphorus balance of the operation by comparing effective supply with demand (SAFA "Nutrient balance (E 5.1.2)")

RATINGS

High (-):	>20%
Medium:	10-20%
Low (+):	<10%

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **N balance**
SUB-THEME: Emission of Water Pollutants
THEME: Abiotic
LINK: Production (En1)

DESCRIPTION

Nitrogen (N) is a limiting nutrient in some freshwater and many coastal marine ecosystems. Leaching of N from cropping systems into water courses is a major cause of eutrophication (excessive nutrient enrichment) and associated algal blooms and biodiversity loss in freshwater and coastal marine water bodies. N leaching is closely related to total N application in SNF and organic fertilisers. A useful indicator of resource (in)efficiency and risk of N loss to water is N surplus. As for P surplus, we propose that N surplus is initially calculated as kg N outputs minus kg N inputs per hectare, then expressed as a percentage of inputs (see "Nutrient balance (E 5.1.2)" of the SAFA Indicator recommendations).

METRICS

[kg ha-1 N in outputs minus kg N ha-1 in inputs)/ kg N ha-1 in inputs] x 100%. Determine and quantify all types of crops (by area and yield) and animals (by heads or places and performance) in the operation. Quantify all imports and exports of nutrient-containing materials, such as fertilizers, feed and agricultural produce. Using an established method and recognized standard values, calculate the nitrogen and phosphorus supply and demand of the operation. Correct the nitrogen balance for volatile and, if possible, for liquid losses (leaching). Rate the nitrogen and the phosphorus balance of the operation by comparing effective supply with demand. See SAFA "Nutrient balance (E 5.1.2)"

RATINGS

Scale: High(-); Medium; Low (+)

High (-):	>20%
Medium:	10-20%
Low (+):	<10%

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: SynP fertilisers
SUB-SUB-SUB-THEME: Syn Fertilisers
SUB-SUB-THEME: Resource use
SUB-THEME: Resource depletion
THEME: Abiotic
LINK: Production (En1)

DESCRIPTION

Mineral P fertilizer is produced from finite reserves of phosphate rock, proven reserves of which are forecast to be depleted by the end of the century (Cordell, Drangert, and White 2009). High rates of mineral P fertilizer use is therefore a hotspot for abiotic resource depletion within crop production systems. Here, we propose the absolute rate of mineral P fertilizer application (excluding P in manures and biofertilzers) per Mg DM harvested product as a useful indicator of comparative resource depletion across crop production systems.

METRICS

Kg mineral P fertilizer application per Mg DM harvested product. Examples of crop-specific nutrient requirements and recommended fertiliser application rates can be found in nutrient management guidelines, e.g. AHDB (2017).

RATINGS

Low: < 2 kg P Mg^{-1} DM harvested product

Medium: 2-5 kg P Mg^{-1} DM harvested product

High: > 5 kg P Mg^{-1} DM harvested product

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **SynN fertilisers**
SUB-SUB-SUB-THEME: Syn Fertilisers
SUB-SUB-THEME: Resource use
SUB-THEME: Resource depletion
THEME: Abiotic
LINK: Production (En1)

DESCRIPTION

Synthetic N fertilizer manufacture requires large amounts of energy, usefully in the form of natural gas or other finite fossil fuels. Fertilizer manufacture is a major driver of energy consumption in the life cycle of crop production. Here, we propose the absolute rate of SNF application (excluding N in manures and biofertilzers) per Mg DM harvested product as a useful indicator of comparative resource depletion across crop production systems.

METRICS

Kg SNF applied per Mg DM harvested product. Examples of crop-specific nutrient requirements and recommended fertiliser application rates can be found in nutrient management guidelines, e.g. AHDB (2017).

RATINGS

Low: < 5 kg N Mg^{-1} DM harvested product

Medium: 5-15 kg N Mg^{-1} DM harvested product

High: > 15 kg N Mg^{-1} DM harvested product

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Ground and Surface Water Withdrawals
SUB-SUB-THEME: Resource use
SUB-THEME: Resource depletion
THEME: Abiotic
LINK: Production (En1)

DESCRIPTION

Globally, agriculture is responsible for over 70% of freshwater abstraction, often at rates in excess of natural recharge, leading to lowering of water tables and representing a fundamentally unsustainable practice. This challenge is likely to be exacerbated by climate change. However, data on water abstraction are often not collated, and here we propose a simple indicator of *potential* water stress based on irrigation practice. Where no irrigation is needed, water stress induced by cropping is assumed to be minor. Where irrigation is required, practices are differentiated into "advanced" methods that maximise water use efficiency, such as drip irrigation and deficit (control) irrigation, and less efficient (basic) irrigation methods such as flood irrigation and sprinkler irrigation.

METRICS

Type of irrigation practice implemented for the crop (Antonopoulos et al. 2014).

RATINGS

High (-):	Sprinkler/flood irrigation employed
Medium:	Advanced irrigation employed (e.g. drip irrigation, deficit irrigation, etc).
Low (+):	None

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: SynN fertilisers
SUB-SUB-THEME: Energy Efficiency
SUB-THEME: Resource depletion
THEME: Abiotic
LINK: Production (En1)

DESCRIPTION

Synthetic N fertilizer manufacture requires large amounts of energy, usefully in the form of natural gas or other finite fossil fuels. Fertilizer manufacture is a major driver of energy consumption in the life cycle of crop production. Here, we propose the absolute rate of SNF application (excluding N in manures and biofertilzers) per Mg DM harvested product as a useful indicator of comparative resource depletion across crop production systems.

METRICS

Kg SNF applied per Mg DM harvested product. Examples of crop-specific nutrient requirements and recommended fertiliser application rates can be found in nutrient management guidelines, e.g. AHDB (2017).

RATINGS

Low: < 5 kg N Mg^{-1} DM harvested product

Medium: 5-15 kg N Mg^{-1} DM harvested product

High: > 15 kg N Mg^{-1} DM harvested product

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Diesel consumption
SUB-SUB-THEME: Energy Efficiency
SUB-THEME: Resource depletion
THEME: Abiotic
LINK: Production (En1)

DESCRIPTION

The main on-farm use of energy in cropping systems is usually the combustion of diesel to power agricultural machinery. If fuel is used for e.g. on-farm grain drying, then this fuel consumption may be included in the proposed metric, which is simply the volume (L) of fossil fuel consumed per Mg DM harvested product. For the purposes of this simple metric, it is not necessary to differentiate by type of fossil fuel (petrol/diesel/liquid petroleum gas). However, biofuels should be excluded from the volumes.

METRICS

Fuel consumption, L Mg-1 harvested product. The following scales are provisionally suggested based on range of crop footprint values (Wernet et al. 2016), and may need calibrating.

RATINGS

High (-): >18L Mg^{-1} DM harvested product

Medium: 12-18L Mg^{-1} DM harvested product

Low (-): <12L Mg^{-1} DM harvested product

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INDICATOR NAME: Land use
THEME: Ecosystem impact
LINK: Production (En1)

DESCRIPTION

Agriculture utilizes 70% of global land area. Land occupation by agriculture is a major driver of habitat loss and soil degradation. Here, we propose a simple metric based on the area required overt time to produce one Mg DM of harvested product. The metric is $m^2.yr$. Crucially, if multiple crops are harvested in one year on a particular area of land, then this should be represented within the metric by dividing the area by the fraction of year allocated to the crop in question. For example, if two soybean crops are cultivated within one year in a particular region, then the yield-derived m^2 Mg^{-1} required for each crop may be divided by 2 to produce the final specific time-weighted area ($m^2.yr$ Mg^{-1} DM). This metric provides an indication of land use efficiency and therefore could be used to identify "land sparing" opportunities, or pressures driving agricultural expansion that may ultimately lead to undesirable (indirect) land use change (Searchinger et al. 2018).

METRICS

$M^2.yr$ Mg^{-1} DM harvested product. The following scales are provisionally suggested based on range of crop yields (FAO 2018), and may need calibrating.

RATINGS

High (-):	> 2000 $m^2.yr$ Mg^{-1} DM harvested product
Medium:	1000-2000 $m^2.yr$ Mg^{-1} DM harvested product
Low (+):	< 1000 $m^2.yr$ Mg^{-1} DM harvested product

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INDICATOR NAME: Land sharing/habitat provision
THEME: Ecosystem impact
LINK: Production (En1)

DESCRIPTION

Land occupation for agriculture, as measured in the preceding metric, provides an important indication of pressure on natural habitats. However, agriculturally utilized land, such as extensive livestock grazing on low-input pastures, can support high nature value (Haddaway, Styles, and Pullin 2014). This metric therefore represents the extent to which land utilized for agricultural purposes is able to deliver a wider suite of ecosystem services (outside of food provisioning) – i.e. "land sharing".

METRICS

Determine the total area of the ecosystems used in the operations and directly affected by these operations. Determine the share of land or aquatic and marine habitat, where the structural diversity of habitats – aquatic and terrestrial – is at least as high as in natural ecosystems of the region. Structural diversity pertains to the vertical layering and horizontal heterogeneity of habitats at the patch and landscape levels (SAFA indicator E4.1.3, 2013).

RATINGS

High (+):	Structural diversity on the complete utilized and adjacent land is at least as high as in natural ecosystems of the same region. Polyculture is practiced both in land and in aquatic (i.e. multitrophic) operations.
Medium:	Different areas of land affected by relevant operations can be categorized as both High and Low.
Low (-):	All utilized and adjacent land/aquatic habitat is covered by monocultures with a single habitat layer and no substantial horizontal heterogeneity, although the landscape would be structurally diverse without human influence.

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INDICATOR NAME: Soil Organic Matter
THEME: Ecosystem impact
LINK: Production (En1)

DESCRIPTION

Soil organic matter (SOM) has been declining for decades on cropland soils across Europe, and has been proposed as a useful proxy indicator for soil quality (Mila, RomanyÃ, and Cowell 2007). SOM is closely related to biological activity, water retention and general fertility of cropland soils. However, SOM varies considerably depending on factors outside of farmer management practises, including climate and soil type. Here, we propose SOM concentration (FAO 2013) in the topsoil (0-10 cm) of fields producing the assessed crop as a metric of soil quality. This metric applies only to cropland soils, as grassland soils have higher SOM. Often, SOM is reported in terms of soil organic carbon (de Brogniez et al. 2015); typically, SOM is twice the mass of soil organic carbon (IPCC 2006a).

METRICS

SOM concentration, expressed as a percentage weight of dried soil, in soil samples taken from top 10 cm of topsoil.

RATINGS

Low (-):	<2% SOM content in top 10 cm of soil.
Medium:	2-4% SOM content in top 10 cm of soil.
High (+):	>4% SOM content in top 10 cm of soil.

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INDICATOR NAME: Electricity
SUB-THEME: Energy Efficiency
THEME: Energy
LINK: Processing (E2)

DESCRIPTION

Typically, the main direct source of energy consumed in crop processing is electricity. Generation of electricity using fossil fuels gives rise to GHG emissions and air pollution, whilst depleting finite fossil fuel reserves. Electricity consumption is usually measured at site level for billing purposes, but may be monitored at a smaller scale (building or process scale) in some cases. The metric proposed here is simply the quantity of electricity used to process one tonne (Mg) DM product. For sites processing just one main crop/commodity, total site-level electricity consumption over a given time period can simply be divided by output of processed product over that same time period. For sites processing multiple commodities, site level electricity consumption may be allocated across products based on weight (unless more accurate splits are possible based on known intensities of processing). Similarly, electricity consumption may be allocated across co-products based on e.g. relative mass, gross energy value or economic value (Finkbeiner et al. 2006). Note that product output (rather than throughput) excludes waste streams arising from production.

METRICS

Total electricity consumption, kWh Mg^{-1} DM product output (includes renewable electricity).

RATINGS

Scale: High (-); Medium; Low (+)

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INDICATOR NAME: Other fuels
SUB-THEME: Energy Efficiency
THEME: Energy
LINK: Processing (E2)

DESCRIPTION

In addition to electricity use, a considerable amount of energy may be required in the form of fuels for heating during crop/commodity processing – e.g. for drying, boiling, etc. A range of fuel types may be used, the most common being kerosene, natural gas and liquified petroleum gas (LPG). The efficiency metric here requires all fuels to be compared in terms of their lower heating value (LHV). The LHV of common fuel types can be found in (DEFRA 2019), and should be summed across all types of fuel consumed on site. Total fuel consumption, expressed as MJ LHV, may then be allocated to the main product output as described above for electricity consumption.

METRICS

Total fuel consumption, MJ / Mg^{-1} DM product output (includes renewable fuels such as biogas and wood pellets).

RATINGS

Scale: High (-); Medium; Low (+)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Renewable electricity**
SUB-THEME: Renewable Energy %
THEME: Energy
LINK: Processing (E2)

DESCRIPTION

The previous metric on total electricity consumption provides an indication of energy efficiency. The environmental impact generated by that electricity consumption is heavily dependent upon the type of electricity used. Fossil fuel electricity drives large environmental impact, whilst electricity generated from renewable sources such as wind, solar photovoltaic and hydro- drives much lower environmental impact. This metric therefore assesses the sustainability of the specific electricity supply. In order to avoid double-counting of renewable electricity generation in the grid mix, only onsite or dedicated additional renewable electricity generation is considered here, as per carbon footprint guidelines (BSI 2011). Thus, the purchase of renewable electricity from the grid does not count as dedicated renewable electricity in this metric.

METRICS

Percentage share of dedicated (non-grid) renewable electricity consumption in relation to total electricity consumption.

RATINGS

Share of dedicated renewable electricity consumption

Low (-):	<20%
Medium:	20-50%
High (+):	>50%

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Renewable other sources
SUB-THEME: Renewable Energy %
THEME: Energy
LINK: Processing (E2)

DESCRIPTION

As with electricity use, it is important to determine what proportion of other fuel use originates from more sustainable, renewable sources. These may include biogas and wood pellets. The proportion of these sources in the fuel mix can be calculated as a percentage based on MJ of LHV (DEFRA 2019).

METRICS

Percentage share of renewable fuels in relation to total (non-electricity) onsite fuel consumption.

RATINGS

Share of onsite fuel consumption that is renewable.

Low (-): <20%

Medium: 20-50%

High (+): >50%

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: GHG Balance
SUB-THEME: Atmosphere emissions
THEME: Energy
LINK: Processing (En2)

DESCRIPTION

The significant energy inputs required for processing often give rise to GHG emissions via use of fossil fuels as energy carriers. For example, the generation of electricity used in processing, or the direct combustion of natural gas or oil in boilers to generate heat onsite. These emissions are highly variable, depending on the source of energy and the quantities used, which depend on the type of food products being produced. In addition, leakage of refrigerants from cooling systems can contribute significantly to GHG emissions. Whilst the ideal metric for GHG emissions from processing would combine information on energy use and energy source to estimate total GHG emissions, these data are rarely available, and processing covers such as wide range of activities that it is impossible to propose universally applicable thresholds. Thus, a simplified approach is to use the main source of energy (accounting for than 50% of energy inputs) as a proxy for the GHG intensity of energy. Coal and oil are the most GHG-intensive energy sources per MJ, followed by gas, and then renewables as the least GHG-intensive sources of energy per MJ. The GHG intensity of electricity strongly depends on national grid profiles, but it reducing strongly across EU member states in line with various EU policies. Therefore, electricity is proposed as an intermediate GHG-intensive source of energy, unless it can be demonstrated that national grid average electricity generation in the relevant country where processing takes places is less than 0.3 kg CO2 eq. per kWh.

METRICS

Grids with low GHG generation would include France, Sweden, Norway, possibly also UK now, and some others

RATINGS

High: Most energy comes from coal and oil

Medium: Most energy comes from natural gas or electricity

Low: Most energy comes from renewable (or electricity is from a national grid with low GHG intensity generation)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Emission of Air Pollutants**
SUB-THEME: Atmosphere emissions
THEME: Energy
LINK: Processing (En2)

DESCRIPTION

Combustion of fuels onsite for heat is the main source of polluting emissions to air during processing. Emissions of particular concern regarding human health and ecosystem damage include nitrogen oxides (NOx), volatile organic compounds (VOCs) and particulate matter (PM). Solid fuels including coal and wood, and oil, are responsible for much higher emissions of these species than natural gas. If no solid or fossil fuels are combusted, then onsite emissions will be negligible. Use of renewable sources of heat, or use of electricity for heating., can avoid onsite emissions, but may incur upstream emissions. These are almost always much lower owing to better combustion control and abatement technologies for large-scale power generation compared with smaller boilers. Given that these emissions cannot be easily measured in small-scale processing factories, a simple indicator based on the type of fuel combusted onsite is proposed.

METRICS

Type of fuel combusted onsite for process heat.

RATINGS

High:	High-solid fuels or oil
Medium:	Gas
Low:	Non

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Food Loss and Waste Reduction**
THEME: Waste generation
LINK: Processing (En2)

DESCRIPTION

Loss of food through the processing value chain not only creates waste that needs to be managed, incurring environmental impact, but also generates wider environmental pressure by driving additional production to compensate for foregone useful output. A simple metric is proposed here, based on the percentage of commodity entering a processing chain, expressed on a dry matter basis, that exits the processing chain as (a) useful product(s).

METRICS

Percentage of dry matter entering processing chain that leaves the chain as (a) product(s) for onward transport to distribution for consumption.

RATINGS

Low (-): <80% inputs as products

Medium: 80-90% inputs as products

High (+): >90% inputs as products

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Waste Disposal**
THEME: Waste generation
LINK: Processing (En2)

DESCRIPTION

Some waste is inevitably generated during processing, and the way in which this waste is managed determines the environmental pollution associated with it, and the overall resource efficiency of the value chain. Organic waste arising from the processed commodity may be reused or recycled according to the following waste hierarchy (most efficient option first): animal feed, anaerobic digestion, composting (Tufvesson, Lantz, and Börjesson 2013). Packaging and other waste may be reused or recycled via e.g. return of pallets for reuse, separation and diversion of plastics, metals, paper, glass from residual waste streams into recycling streams. This metric reflects the percentage of waste generated, by mass, that enters a reuse or recycling stream rather than the residual waste stream.

METRICS

Percentage of total waste, by mass, that is separated and sent for reuse or recycling.

RATINGS

Percentage mass of total waste generated that is sent for reuse or recycling:

Low (-): <50% recycling

Medium: 50-80% recycling

High (+): >80% recycling

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Renewable and Recycled packaging**
THEME: Resource use
LINK: Processing (En2)

DESCRIPTION

Packaging is a significant source of waste and non-renewable material use within food value chains. Crucially, it is a major source of single-use plastic that is increasingly recognized for its contribution to littering and ecosystem pollution (Dris et al. 2015). The previous metric addresses the management of waste arising in the processing chain. Packaging waste usually arises at the consumption stage of the value chain, but is heavily influenced by the actions of processors and retailers who package products and specific packaging requirements, respectively. Therefore, this metric places an onus on processors to use renewable (e.g. bioplastic: Álvarez-Chávez et al. 2012) and recycled materials in their packaging. A subsequent metric, aimed at market actors who determine packaging specifications, relates to the quantity of packaging used.

METRICS

Percentage of packaging material, by mass, that is recycled or renewable material.

RATINGS

Percentage of packing by weight that is either renewable (e.g. paper, bioplastics) or recycled.

Low (-):	<50% renewable or recycled
Medium	50-80% renewable or recycled
High (+):	>80% renewable or recycled

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Ground and Surface Water Withdrawals
THEME: Resource use
LINK: Processing (En2)

DESCRIPTION

Processing foods involves use of water as an ingredient, for cooking, for rinsing produce and for general cleaning. Water may also be needed for cooling. The impact of water use is heavily dependent on where it is sourced from, whether or not it is returned to a nearby waterbody in a clean state, and how water stressed the local region is. An ideal indicator for water stress would be the Available Water Remaining method for water foot-printing (Boulay et al. 2018). However, this method involves a considerable amount of data and effort. Therefore, a simple metric of total water used for processing divided by the tonnes of product produced is proposed.

METRICS

M3/tonne of product

RATINGS

High (-):

Medium:

Low (+):

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Transport intensity**
THEME: Transport and Distribution
LINK: Transport and Distribution (En3)

DESCRIPTION

Whilst there has been a lot of focus on "food miles" as a proxy for the environmental footprint of consumed food, it has been shown that transport typically accounts for a small share of the carbon footprint of many food products (Edwards-Jones et al. 2008). The distance travelled is therefore not a useful indicator of sustainability, given that e.g. tomatoes imported to the UK in winter have a lower environmental footprint than tomatoes grown in heated greenhouses in the UK (Antonopoulos et al. 2014). The mode of transport strongly influences environmental impact, with air freight generating up to 500 times more CO_2 eq. per tonne.km travelled than ocean transport over long distances (DEFRA 2019). Therefore, we propose mode of transport, and local vs global transport, as two important components of environmental sustainability (local supply chains within Europe are likely to be subject to higher levels of environmental regulation than global supply chains). Where products comprise multiple ingredients, this metric relates to the most environmentally intensive mode across any of the ingredients accounting for more than 10% by mass of the final product(s).

METRICS

Highest intensity scale and mode of transport applicable to any ingredient accounting for >10% by mass of final product(s)

RATINGS

Low (-):	Global airfreight
Medium/low:	Global ocean
Medium/high:	Within EU transport
High (+):	Local (+)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Atmosphere emissions
THEME: Transport and Distribution
LINK: Transport and Distribution (En3)

DESCRIPTION

The mode of transport can have a very significant influence on GHG and related air pollutant emissions. GHG emissions from transport can be estimated based on the main mode(s) and distances of transport for each tonne of product (or preceding ingredient). The aforementioned databases for LCA (Wernet et al., 2016) and carbon factors for company reporting (DEFRA, 2019) contain information on CO_2 intensities per tonne-km for various transport modes. Therefore, users can sum distances travelled by different transport modes multiplied by respective CO_2 intensities.

METRICS

Kg CO_2e/t product dry matter (DM). Here is a link to the calculation tool (GHG Emissions from Transport or Mobile Sourcesand) and the DEFRA (2019)

RATINGS

High (-):	>100 kg CO_2e/t DM
Medium:	20-100 kg CO_2e/t DM
Low (+):	<20kg CO_2e/t DM

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Loss of products
THEME: Transport and Distribution
LINK: Transport and Distribution (En3)

DESCRIPTION

A significant proportion of some perishable products may deteriorate during transport, leading to wastage. As with processing waste, this has downstream environmental implications in terms of waste management and upstream environmental implications in terms of additional (excess) production requirement. This metric represents the proportion of product that enters the transport and distribution stage of the value chain that is lost as waste – i.e. that is not successfully conveyed as product to the next (market) stage of the value chain.

METRICS

Percentage, by weight, of product transported that is lost from the value chain as waste

RATINGS

Low (-):	>5% loss (-)
Medium:	2-5% loss
High (+):	<2% loss (+)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Food Loss and Waste Reduction**
THEME: Waste
LINK: Markets and Retailers (En4)

DESCRIPTION

Loss of food through the retail and market stage of the value chain not only creates waste that needs to be managed, incurring environmental impact, but also generates wider environmental pressure by driving additional production to compensate for foregone useful output. A simple metric is proposed here, based on the percentage of food stuffs purchased by retailers, expressed on a dry matter basis, that does not reach the consumer (via sales or donation to food banks).

METRICS

Percentage of food by weight purchased by the retailer that does not reach the consumer, but is instead disposed of as waste.

RATINGS

Low (-):	>5% food disposed of as waste
Medium:	2-5% food disposed of as waste
High (+):	<2% food disposed of as waste

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Waste Disposal**
THEME: Waste
LINK: Markets and Retailers (En4)

DESCRIPTION

The way in which retail and market waste is managed determines the environmental pollution associated with it, and the overall resource efficiency of the value chain. Organic waste may be reused or recycled according to the following waste hierarchy (most efficient option first): animal feed, anaerobic digestion, composting (Tufvesson, Lantz, and Börjesson 2013). Packaging and other waste may be reused or recycled via e.g. return of pallets for reuse, separation and diversion of plastics, metals, paper, glass from residual waste streams into recycling streams. This metric reflects the percentage of waste generated, by mass, that enters a reuse or recycling stream rather than the residual waste stream.

METRICS

Percentage of waste, by mass, that is sent for reuse or recycling.

RATINGS

Percentage mass of total waste generated that is sent for reuse or recycling:

Low (-): <50% recycling

Medium: 50-80% recycling

High (+): >80% recycling

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Energy Efficiency
THEME: Energy
LINK: Markets and Retailers (En4)

DESCRIPTION

Wholesalers and retailers consume a considerable amount of energy across store lighting, heating ventilation and air conditioning and chilling or freezing food stuffs (Schoenberger, Galvez-Martos, and Styles 2013). Energy consumption for wholesale and retail of food stuffs is strongly related to the storage and display temperature, with substantial amounts of energy required for chilling and freezing (Galvez-Martos, Styles, and Schoenberger 2013). It can be difficult to isolate the specific energy consumption required for this purpose from other forms of onsite energy demand at storage and sales outlets. Therefore, this metric relates the intensity of energy demand to the type of storage and display.

METRICS

Category of storage/display.

RATINGS

The type of food storage and display:

Low (-):	Frozen
Medium:	Refrigeration
High (+):	Ambient

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Renewable Energy %**
THEME: Energy
LINK: Markets and Retailers (En4)

DESCRIPTION

The main form of energy used in the retail sector is electricity (Galvez-Martos, Styles, and Schoenberger 2013). Therefore, the share of electricity generated from dedicated additional renewable sources is the principle metric proposed here, and follows the same calculation as described for Renewable Electricity in the processing stage.

METRICS

Percentage of total electricity consumption that is met by electricity generated from dedicated additional renewable sources (e.g. onsite renewable sources not counted in the grid mix).

RATINGS

Scale:

Low: <20% (-)

Medium: 20-50%;

High: >50% (+)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Emission of Air Pollutants
THEME: Energy
LINK: Markets and Retailers (En4)

DESCRIPTION

Combustion of fuels onsite for heat is the main source of polluting emissions to air from the retail and market stage of the value chain. Emissions of particular concern regarding human health and ecosystem damage include nitrogen oxides (NOx), volatile organic compounds (VOCs) and particulate matter (PM). Solid fuels including coal and wood, and oil, are responsible for much higher emissions of these species than natural gas. If no solid or fossil fuels are combusted, then onsite emissions will be negligible. Use of renewable sources of heat, or use of electricity for heating., can avoid onsite emissions, but may incur upstream emissions. These are almost always much lower owing to better combustion control and abatement technologies for large-scale power generation compared with smaller boilers. Given that these emissions cannot be easily measured in small-scale processing factories, a simple indicator based on the type of fuel combusted onsite is proposed.

METRICS

Main fuel types combusted onsite.

RATINGS

Low:	Oil, solid fuel combustion
Medium:	Gas combustion
High:	No on site combustion

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Renewable and Recycled Materials**
THEME: Resource use
LINK: Markets and Retailers (En4)

DESCRIPTION

Retailers have a strong influence on product and packaging specification. Therefore, the metric for renewable and recyclable materials used in packaging specified in the processing stage is also included here.

METRICS

As per processing sector.

RATINGS

Scale:

Low: <50% renewable recycled (-)

Medium: 50-80% renewable recycled

High: >80% renewable recycled (+)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Packaging specification
THEME: Resource use
LINK: Markets and Retailers (En4)

DESCRIPTION

To reflect the strong influence of retailers on packaging specification during process and also final display, this metric assesses the amount of packaging on final marketed products. A simplified approach is taken where the number of layers of packaging on the displayed product represent packaging intensity. For example, fruit and vegetables displayed loose on shelves would be associated with no layers of packaging.

METRICS

Number of layers of packaging of displayed products.

RATINGS

Low (-):	More than one layer (-)
Medium:	One layer
High (+):	No packaging

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Food Loss and Waste Reduction**
THEME: Waste
LINK: Consumer (En5)

DESCRIPTION

In industrialized countries, the majority of the circa 40% of food that is wasted arises at the final consumer stage of the food value chain. The metric proposed here is a simple percentage of food, by weight, that is not consumed but ends up being discarded.

METRICS

Percentage of food not consumed but discarded.

RATINGS

Low (-):	>25% product wasted
Medium:	10-25% product wasted
High (+):	<10% product wasted

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Waste Disposal**
THEME: Waste
LINK: Consumer (En5)

DESCRIPTION

Some waste is inevitably generated during processing, and the way in which this waste is managed determines the environmental pollution associated with it, and the overall resource efficiency of the value chain. Organic waste arising from the processed commodity may be reused or recycled according to the following waste hierarchy (most efficient option first): animal feed, anaerobic digestion, composting (Tufvesson, Lantz, and Börjesson 2013). Packaging and other waste may be reused or recycled via e.g. return of pallets for reuse, separation and diversion of plastics, metals, paper, glass from residual waste streams into recycling streams. This metric reflects the percentage of waste generated, by mass, that enters a reuse or recycling stream rather than the residual waste stream.

METRICS

Percentage of waste, by mass, that is sent for reuse or recycling.

RATINGS

Percentage mass of total waste generated that is sent for reuse or recycling:

Low (-): <50% waste recycled

Medium: 50-80% waste recycled

High (+): >80% waste recycled

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Cooking intensity
THEME: Energy
LINK: Consumers (En5)

DESCRIPTION

Large quantities of energy may be consumed at the final step of food preparation, especially for cooking. Based on the cooking duration and energy intensities of different cooking methods (Hager and Morawicki 2013), we propose a metric based on the type of cooking (if any) required.

METRICS

Type of cooking required.

RATINGS

Low (-):	Pot boiling
Medium-low:	Oven baking
Medium-high:	Pan
High (+):	No cooking

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Renewable Energy %**
THEME: Energy
LINK: Consumer (En5)

DESCRIPTION

Consumers use electricity for cooling food and for cooking, alongside natural gas which is also commonly used for cooking. The share of electricity (or gas) generated from dedicated additional renewable sources is the principle metric proposed here. It is unlikely that consumers have a source of biogas, so the majority of renewable energy will be in the form of electricity. This could be sourced from e.g. onsite solar photovoltaic panels or micro wind turbines. As described for Renewable Electricity in the processing stage, the renewable electricity must be additional to that already installed and accounted for in the grid mix.

METRICS

Percentage of energy used for food storage and preparation that originates from dedicated additional (e.g. onsite) renewable sources.

RATINGS

Scale:

Low: <20% (-) renewable

Medium: 20-50% renewable

High: >50% (+) renewable

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Water use**
THEME: Water use
LINK: Consumers (En5)

DESCRIPTION

Domestic and commercial kitchens are a significant source of potable water use. Water use during food consumption is driven by food preparation, cooking and cleaning cooking equipment and dishes (Styles, Schoenberger, and Galvez-Martos 2015). The main differentiating factor across different types of food will be food preparation and cooking. Therefore, this metric combines "hotspot" processes for those steps to generate rankings of performance.

METRICS

Type of food preparation and cooking required.

RATINGS

Use of water for:

High (-): Cleaning /soaking and boiling

Medium: Cleaning / soaking or boiling

Low (+): No cleaning/soaking nor boiling required

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TRansition paths to sUstainable legume-based systems in Europe

DESCRIPTION AND METRICS OF SOCIAL THEMES AND SUBTHEMES

PRODUCTION (En1)

The environmental pillar of the Production node is separated into Abiotic effects and Ecosystem impacts.

THEME: En1.1 Abiotic
NODE: Production (En1)

DESCRIPTION

Abiotic effects relate to the consumption of resources, such as fertilisers and fossil fuels, and associated emissions to the air and water. Thus, three sub-themes are classified below Abiotic effects: Atmosphere emissions; Emissions of water pollutants; Resource depletion.

RATINGS

Scale: Low (-); Medium; High (+)

SUB-THEME: En1.1.1 Atmosphere emissions
THEME: Abiotic (En1.1)
NODE: Production (En1)

DESCRIPTION

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Within the Abiotic theme, the Atmosphere emissions subtheme comprises the major emissions to air that drive two major environmental impacts: climate change, represented by the GHG balance indicator, and air pollution, represented by the Emissions of air pollutants indicator. The GHG balance can represent carbon offset via sequestration, whilst the Emissions of air pollutants is dominated by a few gases but represents a wide range of associated human health and ecosystem damage impacts.

RATINGS

Scale: High (-); Medium; Low (+)

SUB-THEME: **En1.1.2 Emission of Water Pollutants**
THEME: Abiotic (En1.1)
NODE: Production (En1)

DESCRIPTION

The Emissions of water pollutants theme represents the primary drivers of environmental water quality impact associated with agriculture, namely losses of nutrients that cause nutrient enrichment (eutrophication) and associated loss of biodiversity within water bodies. This subtheme is represented by two indicators: P balance and N Balance. Although not directly representing losses to water, they are easy to calculate metrics that correlate strongly with risk of nutrient loss to water.

RATINGS

Scale: High (-); Medium; Low (+)

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TRansition paths to sUstainable legume-based systems in Europe

SUB-THEME: **En1.1.3 Resource depletion**
THEME: Abiotic (En1.1)
NODE: Production (En1)

DESCRIPTION

The Resource depletion subtheme within the Abiotic theme represents the primary non-renewable inputs to agricultural production systems, primarily fertilisers and fossil energy. This subtheme is represented by two further subthemes: Resource use and Energy efficiency.

RATINGS

Scale: High (-); Medium; Low (+)

SUB-SUB-THEME: **En1.1.3.1 Resource use**
SUB-THEME: En1.1.3 Resource depletion
THEME: Abiotic (En1.1)
NODE: Production (En1)

DESCRIPTION

The Resource use subtheme within the Resource depletion subtheme represents the non-energy inputs to agricultural production, primarily fertilisers and irrigation water. Although water is a renewable resource, it is often extracted from groundwater at rates in exceedance of natural recharge rates; therefore, use of groundwater for irrigation can represent unsustainable use of this renewable resource. Resource use is represented by the Synthetic fertilisers subtheme, and the Ground and Surface water withdrawals indicator.

RATINGS

Scale: High (-); Medium; Low (+)

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SUB-SUB-SUB-THEME: **En1.1.3.1.1 Syn Fertilisers**
SUB-SUB-THEME: En1.1.3.1 Resource use
SUB-THEME: En1.1.3 Resource depletion
THEME: Abiotic (En1.1)
NODE: Production (En1)

DESCRIPTION

The Synthetic fertilisers sub-sub-sub theme represents use of finite resources and fossil energy to produce non-renewable fertilisers, including N fertilisers produced using large amounts of fossil fuel and P fertilisers produced from finite phosphate rock. This subtheme has two simple indicators: Synthetic P fertilisers and Synthetic N fertilisers.

RATINGS

Scale: High (-); Medium; Low (+)

SUB-SUB-THEME: **En1.1.3.2 Energy Efficiency**
SUB-THEME: En1.1.3 Resource depletion
THEME: Abiotic (En1.1)
NODE: Production (En1)

DESCRIPTION

The Energy efficiency subtheme with the Resource depletion subtheme represents the main measurable processes responsible for most energy consumption within agricultural production, both directly and indirectly. The subtheme is represented by two indicators: Synthetic N fertilisers and Diesel consumption. The Synthetic N fertilisers indicators is repeated from the Synthetic fertilisers subtheme, because it represents multiple environmental impacts. In this case, synthetic N fertiliser is the major (indirect) driver of fossil energy consumption in cropping systems.

RATINGS

Scale: Low (-); Medium; High (+)

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TRansition paths to sUstainable legume-based systems in Europe

THEME: En1.2 Ecosystem impact
NODE: Production (En1)

DESCRIPTION

Ecosystem impacts relate to wider land management and land degradation associated with agricultural production. These effects are less easy to quantify than Abiotic depletion, and are represented by three broad indicators: land use; Land sharing/habitat provision; Soil organic matter.

RATINGS

Scale: High (-); Medium; Low (+)

PROCESSING (En2)

The main environmental themes within the Processing node are Energy, Waste generation and Resource use.

THEME: En2.1 Energy
NODE: Processing (En2)

DESCRIPTION

Energy use is a major driver of environmental impact from food processing operations. This theme represents the amount of energy used, the source of that energy, and the air emissions impacts associated with the energy. Energy use is represented by three subthemes: Energy efficiency; Renewable energy; Atmosphere emissions.

RATINGS

Scale: High (-); Medium; Low (+)

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TRansition paths to sUstainable legume-based systems in Europe

SUB-THEME: **En2.1.1 Energy Efficiency**
THEME: Energy (En2.1)
NODE: Processing (E2)

DESCRIPTION

Within the Energy theme, the Energy efficiency subtheme represents the amount of energy that is required to process food products. It is represented by two indicators for the major types of energy consumed: Electricity, and Other fuels.

RATINGS

Scale: Low (-); Medium; High (+)

SUB-THEME: **En2.1.2 Renewable Energy %**
THEME: Energy (En2.1)
NODE: Processing (E2)

DESCRIPTION

The Renewable energy subtheme quantifies the share of total energy consumption that is provided from additional renewable resources. Thus, after being assessed on their efficiency in the use of energy, processors are then assessed in relation to how sustainably that energy is produced. As with the Energy subtheme, indicators are divided by energy source: Electricity, and Other fuels.

RATINGS

Scale: Low (-); Medium; High (+)

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SUB-THEME: En2.1.3 Atmosphere emissions
THEME: Energy (En2.1)
NODE: Processing (E2)

DESCRIPTION

Energy use is a major driver of GHG and air pollutant emissions. The Atmosphere emissions subtheme therefore represents the contribution of energy use to emissions that drive climate change and, via air pollution, health and ecosystem damage. This subtheme is represented by two indicators: GHG balance, and Emission of air pollutants.

RATINGS

Scale: High (-); Medium; Low (+)

THEME: En2.2 Waste generation
NODE: Processing (En2)

DESCRIPTION

Waste generation is another important environmental aspect of food processing. A significant share of commodity ingredients, and associated packaging, may be disposed of during processing. This subtheme is represented by two indicators that reflect the amount of waste generated, and the management of that waste: Food loss and waste reduction, and Waste disposal.

RATINGS

Scale: High (-); Medium; Low (+)

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TRansition paths to sUstainable legume-based systems in Europe

THEME: En2.3 Resource use
NODE: Processing (En2)

DESCRIPTION

Resource use relates to the use of non-energy resources captured under the Energy subtheme. For processing, these mainly comprise non-renewable packaging materials and water used for processing and cleaning operations. This subtheme is represented by the following two indicators: Renewable and recycled packaging, and Ground and surface water withdrawals.

RATINGS

Scale: High (-); Medium; Low (+)

TRANSPORT AND DISTRIBUTION (En3)

There are no main environmental themes within the Transport and Distribution node.

THEME: Transport and Distribution (En3)
NODE: Transport and Distribution (En3)

RATINGS

Scale: Low (-); Medium; High (+)

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TRansition paths to sUstainable legume-based systems in Europe

MARKETS AND RETAILERS (En4)

As with the processing node, environmental aspects pertinent to the markets & retailers node are covered by three themes: Waste, Energy & Resource use.

THEME: **En4.1 Waste**
NODE: Markets and Retailers (En4)

DESCRIPTION

The Waste theme represents the proportion of food purchased by retailed that does not end up with consumers, and the management of that waste. It is represented by two indicators: Food loss and waste reduction, and Waste disposal.

RATINGS

Scale: High (-); Medium; Low (+)

THEME: **En4.2 Energy**
NODE: Markets and Retailers (En4)

DESCRIPTION

The Energy theme represents the main environmental aspects that can be readily documented and over which retailers have a high degree of control in relation to the source of energy and the associated emissions to air. Thus, this theme is represented by two indicators: Renewable energy, and Emission of air pollutants.

RATINGS

Scale: High (-); Medium; Low (+)

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TRansition paths to sUstainable legume-based systems in Europe

THEME: En4.3 Resource use
NODE: Markets and Retailers (En4)

DESCRIPTION

The Resource use theme represents the aspects of resource use over which retailers have direct control, outside of energy resources which are represented in the Energy theme. This theme primarily addresses resources used by retailers, or specified by retailers, for packaging. The theme is represented by two indicators that reflect the pathways of influence that retailers have on direct operations and via specifications provided to suppliers: Renewable and recycled materials, and packaging specification.

RATINGS

Scale: High (-); Medium; Low (+)

CONSUMERS (En5)

Consumers at the end of the value chain play an important role in driving demand, generating waste and using energy and water during food storage and preparation. This node is therefore represented by two themes, Waste and Energy, and one direct indicator, Water use.

THEME: En5.1 Waste
NODE: Consumers (En5)

DESCRIPTION

The Waste theme represents first the proportion of purchased food that is not consumed, but instead discarded, and secondly the management of that discarded food waste. This theme indicates pressure on food production, through demand increases linked with waste, in addition to pressure on waste management systems. It is therefore an important theme within the overall value chain, and is represented by two indicators: Food loss and waste reduction, and Waste disposal.

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TRansition paths to sUstainable legume-based systems in Europe

RATINGS

Scale: High (-); Medium; Low (+)

THEME: En5.2 Energy
NODE: Consumers (En5)

DESCRIPTION

The Energy theme is less important than the waste theme in terms of overall value chain environmental impact, and is more difficult to quantify owing to lack of submetering (smart meters) of energy consumption in most homes. However, it is represented by two indicators that are easy to quantify and that give a good indication of the amount of energy required, and the environmental intensity of the source of that energy: Cooking intensity, and Renewable energy %.

RATINGS

Scale: High (-); Medium; Low (+)

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Economic Pillar

Description and metrics of indicators

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Indicator Structure and Theme ratings for the Economic sustainability pillars

PRODUCTION(E1) Scale: Low(-); Medium; High(+)		
THEME	**SUB-THEME**	**INDICATOR**
Economic Behavior Scale: Weak(-); Medium; Strong(+)	Snapshot Scale: Low(-); Medium; High(+)	Net Income
		Safety Nets
		Full Cost Accounting
	Planning and Forecasting Scale: Low(-); Medium; High(+)	Internal Investment
		Long Term Profitability
		Sustainability Management Plan
Vulnerability Scale: Weak(-); Medium; Strong(+)	Relationship with suppliers Scale: Weak(-); Medium; Strong(+)	Stability of Supplier Relationships
		Dependence on the Leading Supplier
	Market Scale: Weak(-); Medium; Strong(+)	Stability of Market
		Price Determination
		Product Diversification
Welfare Scale: Low(-); Medium; High(+)	Quality and Safety Scale: Low(-); Medium; High(+)	Control Measures
		Food Quality
		Certified Production
	Value added to Community Scale: Low(-); Medium; High(+)	Regional Workforce
		Local Procurement
	Footprint Scale: Low(-); Medium; High(+)	Food Loss and Waste Reduction
		GHG Reduction Target
		Land Use and Land Cover Change

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PROCESSING (E2) Scale: Low(-); Medium; High(+)		
THEME	**SUB-THEME**	**INDICATOR**
Economic Behavior Scale: Weak(-); Medium; Strong(+)	Snapshot Scale: Low(-); Medium; High(+)	Net Income
		Cost of Production
		Safety Nets
	Planning and Forecasting Scale: Low(-); Medium; High(+)	Internal Investment
		Long Term Profitability
		Sustainability Management Plan
	Net Trade	
Vulnerability Scale: Weak(-); Medium; Strong(+)	Market Scale: Weak(-); Medium; Strong(+)	Stability of Market
		Guarantee of Product level
		Product Diversification
	Supplier Scale: Weak(-); Medium; Strong(+)	Stability of Supplier Relationships
		Dependence on the Leading Supplier
		Guarantee of Supply Level
Welfare Scale: Low(-); Medium; High(+)	Quality and Safety Scale: Low(-); Medium; High(+)	Control Measures
		Food Quality
		Certified Production
	Labelling Scale: Absence(-); Presence(+)	Product Labelling
		Traceability System
	Value added to Community Scale: Low(-); Medium; High(+)	Regional Workforce
		Local Procurement

TRANSPORT AND DISTRIBUTION (E_3) Scale: Low(-); Medium; High(+)		
THEME	**SUB-THEME**	**INDICATOR**
Economic Behavior Scale: Weak(-); Medium; Strong(+)		Net Income
		Safety Nets
		Internal Investment
Externalities Scale: Weak(-); Medium; Strong(+)	Control Measures	
	Footprint Scale: Low(-); Medium; High(+)	GHG Reduction Target
		Food Loss

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MARKETS AND RETAILERS (E4) Scale: Low(-); Medium; High(+)		
THEME	**SUB-THEME**	**INDICATOR**
Economic Behavior Scale: Weak(-); Medium; Strong(+)	Snapshot Scale: Low(-); Medium; High(+)	Net Income
		Safety Nets
		Cost of Marketing and Storage
	Planning and Forecasting Scale: Low(-); Medium; High(+)	Internal Investment
		Long Term Profitability
		Sustainability Management Plan
	Net Trade	
Vulnerability Scale: Weak(-); Medium; Strong(+)	Consumer Scale: Weak(-); Medium; Strong(+)	Stability of Consumer Demand
		Product Diversification
		Guarantee of Product Level
	Supplier Scale: Weak(-); Medium; Strong(+)	Stability of Supplier Relationships
		Dependence on the Leading Supplier
		Guarantee of Supply Level
Welfare Scale: Low(-); Medium; High(+)	Quality and Safety Scale: Low(-); Medium; High(+)	Control Measures
		Food Quality
		Certified Production
	Labelling Scale: Absence(-); Presence(+)	Product Labelling
		Traceability System
	Value added to Community Scale: Low(-); Medium; High(+)	Regional Workforce
		Local Procurement
		Food Redistribution Scheme(Including waste management)

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CONSUMERS (E5) Scale: Low(-); Medium; High(+)			
THEME	**Sub-theme**	**Sub-sub theme**	**INDICATOR**
Economic Aspect of Behavior Scale: Weak(-); Medium; Strong(+)	Price and Availability Scale: Low(-); Medium; High(+)	Price Scale: Low(-); Medium; High(+)	Price of Food
			Price Promotion
		Food Expenditure	
		Availability of Products	
	Willingness to Pay Scale: Low(-); Medium; High(+)		Willingness to Pay for Healthy Products
			Willingness to Pay For Convenience
			Willingness to Pay For Environmental Friendly Products
	Vulnerability Scale: Low(-); Medium; High(+)		Food Scarcity*(quality and quantity)
			Financial Vulnerability
Social Aspect of Behavior Scale: Weak(-); Medium; Strong(+)	Product Information *(Labelling and other Information)		
	Education and Information		
	Culture		
Policy Scale: Weak(-); Medium; Strong(+)	Taxes and Bans		
	Educational Campaigns		
	Income support Policies		

Table of Indicators for the Economic sustainability pillars

LEGEND:	
E	Economic Pillar for the Agri-food Chain
1	Production link
2	Processing link
3	Transport and Distribution link
4	Markets and Retailers link
5	Consumers link

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DESCRIPTION AND METRICS OF ECONOMIC INDICATORS

INDICATOR NAME: Net Income
SUB-THEME: Snapshot
THEME: Economic Behaviour
LINK: Production (E1)

DESCRIPTION

It is a measure of financial sustainability over a period of time (for instance last five years). It indicates the financial status of a firm hence is used most frequently by the producers (or processors, retailers, transporters etc.) to determine their financial status.

METRICS

It is measured as total revenues from production or services provided minus costs and expenses incurred to produce or provide services. High - If the income is greater than 0 for more than 2 years. Medium – if the income is greater than 0 for 2 consecutive years and Low- if the income is less than 0.

RATINGS

Scale: Low (-); Medium; High (+)

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INDICATOR NAME: Safety Nets
SUB-THEME: Snapshot
THEME: Economic Behaviour
LINK: Production (E1)

DESCRIPTION

Safety nets are financial mechanisms put in place to provide support in times of financial hardship. This indicator measures whether the firm has access to such a financial support or not to mitigate short term cash flow. It could be an access to bank loans, credits, private funds, financial support or even own savings put aside for future need. Examples of safety net measures are the Financial Instruments (FIs) which were first introduced in the 2000-2006 EU Rural Development Programme (RDP) (EU,2017) to correct market failures/imperfections that give rise to an insufficient funding of areas perceived as too risky by the private sectors and crop insurance policies (USDA, 2011).

METRICS

Yes - Presence of a sufficient number of such instruments capable of maintaining the firm's capital flow;

No – Absence of such instrument.

RATINGS

Scale: No (-); Yes (+)

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INDICATOR NAME: Full Cost Accounting
SUB-THEME: Snapshot
THEME: Economic Behaviour
LINK: Production (E1)

DESCRIPTION

This indicator includes financial, social and environment measures. It includes financial performance of the firm alongside the social and environment impacts of its products and activities. As sustainable production is getting more importance in recent years, more and more firms will be required to include full cost accounting in their management plans. Using a Life Cycle Analysis (LCA) in alongside economic analysis of products and its distribution to the market is one such example of full cost accounting.

METRICS

A firm's records and analysis of its economic, social and environment performance and impacts.

Yes – if such records are kept

No – if the firm does not keep such record.

RATINGS

Scale: No (-); Yes (+)

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INDICATOR NAME: Internal Investment
SUB-THEME: Planning and Forecasting
THEME: Economic Behaviour
LINK: Production (E1)

DESCRIPTION

Regular investment over a period of time is required to sustain productivity and make progress. The level of investment over time is the measure to determine this indicator. Without proper investment, it is less probable that an enterprise could make significant progress (SAFA, 2013). Investments in monitoring performance and efficient machineries to improve productivity can be considered as examples of this indicator.

METRICS

This measures the extent to which the firm has invested over last few years (eg., five years) to improve firm's performance. High – if the firm has regularly invested multiple times over last five years. Medium – if the firm has invested once over last five years. Low – if the firm has not invested over last five years.

RATINGS

Scale: Low (-); Medium; High (+)

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INDICATOR NAME: Long Term Profitability
SUB-THEME: Planning and Forecasting
THEME: Economic Behaviour
LINK: Production (E1)

DESCRIPTION

This indicator implies the long term financial sustainability of the firm. It measures long term investment and expected returns of profit over 5-10 year time period. A short term profitability does not guarantee a long term sustainability on an enterprise. Investing in upscaling the skills of employers and efficient machineries as well as access to resources and market to generate profits over a longer term will guarantee financial sustainability of an enterprise.

METRICS

Identifying investments on a firm that generates profits over a number of years. High – if multiple investments are made over a longer time (more than 5 years). Medium – if atleast one such investment is made. Low- if no such investments are made over at least last five years.

RATINGS

Scale: Low (-); Medium; High (+)

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INDICATOR NAME: Sustainability Management Plan
SUB-THEME: Planning and Forecasting
THEME: Economic Behaviour
LINK: Production (E1)

DESCRIPTION

Indicator Sustainability management plan identifies if a firm has adopted management plans to ensure financial (and social/environment) sustainability of the firm. The management plans include proper accounting and keeping records of resource allocations, waste disposals, recording outputs etc. A manager can then make decisions on management strategies to ensure sustainability of the firm.

METRICS

The indicator is measured by the presence of such plans (YES) or absence of such plans (NO)

RATINGS

Scale: No (-); Yes (+)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Stability of Supplier Relationships**
SUB-THEME: Relationship with suppliers
THEME: Vulnerability
LINK: Production (E1)

DESCRIPTION

The indicator assesses the stability of the relationships between a firm (farm) and its input suppliers. A pattern showing a stable trend without major fluctuations may lead to an improvement in the performance of business partners and contribute to minimise the vulnerability of the firm (farm) to unexpected changes to input procurement processes (FAO, 2013. SAFA Sustainability Assessment of Food and Agriculture systems indicators. http://www.fao.org/nr/sustainability/sustainability-assessments-safa). Stability of the relationships between the firm (farm) and its input suppliers is measured over medium to long term and applies to businesses of any size and at any supply chain stage.

METRICS

Share of ongoing supplier contracts during the past 5 years, or since creation of the enterprise if more recent than 5 years.

RATINGS

Scale: Low (-) 0%; Medium 50%; High (+) 100%

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Dependence on the Leading Supplier**
SUB-THEME: Relationship with suppliers
THEME: Vulnerability
LINK: Production (E1)

DESCRIPTION

The indicator assesses the type of relationship a firm (farm) has with their main supplier, which is determined by the relative reliance on a specific supplier for obtaining essential inputs. Lower reliance on any single supplier through diversification of supply structure reduces supply risk, creates benefits for the firm (farm) through competitive advantage of having a specialised range of suppliers, and may contribute to enhance business growth of any suppliers, however at times it may reduce access to economies of scale aspects of supplier contracts and thus a risk assessment analysis is recommended based on the specific circumstances of firms (farms) (FAO, 2013. SAFA Sustainability Assessment of Food and Agriculture systems indicators. http://www.fao.org/nr/sustainability/sustainability-assessments-safa). Dependence on the leading supplier is measured over medium to long term and applies to businesses of any size and at any supply chain stage.

METRICS

Share of the supply of inputs sourced from the main supplier.

RATINGS

Scale: Weak (25%); Medium (50%); Strong (100%)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Stability of Market
SUB-THEME: Market
THEME: Vulnerability
LINK: Production (E1)

DESCRIPTION

This indicator assesses the capacity of firms (farms) to understand and forecast market stability and accordingly plan and implement a marketing strategy that allows it to build stable marketing channels through which it can identify and finalise contracts with a diversified number of buyers at an appropriate time for the firm (farm) and perform contingency planning against market risk taking into consideration the specific circumstances of the firm (farm). (FAO, 2013. SAFA Sustainability Assessment of Food and Agriculture systems indicators. http://www.fao.org/nr/sustainability/sustainability-assessments-safa). Stability of market is measured over medium to long term and applies to businesses of any size and at any supply chain stage.

METRICS

The extent to which the firm (farm) has implemented the necessary mechanisms e.g. marketing strategy and contingency planning to build stable marketing channels.

RATINGS

Scale: Low (0%); Medium (50%); High (100%)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Price Determination
SUB-THEME: Market
THEME: Vulnerability
LINK: Production (E1)

DESCRIPTION

This indicator assesses the firm (farm)'s decision with regard to the target price for its products and services. This is based on production costs and market situation (competition and consumers), and impacts the revenue earned and profits generated. The difference between the selling price and the cost per unit of production depends on the perceived quality and availability of the product or service, and buyers' purchasing power. (FAO, 2013. SAFA Sustainability Assessment of Food and Agriculture systems indicators. http://www.fao.org/nr/sustainability/sustainability-assessments-safa). Price determination is measured over medium to long term and applies to businesses of any size and at any supply chain stage.

METRICS

The ability of the firm (farm) to negotiate with its buyers and determine a price that ensures the necessary profit margin.

RATINGS

Scale: No (-); Yes (+)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Product Diversification
SUB-THEME: Market
THEME: Vulnerability
LINK: Production (E1)

DESCRIPTION

This indicator assesses the capacity of the firm (farm) to diversity its range of products and services. Diversification may require investment in skilled labour and technology, and may lead to a lower environmental footprint, higher income through higher and/or diversified production and access to new markets, and lower production risk. Assessment of the capacity to invest and potential risks associated with business diversification/expansion is necessary and has to consider the specific circumstances of the firm (farm). (FAO, 2013. SAFA Sustainability Assessment of Food and Agriculture systems indicators. http://www.fao.org/nr/sustainability/sustainability-assessments-safa). Product diversification is measured over medium to long term and applies to businesses of any size and mostly at the production and processing stages of the supply chain.

METRICS

Extent to which the firm (farm) has the capacity to diversify e.g. increase its range of products and services.

RATINGS

Scale: High (100%); Medium (50%); Low (0%)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Control Measures**
SUB-THEME: *Quality and Safety*
THEME: Welfare
LINK: Production (E1)

DESCRIPTION

Control Measures refers to the actions that the enterprise can take to reduce the potential of exposure to food hazards, or to reduce the likelihood of the risk of exposure to the hazards being realized. This might include the following tasks: conduct a risk analysis to identify all possible hazards; identify any steps in the production process that are critical to the safety of food; implement effective procedures to ensure as appropriate food safety by eliminating or isolating hazards; conduct a monitoring and evaluation of these procedures to ensure their effectiveness to avoid any food contamination. Food contamination should be avoided; implementing control measures enables the enterprise to prevent and combat any situation that might lead to food contamination. Food safety has a direct impact on consumers' health, as well as on the employees that are in direct contact with the food ingredients. An integrated approach to ensure food safety requires a strong cooperation by the food industry and chain stakeholders in order to build consumers trust and confidence. The enterprise requires investing in education programmes, preventive measures and adoption of adequate practices. A food safety hazard is a biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect. Some examples include improper use of agricultural chemicals (i.e. insecticides, fungicides, herbicides, fertilizers), metal and rock fragments, the appearance of virus, bacteria and parasites and the use of genetically-modified organisms that have been proven to be harmful. (FAO, 2013. SAFA Sustainability Assessment of Food and Agriculture systems indicators). http://www.fao.org/nr/sustainability/sustainability-assessments-safa).

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TRansition paths to sUstainable legume-based systems in Europe

METRICS

This indicator measures whether the enterprise has food hazards and safety control measures in place that comply with correspondent regulations. For the measurement you should:

- Implement sound good agricultural and manufacturing practices.
- Review the policies and practices that have been implemented in terms of food quality and
- safety control in the production and processing department.
- Check whether there are mechanisms in effective operation to prevent and control food hazards and food contamination.
- When applicable, check whether the measures in place are updated and comply with correspondent regulations referred to food safety.

RATINGS

Scale: Absence (-); Presence (+)

Presence (+): There are mechanisms in effective operation that fully comply with correspondent regulations to prevent and control food hazards and food contamination; AND There are no records of food contamination incidents since the mechanisms are in place.

Absence (-): There are no mechanisms in place to prevent and control neither food hazards nor food contamination; OR There are records of food contamination incidents in the last five years.

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Food Quality**
SUB-THEME: *Quality and Safety*
THEME: Welfare
LINK: Production (E1)

DESCRIPTION

Food Quality refers to the set of rules defined to guarantee food quality and to meet the highest nutritional standards respective to the type of product. Quality standards are also important for forest products, including wood products and non-wood products. For storage and transportation, quality refers also to cleanliness and packing that guarantee quality assurance within the supply chain. Food standards are a body of rules or legislation defining certain criteria, such as composition, appearance, freshness, source, sanitation, purity, which food must fulfil to be suitable for distribution or sale. The enterprise implements quality control measures to ensure that the expected level of quality of the product and nutritional standards are met. Product quality is an important component to leverage the enterprise' market positioning and growth. Its competitive advantage lays predominately in two main factors: the quality of the product and its price. Achieving high-quality levels and the highest nutritional standards might benefit considerably the enterprise' business growth. Even though each product might require to meet specific nutritional standards, there are some that might be recommended across the food chain, for instance: level of calories based on the ranges defined by the Dietary Reference Intakes (DRIs), low content of saturated and trans fat, no added sugar, low content of additives, rich in fiber, minerals, vitamins and proteins. The national departments or ministries of health, education or agriculture tend to define and recommend specific nutritional standards for each product that the enterprise should know to ensure its compliance (Cardello, 1995; FAO, 2013).

METRICS

This indicator measures the share of the total volume of production that meets quality standards, that is the set of parameters describing internal (e.g. taste, maturity, nutritional content) and external (e.g. cleanliness, color, freshness, shape, presentation, packing) characteristics, which are necessary to ensure safety, transparency in trade and good eating quality. To measure food safety:

- Review the quality control report referred to the total volume of production for a given period.
- Check whether the quality control report observes the required standards, according to the
- norms that the product needs to meet.

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- Calculate the share of the volume of production that has successfully passed the quality control.

RATINGS

Scale: Low (-); Medium; High (+)

High (+):

- 100% of the volume of production has successfully passed the quality control that measures the required and highest nutritional standards the product needs to meet; AND
- The enterprise has advanced in adopting the best practices to produce food products that meet the highest nutritional standards considered for its target population; AND
- The respective staff is informed and trained in adopting the best practices to meet the expected food quality levels and the highest nutritional standards

Medium:

- One or two of the criteria mentioned above (under the "High (+)") is/are not satisfied.

Low (-)

- Any amount of the production has not passed the quality control that measures the required nutritional standards the product needs to meet; OR
- The enterprise has not implemented any step towards adopting best practices to produce food products that meet the highest nutritional standards and food quality levels.

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Certified Production**
SUB-THEME: *Quality and Safety*
THEME: Welfare
LINK: Production (E1)

DESCRIPTION

Certified production enables an enterprise to assure its customers of the sustainability of the entire supply chain. It is a growing field and is gaining credibility, as very large and powerful enterprises are subscribing to it, and investing in ensuring sustainable production across the supply chain. Increasingly, consumers are demanding certification, to the extent that certified agriculture products are increasing their market share at significant rates. Consumers are also becoming wary of self-certification schemes, where producers or marketers create independent "certification" by awarding themselves a brand which mimics independent certification. By contrast, certified sustainable production employs independent or collaborative verification systems, with transparent auditable protocols. Certified production might include organic standards, both third party and participatory guarantee systems, HACCP food safety systems, Fairtrade, Rainforest Alliance, Forest Stewardship Council, Marine Stewardship Council, Aquaculture Stewardship Council, or other voluntary sustainability standards. Certification standards, which are closely associated with large producers and marketers, are subject of some controversy, as to who's interests are given primacy in decisions taken (FAO, 2013; McGee, 2015).

METRICS

Using procurement, distribution and production records, there is need to establish:

- That all procurement, distribution and production is assessed as certified or not, and that this is regularly recorded.
- An assessment is in place for any non-certified procurement, distribution and production which details the problem with the procurement, reason for the decision, plan to remedy and date for review.
- The enterprise has evidence that it transparently reports to its stakeholders on its progress towards certified sustainability procurement, distribution and production.

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RATINGS

Scale: No (-); Yes (+)

Yes (+):

- The enterprise keeps a procurement record which identifies the certification status for all procurement, distribution and production; AND
- The enterprise is able to provide evidence of assessments for any non-certifiable procurement, distribution or production, and this assessment details the problem, reason for the decision, plan to remedy and date for review; AND
- The enterprise has evidence that it transparently reports its progress towards certified procurement, distribution and production to its stakeholders.

No (-)

- The enterprise has no records of certification of its procurement, distribution or production; OR
- The records of certified procurement, distribution or production are not independently verified or are self-awarded; OR
- The enterprise' claims to stakeholders of certified supply cannot be proven.

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Regional Workforce**
SUB-THEME: *Value added to Community*
THEME: Welfare
LINK: Production (E1)

DESCRIPTION

This indicator assesses the contribution of the enterprise to the local economy through employment of local labour directly involved with the community and micro-environment where the enterprise operates. This contributes to the sustainable development of the region through creation of an adaptable skilled labour force, support of employment progression and skills upgrading, improvement of local employment rates and development of local governance and capacity. Additionally, it may strengthen the business viability of the firm (farm). (FAO, 2013. SAFA Sustainability Assessment of Food and Agriculture systems indicators. http://www.fao.org/nr/sustainability/sustainability-assessments-safa). Regional workforce is measured over medium to long term and applies to businesses of any size and mostly at the production and processing stages of the supply chain.

METRICS

Extent to which the firm (farm) hires regional employees when similar skills, profile and conditions are offered in relation to other candidates to perform adequately the required duties and responsibilities.

RATINGS

Scale: Low (0%); Medium (under 50%); High (over 50%)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Local Procurement**
SUB-THEME: *Value added to Community*
THEME: Welfare
LINK: Production (E1)

DESCRIPTION

This indicator assesses the contribution of the enterprise to the local economy through procurement from local/regional suppliers. Procurement from local suppliers may contribute to make the local/regional economy more dynamic, encourage growth of stakeholders through integrating them in the supply chain, supporting their productivity and cost efficiency through provision of training, technology or financial resources, generate value through employment, and overall investment in the community and skills development. This may also lead to benefits for the firm (farm) with regard to the quality of the inputs used. (FAO, 2013. SAFA Sustainability Assessment of Food and Agriculture systems indicators. http://www.fao.org/nr/sustainability/sustainability-assessments-safa). Local procurement is measured over medium to long term and applies to businesses of any size and mostly at the production and processing stages of the supply chain.

METRICS

Extent to which the firm (farm) has purchased its inputs from local/regional suppliers when equal or similar conditions exist, in comparison to non-local suppliers.

RATINGS

Scale: Low (0%); Medium (under 50%); High (over 50%)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Food Loss and Waste Reduction**
SUB-THEME: *Footprint*
THEME: Welfare
LINK: Production (E1)

DESCRIPTION

This indicator assesses the extent to which the firm (farm) mitigates food losses and waste, whether has a clear strategy to identify where losses/waste occur, assess their magnitude, identify causes of loss/waste, identify potential mitigation measures and implements them in an efficient way considering the specific circumstances of the firm (farm). The losses and waste correspond to all stages of the supply chain, namely production (pre- and post-harvest), storage, transport and processing, to consumption. (FAO, 2013. SAFA Sustainability Assessment of Food and Agriculture systems indicators. http://www.fao.org/nr/sustainability/sustainability-assessments-safa). Food loss and waste reduction is measured over medium to long term and applies to businesses of any size and mostly at the production and processing stages of the supply chain.

METRICS

The capacity of the firm (farm) to mitigate food losses and waste in the firm's (farm) operations while optimising overall efficiency as regards planned quantities of by-products and food reaching the intended destinations i.e. passing to subsequent operational stages within the firm (farm) and respectively reaching the buyers e.g. processors, retailers, consumers.

RATINGS

Scale: Managed (loss/waste mitigation strategy implemented); Not managed (loss/waste mitigation strategy not implemented)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: GHG Reduction Target
SUB-THEME: *Footprint*
THEME: Welfare
LINK: Production (E1)

DESCRIPTION

This indicator assesses the extent to which the firm (farm) has a clear strategy to identify where emissions occur, assess their magnitude, identify causes, identify potential mitigation measures and capacity to implement them in an efficient way considering the specific circumstances of the firm (farm). The GHG emissions occur at all stages of the supply chain, namely production (pre- and post-harvest), storage, transport and processing, to consumption. (FAO, 2013. SAFA Sustainability Assessment of Food and Agriculture systems indicators. http://www.fao.org/nr/sustainability/sustainability-assessments-safa). GHG reduction target is measured over medium to long term and applies to businesses of any size and mostly at the production and processing stages of the supply chain.

METRICS

Implementation of a GHG emissions mitigation strategy at firm (farm) level.

RATINGS

Scale: Not achieved (GHG emissions mitigation strategy not implemented); Achieved (GHG emissions mitigation strategy implemented)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Land Use and Land Cover Change**
SUB-THEME: *Footprint*
THEME: Welfare
LINK: Production (E1)

DESCRIPTION

This indicator assesses the extent to which human activities cause modification of the Earth's terrestrial surface. Current Land Use and Land Cover Change rates and intensities have increased at unprecedented levels with corresponding impact on ecosystems. in the context of this indicator, land use refers to human activities stemming from agriculture, forestry, aquaculture and industrial activities that alter processes using land surfaces, whereas land cover refers to the physical and biological cover over the surface of land, including water, vegetation, bare soil, and/or artificial structures. (FAO, 2013. SAFA Sustainability Assessment of Food and Agriculture systems indicators. http://www.fao.org/nr/sustainability/sustainability-assessments-safa). Land Use and Land Cover Change is measured over medium to long term and applies to businesses of any size and mostly at the production and processing stages of the supply chain.

METRICS

Implementation of a strategy at firm (farm) level to minimise the footprint of its operations as regards land use and cover and avoid conversions from ecologically valuable to less valuable habitats caused by the enterprise's operations.

RATINGS

Scale: Not managed (no land use and cover change strategy in place); Managed (land use and cover change strategy in place)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727973

TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Cost of Production**
SUB-THEME: *Snapshot*
THEME: Economic Behaviour
LINK: Processing (E2)

DESCRIPTION

This indicator is used to determine profitability of the firm. Costs of production include all expenses incurred by an enterprise to produce a certain product. It consists of cost of raw inputs, labour, machinery and other costs such as fuel, electricity and administrative costs. An optimal cost structure of production is important for financial, environment and social sustainability of the firm.

METRICS

This indicator is determined by the firms efforts to register all costs of production systematically over a number of years. High – if the firm keeps records every year over a number of years. Medium – if the firm keeps records occasionally over the years. Low – if the firm does not register costs of production at all.

RATINGS

Scale: High (+); Medium; Low (-)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: ***Net Trade***
THEME: Economic Behaviour
LINK: Processing (E2)

DESCRIPTION

This indicator suggests the value of exported processed product to imported inputs over a number of years. This may not be true for small firms but for larger firms it is a good indicator to measure the financial sustainability of the firm.

METRICS

It is based on the value of exported product compared to the value of imported inputs for a firm over a number of years. High – if net trade is greater than zero over last five years. Medium – if the value is greater than zero for at least last 3 years. Low – if the firm has negative net trade for last 5 years.

RATINGS

Scale: Low (-); Medium; High (+)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Guarantee of Product level**
SUB-THEME: *Market*
THEME: Vulnerability
LINK: Processing (E2)

DESCRIPTION

This indicator assesses the extent to which the firm has in place the mechanisms required to ensure that its operations are sufficiently resilient to withstand environmental, social and economic shocks. These are mechanisms to minimise production related risks such as shortages or reduction in quality not corresponding to the standards agreed as part of business commitments. (FAO, 2013. SAFA Sustainability Assessment of Food and Agriculture systems indicators. http://www.fao.org/nr/sustainability/sustainability-assessments-safa). Guarantee of product level is measured over medium to long term and applies to businesses of any size and mostly at the production and processing stages of the supply chain.

METRICS

Implementation of mechanisms to prevent/mitigate disruptions to firm's operations that may affect planned quantity and quality of its products.

RATINGS

Scale: Low (0% no mechanisms in place); Medium (50% some mechanisms in place); High (100% mechanisms in place to cover any production related risks)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Guarantee of Supply Level
SUB-THEME: Supplier
THEME: Vulnerability
LINK: Processing (E2)

DESCRIPTION

This indicator assesses the extent to which the firm has in place the mechanisms required to ensure that contracts with its suppliers cover any potential risks linked to environmental, social and economic shocks that may affect the quantity or quality of its inputs. Additionally, the indicator should consider whether the firm has the capacity to efficiently and timely replace suppliers who cannot fulfil contractual obligations using its contacts with other potential suppliers.

These are mechanisms to minimise production related risks such as shortages or reduction in quality of its products due to inadequate supply of inputs. Guarantee of Supply Level is measured over medium to long term and applies to businesses of any size.

METRICS

Implementation of mechanisms to prevent/mitigate disruptions to firm's supply of inputs that may affect planned quantity and quality of its products.

RATINGS

Scale: Low (0% no mechanisms in place); Medium (50% some mechanisms in place); High (100% mechanisms in place to cover any input supply related risks)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Product Labelling**
SUB-THEME: Labelling
THEME: Welfare
LINK: Processing (E2)

DESCRIPTION

Product labelling is an essential part of transparent accountability to consumers. According to the Codex Alimentarius Commission (COD EX STAN 1-1985), "Labeling means any written, printed or graphic matter that is present on the label, accompanies the food, or is displayed near the food, including that for the purpose of promoting its sale or disposal." Information usually provides details on the content and composition of products but also particular aspects of the product, such as its origin, or its production method, including whether it has been produced using a certified organic production or other methods. Some foodstuffs, such as those containing genetically modified organisms or allergenic substances, especially foods intended for infants or even various beverages, are subject to specific regulations. Labelling may also identify value-based systems, such as whether goods have been produced using a certified fair trade system. Labelling of certain non-food products must also contain particular information such as toxicity, hazard and flammability, to guarantee their safe use and allow consumers to exercise real choice. In addition, the packaging of foodstuffs must adhere to production criteria to avoid contaminating food products with both food and nonfood contaminants. Labelling must be genuine, and in the best systems, this is independently verified, such as an organic certification or fair trade certificate. Therefore, labelling and claims vary from ethical and nutritional, through safety and production process characteristics and can include the mundane, such as origin through to whether the food is the result of genetic engineering. The standard is that labels must be clear, honest and verifiable (FAO, 2013; Boström et al., 2008).

METRICS

- For mandatory labeling as required in the country of sale, 100% of compliance is expected. However, where an enterprise markets to numerous jurisdictions, the highest standard required by any jurisdiction should be applied to all.
- Where an enterprise has adopted labeling and information beyond the minimum standard, this should be noted and again 100% compliance is expected, as anything less is worse than no labeling at all.
- Measurement:
  - All product labeling is audited against legally required code in the country in which it is sold.

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- All voluntary claims (e.g. fair trade, organic) are checked against the independent certifier statement.
- Where content and nutritional claims are made, these are routinely independently audited.
- Labeling codes used are included in the enterprise quality management documentation and any variance from the code is documented and reported internally.

RATINGS

Scale: Absence (-); Presence (+)

Presence (+): The enterprise fully complies with all relevant legally required labelling codes for its products. It seeks to go beyond minimum standards in providing consumer information, is responsive to its stakeholders and has an accessible system, whereby consumers and other stakeholders can obtain further product and product quality and safety information.

Absence (-):

- The enterprise has not complied with labeling codes and has sought to avoid the impact of these codes; OR
- Products are knowingly or regularly incorrectly labeled.

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Traceability System
SUB-THEME: Labelling
THEME: Welfare
LINK: Processing (E2)

DESCRIPTION

A traceability system is a series of mechanisms and procedures that ensure traceability over all stages of the food chain so that products can be easily and correctly identified and recalled. The Codex Alimentarius Commission (COD EX STAN 1-1985) defines traceability as "the ability to follow the movement of a food through specified stage(s) of production, processing and distribution". The "ability to follow the movement" refers to tracing both directions: trace forward in the food chain and trace backward in the food chain. Furthermore, "movement" can relate to the origin of the materials, processing history or distribution. Traceability systems could be composed of rules and documented procedures, organizational structures, processes and management resources (i.e. personnel, financial resources, equipment, information technologies), regulations and training. A traceability system can also use information system technologies for electronic data entry and database management systems. Traceability systems improve management of risks related to food safety, guarantees products authenticity and give reliable information to customers. New legal requirements in many developed and developing countries increase pressure on exporting countries to comply with traceability requirements and especially, with those included in the World Trade Organization agreements, to justify sanitary or phytosanitary objectives. Additionally, traceability is a requirement in all B2B voluntary certifiable standards in good agricultural and manufacturing practices, including HACC P principles. There are two main international standards and guidelines that regulate the establishment and operation of a traceability system: ISO 9001: 2000, a standard for quality management and quality assurance; and ISO 22000: 2005, a standard for food safety and management systems. In the case of forest products, it is important to track the chain of custody of all types of products to ensure that they originated from sustainably managed forests verifiable (Moe, 2008; FAO, 2013).

METRICS

This indicator measures the share of the volume of production that can be identified and recalled along the food chain and in the market place through a traceability system, at least in the last production year. To measure:

- Check whether sound good agricultural and manufacturing practices are in place.

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- Check whether a written procedure details how the enterprise identifies, and eventually recall, withdrawals from the market.
- Review the enterprise business records regarding the volume of production for at least the last production year, and verify the way the product is identified when advancing to the next stage of the food chain, or to the market place.
- Check for any record on the product that will allow following its movement through the different stages of the production, processing and distribution, and to recall it when required.
- Calculate the share of the volume of production that can be followed and recalled through the different stages of the food chain and the market place.
- Check in the production, processing and distribution department for any mechanism and procedures in place that can identify, follow and recall the product through the food chain.

RATINGS

Scale: Absence (-); Presence (+)

Presence (+):

- Complete product information (i.e. ingredients, processing inputs) is available across the supply chain due to tracking and traceability systems; AND
- 100% of the total volume of production for at least the last year has a traceability system in
- place; AND
- The enterprise is able to provide evidence of a traceability system in place and it can be proven at least yearly under recall mock tests throughout the enterprise activities; AND
- The enterprise has evidence that measures are taken when results of tests do not comply with traceability objective.

Absence (-):

- 0% of the total volume of production for a given period has a traceability system in place; OR.
- The enterprise has not advanced in designing and adopting a traceability system.

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Food Loss
SUB-THEME: Footprint
THEME: Externalities
LINK: Transport and Distribution (E3)

DESCRIPTION

This indicator assesses the extent to which the firm mitigates food losses, whether has a clear strategy to identify where losses/waste occur, assess their magnitude, identify causes of loss/waste, identify potential mitigation measures and implements them in an efficient way considering the specific circumstances of the firm. (FAO, 2013. SAFA Sustainability Assessment of Food and Agriculture systems indicators. http://www.fao.org/nr/sustainability/sustainability-assessments-safa). Food loss and waste reduction is measured over medium to long term and applies to businesses of any size.

METRICS

The capacity of the firm to mitigate food losses in its operations while optimising overall efficiency as regards planned quantities of food reaching the intended destinations e.g. processors, retailers, consumers.

RATINGS

Scale: Managed (loss mitigation strategy in place); Not managed (no loss mitigation strategy in place)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Cost of Marketing and Storage
SUB-THEME: Snapshot
THEME: Economic Behaviour
LINK: Markets and Retailers (E4)

DESCRIPTION

This measure indicates the profitability of the firm. An optimal cost structure of marketing and storage is important for financial, environment and social sustainability of the firm.

METRICS

The firm registers costs of marketing and storage effectively over a number of years. High – if such records are maintained continuously over last 5 years. Medium – if such records are kept at least once over last 5 years. Low – if no such records are kept.

RATINGS

Scale: Low (-); Medium; High (+)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Stability of Consumer Demand
SUB-THEME: Consumer
THEME: Vulnerability
LINK: Markets and Retailers (E4)

DESCRIPTION

This indicator assesses the extent to which the firm has in place the mechanisms required to ensure that contracts with its buyers or, if the firm is in retail, its supply, are covered against any potential risks linked to unanticipated fluctuations in consumer demand. Additionally, the indicator should consider whether the firm, unless in retail, has the capacity to efficiently and timely replace buyers who cannot fulfil contractual obligations following such market instability through using its contacts with other potential buyers. These are mechanisms to minimise risks such as shortages or excess of supply linked to unanticipated demand fluctuations. Stability of consumer demand is measured over medium to long term and applies to businesses of any size.

METRICS

Implementation of mechanisms to prevent/mitigate disruptions to firm's supply due to unanticipated demand fluctuations.

RATINGS

Scale: Low (0% no mechanisms in place); Medium (50% some mechanisms in place); High (100% mechanisms in place to cover any demand related risks)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Food Redistribution Scheme (Including waste management)**
SUB-THEME: Value added to Community
THEME: Welfare
LINK: Markets and Retailers (E4)

DESCRIPTION

This indicator assesses whether the firm has a food waste management strategy, particularly whether it is involved in food redistribution activities/scheme. Food redistribution may lead to a more effective use of resources and implicit lower waste generated (Nordic Council of Ministers. 2017. Preventing food waste-better use of resources, http://norden.diva-portal.org/smash/get/diva2:1115667/FULLTEXT01.pdf ; Davies, A., and Evans, D. 2018. Urban food sharing: Emerging geographies of production, consumption and exchange. Geoforum 99, 154-159). There has been recent focus in the literature on food redistribution between different agents along the supply chain, mostly in the hospitality and retail sector using different transformative mechanisms and via a number of channels from the more traditional to online collaborative platforms and other ICT-enabled modes (Falcone P.M., Imbert E. 2017, Bringing a Sharing Economy Approach into the Food Sector: The Potential of Food Sharing for Reducing Food Waste. In: Morone P., Papendiek F., Tartiu V. (eds) Food Waste Reduction and Valorisation, Springer). Food redistribution has not only economic and environmental benefits but also food security and social impacts, and thus any approach to redistribution has to be aligned with the social justice context. Food surplus redistribution may lead to social inclusion benefits and be central to the nexus of waste reduction, social inclusion, and community engagement (Schanes, K. and Stagl, S. 2018. Food waste fighters: What motives people to engage in food sharing?. Journal of Cleaner Production 211, 1491-1501).

METRICS

The capacity of the firm to mitigate food waste through implementation of a waste management plan and involvement in food redistribution activities/scheme.

RATINGS

Scale: Yes (waste management plan implemented through e.g. food redistribution); No (no waste management plan implemented and no involvement in food redistribution activities)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Price of Food
SUB-SUB-THEME: Price
SUB-THEME: Price and Availability
THEME: Economic Aspect of Behaviour
LINK: Consumers (E5)

DESCRIPTION

Food price is the amount of money charged for a food product. Technically, the price of food is the sum of all the values that a customer gives up to gain the benefits of having or using the food in question. Thus, consumers exchange a certain value for having or using the product. That value is called price. Price has been the major factor affecting buyer choice. However, in recent decades, non-price factors (e.g., the origin and the healthiness of the food) have gained increasing importance. Food prices are affected by several factors such as the cost of inputs, labour, transport, processing, marketing, weather, market speculation, and food demand (Köster, 2009; Swinnen, 2011).

METRICS

Two main methods are used to figure out what price to attach to each unit of a food product: competition-based pricing and cost-based pricing. Competition-based pricing is a pricing method that makes use of competitors' prices for the same or similar product as a basis in setting a price. The business may sell its product at a price above or below such a benchmark. Setting a price above the benchmark will result in higher profit per unit but may also result in fewer units sold, as customers would prefer products with lower prices. On the other hand, setting a price below the benchmark might result in more units sold but will cause less profit per unit. The cost-based pricing method consists of adding the direct material cost, the direct labour cost, and overhead to determine what it costs the company to offer the product or service. Then, a markup percentage is added to the total cost to determine the selling price. This markup percentage is profit (Hinterhuber, 2008; Johansson et al., 2012).

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TRansition paths to sUstainable legume-based systems in Europe

RATINGS

Scale: Low (-); Medium; High (+)

Low price: the selling price is described as low if it significantly lower than average market price
Medium price: the selling price is described as medium if it equal or close to average market price
High price: the selling price is described as high if it significantly higher than average market price

INDICATOR NAME: **Price Promotion**
SUB-SUB-THEME: Price
SUB-THEME: Price and Availability
THEME: Economic Aspect of Behaviour
LINK: Consumers (E5)

DESCRIPTION

Price promotion is a sales' promotion technique, wherein the firm reduces the price of a product drastically, but for a short period. Companies adopt several promotional pricing schemes such as special-event pricing, cash rebates, warranties and service contracts, and psychological discounting. Special-event pricing consists in offering discounts and rebates on festivals, during the off-seasons with the intention to pull as many customers as possible. Cash rebates consist in offering the cash rebates on their items if purchased in a particular time period. In the case of loss-leader pricing, big retailers reduce the price of a well-known brand with the intention to have additional store traffic. Through this strategy, the retailers try to compensate for their margin loss from the additional sales achieved from additional customers. Warranties and service contracts consist in offering extended warranties and free services of the product to the customers. Finally, under psychological discounting, the companies artificially set the high price of the product and then offer it at substantial savings (Kendrick, 1998; Kaser, 2012).

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METRICS

There are different techniques to measure the effectiveness of price promotions (Palazon and Delgado-Ballester, 2009; Hawkes, 2009):

1) Compare the sales and gross margins for the promoted product before the promotional period, during the promotional period, and after the promotional period.
2) Compare the overall average order size and the lines per order during the promotion periods to those same metrics during non-promotion periods.
3) Compare the total sales per day of all items during promotional periods (including the items not promoted), to the total sales per day of all items during non-promotional periods.
4) Compare the results for the various promotions against each other. Rank which promotions provided the best sales and gross margin lift for the company. Compare the results against those in prior years to see if the trends are favourable, or if certain promotional activities are getting stale.
5) Compare the added gross margins generated by each promotion, to the underlying incremental cost of each promotion, to determine the overall net profit generated by each program.

RATINGS

Scale: Low (-); Medium; High (+)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Food Expenditure**
SUB-THEME: Price and Availability
THEME: Economic Aspect of Behaviour
LINK: Consumers (E5)

DESCRIPTION

It is the share of total household expenditure (as a proxy of income) spent on food. It is an indicator of household food security because it is widely documented that the poorer and more vulnerable a household, the larger the share of household income spent on food. This observation is known as Engel's law, which demonstrates that as incomes rise, both within a country and across countries, expenditure on food increases but expenditure on other things increases even more, so that the share of total income spent on food declines. Given this observation, the indicator is especially helpful to understand the impact of food price fluctuations on both the quality and quantity of household (Humphries et al., 2017; Venn et al., 2018).

METRICS

Data on food expenditure can be obtained from a limited number of sources, some are open access and others are available upon request (e.g., country's National Bureau of Statistics).

1) Household surveys data (e.g., Living Costs and Food Survey in the UK). In the survey, households are asked to provide data, or estimates, of the amounts they spend on consumption goods and services and for other purposes over a given period. They are also called Household consumption surveys or Household budget surveys. This type of survey is possibly the most important source of information on poverty, food security, and nutrition outcomes at national, sub-national and household level (Grosh and Glewwe, 2000).
2) Scanner data come from two types of data collections. (1) Point-of-sale (retail) collections which use the universal product code (UPC) of products sold at retail checkout counters to identify products and quantities sold and their prices. (2) Household scanner panels, which are usually random samples of households in which household members are asked to scan in the UPC of the items they have purchased, using scanners provided to them (Baron and Lock, 1995).

RATINGS

Scale: Low (-); Medium; High (+)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Availability of Products**
SUB-THEME: Price and Availability
THEME: Economic Aspect of Behaviour
LINK: Consumers (E5)

DESCRIPTION

Availability refers to the physical existence of food in desired quantities and of the desired quality. On national level, food availability is a combination of domestic food production, commercial food imports and exports, food aid and domestic food stocks (Steinhart et al., 2013).

METRICS

Several indicators are used to measure food availability (Kumar, 1989; Hutto, 1990):

- At the individual or household level
  - Frequency of vegetable consumption
  - Frequency of meat and fish consumption
  - Frequency of dairy products
  - Number of meals eaten a day
  - Dietary diversity of 8 major food groups: cereals, milk, meat, sugar, vegetable oils, fruits, vegetables, starchy roots
- At the macro level
  - Cereal yields
  - Food Production Index
  - Livestock Production Index
  - The ratio of total exports to food import

RATINGS

Scale: Low (-); Medium; High (+)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727973

TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Willingness to Pay for Healthy Products**
SUB-THEME: Willingness to Pay
THEME: Economic Aspect of Behaviour
LINK: Consumers (E5)

DESCRIPTION

Willingness to pay refers to the maximum price at or below which a consumer will buy one unit of the product labelled as healthy. To be labelled as healthy, the food must be low in sugar, saturated fat, and salt. It must also provide at least 10 per cent of one or more of vitamins A or C, iron, calcium, protein, or fibre. It also popular in research papers to report the price premium for healthy food products. The price premium is computed as the difference between the willingness to pay for a food product labelled as healthy and its counterpart that is not labelled as healthy (Grunert et al., 2007; Gao and Schroeder, 2009).

METRICS

Willingness to pay is generally expressed as the amount of money per unit of product. Data on consumers' willingness to pay for healthy food are generally collected using value-elicitation methods (e.g., contingent valuation, experimental auctions) or preference-elicitation methods (e.g., discrete choice experiment, ranking conjoint analysis, best-worst mechanism). In the value-elicitation methods, consumers are directly asked to report their maximum willingness to pay for the food product labelled as healthy. In preference-elicitation methods, consumers are presented with a set of alternatives of the same food product that are described in terms of,e.g., their nutritional content and price; and are asked to indicate the alternative they prefer most (or rank the alternatives from the most to the least preferred). Then, a choice model is used to estimate consumers' marginal utility for the health label and the price. Finally, consumers' average willingness to pay is computed as the negative of the ratio of the marginal utility for the health label divided by the marginal utility for the price (Ryan et al, 2007).

RATINGS

Scale: Low (-); Medium; High (+)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Willingness to Pay For Convenience**
SUB-THEME: Willingness to Pay
THEME: Economic Aspect of Behaviour
LINK: Consumers (E5)

DESCRIPTION

Willingness to pay for convenience food refers to the maximum price at or below which a consumer will buy one unit of food that is easier to prepare and consume compared with its conventional counterpart. Convenience foods are appealing to people who have poor cooking skills or have no time to search and execute recipes from scratch. Convenience food includes a range of products like noodles, soup, frozen vegetables, casserole mixes, dessert mixes and yoghurts. To measure the WTP for convenience, first, the attribute convenience of the studied food product needs to be defined. Then, two products one with the attribute convenience and one without this attribute should be identified and valued. The price premium for convenience is the difference between the willingness to pay for the food with the attribute convenience and the food without this attribute (e.g., Ready to eat lasagne versus frozen and not cooked lasagne) (Lyly et al., 2007; Ikiz et al., 2018).

METRICS

Willingness to pay is generally expressed as the amount of money per unit of product. Data on consumers' willingness to pay for convenience food are generally collected using value-elicitation methods (e.g., contingent valuation, experimental auctions) or preference-elicitation methods (e.g., discrete choice experiment, ranking conjoint analysis, best-worst mechanism). In the value-elicitation methods, consumers are directly asked to report their maximum willingness to pay for the convenience food of interest. In preference-elicitation methods, consumers are presented with a set of different alternatives of a food product. The alternatives are described in terms of,e.g., convenience level and price; and are asked to indicate the alternative they prefer most (or rank the alternatives from the most to the least preferred). Then, a choice model is used to estimate consumers' marginal utility for the attribute convenience and the price. Finally, consumers' average willingness to pay is computed as the negative of the ratio of the marginal utility for the attribute convenience divided by the marginal utility for the price (Hensher et al., 2015; Grunert et al., 2009).

RATINGS

Scale: Low (-); Medium; High (+)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Willingness to Pay For Environmental Friendly Products**
SUB-THEME: Willingness to Pay
THEME: Economic Aspect of Behaviour
LINK: Consumers (E5)

DESCRIPTION

Willingness to pay for environmental-friendly food products refers to the maximum price at or below which a consumer will buy one unit of the product labelled environmentally friendly. There is no legal definition of environmentally friendly food products. In academia, researchers who wanted to measure consumers' willingness to pay for environmentally-friendly food products used a product such organic food, food labelled as produced with low greenhouse emissions, or food labelled as having lower food miles (i.e., transported for less distance) etc. The price premium for an environmentally-friendly food product, say organic, is computed as the difference between the willingness to pay for a food product labeled as organic and its counterpart that does not carry the label organic (Meas et al, 2014; Trivedi et al., 2015; Akaichi et al., 2019).

METRICS

Willingness to pay is generally expressed as the amount of money per unit of product. Data on consumers' willingness to pay for environmentally-friendly food are generally collected using value-elicitation methods (e.g., contingent valuation, experimental auctions) or preference-elicitation methods (e.g., discrete choice experiment, ranking conjoint analysis, best-worst mechanism). In the value-elicitation methods, consumers are directly asked to report their maximum willingness to pay for the food product labelled as environmentally friendly. In preference-elicitation methods, consumers are presented with different alternatives of a food product. The alternatives described in terms of,e.g., their environmental friendliness and price; and are asked to indicate the alternative they prefer most (or rank the alternatives from the most to the least preferred). Then, a choice model is used to estimate consumers' marginal utility for the attributes environmental friendliness of the product and the price. Finally, consumers' average willingness to pay is computed as the negative of the ratio of the marginal utility for the attribute environmental friendliness divided by the marginal utility for the price (Hess and Daly, 2014).

RATINGS

Scale: Low (-); Medium; High (+)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Food Scarcity*(quality and quantity)**
SUB-THEME: Vulnerability
THEME: Economic Aspect of Behaviour
LINK: Consumers (E5)

DESCRIPTION

Food scarcity may result in situations where supply is lower than demand (quantity) or does not meet the quality requirements e.g. nutritional needs. This can follow situations such as unforeseen weather events and pest infestations, or unequal distribution of resources within a region/country, institutional and policy framework, and barriers to trade and food aid. Imperfect distribution of resources has been acknowledged as a main cause of food scarcity. The World Trade Organization estimated that an equal distribution between Earth inhabitants of the total calories from food produced worldwide would ensure 2,750 calories per person per day (Conley, D. 2018. Global Food Scarcity: Definition, Distribution, Roadblocks. Science Literacy: Using Research-Based Facts To Make Real-World Decisions, University of Nebraska-Lincoln https://sdn.unl.edu/global-food-scarcity)

METRICS

Food scarcity is measured by the degree to which food demand is not met by the food supply in either quantity or quality.

RATINGS

Scale: Low (-); Medium; High (+)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Financial Vulnerability
SUB-THEME: Vulnerability
THEME: Economic Aspect of Behaviour
LINK: Consumers (E5)

DESCRIPTION

Household's consumption decisions are determined by their financial stability and departures from this to the point of their being financially vulnerable may affect not only their ability to purchase e.g. food but, under certain macroeconomic conditions, the economic stability of the market (Fuenzalida, M, Ruiz-Tagle, J. 2011. Household Financial Vulnerability. Central Banking, Analysis, and Economic Policies Book Serie. In: Rodrigo Alfaro (ed.), Financial Stability, Monetary Policy, and Central Banking, edition 1, volume 15, chapter 10, pages 299-326 Central Bank of Chile). Household consumption is influenced by a number of factors, one of the most important being income. Income fluctuations due to e.g. changes in employment status of household members combined with unsustainable debt levels may lead to household's financial vulnerability and implicitly lower purchasing power and unhealthy consumption patterns.

METRICS

Financial vulnerability is measured by the ability to maintain a sustainable level of income generation that meets household demand for goods and services and thus ensures, among others, a sustainable food consumption pattern.

RATINGS

Scale: Low (-); Medium; High (+)

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INDICATOR NAME: ***Product Information *(Labelling and other Information)***
THEME: Social Aspect of Behaviour
LINK: Consumers (E5)

DESCRIPTION

Food product information such as information on the origin of the product, nutritional content, and portion sizes is critical to help consumers make confident and informed food choices. Food labels are commonly used to communicate information about the characteristics of food products. Labelling requirements vary across countries. For example, in the UK, mandatory labelling requirements for all packaged foods are as follows (Food Standard Agency, 2018; European Commission, 2018)):

- name of the food
- list of ingredients
- ingredients or processing aids causing allergies or intolerances that are stated in the 14 Allergens
- quantity of certain ingredients or categories of ingredients
- net quantity of the food
- date of minimum durability or the 'use by' date
- special storage conditions and/or conditions of use
- name or business name and address of the food business operator
- country of origin or place of provenance
- instructions for use where it would be difficult to make appropriate use of the food in the absence of such instructions
- the alcohol strength by volume for beverages containing more than 1.2 % of alcohol, by volume
- nutritional declaration

In the case of unpackaged food products, producers and marketers do not have to label their food in the same way that manufacturers and sellers of packaged food businesses do. However, the producers and marketers of non-prepacked food products must provide consumers with information on allergen and intolerance information (Food Standard Agency, 2018; European Commission, 2018)).

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METRICS

There is an extensive literature in economics and marketing on the effect of product information on consumers' preferences and demand. Both stated- and revealed-preference methods were used to measure this effect. Contingent valuation, choice experiment, and experimental auctions have been the most commonly used stated-preference methods to investigate the effect of providing consumers with information on products' characteristics such as healthiness, sustainability, origin, and price (Akaichi et al., 2017, 2019). Revealed-preference methods, such as scanner data and household survey data, were also used to assess the effect on consumers' purchases of branding, retailers' promotions and other marketing strategies (Revoredo et al., 2018; Rajavi et al., 2019).

RATINGS

Scale: Absence (-); Presence (+)

INDICATOR NAME: ***Education and Information***
THEME: Social Aspect of Behaviour
LINK: Consumers (E5)

DESCRIPTION

Sustainable consumption patterns involving aspects such as environment, animal welfare and human health may be influenced by a number of factors, such as education and access to information. While on their own they may not necessarily lead to behavioural change, it has been acknowledged that in conjunction with other behavioural determinants, they may have a significant impact on behaviour. Consumers are not always aware of the attributes of the food they consume and increasing awareness through well-targeted information-based tools may lead to change in consumption patterns and correction of perceived barriers to consumption. Such barriers for instance in the case of legumes include lack of preparation and cooking knowledge, lack of knowledge of the health and environmental benefits, availability of convenience products (legume based processed foods). Improved access to information through e.g. cooking demonstrations, recipe ideas, educational advice, clear dietary guidance at the national level will help highlight the nutritional profile of legumes within the overall dietary pattern (Figueira, N.; Curtain, F.; Beck, E.; Grafenauer, S. Consumer

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Understanding and Culinary Use of Legumes in Australia. Nutrients 2019, 11, 1575; Jallinoja, P., Niva, M., Latvala, T. 2016. Future of sustainable eating? Examining the potential for expanding bean eating in a meat-eating culture. Futures 83, 4-14. DOI 10.1016/j.futures.2016.03.006)

METRICS

Education and information indicator is measured through the level of provision of education and information supplied to consumers to potentially influence change to more sustainable consumption patterns.

RATINGS

Scale: Low (-); Medium; High (+)

INDICATOR NAME: ***Culture***
THEME: Social Aspect of Behaviour
LINK: Consumers (E5)

DESCRIPTION

Cultural background of consumers is one of the factors influencing sustainable consumption patterns. In the case of legumes, consumption has been higher in food cultures such as Mexican (refried kidney beans), Indian (dhal and pappadums) , Mediterranean (navy bean soup), Middle Eastern (falafel and hummus), and overall in the Caribbean, tropical Latin America, South Asia, western and eastern sub-Saharan Africa, where legume dishes are a traditional component of the food culture. This has largely been due to the high cost and limited availability of meat but also due to religious beliefs in some of these countries. In some northern European cultures, vegetable proteins are perceived as the protein of the poor and therefore they would be unlikely to feature as main ingredients as part of meals on social occasions. In Europe legumes are associated with rural heritage and ethnic foods more likely originating from Southern countries. Exposure to new cultures through e.g. travel and public and media interest in cuisines and dishes from other parts of the world may affect perceptions of cultural suitability (Figueira, N.; Curtain, F.; Beck, E.; Grafenauer, S. Consumer Understanding and Culinary Use of Legumes in Australia. Nutrients 2019, 11, 157; Jallinoja,

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P., Niva, M., Latvala, T. 2016. Future of sustainable eating? Examining the potential for expanding bean eating in a meat-eating culture. Futures 83, 4-14. DOI 10.1016/j.futures.2016.03.006)

METRICS

Culture as an influence on consumption is measured as the level of exposure to food cultures more likely to encourage sustainable consumption patterns.

RATINGS

Scale: Low (-); Medium; High (+)

INDICATOR NAME: ***Taxes and Bans***
THEME: Policy
LINK: Consumers (E5)

DESCRIPTION

Taxes and bans are tools used by governments to discourage the production of and/or the demand for food products with undesirable attributes (e.g., unhealthy foods, non-ethical products and farming practices). Food tax is a surcharge, generally, applied to food products whose consumptions has negatives externalities (e.g., obesity, pollution, addiction). The food tax helps to decrease the consumption of food products with undesirable attributes by increasing their prices. Furthermore, the money raised through food taxes is generally used by the government to pay for the social cost caused by the consumption of the taxed food. Fat and sugar taxes are among the well-known food taxes that were applied to encourage healthy choices (Bertail and Nichèle, 2010); 2010; Escobar et al., 2013).

Bans constitute another tool used by governments to stop the use of farming and processing practices that were proven to have negatives externalities on the public, farm animals, and the

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environment. For example, bans, such as banning the use of gestation crate (pigs), battery cages (hens), and castration (lamb), were used in the EU to improve the welfare of animals raised in modern EU farms. The trans-fat ban is another example of the use of bans to reduce the consumption of food products with unhealthy attributes. In fact, by the mid-2000s, it was clear beyond doubt that trans-fats increase the risk of coronary heart disease. Denmark banned partially hydrogenated oils in 2003, and several other countries followed suit; in the United States, New York City passed such a ban for restaurant foods in 2006, and the state of California did the same in 2008 (Downs et al., 2013).

METRICS

Demand analysis has been commonly used to assess the effect of taxes on the demand for the taxed food products. Price elasticity is the main output of demand analysis. It measures the percentage change in the demand of the studied product following one per cent change in its price. For example, if the price elasticity of a product A is equal to -2.5, this suggests that an increase in the price of product A by 1% will lead to a decrease in it demand by 2.5%. This also implies that if the price of product A increases by, for example, 10% following the application of a tax, its demand will decrease by 25% (=2.5*10%). There are two types of price elasticity: own-price elasticity and cross-price elasticity. While the own-price elasticity measures the sensitivity of demand for product A to a change in its price, the cross-price elasticity measures the change in the demand for product A to a change in the price of product B. Information on cross-price elasticity is useful to assess how taxing a food product will affect its substitutes and complementary products. For instance, taxing soft drinks may decrease its consumption but may also increase the demand for juice, if juice and soft drinks are complementary products (Gramer et al., 2001; Lin et al., 2011).

RATINGS

Scale: Weak (-); Medium; Strong (+)

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INDICATOR NAME: *Educational Campaigns*
THEME: Policy
LINK: Consumers (E5)

DESCRIPTION

This indicator is interlinked to the education and information indicator and features the tools used to promote behavioural change to more sustainable consumption namely the means of delivering the information perceived as more convincing e.g. food education campaigns in schools or healthy food ad campaigns (Figueira, N.; Curtain, F.; Beck, E.; Grafenauer, S. Consumer Understanding and Culinary Use of Legumes in Australia. Nutrients 2019, 11, 1575; Jallinoja, P., Niva, M., Latvala, T. 2016. Future of sustainable eating? Examining the potential for expanding bean eating in a meat-eating culture. Futures 83, 4-14. DOI 10.1016/j.futures.2016.03.006)

METRICS

Educational campaigns indicator is measured through their perceived usefulness by consumers in adopting more sustainable consumption patterns.

RATINGS

Scale: Weak (-); Medium; Strong (+)

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Income support Policies**
THEME: Policy
LINK: Consumers (E5)

DESCRIPTION

They are generally financial incentives given by the government to individuals or businesses in the form of cash, grants, or tax breaks with the aim of keeping the prices of food products low for people to be able to afford them and also to encourage their production in the first place. Subsidies are the most popular income support policy (Callan et al., 1998; Schwartz and Clements, 1999). There are at least four types of subsidies.

1. Production subsidy is provided to encourage the production and consumption of a product. In order for manufacturers to increase their production output, the government compensates for some of its parts to lessen their expense while increasing their output. As a result, production and consumption grow, but the price remains the same. The drawback of such an incentive though is that it promotes overproduction and incurs the cost for product storage.

2. Consumption subsidy happens when the government offsets the costs of food, education, healthcare, and water.

3. Export subsidy consists of encouraging exports by subsidising the cost. However, this can be easily abused, especially, by exporters who exaggerate the prices of their goods so that they receive a larger incentive, eventually raising their profits at the expense of the government's spending.

4. Employment subsidy is given by the government to companies and organisations in order to enable them to provide more job opportunities.

Perhaps the most popular in the EU is the Common Agricultural Policy CAP, which is a system of subsidies paid to EU farmers. Its main purposes are to guarantee minimum levels of production so that Europeans have enough food to eat and to ensure a fair standard of living for those dependent on agriculture (Gray, 2000).

In developing countries, income support policies are heavily used to reduce food insecurity and malnutrition. Maize, rice, wheat, sugar, and cooking oil are the most subsidised food products in developing countries (Besley and Kanbur, 1988).

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There is an increasing body of literature on the negative effect of the use of subsidies. It seems that the use of subsidies harms the environment, distorts trade, and benefits those in society who do not require support (Rivas, 2003).

METRICS

Several approaches have been proposed to measure the effect of income support policies (see for example, Cerulli (2010)). As aforementioned, one of the main objectives of income support policies is to increase (directly or indirectly) individuals' income. An easy way to assess the sensitivity of the demand for food products to a change in consumer income is to estimate the income elasticities of these products. The income elasticity measures the percentage change in the demand for a product following a change in consumer income. For example, if the income elasticity of fruit and vegetables is equal to 1.6, this implies that an increase of consumer income by 1% will increase the consumption of fruit and vegetables by 1.6% (Gramer et al., 2001; Haque, 2006).

RATINGS

Scale: Weak (-); Medium; Strong (+)

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DESCRIPTION AND METRICS OF ECONIMIC TEMES AND SUBTEMES

PRODUCTION (E1)

THEME: E1.1 Economic Behaviour
LINK: Production (E1)

DESCRIPTION

This theme includes indicators for both short term and long term economic sustainability of a firm. It consists of both short term and long term economic status of a firm. Short term status as indicated by a snapshot of financial condition of the firm provide mostly year to year financial position of the firm. Long term status includes a firm's capability to forecast, make decisions and invest to keep the

RATINGS

irm economically, socially and environmentally sustainable.

Scale: Weak (-); Medium; Strong (+)

SUB-THEME: E.1.1.1 Snapshot
THEME: Economic Behaviour (E1.1)
LINK: Production (E1)

DESCRIPTION

This sub-theme consists of indicators capturing short term economic sustainability of a firm. It includes net income, safety nets and full cost accounting. These indicators provide an understanding of the firm's economic position on a short term which indicates if the firm is sustainable or not.

RATINGS

Scale: Low (-); Medium; High (+)

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SUB-THEME: E.1.1.2 Planning and Forecasting
THEME: Economic Behaviour (E1.1)
LINK: Production (E1)

DESCRIPTION

This sub-theme is indicative towards long-term sustainability of a firm. It includes long term profitability, investments and management plans which all indicates towards firm's capacity to stay sustainable over a long period of time.

RATINGS

Scale: Low (-); Medium; High (+)

THEME: E1.2 Vulnerability
LINK: Production (E1)

DESCRIPTION

Vulnerability in production, as elsewhere in the supply chain, represents the exposure of a firm (farm) to exogenous shocks, arising out of economic openness i.e. operating as part of a market and influenced by market forces and behaviour of other economic agents such as input suppliers and buyers. The exposure to exogenous shocks and implicit economic vulnerability may constitute a hindrance to economic development through increased risk affecting the growth process, without necessarily compromising the overall viability. (Briguglio, Lino; Cordina, Gordon; Farrugia, Nadia; Vella, Stephanie (2008) : Economic vulnerability and resilience concepts and measurements, WIDER Research Paper, No. 2008/55, ISBN 978-92-9230-103-3, The United Nations University World Institute for Development Economics Research (UNU-WIDER), Helsinki). Overall vulnerability in agriculture applies at various spatial scales (from farms to countries) and has been used to describe the response of agricultural systems exposed to diverse socio-economic changes, such as market fluctuations or land use changes. To reduce impact of exogenous factors and implicit vulnerability, the adaptive capacity of agricultural systems represents their ability to design and implement effective changes through mobilising natural, financial, institutional, or human resources available (Urruty, N., Tailliez-

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Lefebvre, D. & Huyghe, C. Stability, robustness, vulnerability and resilience of agricultural systems. A review. *Agron. Sustain. Dev.* **36,** 15 (2016). https://doi.org/10.1007/s13593-015-0347-5).

METRICS

The degree of exposure of the firm to exogenous shocks and their adaptive capacity to reduce the potential impact of these shocks.

RATINGS

Scale: Weak (-); Medium; Strong (+)

SUB-THEME: **E.1.2.1 Relationship with suppliers**
THEME: Vulnerability (E1.2)
LINK: Production (E1)

DESCRIPTION

The sub-theme assesses the relationships between a firm (farm) and its input suppliers. The relationships with suppliers are characterised by stability and dependence, with trends displaying minimal fluctuations and minimal difference between the dependence on some suppliers as compared to others, seen as the optimal state of minimal vulnerability. Relationships between the firm (farm) and its input suppliers are assessed over medium to long term and apply to businesses of any size and at any supply chain stage.

METRICS

Share of ongoing supplier contracts and corresponding mechanisms to reduce disruptions to firm's (farm) supply of inputs.

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RATINGS

Scale: Weak (-); Medium; Strong (+)

SUB-THEME: **E.1.2.2 Market**
THEME: Vulnerability (E1.2)
LINK: Production (E1)

DESCRIPTION

Market refers to the means by which goods and services are exchanged between buyers and sellers either directly or through mediating agents or institutions. Market may affect the vulnerability of firms through market stability, price fluctuation, and demand for and constraints to product differentiation.

METRICS

The ability of the firm (farm) to respond to market requirements i.e. implement the necessary mechanisms to build stable marketing channels, negotiate with its buyers and determine a price that ensures the necessary profit margin, diversify its production.

RATINGS

Scale: Weak (-); Medium; Strong (+)

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THEME: **E1.3 Welfare**
LINK: Production (E1)

DESCRIPTION

Welfare in production encompasses aspects of food quality and safety, value added to community through local employment and procurement of services, and environmental footprint in terms of e.g. greenhouse gas emissions and land use change. Ensuring the required level of welfare is dependent on achieving the necessary level of food safety and socio-environmental protection in production as well as at any other stage of the supply chain (Hediger, W., Knickel, K. (2009) Multifunctionality and Sustainability of Agriculture and Rural Areas: A Welfare Economics Perspective, Journal of Environmental Policy & Planning, 11:4, 291-313, DOI: 10.1080/15239080903412453).

METRICS

The capacity of the firm (farm) to minimise its footprint on the environment, maximise safety and quality of food production, and local procurement of labour and services.

RATINGS

Scale: Low (-); Medium; High (+)

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TRansition paths to sUstainable legume-based systems in Europe

SUB-THEME: E.1.3.1 Quality and Safety
THEME: Welfare (E1.3)
LINK: Production (E1)

DESCRIPTION

This sub-theme refers to the actions that the enterprise can take to control and reduce the potential of exposure to food hazards, or to reduce the likelihood of the risk of exposure to the hazards being realized; to guarantee food quality and to meet the highest nutritional standards respective to the type of product; and assure its customers of the sustainability of the entire supply chain through certification.

METRICS

This sub-theme measures whether the enterprise has food hazards and safety control measures, monitoring and control of certification and food quality standards in place that comply with correspondent regulations.

RATINGS

Scale: Low (-); Medium; High (+)

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TRansition paths to sUstainable legume-based systems in Europe

SUB-THEME: **E.1.3.2 Value added to Community**
THEME: Welfare (E1.3)
LINK: Production (E1)

DESCRIPTION

This sub-theme assesses the contribution of the enterprise to the local economy through employment of local labour directly involved with the community and micro-environment where the enterprise operates; through procurement from local/regional suppliers, and through involvement in food redistribution activities/scheme.

METRICS

Extent to which the firm (farm) hires regional employees, purchases its inputs from local/regional suppliers and contributes to food redistribution locally.

RATINGS

Scale: Low (-); Medium; High (+)

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TRansition paths to sUstainable legume-based systems in Europe

SUB-THEME: **E.1.3.3 Footprint**
THEME: Welfare (E1.3)
LINK: Production (E1)

DESCRIPTION

This sub-theme encompasses the impact of a firm (farm) on environment, food waste and land use and the mechanisms it employs to reduce these, such as strategies to identify causes of food waste, GHG emissions and implement corresponding mitigation measures. Footprint and its prevention/mitigation are measured over medium to long term and apply to businesses of any size and along the supply chain (FAO, 2013. SAFA Sustainability Assessment of Food and Agriculture systems indicators. http://www.fao.org/nr/sustainability/sustainability-assessments-safa ; Hediger, W., Knickel, K. (2009) Multifunctionality and Sustainability of Agriculture and Rural Areas: A Welfare Economics Perspective, Journal of Environmental Policy & Planning, 11:4, 291-313, DOI: 10.1080/15239080903412453).

METRICS

Implementation of a strategy at firm (farm) level to minimise the footprint of its operations as regards food waste, GHG emissions and land use and cover and avoid conversions from ecologically valuable to less valuable habitats caused by the enterprise's operations.

RATINGS

Scale: Low (-); Medium; High (+)

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TRansition paths to sUstainable legume-based systems in Europe

PROCESSING (E2)

SUB-THEME: E2.2.2 Supplier
THEME: Vulnerability (E2.2)
LINK: Processing (E2)

DESCRIPTION

The sub-theme assesses the relationships between a firm (farm) and its input suppliers. The relationships with suppliers are characterised by stability and dependence, with trends displaying minimal fluctuations and minimal difference between the dependence on some suppliers as compared to others, seen as the optimal state of minimal vulnerability. Relationships between the firm (farm) and its input suppliers are assessed over medium to long term and apply to businesses of any size and at any supply chain stage.

METRICS

Share of ongoing supplier contracts and corresponding mechanisms to reduce disruptions to firm's (farm) supply of inputs.

RATINGS

Scale: Weak (-); Medium; Strong (+)

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TRansition paths to sUstainable legume-based systems in Europe

SUB-THEME: **E2.3.2 Labelling**
THEME: Welfare (E2.3)
LINK: Processing (E2)

DESCRIPTION

According to the Codex Alimentarius Commission (COD EX STAN 1-1985), "Labeling means any written, printed or graphic matter that is present on the label, accompanies the food, or is displayed near the food, including that for the purpose of promoting its sale or disposal." Information usually provides details on the content and composition of products but also particular aspects of the product, such as its origin, or its production method, including whether it has been produced using a certified organic production or other methods.

METRICS

- Measurement:
  - All product labeling is audited against legally required code in the country in which it is sold.
  - All voluntary claims (e.g. fair trade, organic) are checked against the independent certifier statement.
  - Where content and nutritional claims are made, these are routinely independently audited.
  - Labeling codes used are included in the enterprise quality management documentation and any variance from the code is documented and reported internally.

RATINGS

Scale: Absence (-); Presence (+)

Presence (+): The enterprise fully complies with all relevant legally required labelling codes for its products. It seeks to go beyond minimum standards in providing consumer information, is responsive to its stakeholders and has an accessible system, whereby consumers and other stakeholders can obtain further product and product quality and safety information.

Absence (-):

- The enterprise has not complied with labeling codes and has sought to avoid the impact of these codes; OR
- Products are knowingly or regularly incorrectly labeled.

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TRansition paths to sUstainable legume-based systems in Europe

TRANSPORT AND DISTRIBUTION (E3)

THEME: E3.2 Externalities
LINK: Transport and Distribution (E3)

DESCRIPTION

This sub-theme encompasses the impact of a firm (farm) on environment, food waste and land use and the mechanisms it employs to reduce these, such as strategies to identify causes of food waste, GHG emissions and implement corresponding mitigation measures. Externalities are measured over medium to long term and apply to businesses of any size and along the supply chain (FAO, 2013. SAFA Sustainability Assessment of Food and Agriculture systems indicators. http://www.fao.org/nr/sustainability/sustainability-assessments-safa ; Hediger, W., Knickel, K. (2009) Multifunctionality and Sustainability of Agriculture and Rural Areas: A Welfare Economics Perspective, Journal of Environmental Policy & Planning, 11:4, 291-313, DOI: 10.1080/15239080903412453).

METRICS

Implementation of a strategy at firm (farm) level to minimise the externalities caused by its operations as regards food waste, GHG emissions and land use and cover and avoid conversions from ecologically valuable to less valuable habitats caused by the enterprise's operations.

RATINGS

Scale: Weak (-); Medium; Strong (+)

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MARKETS AND RETAILERS (E4)

SUB-THEME: E4.2.1 Consumer
THEME: Vulnerability (E4.2)
LINK: Markets and Retailers (E4)

DESCRIPTION

Consumer is a person who decides on the purchase of a good or a service for personal use, based on personal preferences, beliefs, intentions, and needs or the influence of external factors such as advertising and branding.

RATINGS

Scale: Weak (-); Medium; Strong (+)

CONSUMERS (E5)

THEME: E5.1 Economic Aspect of Behaviour
LINK: Consumers (E5)

DESCRIPTION

Economic Aspects of Behaviour are the economic factors that determine consumer behaviour such as personal income (especially, disposable income which is the amount of money that a consumer has at his/her disposal for spending or/and saving), household income, consumer willingness to pay, availability of products and services (i.e., having products and services available when the consumer needs them), prices of products and services (and their effect on affordability), and consumer market-specific vulnerability (consumer inability unable to engage effectively in a market).

RATINGS

Scale: Weak (-); Medium; Strong (+)

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SUB-THEME: **E5.1.1 Price and Availability**
THEME: Economic Aspect of Behaviour (E5.1)
LINK: Consumers (E5)

DESCRIPTION

Price and Availability: price and availability are among the key economic determinants of consumer behaviour. Food prices and food availability are linked. The lack of availability of food products is likely to drive food prices up, at least for a short time until the shortage of food is addressed (with sufficient quantities that are made available to those who need them at the right time and place).

RATINGS

Scale: Low (-); Medium; High (+)

SUB-SUB-THEME **E5.1.1.1 Price**
SUB-THEME: Price and Availability (E5.1.1)
THEME: Economic Aspect of Behaviour (E5.1)
LINK: Consumers (E5)

DESCRIPTION

Price is the monetary value of a good, service or resource established during a transaction. Price can be set by a producer, seller, the market and to a less extent by the buyer. Price is generally expressed as currency per unit of a commodity or service (e.g., kg, hour, task)

RATINGS

Scale: Low (-); Medium; High (+)

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SUB-THEME: E5.1.2 Willingness to Pay
THEME: Economic Aspect of Behaviour (E5.1)
LINK: Consumers (E5)

DESCRIPTION

Willingness to pay is the maximum amount an individual is willing to pay for a product or service. Willingness to pay is a key component of individuals' demand and is a critical piece of information for a business in the process of pricing their product or service.

RATINGS

Scale: Low (-); Medium; High (+)

SUB-THEME: E5.1.3 Vulnerability
THEME: Economic Aspect of Behaviour (E5.1)
LINK: Consumers (E5)

DESCRIPTION

Vulnerability at consumption level represents the exposure of consumers to exogenous shocks, such as fluctuations in food supply in terms of safety, quality and quantity, and fluctuations in income that may hinder food consumption. The exposure to exogenous shocks and implicit economic vulnerability may constitute a hindrance to household resilience through increased risk affecting the consumption patterns, without necessarily compromising the overall household viability.

METRICS

The degree of exposure of the household to exogenous shocks and their adaptive capacity to reduce the potential impact of these shocks.

RATINGS

Scale: Low (-); Medium; High (+)

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THEME: E5.2 Social Aspect of Behaviour
LINK: Consumers (E5)

DESCRIPTION

Social Aspects of Behaviour are the social factors that determine consumer behaviour such as family (desires, attitudes, and values of the other family members), reference groups (close friends and relatives, work colleagues, professionals), social class (e.g., 'rich', 'middle', and 'poor'), and culture (i.e., symbols, anti-factor and behavioural patterns which are passed on socially from one generation to the next)

RATINGS

Scale: Weak (-); Medium; Strong (+)

THEME: E5.3 Policy
LINK: Consumers (E5)

DESCRIPTION

Policy is a principle or statement of intent that is meant to guide decisions and achieve specific outcomes. Policies are called public policies when they are designed and proposed by governments. However, policies can be proposed or adopted by governments, companies, NGOs and even individuals. Policies can also operate at different levels: the global, national, regional, local and organizational levels.

RATINGS

Scale: Weak (-); Medium; Strong (+)

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TRansition paths to sUstainable legume-based systems in Europe

Social Pillar

Description and metrics of indicators

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TRansition paths to sUstainable legume-based systems in Europe

Indicators Structure and Theme ratings for the Social sustainability pillars

PRODUCTION(S1) Scale: Low (-); Medium; High (+)		
THEME	**SUB-THEME**	**INDICATOR**
Economic Incentives to Environment friendly Agricultural practices Scale: Low (-); Medium; High (+)		CAP
		Food Sovereignty
		Agro-ecology
Quality of life (farmers) Scale: Low (-); Medium; High (+)	Safety Scale: Low (-); Medium; High (+)	Safety and Health Trainings
		Safety of Workplace, Operations and Facilities
		Health Coverage and Access to Medical care
	Employment (quality) Scale: Low (-); Medium; High (+)	Employment Relations
		Wage Level
		Capacity Development
Equity Scale: Low (-); Medium; High (+)	Power structure Scale: Concentrated (-); Distributed; Participatory (+)	Non-Discrimination
		Gender Equality
		Support to Vulnerable People
		Fair Access to Means of Production
		Freedom of Association and Right to Bargaining

PROCESSING (S2) Scale: Low (-); Medium; High (+)		
THEME	**SUB-THEME**	**INDICATOR**
Food Policies Scale: Absent (-); Present (+)		Safety and Health Training
		Public Health
		Innovation and Licencing
Quality of work Environment Scale: Low (-); Medium; High (+)	Employment Scale: Low (-); Medium; High (+)	Employment Relations
		Wage Level
		Capacity Development
	Rights	Rights of Suppliers

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	Scale: Absent (-); Present (+)	Freedom of Association and Right to Bargaining
		Rights of Retailers
	Health and Safety Scale: Low (-); Medium; High (+)	Health Coverage and Access to Medical care
		Safety of Workplace, Operations and Facilities
Equity Scale: Concentrated (-); Distributed; Participatory (+)		Discrimination
		Gender Equality
		Support to Vulnerable People

TRANSPORT AND DISTRIBUTION (S_3) Scale: Low (-); Medium; High (+)		
THEME	**SUB-THEME**	**INDICATOR**
Food Safety Policies Scale: Low (-); Medium; High (+)		Safety and Health Training
		Public Health
Quality of work Environment Scale: Low (-); Medium; High (+)	Employment Scale: Low (-); Medium; High (+)	Employment Relations
		Wage Level
		Capacity Development
	Rights Scale: Absent (-); Present (+)	Rights of Suppliers
		Freedom of Association and Right to Bargaining
		Rights of Retailers
	Health and Safety Scale: Low (-); Medium; High (+)	Health Coverage and Access to Medical care
		Safety of Workplace, Operations and Facilities

MARKETS AND RETAILERS (S_4) Scale: Low (-); Medium; High (+)		
THEME	**SUB-THEME**	**INDICATOR**
Policy Scale Absent (-); Present (+)		Connect Farmers to markets
		Rights of Consumers
		Community Supported Agriculture
Quality of work Environment Scale: Low (-); Medium; High (+)	Employment Scale: Low (-); Medium; High (+)	Employment Relations
		Wage Level
		Capacity Development

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	Rights Scale: Absent (-); Present (+)	Rights of Suppliers
		Rights of Consumers
	Health and Safety Scale: Low (-); Medium; High (+)	Health Coverage and Access to Medical care
		Safety of Workplace and Facilities
		Safety and Health Training
Equity Concentrated (-); Distributed; Participatory (+)		Non-Discrimination
		Gender Equality
		Fair Pricing and Transparent Contracts

CONSUMERS (S5) Scale: Low (-); Medium; High (+)		
THEME	**SUB-THEME**	**INDICATOR**
Behaviour Scale: Low Responsibility (-); Medium Responsibility; High Responsibility		Income
	Culture Scale: Weak (-); Medium; Strong (+)	Indigenous Knowledge
		Food Sovereignty
		Traditional recipes
	Consumers' Awareness Scale: Weak (-); Medium; Strong (+)	Consumers' Education
		Preference for processed Food
Policies Scale: Absent (-); Present (+)	Educational Campaigns Scale: Weak (-); Medium; Strong (+)	Advertising of Healthy Food
		School meals
		Taxation of Unhealthy Food
		Income Support Policies
Nutrition and Health Claims Scale: Low (-); Medium; High (+)		Health Coverage and Access to Medical care
		Public procurement
		Dietary guidelines

Table of Indicators for the Social sustainability pillars

LEGEND:	
S	Social Pillar for the Agri-food Chain
1	Production link
2	Processing link
3	Transport and Distribution link
4	Markets and Retailers link
5	Consumers link

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TRansition paths to sUstainable legume-based systems in Europe

DESCRIPTION AND METRICS OF SOCIAL INDICATORS

INDICATOR NAME: CAP
THEME: Economic Incentives to Environment friendly Agricultural practices
LINK : Production (S1)

DESCRIPTION

The current CAP contains a range of provisions for climate mitigation and environmental protection: the obligatory 'cross-compliance' standards for keeping land in Good Agricultural and Environmental Condition (GAEC); Pillar 1 green direct payments; and Pillar 2 Rural Development measures (for land management, investments, and advice and capacity building); and the Farm Advisory System (FAS). The 'greening' measures introduced in the 2014 CAP reforms required farmers to adopt a standardized set of practices – diversification, maintenance of permanent grasslands, and the creation of ecological focus areas – in order to access their full direct payments. Some of these measured can relate directly to intensification of legume production, for example Zinngrebe et al. (2017)[1] report that EFA in Germany have pushed farmers to increase the cultivation of nitrogen fixing crops.

METRICS

This defines whether there are some greening of the CAP measures in place (i.e., VCS: voluntary coupled support, EFA:Ecological Focus Areas) or not.

RATINGS

Scale: No (-); Yes (+)

- NO- no Greening of the CAP measure in place
- YES – both/ either VCS and EFA are available

[1] Zinngrebe, Y., Pe'er, G., Schueler, S., Schmitt, J., Schmidt, J. and Lakner, S., 2017. The EU's ecological focus areas–How experts explain farmers' choices in Germany. *Land use policy*, *65*, pp.93-108. doi.org/10.1016/j.landusepol.2017.03.027

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Food Sovereignty**
THEME: Economic Incentives to Environment friendly Agricultural practices
LINK: Production (S1)

DESCRIPTION

Based on a renewal of traditional agrarian and indigenous wisdom, food sovereignty encompasses the need for a more just, local and sustainable food system that affirms the underlying values of democracy, empowerment and self-determination. Food sovereignty results in a just, ecologically harmonious and local, food and agriculture system, which is derived from the right of peoples and communities to define it themselves. Generally, food sovereignty is discussed at a community level and is considered inclusive of all types of ownership and production models in communities of every ethnicity and variety and both rural and urban. This indicator, however, applies to the individual enterprise being assessed and it measures whether the operation has choices between different inputs and raw materials and marketing outlets. Access to choice reflects the independence of the enterprise and the ability of the food chain to have control, or ownership, over their production and supply system, as well as making choices that reinforce this independence from other operations.

METRICS

An enterprise ownership and ability to choose is measured by assessing whether the operation sources locally-adapted seed varieties or livestock breeds, or traditional or heirloom varieties, for at least a majority of their production:

- The operation avoids changes in production or purchasing that would eliminate seed saving, or the use of heirloom, traditional or locally adapted varieties or breeds in their own production, or that of their suppliers.
- The operation avoids changes in production or purchasing that would limit market access and consumers freedom to choose.

RATINGS

Scale: No (-); Yes (+)

No – The enterprise ability to choose its production and supply system does not meets all relevant criteria defined above under Metrics.
Yes- The enterprise ability to choose its production and supply system meets all relevant criteria defined above under Metrics.

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Agro-ecology
THEME: Economic Incentives to Environment friendly Agricultural practices
LINK: Production (S1)

DESCRIPTION

The EU has committed to reduce GHG emissions by 40% by 2030. The agriculture sector will be part of this effort. Both organic agriculture and agroecology promote a "closed system" approach, which minimizes external inputs; they use multiple and diverse agroecology (crop rotation, crop spatial distribution and temporal succession, biological pest control, organic fertilization, intercropping, cover crops, optimized tillage, integration of semi-natural landscapes elements, etc.). Both tend to favor more direct links with customers and to engage with social movements.

METRICS

The indicator is measured by the level of presence of agroecology policies (high, medium) or absence of such policies (low).

RATINGS

Scale: Low (-); Medium; High (+)

- Low - absence of Agroecology policies
- Medium – There is knowledge of Agroecological practices but implementation of policies in support of these practices is absent
- High: presence of Agroecology policies

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Safety and Health Trainings
SUB-THEME: Safety
THEME: Quality of life (farmers)
LINK: Production (S1)

DESCRIPTION

By providing training in health and safety, enterprises empower employees to understand the possible hazards of the workplace, to have familiarity with the materials and machinery they work with and are exposed to, and to understand the ergonomics of the work so that injuries from repeated motions, lifting or other physical challenges are reduced. Successful trainings ensure a more efficient and positive work environment for all.

METRICS

This qualitative indicator measures whether the enterprise has been providing training in health and safety for employees, and whether these trainings are effective.

RATINGS

Scale: Low (-); Medium; High (+)

- Low - Health and safety trainings are not offered on-site or off-site for employees at least annually
- Medium - Health and safety trainings are not offered on-site or off-site for employees at least 2-3 times a year, or at least at the recommended level by local authorities or regional agencies
- High - 100% of employees have attended at least a basic health and safety training, those working on specialized equipment have also received appropriate trainings, and all above criteria have been met.

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Safety of Workplace, Operations and Facilities
SUB-THEME: Safety
THEME: Quality of life (farmers)
LINK: Production (S1)

DESCRIPTION

Employers are responsible for providing a safe and healthy workplace for all personnel and employees. That begins by providing workplace facilities that are clean, adequately ventilated, and that are structurally sound and meet or exceed local building codes. Furthermore, the necessary equipment is provided and is safe. The enterprise monitors the health of employees who are exposed to toxic, radioactive or nano materials, or excessive noise, and sets reasonable limits to exposure. The workplace can include showers for workers who need to wash off dust, toxic materials, extreme temperatures, etc. to which they have been exposed on the job. Enterprises can also encourage and even provide incentives for preventive health measures, healthy eating, exercise, cessation of smoking, and treatment for workers addicted to drugs or alcohol. If an enterprise is large enough to have a cafeteria, the food provided is safe, fresh, locally produced and nutrient rich. Enterprises allow employees to take food for themselves and their families or purchase food at a discount. Enterprises should also require that all business partners, subsidiaries and sub-contractors provide safe and healthy workplaces.

METRICS

This qualitative indicator measures whether the enterprise has been ensuring a safe, clean and healthy workplace for employees by determining if facilities and structures, equipment, practices, and food offered are safe and meet employee needs for healthy lifestyles.

RATINGS

Scale: Low (-); Medium; High (+)

Low (if at least 2 out of 5 points below are met)

- Enterprise fires workers who have been injured on the job, or fail to provide alternative work that these workers are still capable of performing AND
- Enterprise has a higher rate of accidents than industry average AND
- Buildings are compromised or unsafe AND

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- Employees do not follow safety protocols, or none exist, for employees when using toxic materials, hazardous materials or inputs AND
- Sanitation facilities, transportation or housing are filthy and unsafe for employees using them

Medium (if at least 1 out of 5 points below are met)

- Enterprise fires workers who have been injured on the job, or fail to provide alternative work that these workers are still capable of performing OR
- Enterprise has a higher rate of accidents than industry average OR
- Buildings are compromised or unsafe OR
- Employees do not follow safety protocols, or none exist, for employees when using toxic materials, hazardous materials or inputs OR
- Sanitation facilities, transportation or housing are filthy and unsafe for employees using them

High - The enterprise ensures a safe, clean and healthy workplace for employees by determining if facilities and structures, equipment, practices and food offered are safe and meet employee needs for healthy lifestyles.

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Health Coverage and Access to Medical care
SUB-THEME: Safety
THEME: Quality of life (farmers)
LINK: Production (S1)

DESCRIPTION

Employers play an important role in ensuring the access to medical care of their employees. Larger enterprises often have a clinic with medical personnel available on site, while smaller enterprises may provide access to the medical care of choice for their employees. Either way, enterprises provide health coverage, either in the form of health insurance, workers compensation, or public health services as provided by local law. In addition, enterprises are prepared for medical emergencies. Whether through on-site care or off-site care, enterprises have emergency plans and transportation available in case of an accident to ensure that medical care reaches their employees. Larger enterprises have a clinic with medical personnel available on site, or formal contract with a medical center in the surrounding area of the enterprise.

METRICS

This qualitative indicator measures whether the enterprise has been providing health coverage and ensuring emergency access to medical care for employees.

RATINGS

Scale: No (-); Yes (+)

No (if at least 1 out 3 points below are met)

- Enterprise fails to provide legally required level of health coverage, or fails to provide any form of health coverage AND
- Enterprise does not have emergency plan in place to ensure medical care reaches injured or at-risk employees AND
- Employees report that accidents were not dealt with quickly, and injured employees suffered increased injury as a result

Yes - The enterprise provides health coverage and ensures emergency access to medical care for all employees according to the criteria mentioned above.

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Employment Relations
SUB-THEME: Employment (quality)
THEME: Quality of life (farmers)
LINK: Production (S1)

DESCRIPTION

Employment Relations refer to enterprises maintaining legally-binding transparent contracts with all employees that are accessible and cover the terms of work. Employment is compliant with national laws on labour and social security. Verbal terms of employment should be discouraged, however they are considered contracts by courts

METRICS

This qualitative indicator measures whether the enterprise has written agreements with their employees that meet at least national and international labour treaties including social security. For small-scale producers, it is more likely that only one or two employees are involved and may have verbal work agreements. In this case, this indicator measures whether there is a clear understanding of the wages and conditions of work between the employer and employees.

RATINGS

Scale: No (-); Yes (+)

No (if at least 1 out of 5 points below are met)

- No written contract or terms of employment are provided; OR
- Contracts do not meet national and international labour laws and treaties; OR
- Contract terms are not clear to employees; OR
- Employees (or both employers and employees) are not literate and no provision is made for third party verbal contract terms communications; OR
- The contract is not made available to employees upon request

Yes - In written policies and in practice, enterprises provide legally binding contracts for all employees that meet labor laws and treaties, and all of the components listed above are met.

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Wage Level**
SUB-THEME: Employment (quality)
THEME: Quality of life (farmers)
LINK: Production (S1)

DESCRIPTION

A living wage is the amount paid to employees or earned by an individual within a standard work-week (that does not include over-time or exceed normal working hours) that meets basic needs for subsistence, including nutrition, clothing, health care, education, potable water, child care, transportation, housing, and energy, plus savings.

METRICS

This is a quantitative indicator that measures the percent of employees that are paid a living wage. All employees, workers, or hired help of any kind whether permanent or temporary, full-time or part-time, are part of the scope of this indicator. It is critical that wages paid for work at the operation to employees hired through sub-contractors (such as labor contractors, temporary agencies and others), are also considered.

RATINGS

Unacceptable (-); Acceptable (+)

Unacceptable (if at least 1 of 4 points below are met)

- Paying employees below the poverty rate for the same region; OR
- Paying employees below the prevailing average rate for the same industry; OR
- Paying employees by piece-rate at a wage that requires more than standard work-week hours, or encourages unhealthy conditions to reach a living wage; OR
- Docking of pay, or withholdings by the employer, for punishment purposes

Acceptable - 100% of employees and personnel involved in the enterprise are paid a living wage

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Capacity Development
SUB-THEME: Employment (quality)
THEME: Quality of life (farmers)
LINK: Production (S1)

DESCRIPTION

For enterprises to be sustainable, they must provide conditions for stable employment, internal advancement, capacity development and growth for employees. Employees who are learning and growing and feel that they have a promising career path are more likely to do their best work and contribute to the improvement of the enterprise. Similarly, primary producers have the right to adequate resources so that they can increase their own skills and knowledge, and assure the future of their enterprise by providing opportunities for learning and training for members of their family, community or tribe.

METRICS

This qualitative indicator measures whether employees have opportunities for capacity development and advancement within the enterprise, as well as whether primary producers have adequate resources to build their own capacities and their family members, in order to adopt improved techniques and provide for succession to the next generation.

RATINGS

Scale: Low (-); Medium; High (+)

Low (if at least 2 out of 3 points below are met)

- Employers hire from outside their enterprise when they want new skills or greater capacity, and do not give their own workers the chance to advance ; AND
- Primary producers fail to adopt innovations and their children leave to seek opportunities elsewhere; AND
- Training programmes are only open to men or members of a particular ethnic, racial or economic group

Medium (if 1 out of 3 points below are met)

- Employers hire from outside their enterprise when they want new skills or greater capacity, and do not give their own workers the chance to advance; OR
- Primary producers fail to adopt innovations and their children leave to seek opportunities elsewhere; OR
- Training programmes are only open to men or members of a particular ethnic, racial or economic group.

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High (all points below are met)

- Employees may attend trainings, conferences, or other learning and networking events;
- Employees may discuss opportunities for advancement openly with management, and may develop plans for acquisition of necessary skills;
- Employees can give examples of colleagues, or their own experience, of being promoted fairly, or of being given by the enterprise, opportunities for career development.

INDICATOR NAME: Non Discrimination
SUB-THEME: Power structure
THEME: Equity
LINK: Production (S1)

DESCRIPTION

Sustainable enterprises do not discriminate against any employee, or prospective employee, based on race, creed, color, national or ethnic origin, gender, age, handicap or disability (including HIV status), union or political activity, immigration status, citizenship status, marital status, or sexual orientation in hiring, job allocation, training, advancement, lay-offs or firing.

METRICS

This qualitative indicator measures whether the enterprise discriminates against particular groups or by sexual identity in hiring, job allocation, promotions and firing or in awarding contracts to suppliers.

RATINGS

Scale: No (-); Yes (+)

No (if at least 1 of 3 points below are met)

- Evidence exists of discrimination in the workplace against employees of any grouping; OR
- Evidence exists of discrimination as a buyer against suppliers of any grouping; OR
- Enterprises pit one ethnic or racial group against another to drive down prices or conditions of work.

Yes - Enterprises have clear policies of non-discrimination and apply those policies consistently to all employees and in all dealings with suppliers.

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Gender Equality
SUB-THEME: Power structure
THEME: Equity
LINK: Production (S1)

DESCRIPTION

This indicator intends to ensure that barriers to the employment of women on an equal basis with men are removed, that women receive equal pay for the same or similar work, and have equal opportunities for training and advancement. In addition, there are special protections for women employees before, during, and after pregnancy. Medical benefits are provided for the woman and her child in accordance with national laws and regulations, or in any other manner consistent with national practice. Finally, women are protected in their employment, and are guaranteed the right to return to the same position, or an equivalent position, paid at the same rate at the end of her maternity leave.

METRICS

This qualitative indicator measures whether the enterprise has discriminated against women in hiring, remuneration, training, advancement and access to resources.

RATINGS

Unacceptable (-); Acceptable (+)

Unacceptable (if at least 1 out of 3 points below are met)

- Employers give preference to men in hiring, placement, training, pay and advancement, or any other aspect of the operations; OR
- As buyers, enterprises give preference or pay higher prices to male primary producers in awarding contracts; OR
- Enterprises fail to provide for the safety of pregnant women employees, do not provide paid maternity leave, fire women who take time off to have a baby, or refuse to allow women to return to their previous position or a position with similar wages when they return from maternity leave, and do not allow women to nurse during working hours.

Acceptable - The enterprise does not discriminate against women in hiring, remuneration, training, advancement and access to resources, according to the criteria mentioned above.

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Support to Vulnerable People
SUB-THEME: Power structure
THEME: Equity
LINK: Production (S1)

DESCRIPTION

Support to vulnerable people focuses on enterprises providing support and making accommodations for employees and primary producer suppliers at different life stages and differing levels of ability and disability. Enterprises can perform important services by providing targeted recruitment for minorities, or the socially disadvantaged and language training for people who do not speak the dominant language or have not had the benefit of schooling. In addition, if a worker is injured on the job, they are considered a vulnerable employee, and the employer provides alternative work at a comparable wage to accommodate the disability.

METRICS

This qualitative indicator looks into policies and practices that have effectively accommodated varying levels of ability and disability, young workers and aged ones. It also measures whether the enterprise has provided resources to the local community to support vulnerable people with social and health services, training including languages, and cultural events.

RATINGS

Scale: Low (-); Medium; High (+)

Low (if at least 3 out of 6 points below are met)

- Enterprise fires workers who have been injured on the job or fails to provide alternative work that these workers are still capable of performing; AND
- As a buyer, enterprise fails to award contracts to primary producers from minority or disadvantaged groups; AND
- Enterprise assigns vulnerable workers (such as young or very old workers) to tasks that involve using toxic materials or dangerous equipment, or schedules them on night shifts; AND
- Enterprise does not provide jobs for the disabled, but does have the capacity to do so; AND

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- Enterprise does not provide work that is appropriate for elderly employees, but does have the capacity to do so; AND
- Employer hires only athletic young men and fails to rehire them if they have suffered injuries or become older and slower.

Medium (if at least 1 out of 6 points below are met)

- Enterprise fires workers who have been injured on the job or fails to provide alternative work that these workers are still capable of performing; OR
- As a buyer, enterprise fails to award contracts to primary producers from minority or disadvantaged groups; OR
- Enterprise assigns vulnerable workers (such as young or very old workers) to tasks that involve using toxic materials or dangerous equipment, or schedules them on night shifts; OR
- Enterprise does not provide jobs for the disabled, but does have the capacity to do so; OR
- Enterprise does not provide work that is appropriate for elderly employees, but does have the capacity to do so; OR
- Employer hires only athletic young men and fails to rehire them if they have suffered injuries or become older and slower.

High - The enterprise has accommodated varying levels of ability and disability, young workers and aged ones, and has provided resources to the local community to support vulnerable people with social and health services, training including languages, and cultural events, as described above.

INDICATOR NAME: **Fair Access to Means of Production**
THEME: Equity
LINK: Production (S1)

DESCRIPTION

Primary producers' rights to equal access to means of production are critical to their ability to build a decent livelihood for themselves and their families. The means of production include knowledge, equipment and facilities required for the producer to meet the output level necessary to maintain a decent livelihood and cover their costs of production, including paying a living wage to their employees. When primary producers have equal access to the means of production, they are able to access and implement trainings or other knowledge transfer regarding the best practices for their

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farm. They are able to purchase or make equipment and materials that allow for their operation to run efficiently and complete their harvests without facing debt loads that could destabilize their operation.

METRICS

This qualitative indicator measures whether primary producers have access to the means of production, meaning the knowledge, facilities and equipment necessary for the enterprise owners, managers and employees to maintain a decent livelihood.

RATINGS

Scale: Low (-); Medium; High (+)

Low (if at least 2 out of 3 points below are met)

- The enterprise is unable to maintain facilities, and buildings or equipment are in disrepair; AND
- Significant post-harvest losses, contamination, or other loss of product occur that reduce profits, and would be preventable with better equipment or implementation of best practices; AND
- The enterprise does not have access through any conduit to further training or knowledge and skill building regarding their operations.

Medium (if at least 1 out of 3 points below are met)

- The enterprise is unable to maintain facilities, and buildings or equipment are in disrepair; OR
- Significant post-harvest losses, contamination, or other loss of product occur that reduce profits, and would be preventable with better equipment or implementation of best practices; OR
- The enterprise does not have access through any conduit to further training or knowledge and skill building regarding their operations.

High – The enterprise has access to sufficient knowledge of their practices, in order to make beneficial improvements of their operations. For example, enterprise has access to agricultural extension services, conferences, trainings, courses at local or online colleges and events. In addition, the enterprise has access to necessary equipment and facilities.

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Freedom of Association and Right to Bargaining
THEME: Equity
LINK: Production (S1)

DESCRIPTION

Freedom of Association and Right to Bargaining form the necessary conditions for fair trading practices, should these be established and flourishing into the future.

METRICS

This qualitative indicator measures whether any employee in an enterprise is free to negotiate, as individuals or as groups, or through a union or representatives of their choice, the terms of their employment.

RATINGS

Scale: No (-); Yes (+)

No (if at least 2 out of 6 points below are met)

- Employer retaliation against employees for initiating the rights and freedoms, including cancelling of contracts/subcontracts and verbal threats against labour; OR
- Restrictions on transparency and negotiations; OR
- Refusal to allow employees to have representative of their choice present during and negotiations; OR
- Employer makes arbitrary changes to contract without agreement of employees; OR
- Employer pits one employee or group of employees against another; OR
- Failure to allow employees to share proposed contracts or agreements with family members and/or seek and retain legal counsel.

Yes - The rights to freedom of association and collective bargaining are fully established and understood by all employees involved and employers provide training in their legal rights for all employees.

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Public Health**
THEME: Food Policies
LINK: Processing (S2)

DESCRIPTION

This indicator refers to enterprises ensuring that operations and business activities do not limit the healthy and safe lifestyles of the local community by polluting or contaminating water, air and soils. Furthermore, a larger-scale enterprise makes positive contributions to community health resources and services by providing financial support, while a family-scale primary producer contributes by selling healthy, clean, locally grown food. Farms of any size can contribute culls and edible excess produce to the local emergency food supply.

METRICS

This indicator asks whether the enterprise: takes measures to avoid polluting or contaminating the local community; and contributes to the health of the local community.

RATINGS

Scale: Absent (-); Present (+)

Absent

- The enterprise pollutes water, air and soils with toxic materials; AND/OR
- The enterprise expands without consideration for other area residents and their needs.

Present

The enterprise takes measures to avoid polluting or contaminating the local community and contributes to the health of the local community according to all the conditions mentioned above.

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Innovation and Licencing
THEME: Food Policies
LINK: Processing (S2)

DESCRIPTION

The creation of innovative technologies for the processing of food is important to add value to a crop and create a product that is marketable at higher price and [2]safe for consumption. For example, for legumes used both for feed and for human consumption, processing will entail manufacturing, canning, preserving, freezing, drying, dehydrating, heating and cooking, pressing, packing, etc. Innovation concerns the efficient use of resources (i.e., energy, water) as well as the use of alternative processing technologies such as hydrostatic pressure and pulse electric fields (PEFs), which offer products that have a more 'natural' flavor and are safer with extended shelf-life. Licensing is required to operate the processing facility in accordance with national and EU law.

METRICS

The indicator is measured by the presence of such policies (present) or absence of such policies (absent).

RATINGS

Scale: Absent (-); Present (+)

- Absent – Absence of such policies
- Present – Presence of such policies

[2] https://ec.europa.eu/agriculture/rural-development-2014-2020/country-files_en

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Rights of Suppliers
SUB-THEME: Rights
THEME: Quality of work Environment
LINK: Processing (S2)

DESCRIPTION

Suppliers, particularly primary producers, rights to freedom of association and collective bargaining are basic freedoms that form the necessary basis and prerequisite conditions for fair trading with buyers. This indicator refers to buyers treating the primary producers who supply them with farm products with respect, as well as other suppliers such as processors and other businesses.

METRICS

This qualitative indicator measures whether buyers explicitly recognize and support in good faith primary producers and suppliers' rights to freedom of association and to collective bargaining for all contracts and agreements. This indicator shall be measured and rated by whether the buyers recognize these fundamental rights of all suppliers.

RATINGS

Scale: No (-); Yes (+)

No (if at least 2 of 6 points below are met)

- Buyer retaliation against suppliers for initiating their rights and freedoms, including cancelling of contracts and verbal threats against producers; OR
- Restrictions on transparency and fair negotiations; OR
- Refusal to allow supplier to have representative(s) of their choice present during any negotiations; OR
- Buyer making arbitrary changes to contract without agreement of supplier; OR
- Buyer pits one producer (or group of producers) against another; OR
- Failure to allow producers to share proposed contracts or agreements with family members and/or seek and retain legal counsel.

Yes - Buyers have long-term relationships of trust with 100% of their suppliers, based on their rights to freedom of association and collective bargaining.

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Rights of Retailers
SUB-THEME: Rights
THEME: Quality of work Environment
LINK: Processing (S2)

DESCRIPTION

The relationships between retailers, especially small or independent retailers, and large businesses and suppliers, are critical points for ensuring fair relationships, based on balanced power and equal negotiation.

METRICS

This qualitative indicator measures whether buyers explicitly recognize and support in good faith primary producers and suppliers' rights to freedom of association and to collective bargaining for all contracts and agreements. This indicator shall be measured and rated by whether the buyers recognize these fundamental rights of all suppliers.

RATINGS

Scale: No (-); Yes (+)

No

- Buyer making arbitrary changes to contract without agreement of supplier
- Buyer making arbitrary changes to contract, including canceling of contracts and verbal threats against producers
- Restrictions on transparency and fair negotiations, including refusal to allow suppliers to have representatives of their choice present during any negotiations
- Buyer pits one producer against another.

Yes - Buyers have long-term relationships of trust with 100% of their retailers, based on their rights to freedom of association and collective bargaining.

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Health Coverage and Access to Medical care
SUB-THEME: Health and Safety
THEME: Quality of work Environment
LINK: Processing (S2)

DESCRIPTION

Employers play an important role in ensuring the access to medical care of their employees. Larger enterprises often have a clinic with medical personnel available on site, while smaller enterprises may provide access to the medical care of choice for their employees. Either way, enterprises provide health coverage, either in the form of health insurance, workers compensation, or public health services as provided by local law. In addition, enterprises are prepared for medical emergencies. Whether through on-site care or off-site care, enterprises have emergency plans and transportation available in case of an accident to ensure that medical care reaches their employees. Larger enterprises have a clinic with medical personnel available on site, or formal contract with a medical center in the surrounding area of the enterprise.

METRICS

This qualitative indicator measures whether the enterprise has been providing health coverage and ensuring emergency access to medical care for employees.

RATINGS

Low (-) Enterprise fails to provide legally required level of health coverage, or fails to provide any form of health coverage.

Medium - Provides legally required level of health coverage health but it does not have emergency plan in place to ensure medical care reaches injured or at-risk employees AND Employees report that accidents were not dealt with quickly, and injured employees suffered increased injury as a result.

High (+) The enterprise provides health coverage and ensures emergency access to medical care for all employees according to the criteria mentioned above.

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Safety and Health Trainings
THEME: Food Safety Policies
LINK: Transport and Distribution (S3)

DESCRIPTION

By providing training in health and safety, enterprises empower employees to understand the possible hazards of the workplace, to have familiarity with the materials and machinery they work with and are exposed to, and to understand the ergonomics of the work so that injuries from repeated motions, lifting or other physical challenges are reduced. Successful trainings ensure a more efficient and positive work environment for all.

METRICS

This qualitative indicator measures whether the enterprise has been providing training in health and safety for employees, and whether these trainings are effective.

RATINGS

Absent (-); Present (+)

Absent (-) Absence of safety and health training

Present (+) Presence of safety and health training

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Connect Farmers to markets
THEME: Policy
LINK: Markets and Retailers (S4)

DESCRIPTION

In general, this indicator refers to the ability of smallholder farmers to access markets. There may be a need to create a space (market, retail area, sale point) for vegetables and fruit producers to meet the consumers locally. Other market structures may help the transition to legumes cultivation and marketing, see following points:

1. Insurance products - Specific insurance products to support the agro-ecological transition phase can help overcome a significant barrier that food producers face in transitioning to agroecology.
2. Credit line - Establishing specific credit lines and investment schemes can help promote agro-ecological production. Credit lines that allow greater flexibility for food producers to buy local products and take decisions based on their own needs will support the autonomy and adaptive capacity of producers.
3. Sanitary and phytosanitary measures should be adjusted to support smallholders farmers' ability to comply with the law.

METRICS

The indicator is measured by the level of connection of farmers to market as described in the ratings.

RATINGS

Scale: Low (-); Medium; High (+)

Low (if at least 2 of the 4 points below are met)

- Smallholder famers are not connected to markets, > 5 markets or sale points within 100 km radius around the farm
- Insurance products that support transition to sustainable agricultural practices are not available
- Credit line and investment schemes for smallholder farmers who practice sustainable agriculture are not available
- Sanitary and phytosanitary measures hinders smallholder farmers access to markets.

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Medium (if at least 1 of the 4 points below are met)

- Smallholder famers are not connected to markets, > 5 markets or sale points within 100 km radius around the farm
- Insurance products that support transition to sustainable agricultural practices are not available
- Credit line and investment schemes for smallholder farmers who practice sustainable agriculture are not available
- Sanitary and phytosanitary measures hinder smallholder farmers access to markets.

High

- Smallholder famers are connected to markets, > 10 markets or sale points are available within 100 km radius around the farm
- Insurance products that support transition to sustainable agricultural practices are available
- Credit line and investment schemes for smallholder farmers who practice sustainable agriculture are available.

INDICATOR NAME: Rights of Consumers
THEME: Policy
LINK: Markets and Retailers (S4)

DESCRIPTION

Rights of consumers can be divided into a) food safety issues; b) right to information about nutritional value (front-of-pack nutritional label, GMOs, and chemical load in the product; and c) right of association and right to confront the food industry.

METRICS

This qualitative indicator refers to, whether the consumer has any rights/trustful relationship white the suppliers.

RATINGS

Unacceptable (-); Acceptable (+)

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Unacceptable - Restrictions on transparency and fair negotiations, including refusal to allow consumers to have representatives of their choice present during any negotiations.

Acceptable - Consumers have long-term relationships of trust with 100% of their suppliers and retailers, based on their rights to information.

INDICATOR NAME: **Community Supported Agriculture**
THEME: Policy
LINK: Markets and Retailers (S4)

DESCRIPTION

Dominant market models are not consistent with agro-ecological production. Markets that are developed as vertical value chains for single products do not match the needs of diversified agro-ecological approaches, particularly those of small-scale food producers. A diversity of markets that emphasize local and regional production and consumption can help encourage diversified agro-ecological production. Successful models include community-supported agriculture schemes, e-commerce and participatory guarantee schemes, which re-connect producers and consumers, rural and urban areas.

METRICS

Presence of CSA in the EU.A source of information and data can be the following: https://urgenci.net/

RATINGS

Scale: Absent (-); Present (+)

Absent – CSA is absent; it is not used by the enterprise

Present – CSA is present; it is not used by the enterprise

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Fair Pricing and Transparent Contracts
THEME: Equity
LINK: Markets and Retailers (S_4)

DESCRIPTION

For sustained trading relationships to exist, buyers must pay primary producers' prices for their products that reflect the real cost of the entire process of sustaining a regenerative ecological system. This includes supporting a decent livelihood for primary producers, their families and workers by providing living wages that cover producer's costs. Fair pricing becomes possible when buyers agree to negotiate with their suppliers on terms of equality before establishing contracts, whether written or verbal that set the terms of trade.

METRICS

The qualitative indicator focuses on the type of policies and practices of buyers that recognize and support two things: primary producers' rights to fair pricing; and primary producers rights to fair contracts or agreements.

RATINGS

Scale: No (-); Yes (+)

No

- Buyers set prices without consultation with suppliers; OR
- Buyers retaliate against suppliers who raise issues, or complaints about the terms of trade; OR
- Buyers terminate trade agreements with suppliers without just cause; OR
- Agreements lack mutual understanding on the conflict resolution process.

Yes

- 100% of trade deals with suppliers are based on contracts with buyers that include the rights to negotiate the terms of trade, a conflict resolution process for resolving differences, and agreement that trade relations will not be terminated, except for just cause.

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Income
THEME: Behaviour
LINK: Consumers (S5)

DESCRIPTION

Cost and accessibility are one of the major factors that influence our food choices. Therefore, income level determines what type of food we choose. Low-income people usually buy food of low quality and safety. However, access to more money does not automatically equate to a better-quality diet but the range of foods from which one can choose should increase.

METRICS

This descriptive indicator refers to the food choices based on income.

RATINGS

Scale: Low (-); Medium; High (+)

Low – Between 500 and 800 Euros per month (after tax) with food choices of low quality (highly processed food, no concern for social and environmental externalities of food choices)

Medium – between 1000 and 2500 euros per month (after tax) with food choices that consider (less than 30%) social and environmental externalities and low consumption of highly processed food (less than 30% of the total amount of food consumed)

High – Above 2500 euros per month (after tax) with food choices that take into account (< 50%) social and environmental externalities and low consumption of highly processed food (< 50% of food consumed)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727973

TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Indigenous Knowledge
SUB-THEME: Culture
THEME: Behaviour
LINK: Consumers (S5)

DESCRIPTION

This indicator refers to the recognition and protection of intellectual property rights of indigenous populations. This is inclusive of a broad range of cultural knowledge, such as art, rituals and indigenous customs in general, but more specifically knowledge concerning growing and catching methods, seeds/breeds and their usage, and medicinal plants and their uses. Indigenous communities concerned should be remunerated in a fair and equitable way, based on mutually agreed terms which explicitly provides for continued access and on-going applications of this knowledge for their communities.

METRICS

This qualitative indicator measures whether enterprises: recognize and respect the universal rights of indigenous communities to protect their knowledge; and if appropriated and acquired, whether enterprises remunerate indigenous communities in a fair and equitable manner, based on mutually agreed terms.

RATINGS

Excluded (-); Included (+)

Excluded – The enterprise does not recognize and respects the universal rights of indigenous communities to protect their knowledge; if appropriated and acquired, the enterprise does not remunerate indigenous communities in a fair and equitable manner, based on mutually agreed terms.

Included - The enterprise recognizes and respects the universal rights of indigenous communities to protect their knowledge; if appropriated and acquired, the enterprise remunerates indigenous communities in a fair and equitable manner, based on mutually agreed terms.

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Food Sovereignty
SUB-THEME: Culture
THEME: Behaviour
LINK: Consumers (S5)

DESCRIPTION

Based on a renewal of traditional agrarian and indigenous wisdom, food sovereignty encompasses the need for a more just, local and sustainable food system that affirms the underlying values of democracy, empowerment and self-determination. Food sovereignty results in a just, ecologically harmonious and local, food and agriculture system, which is derived from the right of peoples and communities to define it themselves. Generally, food sovereignty is discussed at a community level and is considered inclusive of all types of ownership and production models in communities of every ethnicity and variety and both rural and urban. This indicator, however, applies to the individual enterprise being assessed and it measures whether the operation has choices between different inputs and raw materials and marketing outlets. Access to choose reflects the independence of the enterprise and the ability of the food chain to have control, or ownership, over their production and supply system, as well as making choices that reinforce this independence from other operations.

METRICS

An enterprise ownership and ability to choose is measured by assessing whether the following criteria apply to all relevant business decisions, including whether:

- the operation sources locally-adapted seed varieties or livestock breeds, or traditional or heirloom varieties, for at least a majority of their production.
- the operation maximizes purchases from local producers specifically using heirloom or traditional varieties instead of importing or buying non-traditional varieties, for at least a majority of their raw material needs.
- the operation avoids changes in production or purchasing that would eliminate seed saving, or the use of heirloom, traditional or locally adapted varieties or breeds in their own production, or that of their suppliers.
- the operation avoids changes in production or purchasing that would limit market access and consumers freedom to choose.

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RATINGS

Low (-); Medium; High (+)

Low (if at least 1 out of 4 points below are met)

- the operation sources locally-adapted seed varieties or livestock breeds, or traditional or heirloom varieties, for at least a majority of their production.
- the operation maximizes purchases from local producers specifically using heirloom or traditional varieties instead of importing or buying non-traditional varieties, for at least a majority of their raw material needs.
- the operation avoids changes in production or purchasing that would eliminate seed saving, or the use of heirloom, traditional or locally adapted varieties or breeds in their own production, or that of their suppliers.
- the operation avoids changes in production or purchasing that would limit market access and consumers freedom to choose.

Medium - (if at least 2 out of 4 points below are met)

- the operation sources locally-adapted seed varieties or livestock breeds, or traditional or heirloom varieties, for at least a majority of their production.
- the operation maximizes purchases from local producers specifically using heirloom or traditional varieties instead of importing or buying non-traditional varieties, for at least a majority of their raw material needs.
- the operation avoids changes in production or purchasing that would eliminate seed saving, or the use of heirloom, traditional or locally adapted varieties or breeds in their own production, or that of their suppliers.
- the operation avoids changes in production or purchasing that would limit market access and consumers freedom to choose.

High – If the enterprise meets all relevant criteria defined above under Metrics.

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Traditional recipes
SUB-THEME: Culture
THEME: Behaviour
LINK: Consumers (S5)

DESCRIPTION

Role of tradition in food choices, role of legumes in traditional recipes, counter-movement against processed and convenience food, slow food movement.

METRICS

The indicators identify the role of traditional recipes in the consumer food choice.

RATINGS

Excluded (-); Included (+)

Excluded – traditional recipes do not play any role in food choices
Included – traditional recipes play a fundamental role in food choices

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Consumers' Education
SUB-THEME: Awareness
THEME: Behaviour
LINK: Consumers (S5)

DESCRIPTION

The understanding by an individual of their rights as a consumer concerning available products and services being marketed and sold. The concept involves four categories including safety, choice, information, and the right to be heard[3]. European consumer rights legislation provides a set of rules to protect consumers across Europe when buying goods and services[4].

METRICS

This indicator measures consumers' awareness such as bargain/hunting knowledge, general consumers' knowledge, product knowledge, information search and price consciousness.

RATINGS

Scale: Low (-); Medium; High (+)

Low (-); Consumers' awareness is low as general consumers knowledge, product knowledge, and information search are not present.

Medium; Consumers' awareness is medium as general consumers knowledge, product knowledge, and information search are present.

High (+); Consumers' awareness is high as bargain/hunting knowledge, general consumers knowledge, product knowledge, and information search and price consciousness are very strong.

[3] http://www.businessdictionary.com/definition/consumer-awareness.html
[4] https://europa.eu/european-union/life/consumer-rights_en and http://www.europarl.europa.eu/RegData/etudes/IDAN/2015/565904/EPRS_IDA(2015)565904_EN.pdf

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: **Preference for processed Food**
SUB-THEME: Awareness
THEME: Behaviour
LINK: Consumers (S5)

DESCRIPTION

Processed food is considered any food that has been altered in some way during the preparation. Bread is an example of processed food because milling, grinding grains to make flour, is food processing. The amount of processed food that is consumed by an adult per day (g/kg body weight/day) can be a variable used to measure the preference of processed food. One could even calculate the amount of processed food consumed versus the amount of raw food (fresh fruit and vegetables) to quantify the amount of each item consumed.

METRICS

This indicator measures the amount of processed food that is consumed by an adult.

RATINGS

Scale: High (-); Medium; Low (+)

Low – less than 20% of diet preferences are for processed food and at least 80% of diet preferences are for unprocessed food (fruit and vegetables);

Medium – less than 40% of diet preferences are for processed food and at least 60% of diet preferences are for unprocessed food;

High – more than 60% of diet preferences are for (highly) processed food and less than 40% of diet preferences are for unprocessed food.

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Advertising of Healthy Food
SUB-THEME: Educational Campaigns
THEME: Policies
LINK: Consumers (S5)

DESCRIPTION

Advertising at influencing consumer's behavior can be achieved through a range of different media from newspapers, billboards, and television adverts etc. For example food, health and nutrition related advertisements are subject to Regulation (EC) No 1924/2006 on nutrition and health claims made on foods (the Health Claims Regulation). The Health Claims Regulation is mandatory and seeks to protect consumers from misleading or false claims.

METRICS

This indicator measures the presence or absence of advertising schemes by the member states.

RATINGS

Scale: Absent (-); Present (+)

Absent - no adoption of any advertising scheme by the member state

Present - adoption of advertising scheme by the member state

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: School meals
SUB-THEME: Educational Campaigns
THEME: Policies
LINK: Consumers (S5)

DESCRIPTION

School meals programmes in the EU support the consumption of fruit and vegetables and are often part of a wider programme of education about European agriculture and the benefits of healthy eating.

METRICS

This indicator measures the presence or absence of adoption of school meals schemes by the member states.

RATINGS

Scale: Absent (-); Present (+)

- Absent - no adoption of the school meals scheme by the member state
- Present - adoption of the school meals scheme by the member state

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Taxation of Unhealthy Food
THEME: Policies
LINK: Consumers (S5)

DESCRIPTION

A tax on unhealthy food is usually called a fat tax because it is applied on fat and also on sweetened beverages (sugar tax)[5].
Unhealthy food and beverage taxes have gained attention as a potentially effective intervention to reduce non-nutritive caloric intake, while raising government funds for health promotion programs at the community level.[6]

METRICS

This qualitative indicator refers to the presence of fat and sugar tax at the country level as a food policy measure to reduce consumption of unhealthy food.

RATINGS

Scale: Absent (-); Present (+)

Absent – Fat or sugar tax is absent in the country of analysis
Present - Fat or sugar tax is present in the country of analysis

[5] Tamir, O., Cohen-Yogev, T., Furman-Assaf, S. and Endevelt, R., 2018. Taxation of sugar sweetened beverages and unhealthy foods: a qualitative study of key opinion leaders' views. *Israel journal of health policy research*, *7*(1), p.43. doi: 10.1186/s13584-018-0240-1.

[6] Rajagopal, S., Barnhill, A. and Sharfstein, J.M., 2018. The evidence—and acceptability—of taxes on unhealthy foods. *Israel journal of health policy research*, *7*(1), p.68. doi.org/10.1186/s13584-018-0264-6

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Income Support Policies
THEME: Policies
LINK: Consumers (S5)

DESCRIPTION

Income support comprises all measures taken by national authorities in EU countries to provide an adequate income to their citizens via different benefit schemes, such as:

- unemployment benefits,
- family and child benefits,
- pensions,
- disability benefits,
- minimum income schemes.[7]

METRICS

This qualitative indicator considers income support policies as a measure to facilitate consumer to make food choices that are less constrained by price. Price is one of the most important factors determining food quality.

RATINGS

Scale: Absent (-); Present (+)

Absent – Income support policies (as listed above) are absent in the country of analysis
Present - Income support policies (as listed above) are present in the country of analysis

[7] https://ec.europa.eu/social/main.jsp?catId=1092&langId=en

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Public procurement
THEME: Nutrition and Health
LINK: Consumers (S5)

DESCRIPTION

Public procurement rules often follow complex procedures, including specific requirements for tendering and decision-making. These complex rules are some of the main barriers for smallholder farmers to access the market represented by school feeding programmes and canteens, hospitals, etc.
Instead of buying its inputs supplies from overseas, the enterprise could establish business relationships with local suppliers and integrating them in the supply chain.

Green public procurement (GPP) is a mechanism aimed at encouraging public bodies to procure goods and services in a manner that considers the principles of sustainable development.

METRICS

This indicator measures the level of inclusion of public procurement by the enterprise.

RATINGS

Scale: Weak (-); Medium; Strong (+)

- Weak - In most cases where local suppliers cannot provide the required inputs to the enterprise, under equal of similar conditions in comparison to non-local, the enterprise has selected non-local suppliers.

- Medium – 50% of the cases were local suppliers can provide the required input to the enterprise, under equal of similar conditions in comparison to non-local, the enterprise has selected local suppliers.

- Strong - The enterprise has developed and applied a procurement policy that prioritizes the purchase of inputs, products and ingredients from local suppliers. In 100% of the cases where local suppliers can provide the required inputs to the enterprise, under equal of similar conditions in comparison to non-local, the enterprise has selected local suppliers.

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TRansition paths to sUstainable legume-based systems in Europe

INDICATOR NAME: Dietary guidelines
THEME: Nutrition and Health
LINK: Consumers (S5)

DESCRIPTION

Dietary guidelines are a set of guidelines or qualitative statements to guide consumers making food choices that support a healthy life, maintain optimum weight, and reduce the risk of chronic disease.

METRICS

This indicator measures the inclusion of legumes in the dietary guidelines of the member states.

RATINGS

Excluded (-); Included (+)

Excluded – Dietary guidelines do not include legumes and/or are not strongly advertised as a source of information for healthy food choices

Included - Dietary guidelines include legumes and/or are strongly advertised as a source of information for healthy food choices

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TRansition paths to sUstainable legume-based systems in Europe

DESCRIPTION OF SOCIAL THEMES AND SUBTHEMES

PRODUCTION (S1)

THEME: S1.1 Economic Incentives to Environment friendly Agricultural practices
LINK: Production (S1)

Economic incentives are intended those that increase or stabilize the farm's revenue and/or reduce the farm's costs. Three types of economic incentives to support environment friendly agricultural practices are considered here: 1) price premium; 2) subsidies; and 3) taxes.
Price premium is a direct and tangible revenue-based incentive for producers to adopt. If environment friendly agriculture is market-driven, focused on commercial production with attributes demanded by consumers, gross farm revenue may increase through higher prices. Consumers may be willing to pay a higher price for these types of products. Subsidies can be those under CAP pillar 2 as explained in the indicator 'CAP' or other types of national subsidies that incentivize environment friendly agriculture. Taxes considered in this indicator are those that are designed to modify behavior by encouraging protection of the environment, these taxes can be in the form of tax credit, tax exemption or tax deduction.

THEME: S1.2 Quality of life (farmers)
LINK: Production (S1)

Primary producers, small-scale producers and employees in enterprises of all scales have the right to a quality of life that affords time to spend with family and for recreation, adequate rest from work, overtime that is voluntary, and educational opportunity for themselves and their immediate families. In addition, quality of life means that they have the time to produce or procure and prepare healthy meals for themselves and their families that include fresh produce and a culturally appropriate diet. Small-scale producers are able to source products for markets without financial pressures that force them to use all of their land, water, resources and production outputs for sales or export markets in order to garner an adequate income.

Quality of life furthermore implies the flourishing of culture, and the ability of all to participate in the collective way of life built over generations by an identified group or society. Defining features of a culture includes one or more of the following: language, religion, ethnicity. The combination of these elements may be expressed in diets, clothing, philosophy, arts, music, architecture, agriculture, business structures, governance structures, celebrations, rituals and other social interactions and customs.

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SUB-THEME: **S1.2.1 Safety**
THEME: Quality of life (farmers) (S1.2)
LINK: Production (S1)

This indicator comprises safety of farming operations, facilities, and safety of products produced from farming operations. The enterprise provides a safe environment for its workers, offers health and safety trainings, and it keeps a clean and healthy environment where products' safety level responds to the CODEX requirements for food safety.

SUB-THEME: **S1.2.2 Employment (quality)**
THEME: Quality of life (farmers) (S1.2)
LINK: Production (S1)

The enterprise maintains legally-binding transparent contracts with all employees and pays a wage that that meets basic needs for subsistence, including nutrition, clothing, health care, education, potable water, child care, transportation, housing, and energy, plus savings. In addition, the enterprise provides employees with opportunities for capacity development and advancement within the enterprise, and primary producers have access to resources so that they can increase their own skills and knowledge.

THEME: **S1.3 Equity**
LINK: Production (S1)

Equity refers to social equity, in this specific context it refers to equal access to social good and services within the enterprise and also respect of civil rights.

SUB-THEME: **S1.3.1 Power structure**
THEME: Equity (S1.3)
LINK: Production (S1)

This indicator refers to the distribution of power within the enterprise. It aims to identify who holds the power for decision-making and how whether it is a bottom-up approach or vice versa.

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PROCESSING (S2)

THEME: S2.1 Food Policies
LINK: Processing (S2)

Set of principles, rules, and guidelines formulated or adopted by the enterprise to reach its long-term goals and typically published in a booklet or other form that is widely accessible. In this context, we consider workplace policy that is a set of rules and principles that aims to guide managers and workers in how to behave in the workplace.

THEME: S2.2 Quality of work Environment
LINK: Processing (S2)

The enterprise maintains legally-binding transparent contracts with all employees and pays a wage that that meets basic needs for subsistence, including nutrition, clothing, health care, education, potable water, child care, transportation, housing, and energy, plus savings. In addition, the enterprise provides employees with opportunities for capacity development and advancement within the enterprise, and primary producers have access to resources so that they can increase their own skills and knowledge.

SUB-THEME: S2.2.2 Rights
THEME: Quality of work Environment (S2.2)
LINK: Processing (S2)

This qualitative indicator ensures that all people involved: work healthy hours without compulsory overtime; are enabled to participate in the culture of their choosing, including for example to speak the language of their choice and practice the religion or rituals that they prefer; enjoy a culturally appropriate diet; and have time to spend with family and neighbors.

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SUB-THEME: S2.2.3 Health and Safety
THEME: Quality of work Environment (S2.2)
LINK: Processing (S2)

By providing training in health and safety, enterprises empower employees to understand the possible hazards of the workplace, to have familiarity with the materials and machinery they work with and are exposed to, and to understand the ergonomics of the work so that injuries from repeated motions, lifting or other physical challenges are reduced. Successful trainings ensure a more efficient and positive work environment for all.

TRANSPORT AND DISTRIBUTION (S3)

THEME: S3.1 Food Safety Policies
LINK: Transport and Distribution (S3)

These policies include policies for the control of food contamination. Many of these policies fall under the CODEX ALIMENTARIUS[8]. Food contamination incidents refer to cases in which adulteration of food has been reported due to negligence, or voluntary misconduct of the enterprise. In these cases, food products that have been distributed and consumed are spoiled or infected because they either contain microorganisms, such as bacteria and parasites, or toxic substances that make them unsuitable for consumption.

MARKETS AND RETAILERS (S4)

THEME: S4.1 Policy
LINK: Markets and Retailers (S4)

Set of principles, rules, and guidelines formulated or adopted by the enterprise to reach its long-term goals and typically published in a booklet or other form that is widely accessible. In this context, we consider workplace policy that is a set of rules and principles that aims to guide managers and workers in how to behave in the workplace.

[8] http://www.fao.org/fao-who-codexalimentarius/en/

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TRansition paths to sUstainable legume-based systems in Europe

SUB-THEME: S4.2.2 Rights
THEME: Quality of work Environment (S4.2)
LINK: Markets and Retailers (S4)

This qualitative indicator ensures that all people involved: work healthy hours without compulsory overtime; are enabled to participate in the culture of their choosing, including for example to speak the language of their choice and practice the religion or rituals that they prefer; enjoy a culturally appropriate diet; and have time to spend with family and neighbours.

CONSUMERS (S5)

THEME: S5.1 Behaviour
LINK: Consumers (S5)

Consumers' behavior represents how individual customers, groups or organizations choose, buy, use, and dispose ideas, goods, and services to satisfy their needs and wants. It refers to the actions of the consumers in the marketplace and the underlying motives for those actions. In this indicator we refer to the consumers' food choices.

SUB-THEME: 5.1.2 Culture
THEME: Behaviour (S5.1)
LINK: Consumers (S5)

Cultural influences lead to the difference in the habitual consumption of certain foods and in traditions of preparation, and in certain cases can lead to restrictions such as exclusion of meat and milk from the diet. Social influences also affect food choice. Even when eating alone, food choice is influenced by social factors because attitudes and habits develop through the interaction with others. However, quantifying the social influences on food intake is difficult because the influences that people have on the eating behaviour of others are not limited to one type and people are not necessarily aware of the social influences that are exerted on their eating behavior.

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SUB-THEME: 5.1.3 Consumers Awareness
THEME: Behaviour (S5.1)
LINK: Consumers (S5)

The understanding by an individual of their rights as a consumer concerning available products and services being marketed and sold. The concept involves four categories including safety, choice, information, and the right to be heard[9]. European consumer rights legislation provides a set of rules to protect consumers across Europe when buying goods and services[10].

SUB-THEME: 5.2.1 Educational Campaigns
THEME: Policies (S5.2)
LINK: Consumers (S5)

Educational campaigns can be used to inform the public about healthy food choices. Dietary guidelines and school meals could be included in this indicator. Some of the policies initiatives currently undertaken are illustrated below.

THEME: S5.3 Nutrition and Health Claims
LINK: Consumers (S5)

Food labels contain nutrition and health information that provide useful knowledge about the food sold on the market. This information can help the consumer to understand the contribution different foods make to health and well-being and to choose a more balanced diet. Legislation about nutrition and health claims can be found here.[11]

[9] http://www.businessdictionary.com/definition/consumer-awareness.html

[10] https://europa.eu/european-union/life/consumer-rights_en and http://www.europarl.europa.eu/RegData/etudes/IDAN/2015/565904/EPRS_IDA(2015)565904_EN.pdf

[11] http://ec.europa.eu/food/safety/labelling_nutrition/claims/register/public/?event=register.home

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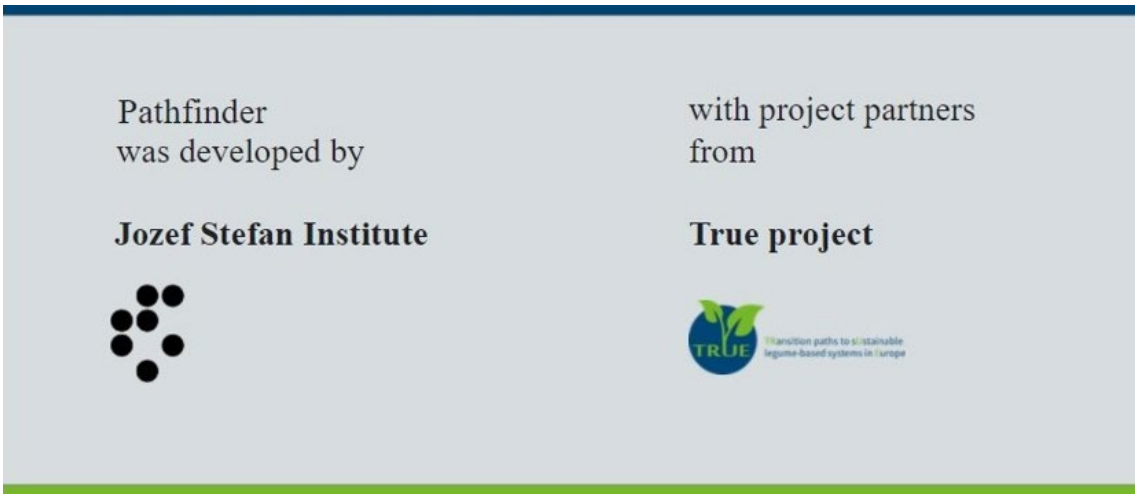

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