Definition:

$$\frac{Grain/Fruit/\ Tuber\ yield}{Nitrogen\ fertilizer}$$

Description

Benefit: This impact area refers to the weight of harvested parts of plants that possess economic value. It is suitable, where production is to be used food or feed purposes or as a non-energetic production factor in bio-refineries. Crops with high per hectare yield will show high efficiencies in this impact area.

Resource: Nitrogen fertilizer is considered a stressed resource for several reasons. While the supply of nitrogen is effectively unlimited, its production is highly energy intensive and its application results in emissions of ammonium and nitrous oxide, creating a conflict between nitrogen fertilizer application and climate change mitigation targets.
Depending on the application rate and type of nitrogen fertilizer (in combination with site specific conditions), diffuse pollution and contamination of water resources is also relevant. Diffuse nitrogen pollution may also strongly affect nutrient poor natural ecosystems and alter species composition. Finally, fertilizer application is a relevant factor in farmers‘ cost calculations.

Correlation with soil management

[67] Application of hydrogel, on sandy soils improves water holding capacity and availability of the nutrients. Higher amount of hydrogel improves fertilizer use efficiency
[92] Integrated management could increase grain yield and nitrogen use efficiency: increasing planting density and tillage depth, improving water management and applying organic fertilizer
[252] In the case of crop rotations, increasing resource-use efficiency while reducing yield gaps can be addressed by suitable agricultural management practices

Strength & weaknesses pertaining to measurement of this impact area

Yield: Yield values are generally easy to measure and readily available at farm level or in the form of national inventories.
However, their informative value is limited where they do not account for qualitative differences between types of biomass and are not accompanied by information on site conditions such as local climate or soil fertility. Therefore, comparisons between efficiencies of different production processes with regard to yields should only be made where products and site conditions are similar. In some cases, it may be advisable to select alternative indicators where the type of benefit is more clearly defined (e.g., energetic value, financial benefit).

Sample Indicators

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

Table 1: Field Scale

Indicator	**Unit**	**Indicator values from**
[67] Fertilizer use efficiency (Squash yield/Amount of N fertilizer)	kg * kg^{-1}	
[92] Nitrogen partial factor productivity (Grain yield/Total N input (fertilizer + manure + biological N2 fixation + atmospheric deposition + straw recycled + irrigation))	kg * kg^{-1}	

Table 2: Farm Scale

Indicator	**Unit**	**Indicator values from**
[252] Nitrogen use efficiency (Grain yield/Available N)	kg * kg^{-1}	

References

ID	Citation	[1]Soil type/ texture
67	"Water and fertilizer use efficiency by squash grown under stress on sandy soil treated with acrylamide hydrogels." Journal of Applied Sciences Research **7**(12): 1828-1833.	Sandy soil
92	Gu, J., et al. (2017). "Canopy light and nitrogen distributions are related to grain yield and nitrogen use efficiency in rice." Field Crops Research **206**: 74-85.	Typic Fluvaquent; Sandy loam
252	Tomaz, A., et al. (2018). "Efficient use of water and nutrients in irrigated cropping systems in the Alqueva region." Spanish Journal of Soil Science **8**(1): 12-23.	Chromic Cambisols (Bc); Silt loam

[1]**Soil type/ texture:** If provided, what are type and texture of the soils studied in the paper?