Ecosystem Service	**Disease control**
CICES class name	Disease control
CICES Section	Regulation & Maintenance (Biotic)
CICES Class code	2.2.3.2

Brief Description

- Controlling disease
- Reduction in the severity or spread rate of infections by bacteria, viruses or fungi through biological interactions

Sample Indicators

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

Table 1: Field Scale

Indicator	**Unit**	**Indicator values from**
[1] Leaf damages: Maximal percentage of young leaves infected in the year	%	
[1] Plant damages: Dieback. Percentage of (coffee) plants infected in the plot	%	
[3] Damage from diseases six weeks after planting. Based on visual inspection of 40 randomly selected plants.	Index 1 - 3	
[1] Fruit Damages: Incidence of Ceratocystis canker. Maximal percentage of fruits infected in the year	%	
[2] Level of injury severity, fruit loss, leaf loss, LAI loss	%	
[2] Indicators or models to assess the impact of pesticides	Not provided	

[4] Indicator value calculated as: $$I = \frac{\sum \quad \left| log\ (\frac{i}{i_{max}}) \right|}{n}$$ With: i – variable i measured, i_{max} – maximum ecologic potential of variable i in benchmark reference, n – number of variables. Where performance is considered better than in the benchmark and deviation, therefore, has a positive effect, $\left| log\ (\frac{i}{i_{max}}) \right|$ is subtracted from the sum instead of added. For this ecosystem service, variables were: -Soil organic matter [% dw] -pH in KCl -Number of nematode taxa [-] -Number of micro-arthropod taxa [-] -Density of nematode plant-parasites [number per 100 g soil]	-	

Table 2: Regional Scale

Indicator	Unit	Indicator values from
[6] Disease prevalence	Not provided	
[6] Host and vector abundances	Not provided	
[6] Infection levels	Not provided	
[7] Expert-/stakeholder rating of how much of this ecosystem service can be provided by a landscape (represented by a land use map)	6-point Likert-scale (none - highest capacity)	
[7] Expert-/stakeholder rating based on pairwise comparisons of landscapes (represented by land use maps) in an Analytical Hierarchical Process (AHP). Experts select the landscape with higher capacity for providing this ecosystem service and rate the difference between the two landscapes	1 (equal capacity) - 9 (absolute preference of one landscape)	
[5] Human diseases: number of diseases and effects among local inhabitants	#	
[9] Area used for organic agriculture	n/a	

Table 3: National Scale

Indicator	Unit	Indicator values from
[8] Density of hedgerows	m * ha^{-1}	⃠

References

No.	Citation
1	Allinne C, Savary S, Avelino J (2016) Delicate balance between pest and disease injuries, yield performance, and other ecosystem services in the complex coffee-based systems of Costa Rica. Agriculture Ecosystems & Environment 222: 1-12. DOI: 10.1016/j.agee.2016.02.001
2	Demestihas C, Plénet D, Génard M, Raynal C, Lescourret F (2017) Ecosystem services in orchards. A review. Agronomy for Sustainable Development 37(2): 12. DOI: 10.1007/s13593-017-0422-1
3	Kearney SP, Fonte SJ, García E, Siles P, Chan KMA, Smukler SM (2019) Evaluating ecosystem service trade-offs and synergies from slash-and-mulch agroforestry systems in El Salvador. Ecological Indicators 105: 264-278. DOI: 10.1016/j.ecolind.2017.08.032
4	Rutgers M, van Wijnen HJ, Schouten AJ, Mulder C, Kuiten AMP, Brussaard L, Breure AM (2012) A method to assess ecosystem services developed from soil attributes with stakeholders and data of four arable farms. Science of the Total Environment 415: 39-48. DOI: 10.1016/j.scitotenv.2011.04.041
5	Adhikari S, Baral H, Nitschke CR (2018) Identification, Prioritization and Mapping of Ecosystem Services in the Panchase Mountain Ecological Region of Western Nepal. Forests 9(9): 554. DOI: 10.3390/f9090554
6	Duarte GT, Santos PM, Cornelissen TG, Ribeiro MC, Paglia AP (2018) The effects of landscape patterns on ecosystem services: meta-analyses of landscape services. Landscape Ecology 33(8): 1247-1257. DOI: 10.1007/s10980-018-0673-5
7	Inkoom JN, Frank S, Greve K, Furst C (2018) A framework to assess landscape structural capacity to provide regulating ecosystem services in West Africa. Journal of Environmental Management 209: 393-408. DOI: 10.1016/j.jenvman.2017.12.027
8	Maes J, Liquete C, Teller A, Erhard M, Paracchini ML, Barredo JI, Grizzetti B, Cardoso A, Somma F, Petersen JE, Meiner A, Gelabert ER, Zal N, Kristensen P, Bastrup-Birk A, Biala K, Piroddi C, Egoh B, Degeorges P, Fiorina C, Santos-Martín F, Naruševičius V, Verboven J, Pereira HM, Bengtsson J, Gocheva K, Marta-Pedroso C, Snäll T, Estreguil C, San-Miguel-Ayanz J, Pérez-Soba M, Grêt-Regamey A, Lillebø AI, Malak DA, Condé S, Moen J, Czúcz B, Drakou EG, Zulian G, Lavalle C (2016) An indicator framework for assessing ecosystem services in support of the EU Biodiversity Strategy to 2020. Ecosystem Services 17: 14-23. DOI: 10.1016/j.ecoser.2015.10.023
9	Chatzinikolaou P, Viaggi D, Raggi M (2018) Using the Ecosystem Services Framework for Policy Impact Analysis: An Application to the Assessment of the Common Agricultural Policy 2014-2020 in the Province of Ferrara (Italy). Sustainability 10: 890. DOI: 10.3390/su10030890.