Appendix 1. Composition of sustainability indicators from the NEXUS-MESMIS approach

Dimension	Scope	Indicator	Weight	Variable	Weight	Measurement	Question
Food	Organizational and institutional environment	Tradition and culture	2	Importance of culture and tradition in the farm	0	Not important	10
					0.5	Not very important	
					1	Not important	
					1.5	Important	
					2	Very important	
		Supporting organizations	2	Degree of a relationship with supporting organizations	0	Never	11
					0.5	Rarely	
					1	Occasionally	
					1.5	Frequently	
					2	Always	
		Public policies	2	Knowledge and access to public policies	0	Doesn't know	12
					0.5	Knows, but does not have access	
					1	Knows, but chooses not to access	
					1.5	Accesses one policy	
					2	Accesses two policies	
		Social and associative participation	2	Degree of participation in producer associations, unions, and the local community	0	Very low	13
					0.5	Low	
					1	Medium	
					1.5	High	
					2	Very high	
		Cooperation in the markets	2	Existence of collaborative commercialization	0	No	14
					1	Yes, occasionally	
					1.5	Yes, regularly	
					2	Always	
		Logistic and energy infrastructure	2	Conditions of the energy and logistics infrastructure for the development of farm activities	0	Very bad	15
					0.5	Bad	
					1	Regular	
					1.5	Good	
					2	Very good	
		Quality of life	4	Conditions that provide structural quality of life	0	Very bad	8
					1	Bad	

					2	Regular	
					3	Good	
					4	Very good	
		Succession/transmissibility	4	Existence and predisposition of successors to continue operating the farm	0	No successor, age > 60	16
					1	No successor, age < 60	
					2	Existence without predisposition / with an area < 300 ha	
					2.5	Existence without predisposition / with an area > 300 ha	
					3	Existence with predisposition / with an area < 300 ha	
					4	Existence with predisposition / with area over 300 ha	
	Productive and technological environment	Genetics of animal production	4	Beef cattle breeds raised on the farm	0	No breed definition	17
					2	Intermediate breed pattern	
					4	Defined breed pattern	
		Grassland management	6	Relationship between load and load capacity of the grassland	3	> 10 cm	18
					1.5	Between 5 and 10 cm	
					0	< 5 cm	
				Forages, invasive plants, and land cover	3	More than 90% cover-grassland without invasives	19
					2.5	Coverage between 70 and 90%-grassland without invasives	
					2	Coverage between 70 and 90%-grassland with up to 10% invasives	
					1.5	Coverage between 50 and 70%-grassland with up to 20% invasives	
					1	Coverage less than 50%-grassland with up to 20% invasives	
					0	Coverage less than 50%, with invasives and exposed soil	
		Crop management	6	Agriculture incorporation time	3	Consolidated (>10 years)	21

					1.5	Between 5 and 10 years	
					0	Recent (< 5 years)	
				Percentage of agriculture in the system	0	>50% with crops	20
					1	40%-50% with crops	
					1.5	30%-40% with crops	
					2	20%-30% with crops	
					2.5	10%-20% with crops	
					3	Less 10% with crops	
		Feed management	6	Livestock feed management	0	Feedlot or more than 25% supplementation or 30% cultivated pasture	24
					1	< 25% supplementation or more 15%-30% cultivated pasture	
					2	< 15% cultivated pasture	
					4	Up to 20% of natural grassland improved	
					6	Exclusively natural grassland	
		Dependence on external inputs	6	Degree of dependence of the farm on external inputs	3	Independent	25
					2.25	Slightly dependent	
					1.5	Moderately dependent	
					0.75	Very dependent	
					0	Totally dependent	
				Impact of scarcity of inputs on production	3	Not affected	26
					2.25	Slightly affected	
					1.5	Medium affected	
					0.75	Very affected	
					0	Unviable	
		Productive diversification	6	Number of productive activities	0	A single productive activity	27
					2	Two, with a predominance of one	
					4	Two, with a balance in both	
					6	Three or more productive activities	
		Economic management	4	Use of economic management tools in the property	0	Does not use management tools	28
					2	Yes, with control of income and expenses	

					4	Yes, with cost analysis and planning	
		Dependence on the flow of capital	4	Source of income	4	100% of the farm	29
					3	90-100% of the farm	
					2.5	80-90% of the farm	
					2	70-80% of the farm	
					1.5	60-70% of the farm	
					1	50-60% of the farm	
					0	< 50% of the farm	
		Availability of labour force	4	Level of labour availability	0	Very low	30
					1	Low	
					2	Medium	
					3	High	
					4	Very high	
		Cattle raiding	4	Incidence of cattle raiding in the location of the farm	4	None	31
					2	Low	
					1	Medium	
					0	High	
	Commercialization and Consumption	Market structure and prices	8	Characterization of the number of buyers of the main farming product	0	Single buyer	32
					1	Low number of buyers	
					2	Medium number of buyers	
					3	High number of buyers	
					4	Very high number of buyers	
				Price negotiation power	0	No negotiating power	33
					1	Low negotiating power	
					2	Medium negotiating power	
					3	High negotiating power	
					4	I set the price of my product	
		Commercialization chains	8	Geographical scope of consumption of the main product of the farm	4	Locally	34
					3	Regionally	
					2	Nationally	
					1	Internationally	
				Type of marketing channel for the main product of the farm	4	Level zero	35
					3	One level	
					2	Two levels	
					1	Three levels	
					0	Four levels	
		Value addition	6		0	Lower value	36
					1	Equal value	

				Comparative position of the main product value in relation to other regions	3	Higher value	
				Comparative price position received by the main product in relation to the region	0	Below market average	37
					1	Market average	
					3	Above market average	
		Secondary products	4	Additional number of products marketed	0	No other products	38
					1	One product	
					2	Two products	
					4	Three or more products	
		Self-consumption and direct sale	4	Amount of food that the family consumes from the farm	0	No food	39
					0.5	Small portion of food	
					1	Half of the food	
					1.5	Most food	
					2	Almost all food	
				Frequency of direct sales of products to the consumer	0	Never	40
					0.5	Rarely	
					1	Sometimes	
					1.5	Often	
					2	Always	
Energy	Electric	Generation	20	Independent generation	20	Renewable	44
					10	Non-renewable	
					0	None	
		Consumption	20	Continuous use	8	Efficient	48
					6	Regular	
					4	Poorly efficient	
					0	Inefficient	
				High energy-consumption equipment	0	Yes	45
					4	No	
				Demand	1	High > 800 kW	46
					2.5	Medium-High 401 < x < 800 kW	
					3	Medium-Low 201 < x < 400 kW	
					4.5	Low 101 < x < 200 kW	
					6	Very low < 100 kW	
				Excess of reactants	0	Yes	47
					2	No	

		Grid	20	Access to concessionaire grid	6	Yes	41
					0	No	
				Quality	4	Good	43
					2	Average	
					0	Poor	
				Grid dependence	0	Totally dependent	42
					5	Partially dependent	
					10	Independent	
	Thermal	Thermal energy use	10	Cooking	3	3 or more sources	49
					2	2 sources	
					0	1 source	
				Personal hygiene	3	3 or more sources	50
					2	2 sources	
					0	1 source	
				House heating	2	3 or more sources	51
					1	2 sources	
					0	1 source	
				Productive process	2	biomass	52
					1	other sources	
					0	no	
		Thermal energy source	10	Source	10	Own-Waste	53
					9	External-Waste	
					7	Native sustainable use	
					5	Own exotic planting	
					2	Own native planting	
					1	External-Reforestation	
					0	Indiscriminate use of native forest	
					0	External use of native forest	
	Mechanical	Pumping	5	Domestic	3	No need	54
					3	Renewable	
					2	Electric	
					1	Fossil fuel	
					0	Needed but not available	
				Productive	0	Yes	55
					2	No	
		Fossil fuel	15	Intensity of use (L/ha)	0	High	56
					4	Medium	
					6	Low	
				Access	6	<30 km	58

					4	30-50 km	
					2	50-100 km	
					0	>100 km	
				Storage	0	no	57
					1	25-100 L	
					3	>100 L	
Water	Human consumption	Water quantity	10	Source meets consumption	10	(scale 5)	60
					8	(scale 4)	
					6	(scale 3)	
					4	(scale 2)	
					2	(scale 1)	
					0	No access	
		Water quality	10	Quality	10	Good	61
					5	Average	
					0	Poor	
	Production	Water for production	10	Source meets production demand	10	(scale 5)	62
					8	(scale 4)	
					6	(scale 3)	
					4	(scale 2)	
					2	(scale 1)	
					0	No access	
		Water use efficiency	20	Forage and dryland farming	4	High / Don't use	63
					2	Medium	
					0	Low	
				Horticulture	4	High / Don't use	63
					2	Medium	
					0	Low	
				Rice	12	High / Don't use	63
					6	Medium	
					0	Low	
		Drought susceptibility	10	Occurrence	5	No	64
					0	Yes	
				Frequency	5	Low	64
					3	Medium	
					0	High	
	Degradation	Existence of conservation practices	30	Technological soil management	6	Good	65
					3	Average	
					0	Poor	
				Soil compaction management	6	Good	66
					3	Average	
					0	Poor	

				Crop management	6	Good	67
					3	Average	
					0	Poor	
				Water management	12	Good	68
					6	Average	
					0	Poor	
		Perception of the erosive process	10	Wind erosion	2	No	69
					0	Yes	
				Concentrated erosion	2	No	70
					0	Yes	
				Diffuse erosion	2	No	71
					0	Yes	
				Road-related soil erosion	2	No	72
					0	Yes	
				River erosion	2	No	73
					0	Yes	