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Sustainability of the chicken supply chain in Lebanon: An evaluation system

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- **Status of Lebanese chicken industry**
  - Enough production to satisfy private consumption and export frozen product around the Middle East
  - 200 farms for table eggs and 1000 farms for broilers, producing seven million eggs and 180 million broilers per year respectively (Freiji, 2008)
- **Difficulties**
  - High production cost
  - Volatile feed cost
  - High solid waste, water depletion, GHG production (IFC, 2007)

- **Proposed approach**
  - A multifaceted problem requires a multidisciplinary approach
  - Horizontally (environmental, economic and social), **sustainability**
  - Vertically to include the supply chain actors (farmers, processors and distributors) **supply chain**
- **Objectives**
  - Setting up an evaluation system of the **sustainability** of the chicken production **supply chain**
  - Validation through testing

Building the evaluation system: a Life Cycle Analysis Approach

Step 1 • Defining the study objective and borders

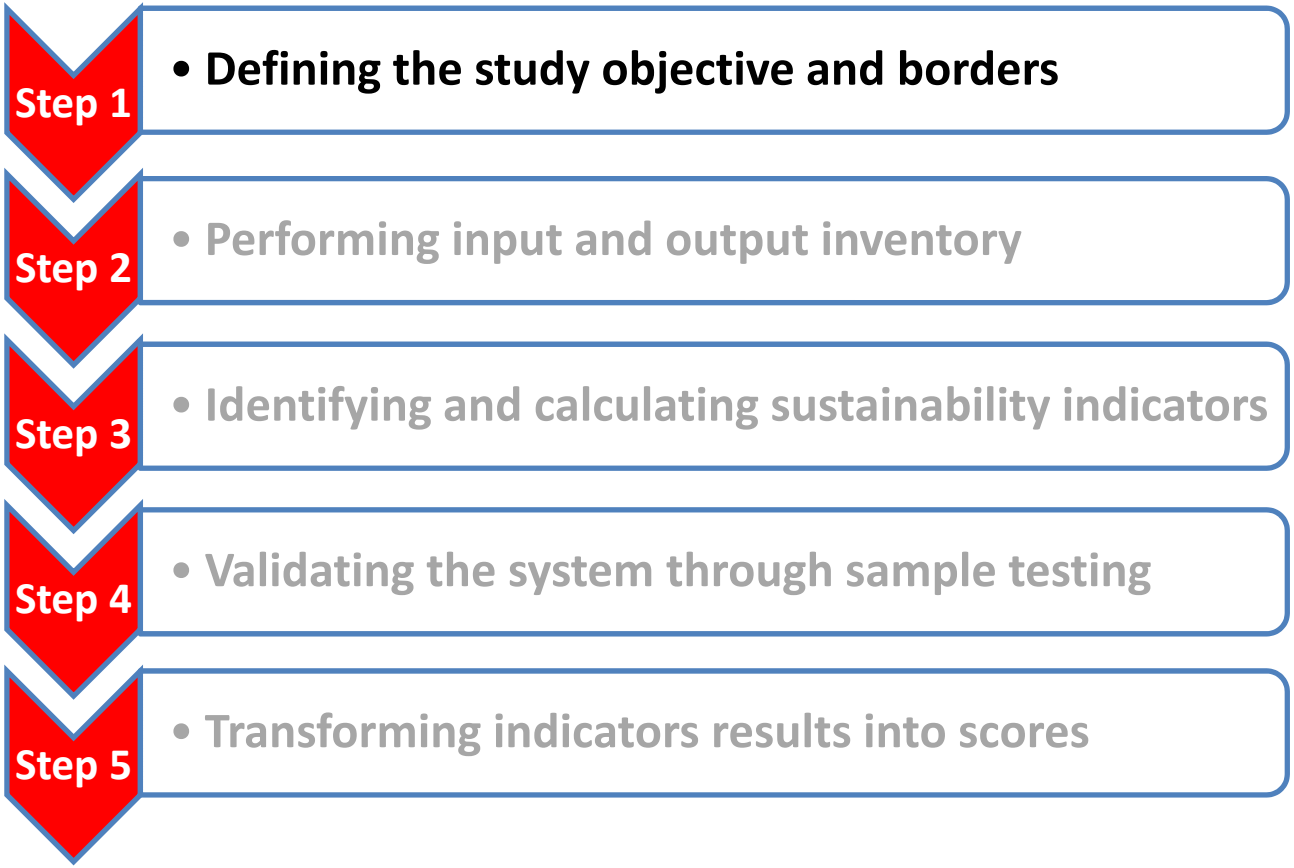
Step 2 • Performing input and output inventory

Step 3 • Identifying and calculating sustainability indicators

Step 4 • Validating the system through sample testing

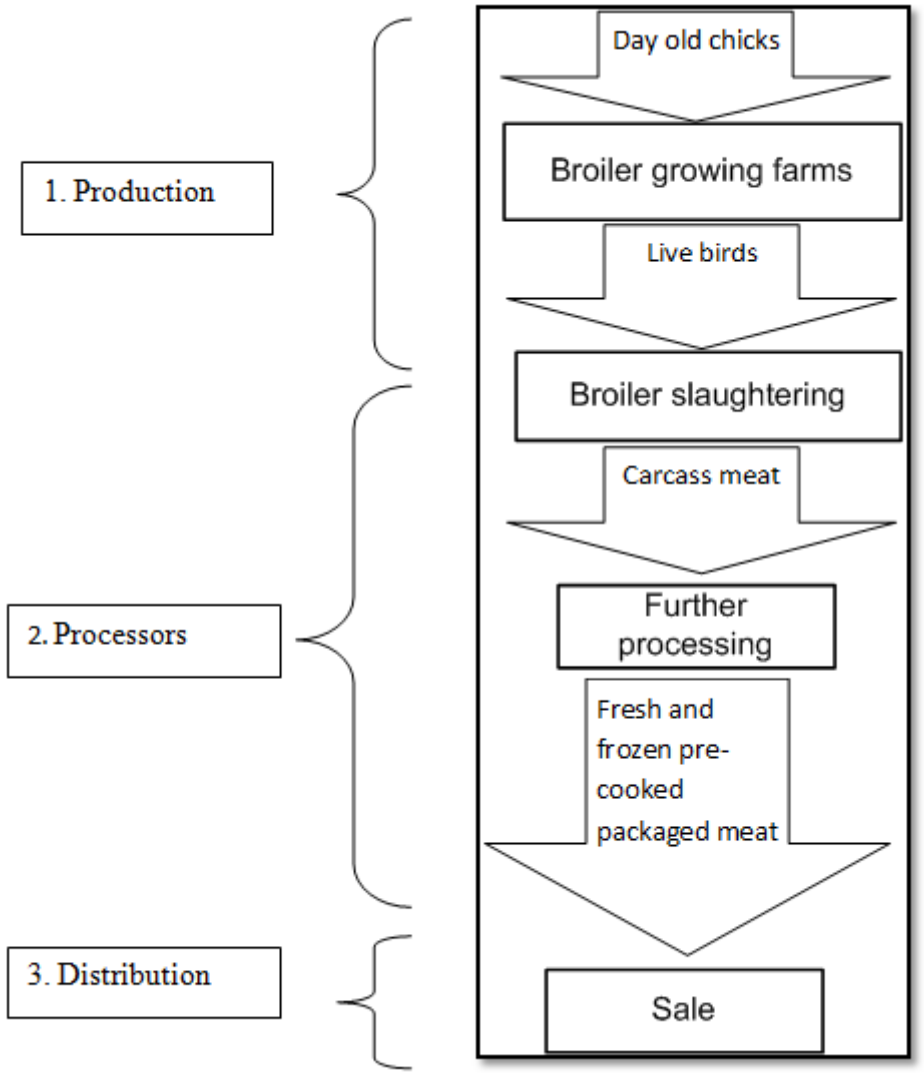
Step 5 • Transforming indicators results into scores

Building the evaluation system: a Life Cycle Analysis Approach



Step 1

- **Defining the study objective and borders**



Supply chain actors:

- Producers
- Processors
- Distributors

Functional Unit

(Kg of edible meat)

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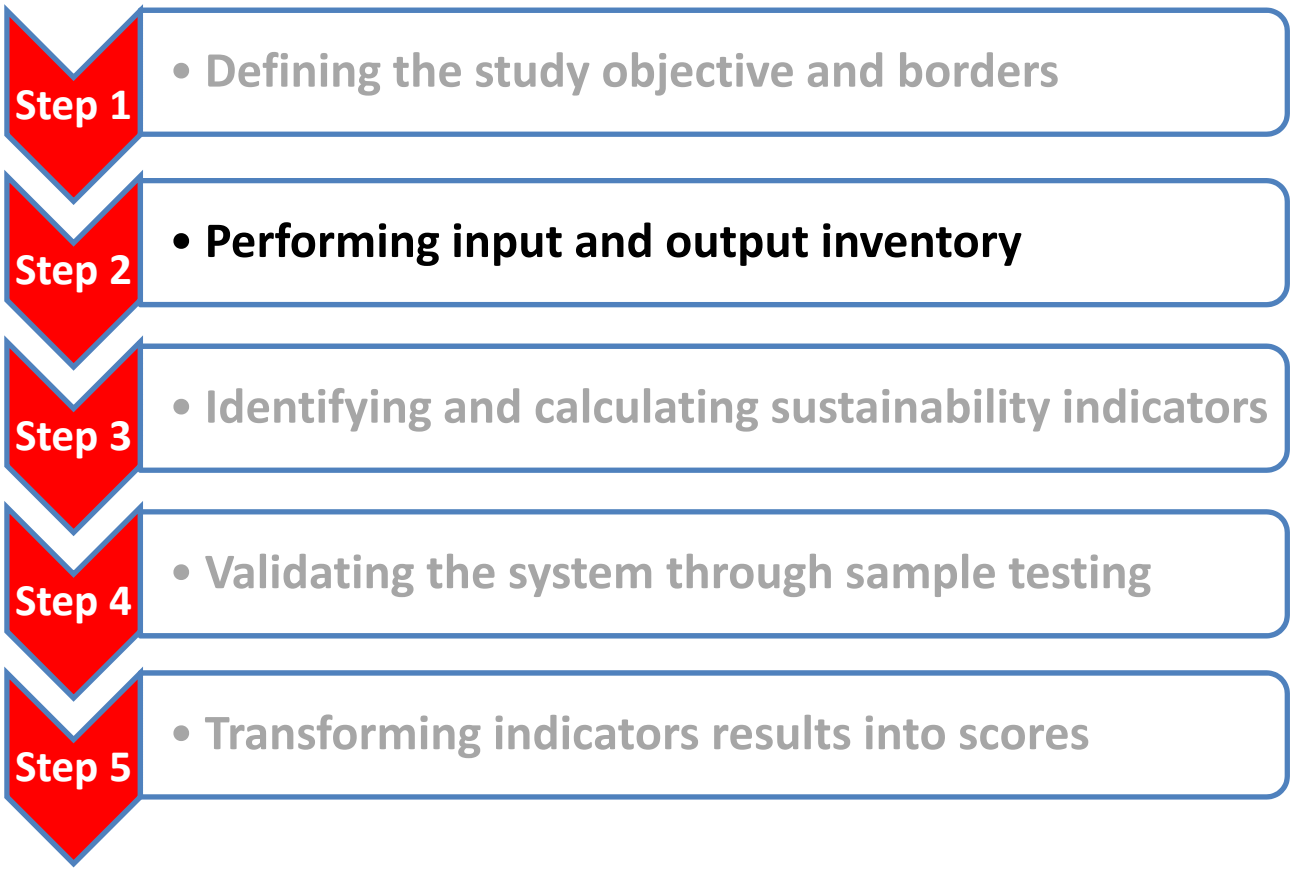
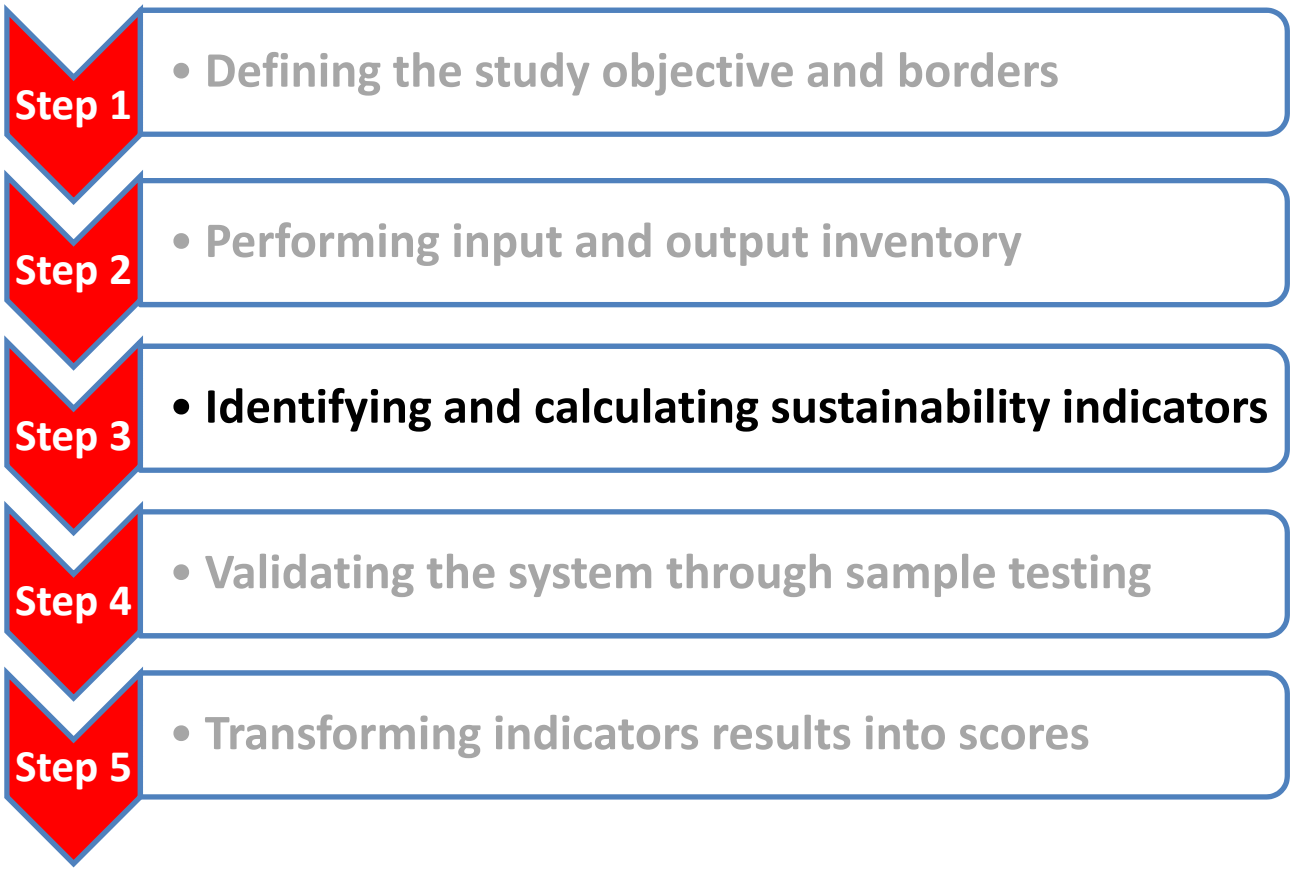


Step 2

- **Performing input and output inventory**

Level	Input	Output
Production	• Feed • Water • Energy • Medicine • Bedding • Equipment	• Air emissions • Wastewater • Manure • fallen stock • Waste • Birds
Processing	• Water • Energy • Chemicals • Raw material (birds) • Equipment	• Air emissions • Wastewater • Animal products • Solid waste
Distribution	• Water • Energy • Chemicals • Equipment	• Air emissions • Wastewater • Solid waste

Building the evaluation system: a Life Cycle Analysis Approach

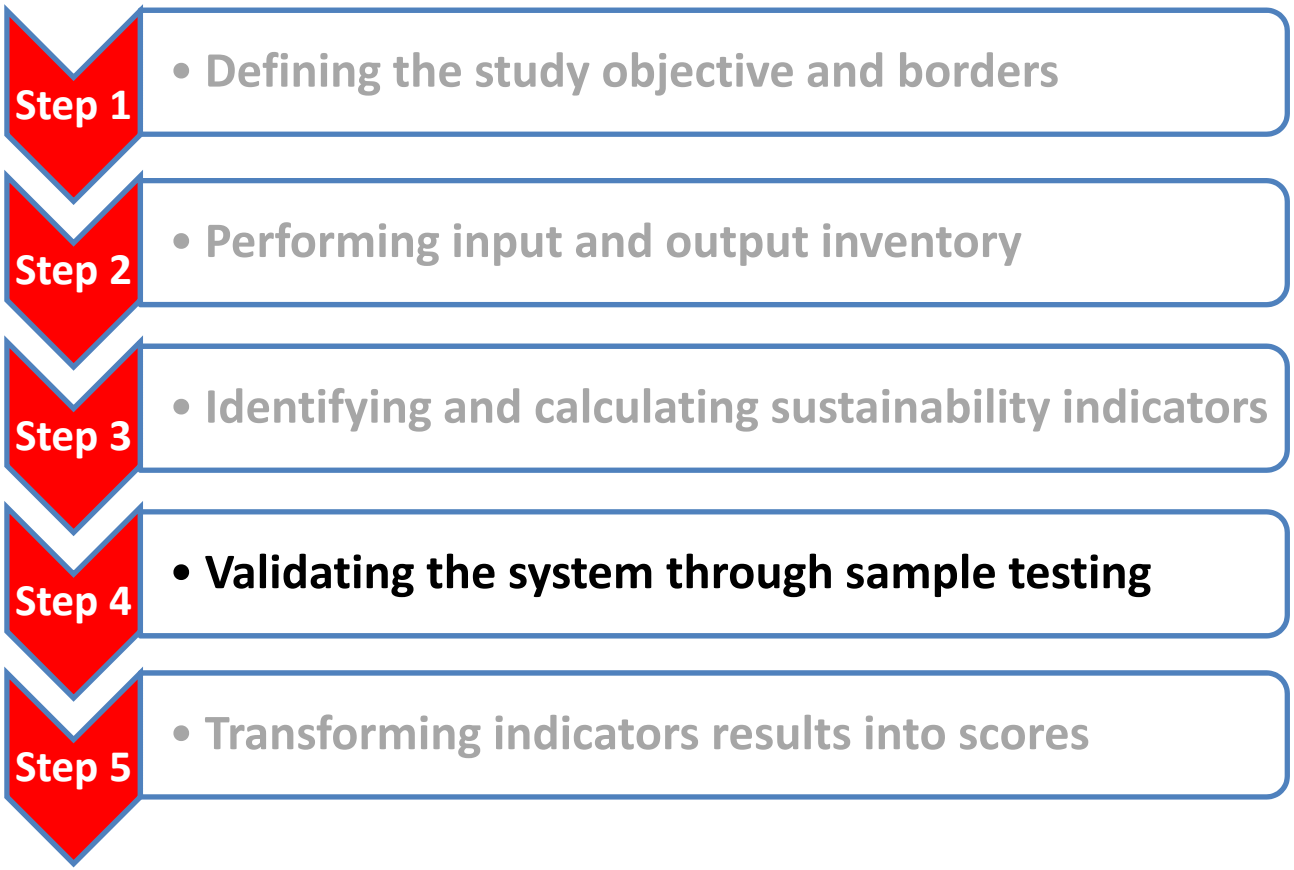


Step 3

- **Identifying and calculating sustainability indicators**

	Variables	Measuring Unit	Supply Chain level		
			Production	Processing	Distribution
Environmental	1) Energy	MJ/ kg	- Electricity - Transportation	- Electricity - Transportation	Electricity
	2) GHG emission	g CO_2/kg	- Electricity - Animal activity - Transportation	- Electricity - Transportation - Boilers	Electricity
	3) Nitrogenous effluents	L / kg	- Animal drinking - Cleaning - Cooling	- Cleaning - Cooling - Cooking	NA
	4) Water consumption	g/ kg	- Manure - Dead birds	- Wastewater treatment - Offal and viscera	NA
	5) Packaging material	g/kg	- Feed packs	- Cartons and nylon	Nylon bags
Social	6) Equity	% of women	Applied at all levels		
	7) Salary	LBP / year	Applied at all levels		
	8) Employees turn-over or rotation rate	Average of working years	Applied at all levels		
	9) Training	Number of trainings per year	Applied at all levels		
	10) Age	Mean age of workers			
	11) Working environment security	% of injuries	Applied at all levels		
Economic	12) Productivity	Kg/HWU	Applied at all levels		
	13) Profit growth	%	Applied at all levels		
	14) Yearly investment	%	Applied at all levels		
	15) Added value	%	Applied at all levels		

Building the evaluation system: a Life Cycle Analysis Approach



Step 4

- **Validating the system through sample testing**

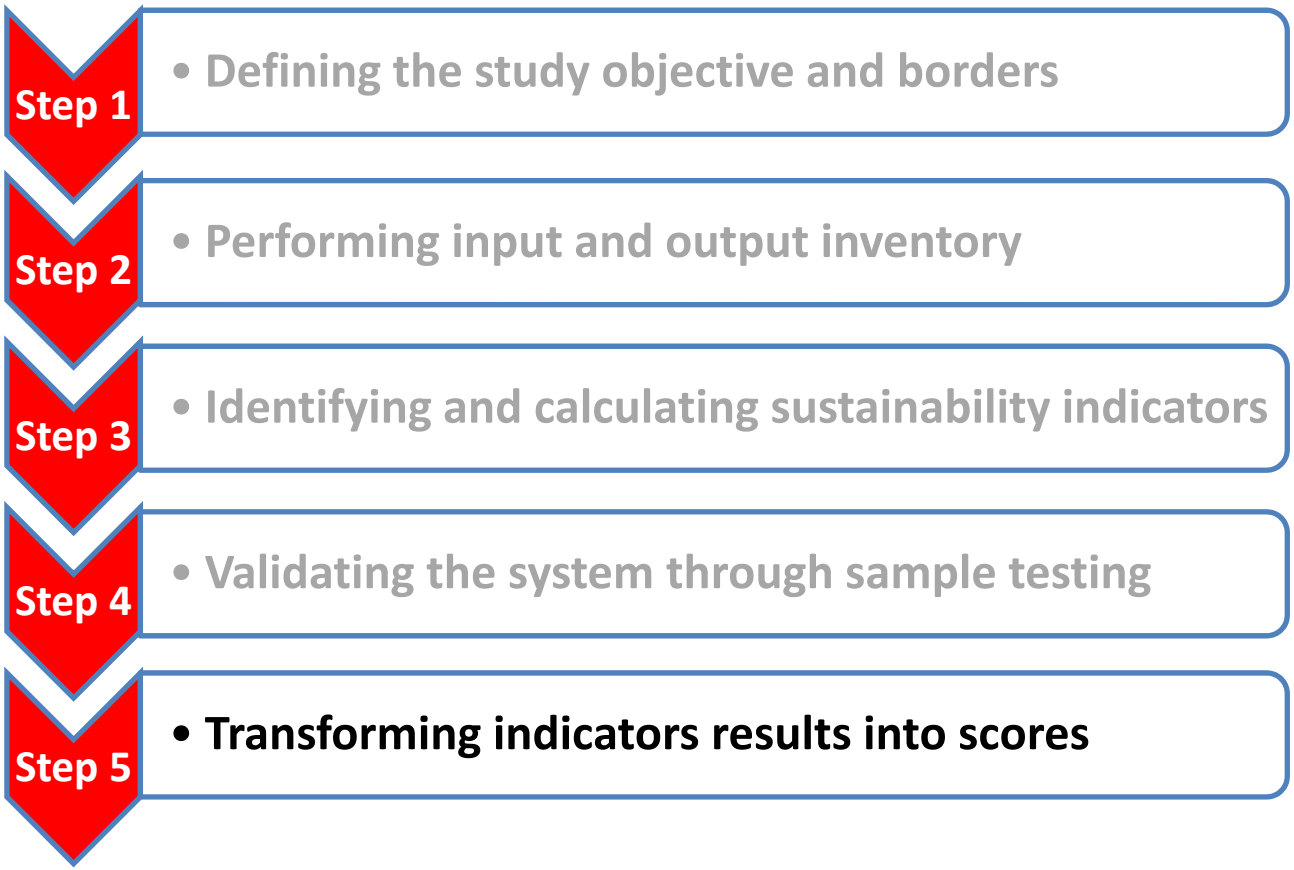
Questionnaire (40 questions), four sections:

1. **General information** (name, the date of opening, the number of employees, etc.)
2. **Environmental issues** (energy consumption for production and transportation, water consumption, chemical detergents, organic effluents etc.
3. **Social conditions** (salary for blue and white collars, rotation rate, average age of workers, etc.
4. **Economical data** (productivity, added value, profit growth, internal investment, etc.)

Sample interviewees

- Two major producers with large market segments
- two processors
- five distributors.

Building the evaluation system: a Life Cycle Analysis Approach



Step 5

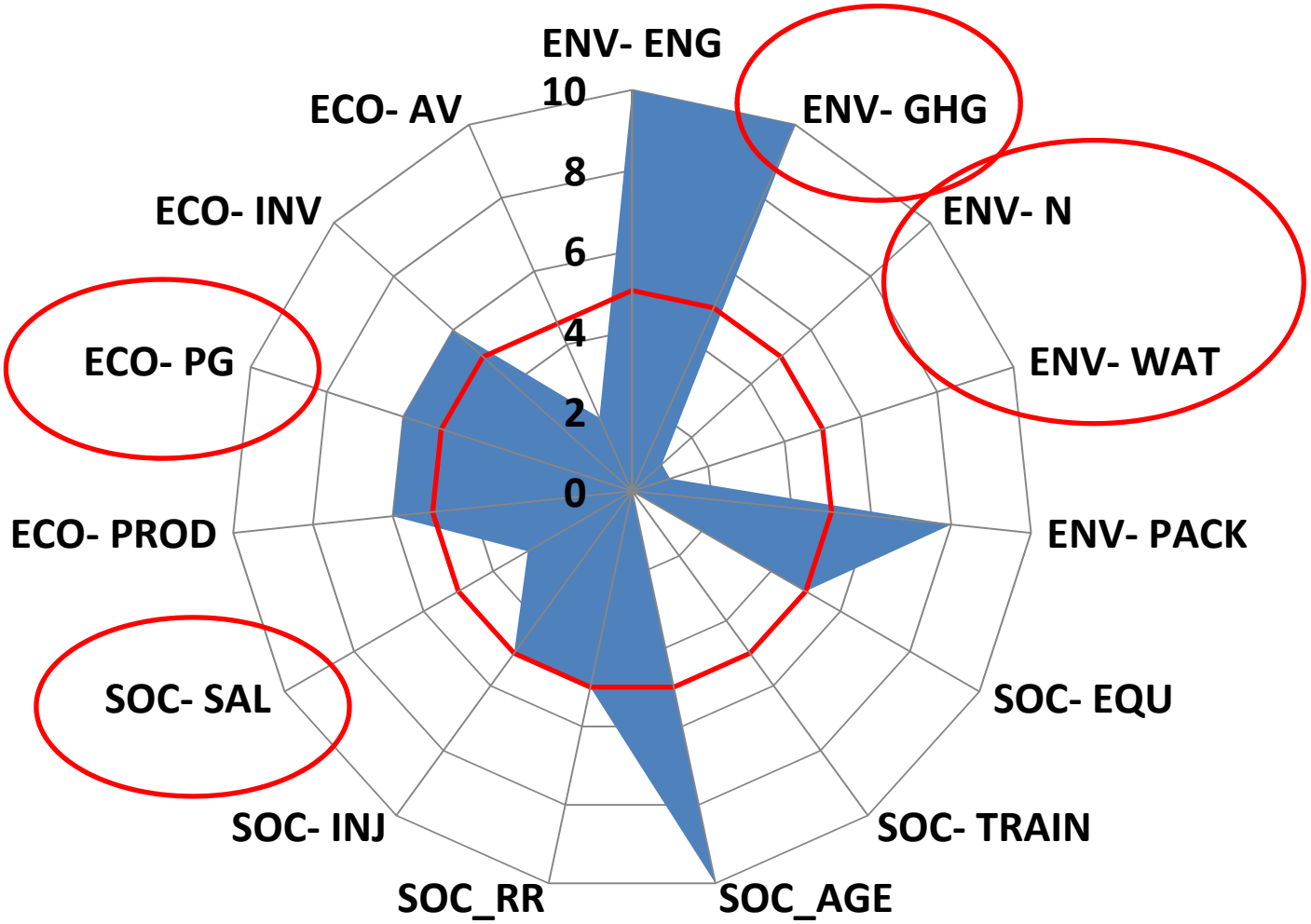
- **Transforming indicators results into scores**

Score ranging between 0 and 10

	Indicator	Acronyms	0	1	2	3	4	5	6	7	8	9	10
Environmental	Energy (MJ/Kg)	ENV-ENG	x≥ 250	250>x≥220	220>x≥200	200>x≥150	150>x≥100	100>x≥80	80>x≥60	60>x≥20	20>x≥10	10>x≥5	5>x
	Green House Gases (g/kg)	ENV-GHG	x≥ 290	290>x≥260	260>x≥200	200>x≥100	100>x≥50	50>x≥25	25>x≥20	20>x≥15	15>x≥10	10>x≥5	5>x
	Effluents (g/Kg)	ENV-N	x≥ 30	30>x≥25	25>x≥20	20>x≥10	10>x≥5	5>x≥2.5	2.5>x≥2	2>x≥1.5	1.5>x≥1	1>x≥0.5	0.5>x
	Water (L/Kg)	ENV-WAT	x≥ 20	20>x≥15	15>x≥10	10>x≥8	8>x≥6	6>x≥4	4>x≥2	2>x≥1.5	1.5>x≥1	1>x≥0.5	0.5>x
	Packaging (kg/kg)	ENV-PACK	x≥ 5	5>x≥4.5	4.5>x≥4	4>x≥3.5	3.5>x≥3	3>x≥2.5	2.5>x≥2	2>x≥1.5	1.5>x≥1	1>x≥0.5	0.5>x
Social	Equity (%)	SOC-EQU	0 ≤ x < 10 100 ≥ x ≥ 90	10 ≤ x < 15 90 > x ≥ 85	15 ≤ x < 20 85 > x ≥ 80	20 ≤ x < 25 80 > x ≥ 75	25 ≤ x < 30 75 > x ≥70	30 ≤ x < 32.5 67.5 > x ≥ 70	32.5 ≤ x < 35 67.5 > x ≥ 65	35 ≤ x < 37.5 65 > x ≥ 62.5	37.5 ≤ x < 40 60 > x ≥ 62.5	40≤ x <45 60 > x ≥ 55	45≤ x <50 55 > x ≥ 50
	Salary (000 LBP/year)	SOC-SAL	x<750	750≤x<950	950≤x<1050	1050≤x<1100	1100≤x<1150	1150≤x<1200	1200≤x<1500	1500≤x<1700	1700≤x<1750	1700≤x<1750	x≥1900
		SOC-SAL	x<950	950≤x<1050	1050≤x<1150	1150≤x<1200	1200≤x<1500	1500≤x<1700	1700≤x<1750	1700≤x<1750	1700≤x<1750	1900≤x<2000	x≥2000
	Rotation Rate (%) ≥5y	SOC-RR	<5%	5≤ x < 10	10 ≤ x < 20	20 ≤ x <30	30 ≤ x < 40	40 ≤ x < 50	50≤ x < 60	60 ≤ x < 70	70 ≤ x <80	80≤ x <90	x ≥ 90
	Age % 30< ≤40	SOC-AGE	<5%	5≤ x < 10	10 ≤ x < 20	20 ≤ x <30	30 ≤ x < 40	40 ≤ x < 50	50≤ x < 60	60 ≤ x < 70	70 ≤ x <80	80≤ x <90	x ≥ 90
	Training (days/year)	SOC-TRAIN	x<1	1≤x<3	3≤x<5	5≤x<8	8≤x<10	10≤x<12	12≤x<15	15≤x<18	18≤x<20	20≤x<25	x≥25
	Injuries	SOC-INJ	x≥ 100	100>x≥80	80>x≥60	60>x≥40	40>x≥20	20>x≥15	15>x≥10	10>x≥5	5>x≥3	3>x≥1	1>x
Economical	Productivity (T/WFU)	SOC-PROD	x<1	1≤x<10	10≤x<15	15≤x<20	20≤x<50	50≤x<500	500≤x<750	750≤x<2500	2500≤x<5000	5000≤x<10000	x≥10000
	Profit Growth (%)	SOC-PG	x<0.25	0.25≤x<0.5	0.5≤x<1	1≤x<3	3≤x<4.5	4.5≤x<6	6≤x<7.5	7.5≤x<9	9≤x<10.5	10.5≤x<15	x≥15
	Investment (%)	SOC-INV	x<0.25	0.5≤x<1	1≤x<1.5	1.5≤x<2	2≤x<2.5	2.5≤x<3	3≤x<3.5	3.5≤x<4	4≤x<4.5	4.5≤x<5	x≥5
	Added Value	SOC-AV	x<200	200≤x<400	400≤x<600	600≤x<800	800≤x<1000	1000≤x<1500	1500≤x<2000	2000≤x<2500	2500≤x<3000	3000≤x<3500	x≥3500

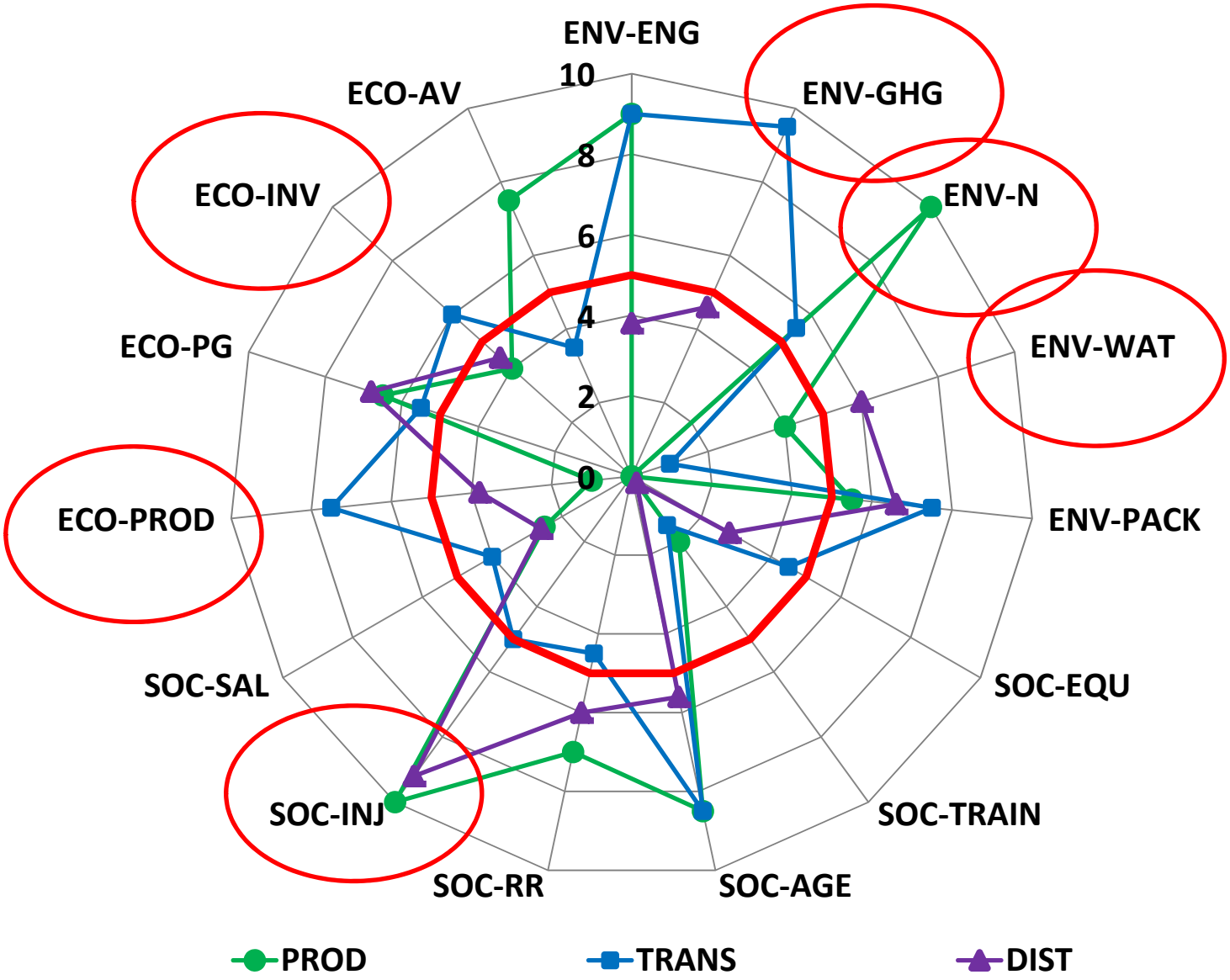
Acceptability Benchmark

1. Unit sustainability performance scoring

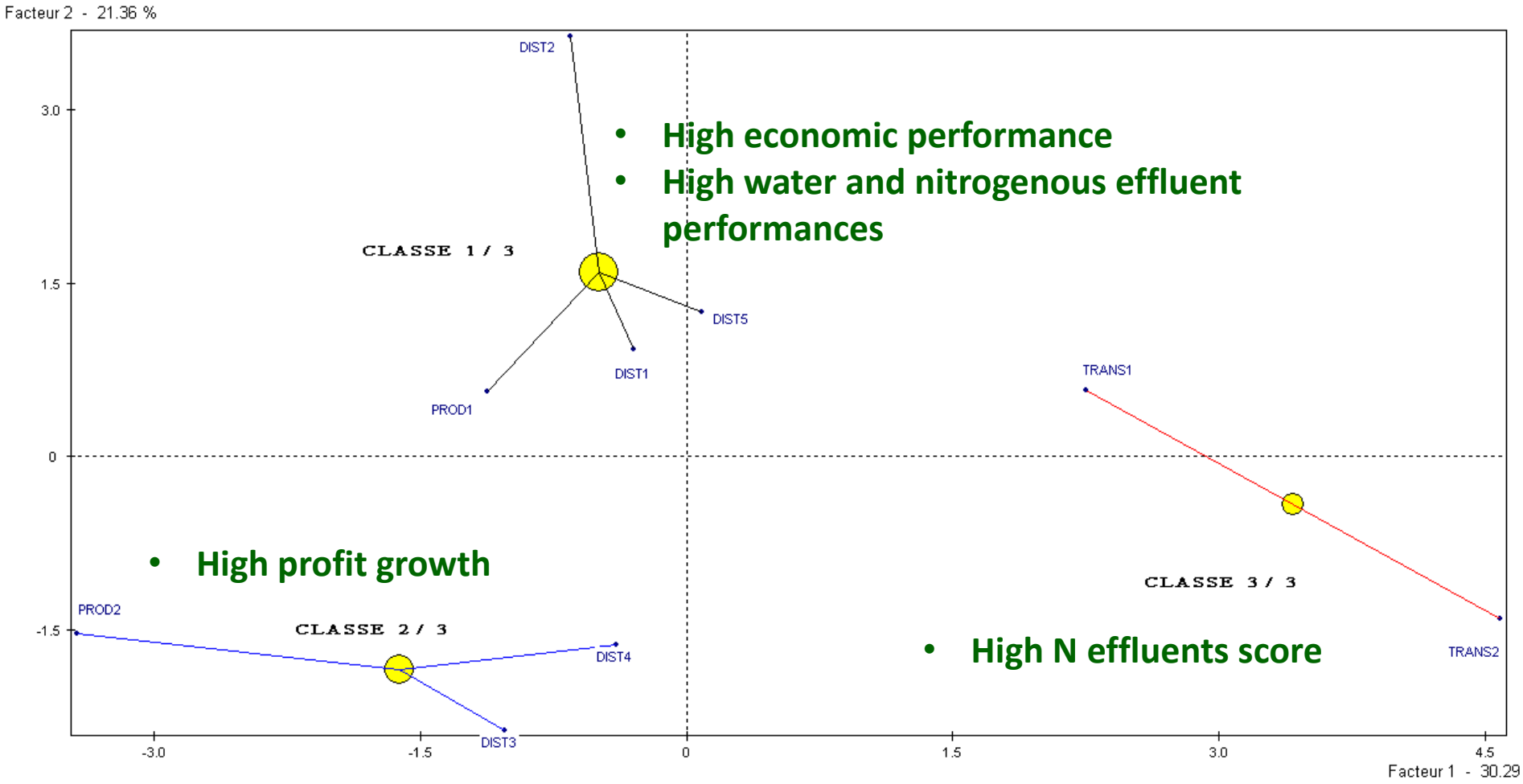


Sustainability performance evaluation of processor 2

2. Supply chain level group performance



3. Typology according to sustainability performances



- High economic performance
- High water and nitrogenous effluent performances
- High profit growth
- High N effluents score

The system was able to:

1. Group supply chain actors into categories solely based on their sustainability performance

2. Quantify sustainability levels and provide scores

3. Offer a static description and a dynamic follow up of the supply chain's sustainability level

4. Offer a holistic approach and reveals the interaction between the different supply chain actors

5. Track sustainability weak sustainability scores to their origin

Use of the evaluation system

- Gathering and quantifying sustainability scores to help take agricultural policy decisions
- Transfer of results by specialised agricultural technicians to stakeholders in a simplified manner
- A fine balance between the accuracy of the information and the simplicity of its presentation

Perspectives

- Test the system on a broader scale to allow fine tuning the scores calculations
- Test the adaptability of the system by testing it in different countries with different production systems and weather conditions
- Automating the calculation system through adapted computer programs

Questions ?