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SORGHUM AND MAIZE SUSTAINABILITY: AN IMPACT ANALYSIS IN PO VALLEY CULTIVATION



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GREAT LIFE PROJECT:
Find crops and cultivation technique more efficient from an environmental point of view.

MAIZE 2020

1° cereal most produced
(61.687.000 ton)

602.856 hectares in ITALY



SIMILARITIES:

- *C4 photosynthesis*
- *Macrotherm plants*
- *Destination of use*
- *Grain composition*
 - *Price*

DIFFERENCES:

Agronomic characteristics



Cultivation techniques



SUSTAINABILITY ?

SORGHUM 2020

5° cereal most produced
(61.687.000 ton)

52.192 hectares in ITALY



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LCA (Life Cycle Assessment)

Internationally standardized method to quantify environmental effects.

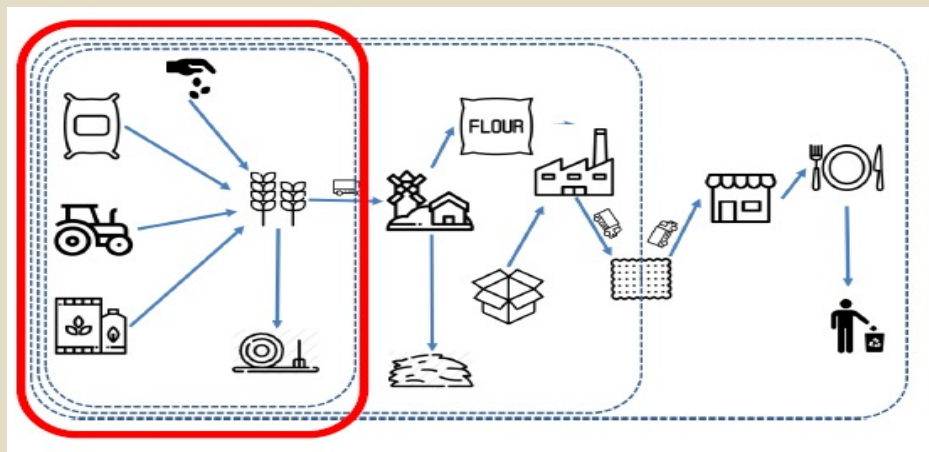
LCA ANALYSIS of the Sorghum and Maize grain production

SYSTEM BOUNDARY:

Year of cultivation: 2020

Production area: Po Valley

“Farm Gate”: All activities from soil preparation to the grains harvest



AIM OF THE STUDY

To compare environmental impacts from sorghum and maize grain production.

Environmental impacts considered:

1. Global Warming Potential (CO₂eq)
2. Eutrophication Potential (PO₄eq)
3. Acidification Potential (SO₂eq)

FUNCTIONAL UNIT:

1 Hectares.

INVENTORY DATA GATHERING:

Interview and survey to farms



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SURVEY

FARM DATA

- Location
- Crop rotation
- Hectares (total,crop)
- Conventional - Organic

CULTURAL OPERATIONS

- Primary tillage
- Secondary tillage
 - Sowing
- Plant health protection
 - Fertilisations
 - Irrigations
 - Harvest

TECHNICAL INPUT

- Seed
- Pesticides
- Fertilizer

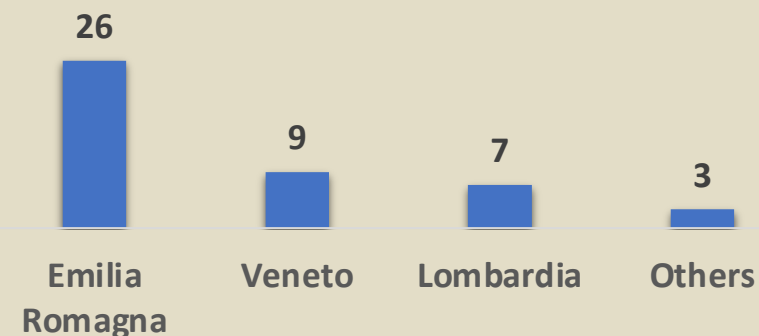
PRODUCTION DATA

- Production yield
- Grain umidity → Drying

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INVENTORY RESULTS

FARM LOCATION :



CROP	Grain MAIZE	Grain SORGHUM
Number of Farms	25	22
Crops Hectares	913,5	385
Total Hectares	2824	2322
Average hectares per crops	36,5	17,5
Average hectares total	113	105,5
% crop on total	32,3%	16,6%



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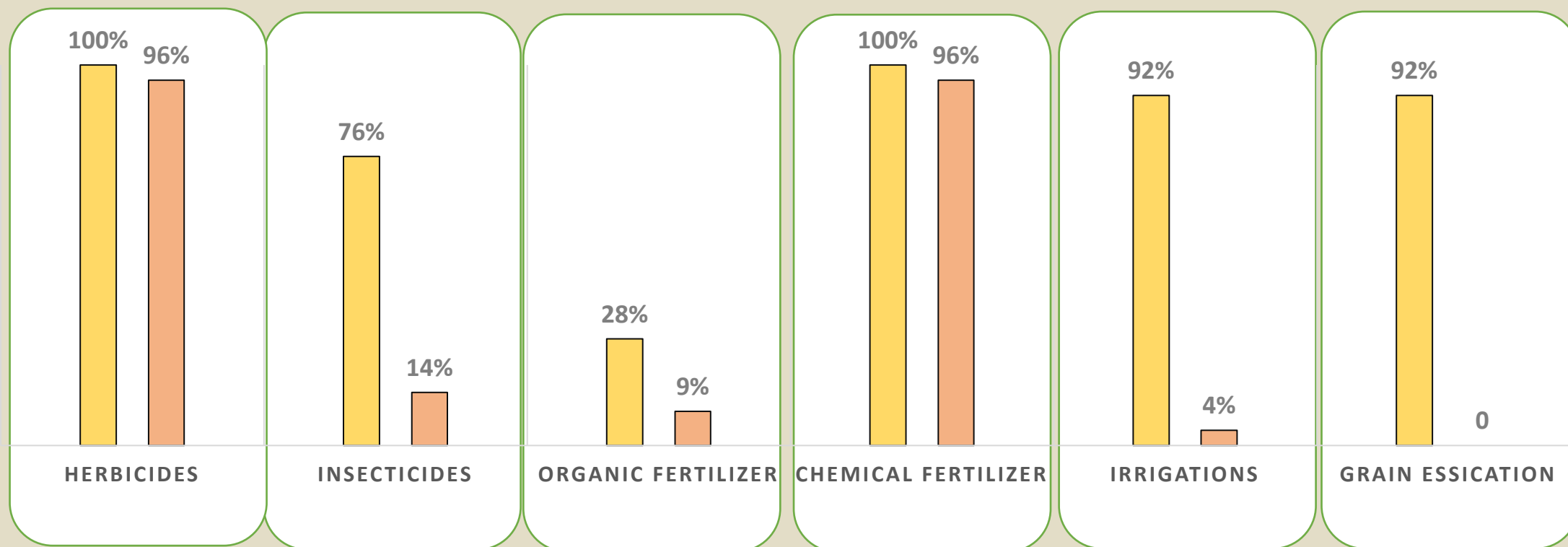


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Agronomic Input Results

■ MAIZE ■ SORGHUM



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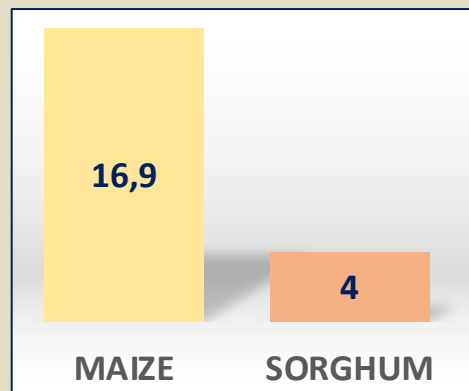


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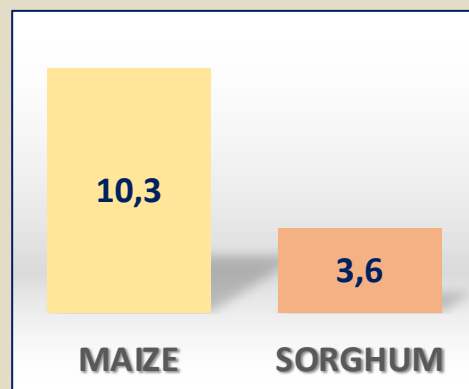
LCA RESULTS

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ACIDIFICATION POTENTIAL (KgSO₂eq)



EUTROPHICATION POTENTIAL (KgPO₄eq)



MAIZE	KgSO ₂ eq		SORGHU	KgSO ₄ eq	
Organic Fertilizer	12,41	73,5%	Cultural Operations	3,23	81,0%
Cultural Operations	3,58	21,2%	Organic Fertilizer	0,39	9,7%
Pesticides	0,74	4,4%	Pesticides	0,23	5,8%
Seed	0,17	1,0%	Seed	0,14	3,6%

MAIZE	KgPO ₄ eq		SORGHUM	KgPO ₄ eq	
Organic Fertilizer	5,15	49,9%	Chemical Fertilizer	2,70	75,8%
Chemical Fertilizer	4,33	41,9%	Cultural Operations	0,56	15,6%
Cultural Operations	0,62	6,0%	Organic Fertilizer	0,16	4,6%
Seed	0,14	1,4%	Seed	0,11	3,1%
Pesticides	0,08	0,8%	Pesticides	0,03	0,8%



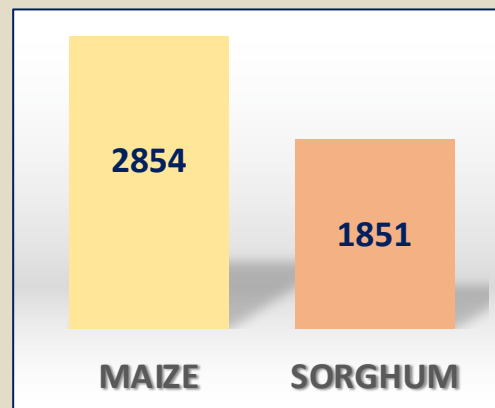
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LCA RESULTS

GLOBAL WARMING
POTENTIAL
(KgCO₂eq)



MAIZE	KgCO ₂ eq		SORGHUM	KgCO ₂ eq	
Chemical Fertilizer	2183,6	76,5%	Chemical Fertilizer	1477,3	79,8%
Cultural Operations	346,7	12,2%	Cultural Operations	310,8	16,8%
Organic Fertilizer	166,6	5,8%	Pesticides	45,6	2,5%
Pesticides	144,3	5,1%	Organic Fertilizer	9,0	0,5%
Seed	12,3	0,4%	Seed	8,4	0,5%

Sorghum's cultivation produce less emission than maize's cultivation for all of the analysed impact (GWP, AP, EP).