

COMPARISON BETWEEN CONVENTIONAL AND ORGANIC RICE PRODUCTION IN NORTHERN ITALY

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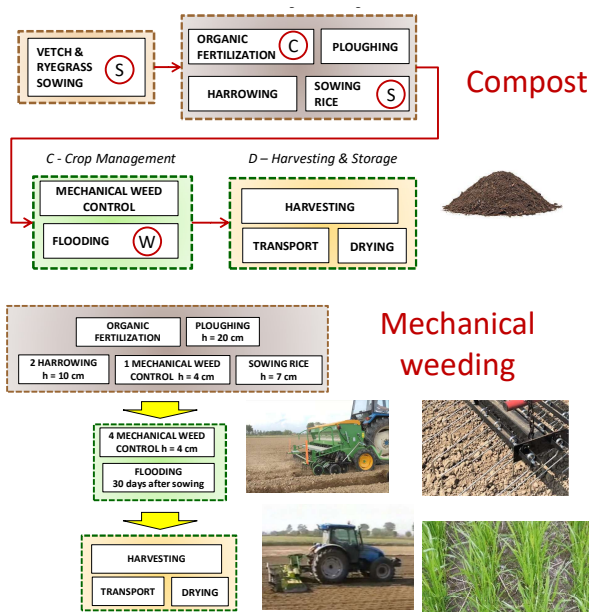
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INTRODUCTION

In Italy, in 2015, the organic rice area was 12,425 ha (5.4% of the overall rice area), with remarkable increase in respect of 2015 (+13.9%). In the same year, the total area dedicate to rice was 227,300 ha. Unlike than for conventional rice production (CRP), where a quite standardised cultivation practice is carried out, in organic rice production (ORP) several different cultivation practices can be performed, leading to a remarkable variability of yields.

The aim of this study is to assess the environmental profile of organic and conventional rice cultivation in Northern Italy.

SYSTEM BOUNDARY FOR THE ORPs



METHODS

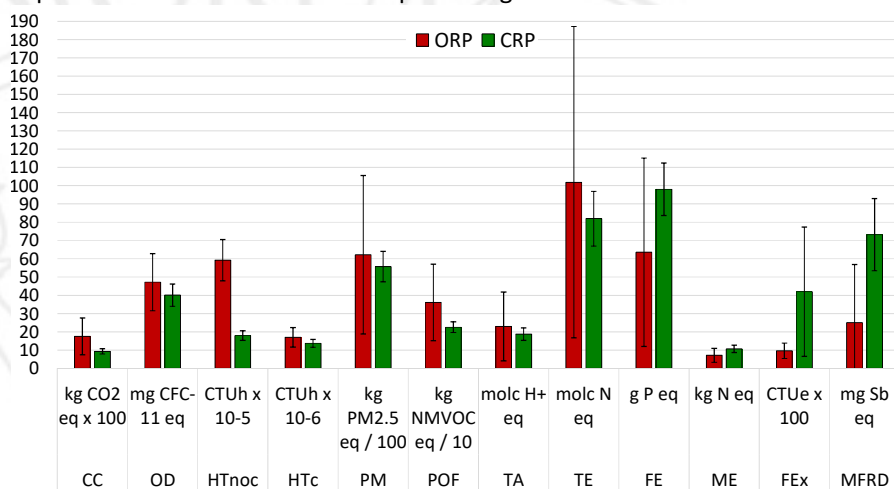
A **cradle to- farm gate perspective** was applied: the system boundaries include the production of inputs consumed during the rice cultivation as well as related emissions.

The **Functional Unit** is 1 t of rice grain (14% moisture).

Inventory data were collected in 69 farms, 20 for ORP and 49 for CRP. After the surveys, 4 different cultivation practices were identified for ORP and 9 for CRP. The paddy rice yield ranges from 3 to 4.6 t/ha for organic production and from 6 to 9 t/ha for the conventional one. The main information concerning the cultivation practice are reported in the Table

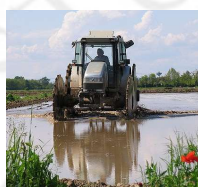
Code	Fertilization	Sowing	Weed control	Flooding	Yield
ORP 1 Water	Not applied	In flooded fields, 270 kg/ha of seed	Thanks to the flooding	1 aeration 104 days	3.0 t/ha
ORP 2 Mechanical weeding	Horn meal (0.6 t/ha)	In dry paddy fields with 220 kg/ha of seed	5 mechanical weeding	1 aeration 101 days	4.6 t/ha
ORP 3 Cover crop	Cover crop (legume crop)	In dry paddy fields with 220 kg/ha of seed	Thanks to the flooding	1 aeration 110 days	4.2 t/ha
ORP 4 Compost	Green manure and compost (21 t/ha)	In dry paddy fields with 220 kg/ha of seed	5 mechanical weeding	1 aeration 95 days	5.1 t/ha
CRP 1	70 kg N mineral/ha	In dry or flooded fields, 185 kg/ha of seed	Herbicides (1.8 kg/ha) Fungicide (1.3 kg/ha)	1 aeration 112 days	6.3 t/ha
CRP 2	Horn meal (0.15 t/ha), 148 kg N mineral/ha	In dry or flooded fields, 165 kg/ha of seed	Herbicides (4.5 kg/ha) Fungicide (1.9 kg/ha)	0 aeration, 123 days	6.6 t/ha
CRP 3	Horn meal (0.15 t/ha), 193 kg N mineral/ha	In dry or flooded fields, 165 kg/ha of seed	Herbicides (3.5 kg/ha)	1 aeration 122 days	8.5 t/ha
CRP 4	Horn meal (0.15 t/ha), 193 kg N mineral/ha	In dry or flooded fields, 172 kg/ha of seed	Fungicide (1.5 kg/ha)	0 aerations 123 days	9.0 t/ha
CRP 5	Horn meal (0.20 t/ha), 82 kg N mineral/ha	In dry or flooded fields, 115 kg/ha of seed	Herbicides (2.14 kg/ha) Fungicide (0.6 kg/ha)	2 aerations, 113 days	7.7 t/ha
CRP 6	Horn meal (0.20 t/ha), 172 kg N mineral/ha	In dry or flooded fields, 115 kg/ha of seed	Herbicides (5.1 kg/ha) Fungicide (1.6 kg/ha)	2 aerations 130 days	7.1 t/ha
CRP 7	Horn meal (0.20 t/ha), 82 kg N mineral/ha	In flooded fields, 210 kg/ha of seed	Herbicides (1.8 kg/ha) Fungicide (0.6 kg/ha)	2 aerations 118 days	6 t/ha
CRP 8	Horn meal (0.23 t/ha), 150 kg N mineral/ha	In dry or flooded fields, 165 kg/ha of seed	Herbicides (2.8 kg/ha) Fungicide (1.5 kg/ha)	1 aeration 115 days	7.3 t/ha
CRP 9	Horn meal (0.23 t/ha), 155 kg N mineral/ha	In dry or flooded fields, 165 kg/ha of seed	Herbicides (2.8 kg/ha) Fungicide (1.5 kg/ha)	1 aeration 88 days	6.1 t/ha

RESULTS: ORP4 shows by far the worst environmental performance, considerably higher also compared to the other ORPs. For ORP4, the CC is 3 times higher than the other ORPs and 4 times higher than CRPs. ORP shows higher impact for 9 of the 12 evaluated impact categories.



Both for ORP and CRP: CH₄ emission is the main hotspot for CC (from 40 to 65% of the total impact), the emissions due to fertilizer applications for TA, PM, FE, TE and ME, the mechanization is a hotspot for MFRD, OD and HTc mainly due to emission from fuel combustions; for CRP the MFRD is almost completely due to (> 90%) to mineral fertilizer production. For FEx, the main hotspot is seed production for ORC and the emission of pesticides into the soil for CRP.

Water



Cover Crop

