**Supplementary material**



**Fig. S1.** Monthly mean temperatures and total rainfall occurred during the three experimental years compared to the climatic data over the 30 last years.



**Fig. S2**. Layout of the two experiments (a: Experiment 1.faba bean- tomato; Experiment 2. wheat-zucchini) embedded within the rotation of MOVE-LTE (b) during the three experimental years (c)

**Table S1.** Main agronomic management practices adopted during the experimental years for the crops in both the experiments

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| **Experiment 1** |
|  | **2018** | **2019** | **2020** |
|  | **faba bean** | **tomato** | **faba bean** | **tomato** | **faba bean** | **tomato** |
| **Fertilization** | not fertilized | Superstallaticoa (Choncimer srl) 4 Mg ha-1 (NPK applied kg ha-1: 120-0-0) applied in two split doses  | not fertilized | Superstallatico (Choncimer srl) 4 Mg ha-1 (NPK applied kg ha-1: 120-0-0) applied in two split doses  | not fertilized | Superstallatico (Choncimer srl) 4 Mg ha-1 (NPK applied kg ha-1: 120-0-0) applied in two split doses  |
|  |  |  |  |  |  |  |
| **Plant protection** | 2 treatments with copper hydroxidec (Cu applied kg ha-1: 0.8) | 3 treatments with copper hydroxide and oxychlorided(Cu applied kg ha-1: 1.2) | no need for treatments | 4 treatments with copper sulphatee, copper oxychloride and sulfurf, and spinosadh(Cu applied kg ha-1: 1.4) | no need for treatments | 5 treatments with copper sulphate, copper oxychloride and sulfur, spinosad and pyrethrini(Cu applied kg ha-1: 2.5) |
|  |  |  |  |  |  |  |
| **Irrigation** | not irrigated | 300 L m-2 | not irrigated | 300 L m-2 | not irrigated | 300 L m-2 |
|  |  |  |  |  |  |  |
| **Weeding** | 2 mechanical weeding with cultivator | 2 manual weeding and 1 mechanical weeding with mowing blade | 2 mechanical weeding with cultivator | 2 manual weeding and 2 mechanical weeding with mowing blade | 1 mechanical weeding with cultivator | 2 manual weeding and 2 mechanical weeding with mowing blade |

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| **Experiment 2** |
|  | **2018** | **2019** | **2020** |
|  | **wheat** | **zucchini** | **wheat** | **zucchini** | **wheat** | **zucchini** |
| **Fertilization** | Prodigyb Plus (CBC srl) 0.48Mg ha-1 (NPK applied kg ha-1: 34-5-6)  | Superstallatico(Choncimer srl) 3.3 Mg ha-1(NPK applied kg ha-1: 100-0-0) applied in two split doses  | Prodigy Plus (CBC srl)0.48 Mg ha-1(NPK applied kg ha-1: 34-5-6)  | Superstallatico (Choncimer srl) 3.3 Mg ha-1 (NPK applied kg ha-1: 100-0-0) applied in two split doses  | Prodigy Plus (CBC srl)0.48 Mg ha-1(NPK applied kg ha-1: 34-5-6)  | Superstallatico (Choncimer srl) 3.3 Mg ha-1 (NPK applied kg ha-1: 100-0-0) applied in two split doses  |
|  |  |  |  |  |  |  |
| **Plant protection** | no need for treatments | 2 treatments with copper hydroxide + oxychloride and sulfur(Cu applied kg ha-1: 0.4) | no need for treatments | 2 treatments with sulfurg and pyrethrin | no need for treatments | 1 treatment with sulfur |
|  |  |  |  |  |  |  |
| **Irrigation** | not irrigated | 110 L m-2 | not irrigated | 250 L m-2 | not irrigated | 200 L m-2 |
|  |  |  |  |  |  |  |
| **Weeding** | not weeded | 2 manual weeding and 1 mechanical weeding with mowing blade | not weeded | 2 manual weeding and 2 mechanical weeding with mowing blade | not weeded | 2 manual weeding and 2 mechanical weeding with mowing blade |

Brand name, company name, and company address for each input:

a) Organic pellets: Superstallatico, Choncimer srl, frazione Rocchetta 63 San Severino Marche (MC) Italy;

b) Organic pellets: PRODIGY PLUS, CBC srl (BIOGARD division), via Zanica 25 Grassobbio (BG) Italy;

c) Copper hydroxide: Coprantol Hi Bio, Syngenta Italia spa, via Gallarate 139 Milano Italy;

d) Copper hydroxide and oxychloride: AIRONE, Gowan Italia srl, via Morgagni 68 Faenza (RA) Italy;

e) Copper sulphate: Cuproxat SDI, SIPCAM Italia, via Sempione 195 Pero (Milano) Italy;

f) Copper oxychloride and sulfur: CUTHIOL, Mormino, via Lungomolo 16 Termini Imerese (PA) Italy;

g) Sulfur: THIOVIT JET, Syngenta Italia spa, via Gallarate 139 Milano Italy;

h) Spinosad: LASER, Dow Agro Sciences Italia, via Francesco Albani 65 Milano Italy

i) Pyrethrin: BIOPIREN PLUS, CBC srl (BIOGARD division), via Zanica 25 Grassobbio (BG) Italy

**Table S2.** Mean annualamount of inputs over the three years and unit costs for a) 1 ha cultivated in pure in a proportion of 42% of faba bean for dry grain and 58% of faba bean for fresh pod production + tomato and b) 1 ha of faba bean and zucchini cultivated in strips with the same widths and management described in the experiments

|  |  |  |  |
| --- | --- | --- | --- |
|   | **a) Faba bean for grain in pure (0.42 ha) + Faba bean for freash pods /Tomato (0.58 ha) in pure** | **b) Faba bean- Tomato in strips** | **Unit cost** |
| Workforce employee (n hours) | 1800.0 | 1868.4 | 14 € h-1 |
| Subcontractor for faba bean harvest + transport (whole-job fixed price) | - | - | 170 € ha-1 in pure; 195 € ha-1 in strip |
| Faba bean seeds(kg) | 150.0 | 150.0 | 4.4 € kg-1 |
| Tomato seeds (n) | 20300.0 | 20300.0 | 0.05 € n-1 |
| Solid organic fertilizer in tomato (kg) | 2320.0 | 2320.0 | 0.192 € kg-1 |
| Liquid organic fertilizer in tomato (l) | 8.5 | 8.5 | 8.91 € l-1 |
| Fungicides in faba bean (kg) | 1.3 | 1.3 | 8 € l-1 |
| Fungicides in tomato (kg) | 5.4 | 5.4 | 9.62 € kg-1 |
| Insecticides in tomato (kg) | 0.46 | 0.46 | 347.2 € kg-1 |
| Diesel fuel (l) | 148.1 | 148.1 | 0.95 € l-1 |
| Lubricants (l) | 4.4 | 4.4 | 6 € l-1 |
| Bamboo sticks (n) | 16570.6 | 16570.6 | 0.2 € n-1 |
| Water (mc) | 1740.0 | 1740.0 | 0.20 € mc-1 |
| Drip line (n) | 8285.3 | 8285.3 | 0.15 € n-1 |
| Electricity (kwh) | 840.6 | 840.6 | 0.276 € kwh-1 |

**Table S3.** Mean annual amount of inputs over the three years and unit costs for a) 1 ha cultivated in pure in a proportion of 42% of wheat for dry grain and 58% of wheat as cover crop + zucchini and b) 1 ha of wheat and zucchini cultivated in strips with the same widths and management described in the experiments

|  |  |  |  |
| --- | --- | --- | --- |
|   | **a) Wheat in pure (0.42 ha) + Cover crop/Zucchini (0.58 ha) in pure** | **b) Wheat- Zucchini in strips (1 ha)** | **Unit cost** |
| Workforce employee (n hours) | 792.3 | 836.9 | 14 € h-1 |
| Subcontractor for wheat harvest+ transport (whole-job fixed price) | - | - | 100 € ha-1 in pure; 115 € ha-1 in strip |
| Wheat seeds (kg) | 200.0 | 200.0 | 1.5 € kg-1 |
| Zucchini seeds (n) | 8000.0 | 8000.0 | 0.14 € n-1 |
| Solid organic fertilizer in wheat (kg) | 480.0 | 480.0 | 1.456 € kg-1 |
| Solid organic fertilizer in zucchini (kg) | 1914.0 | 1914.0 | 0.192 € kg-1 |
| Liquid organic fertilizer in zucchini (l) | 37.1 | 37.1 | 7.8 € l-1 |
| Plant Protection from snails (kg) | 5.8 | 5.8 | 7 € l-1 |
| Fungicides (kg) | 3.5 | 3.5 | 14.56 € kg-1 |
| Diesel fuel (l) | 112.6 | 116.6 | 0.95 € l-1 |
| Lubricants (l) | 3.4 | 3.5 | 6 € l-1 |
| Water (mc) | 1082.7 | 1082.7 | 0.20 € mc-1 |
| Drip line (n) | 4640.0 | 4640.0 | 0.15 € n-1 |
| Electricity (kwh) | 526.6 | 526.6 | 0.276 € kwh-1 |

**Table S4.** Annual costs, gross saleable production, and gross margin in the three experimental years (2018, 2019, 2020) for pure (1 ha cultivated in pure in a proportion of 42% of legume or cereal crop for dry grain and 58% of legume or cereal as cover crop + vegetable crop) and strip (1 ha of legume or cereal crop and vegetable crop cultivated in strips with the same widths and management described in the experiments) of faba bean - tomato and wheat- zucchini systems

|  |
| --- |
| **Faba bean – Tomato** |
|  |  | **Pure (1 ha)** | **Strip (1 ha)**  |
| **Costs (**€) | **2018** | 32477.9 | 33756.7 |
|  | **2019** | 33046.6 | 33933.3 |
|  | **2020** | 33391.1 | 34376.0 |
|  |  |  |  |
| **Gross saleable production (**€) | **2018** | 40077.7 | 67075.7 |
|  | **2019** | 71948.4 | 63621.2 |
|  | **2020** | 86699.5 | 92498.2 |
|  |  |  |  |
| **Gross margin (**€) | **2018** | 7599.8 | 33319.0 |
|  | **2019** | 38901.8 | 29687.9 |
|  | **2020** | 53308.4 | 58122.2 |
| **Wheat - Zucchini** |
|  |  | **Pure (1 ha)** | **Strip (1 ha)** |
| **Costs (**€) | **2018** | 15029.9 | 15865.0 |
|  | **2019** | 15272.5 | 15656.3 |
|  | **2020** | 15207.8 | 15834.3 |
|  |  |  |  |
| **Gross saleable production (**€) | **2018** | 22225.7 | 33288.7 |
|  | **2019** | 16448.8 | 20859.9 |
|  | **2020** | 14854.4 | 26787.2 |
|  |  |  |  |
| **Gross margin (**€) | **2018** | 7195.8 | 17423.6 |
|  | **2019** | 1176.3 | 5203.6 |
|  | **2020** | -353.4 | 10952.9 |