Agronomy for Sustainable Development (2021) 41: 73
https://doi.org/10.1007/s13593-021-00733-9

CORRECTION

Correction to: Design and multicriteria assessment of low-input cropping systems based on plant diversification in southwestern France

Catherine Bonnet[1] · Noémie Gaudio[1] · Lionel Alletto[1] · Didier Rafaillac[1] · Jacques-Eric Bergez[1] · Philippe Debaeke[1] · André Gavaland[2] · Magali Willaume[1] · Laurent Bedoussac[3] · Eric Justes[1,4]

Accepted: 15 October 2021 / Published online: 9 November 2021

Correction to: Agronomy for Sustainable Development
https://doi.org/10.1007/s13593-021-00719-7

In Table 2 of this article, some of the data in the second column headed 'Description and/or calculation – agro-economic output performance' were mistakenly listed under the first column headed 'Indicators – agro-economic output performance'. The correct version of Table 2 is published in this erratum.

The original article has been updated.

The original article can be found online at https://doi.org/10.1007/s13593-021-00719-7.

✉ Noémie Gaudio
noemie.gaudio@inrae.fr

1 AGIR, Univ. Toulouse, INRAE, Castanet-Tolosan, France

2 Unité Expérimentale Grandes Cultures Auzeville, Univ. Toulouse, INRAE, Castanet-Tolosan, France

3 AGIR, Univ. Toulouse, ENSFEA, INRAE, Castanet-Tolosan, France

4 Persyst Department, CIRAD, Montpellier, France

Table 2 Indicators used to characterize the cropping systems. The indicators were calculated at the yearly scale, where 'n' is the number of cash crops in the crop rotation (two for the common two-year durum wheat / sunflower cropping system and three for the prototypes).

Indicators	Description and/or calculation	Unit
Crop diversity		
$Crop_{Species_{Richness}}$	$= 0.3 \times Number_{of_{species_{grown_{per_{rotation}}}}} + 0.7 \times Number\_of\_species\_grown\_per\_year$; Source: Last et al. (2014).	number of species grown
Fixed variables		
$Mean\_price\_for\_crop_i$	$= \sum_{i=1}^{6} \frac{\text{Price for crop}_i \text{ for year}_j}{6}$; crop prices were 137 €.t^{-1} for sorghum, 167 €.t^{-1} for triticale/faba bean, 163 €.t^{-1} for soft wheat/faba bean, 174 €.t^{-1} for faba bean, 203 €.t^{-1} for durum wheat/pea, 234 €.t^{-1} for durum wheat, 332 €.t^{-1} for sunflower/soybean and 347 €.t^{-1} for sunflower.	€.t^{-1}
Subsidies	$= \sum_{i=1}^{6} \frac{\text{Subsidies for crop}_i \text{ for year}_j}{6}$; subsidies were 273 €.ha^{-1} for sorghum, 296 €.ha^{-1} for triticale/faba bean, 269 €.ha^{-1} for soft wheat/faba bean, 402 €.ha^{-1} for faba bean, 279 €.ha^{-1} for durum wheat/pea, 306 €.ha^{-1} for durum wheat, 283 €.ha^{-1} for sunflower/soybean and 273 €.ha^{-1} for sunflower.	€.ha^{-1}.year^{-1}
Soil tillage intensity		
$Mean\_plowing\_for\_year_j$	$= \sum_{i=1}^{n} \frac{\text{Plowing for crop}_i \text{ for year}_j}{3 \times n}$; plowing (depth=30 cm) for $crop_i$ for $year_j$ corresponds to plowing that occurred between harvest of the previous crop and sowing of $crop_i$ in $year_j$.	number of plowing operations per year on one hectare of a given cropping system
$Mean\_shallow\_tillage\_operations\_for\_year_j$	shallow tillage operations (rotary harrow, mounted disc harrow, vibra-shank cultivator; depth<15 cm) that occurred between harvest of the previous crop and harvest of $crop_i$ in $year_j$.	number of shallow tillage operations per year on one hectare of a given cropping system
$Mean\_mechanical\_weed\_control\_operations\_for\_year_j$	mechanical weed-control operations (weed harrow, weeder, rotary harrow; depth<10 cm) that occurred between harvest of the previous crop and harvest of $crop_i$ in $year_j$.	number of mechanical weed control operations per year on one hectare of a given cropping system
Agro-economic output performance		
$Mean\_grain\_yield\_for\_year_j$	$= \sum_{i=1}^{n} \frac{\text{Grain yield for crop}_i \text{ for year}_j}{3 \times n}$	t.ha^{-1}.year^{-1}
$Mean\_gross\_proceeds\_for\_year_j$	$= \sum_{i=1}^{n} \frac{\text{Grain yield for crop}_i \text{ for year}_j \times Mean\_price\_for\_crop_i}{3 \times n}$	€.ha^{-1}.year^{-1}
Operational_costs	= Seed costs + Pesticide costs + Fertilizer costs	€.ha^{-1}.year^{-1}
Mechanical_costs	$= \sum_{i=1}^{n} Area_i \times (Tractor\_cost_i + Equipment\_cost_i + Fuel\_cost)$; where 'n' is the number of mechanical operations on a plot, 'i' is the area worked (in ha) and the costs of the tractor and equipment (in €.ha-1), which depend on the mechanical operation, correspond to wear, maintenance and amortization.	€.ha^{-1}.year^{-1}
Semi_net_margin	=Gross_income+Subsidies-Operational_costs-Mechanical_costs	€.ha^{-1}.year^{-1}
Sunflower_seed_oil_content	measured by NMR spectroscopy.	% of dry matter
Nitrogen_grain_content	determined using the Dumas combustion method.	% of dry matter
Durum_wheat_grain_protein_content	= 5.7 × grain nitrogen content	% of dry matter
Energy_consumption	= Mechanical energy use + Energy used to produce fertilizers + Energy used to produce pesticides + Energy used to produce seeds; Source: ADEME (2011).	MJ.ha^{-1}

Table 2 (continued)

Indicators	Description and/or calculation	Unit
Calorie_content	= Grain yield for $crop_i$ for $year_j$ × calorie content of $crop_i$ where calorie contents were 16,700 MJ. t^{-1} for wheat, pea and faba bean; 16,800 MJ. t^{-1} for sorghum; 16,900 MJ.t^{-1} for sunflower; 17,400 MJ. t^{-1} for triticale and 26,700 MJ. t^{-1} for soybean. Source: ADEME (2011).	MJ.ha^{-1}
Energy_efficiency	$= \frac{\text{Energy\_consumption}}{\text{Calorie\_content}}$	%
Input use		
Fertilizer_applied	$= \sum_{i=1}^{n} \text{Fertilizer\_applied}_i$	kg N.ha^{-1}.$year^{-1}$
Labor_time	labor time in and outside the field where labor time was set as a function of equipment width and tractor forward speed (h.ha^{-1}).	h.ha^{-1}.$year^{-1}$
Toxicity to human health	$= \sum_{i=1}^{n} \text{number of applications of toxic compounds applied during rotation}_i$	number of applications of toxic compounds.ha^{-1}.yr^{-1}
TFI (treatment frequency index)	$= \sum_{i=1}^{n} \frac{\text{rate\_applied}_i \times \text{treatment\_area}_i}{\text{approved\_rate}_i \times \text{plot\_area}_i}$ where 'i' is a given pesticide applied to a crop for given target organisms. The seed treatments used in the experiment were not included in this index since no standard rates exist for these products. TFI was divided into $TFI_{Herbicide}$, $TFI_{Fungicide}$ and $TFI_{Insecticide}$.	number of full pesticide treatments.ha^{-1}.$year^{-1}$