



LIFE Project Number
<LIFE15 ENV/IT/000641>

Deliverable “Cost-benefit evaluation”

Sub-action B4.2 “Evaluation of socio-economic effects on the wine value chain and on local development”

LIFE PROJECT Soil4Wine



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1. Introduction

The present work aims to capture the impact of the grape-growing and winemaking activities on the territory of the Provinces of Parma and Piacenza, through the assessment of its direct economic impact on local activities. **The analysis, conducted on the direct costs, evaluated the economic value, generated in the Provinces, by the vine-growing (per hectare) and winemaking (per hectoliter) activities.**

More specifically, the analysis aims to quantify the economic impact that the small-scale vine-growing activities involved in the **S4W** project have on the local territory, thus identifying further positive effects which might not emerge from a classic economic impact assessment. The focus of the inquiry is to quantify the cost for the activities of winegrowing and winemaking realized in the local territory. **The final goal of this study is to identify the positive effects of the economic activation generated by viticulture in the Provinces of reference**, namely Parma and Piacenza.

The qualitative part of the present analysis has been assessed through a questionnaire survey in order to collect information on the direct costs for each production phase (i.e. vine-growing and winemaking) that are directly carried out by the wineries involved in the S4W project.

The questionnaire was divided into three sections:

1. The first part aimed at identifying the **extension** of the vineyards in terms of hectares and the presence of other crops besides the grapevine. This information intended to record the average company size and the relative areas dedicated to the vine-growing activity.
2. **Direct costs of vine-growing activity.** The second part aimed at identifying the direct costs of production for the winery, up to the grape harvest. Information on the costs related to the remuneration of the workforce, to the cultural operations, is collected from secondary sources¹.
3. **Direct costs for winemaking activities.** This part identifies the cost directly linked to the wine-making activity. Information has been collected for: the processing phase, enological and marketing services, and the purchasing of enological adjuvants, bottles, corks, labels, and packing materials.

All respondents are winemakers, carrying out their own wine-making activities, by using their own wine cellar and by making direct sales to the public.

The questionnaire aimed at identifying the percentage of expenditure directly made at the local level for the purchase of the production factors. In order to facilitate the answering to the questionnaire, only one reference year was used, i.e. the 2017-2018 agricultural year.

The Informatore Agrario (2016), *Costi e mercato del vino, focus su Emilia-Romagna*. Dicembre 2016, has been useful to identify the cost structure, to verify yields according to the landscape, and their impact on production costs.

“The production yield is highly diversified depending on whether the range is located in the plain or in the mountain. These are total costs that vary in a range of 0,25 – 0,28 €/kg (Emilia Romagna Region, the cases of the mechanized system located in lowland) to a range of 0,45 – 0,48 €/kg in Lambrusco locations, while in the central-eastern hills the total cost reaches 0,75 – 0,80 €/kg.”

¹ i.e. 1) E. Pomarici (2015), *Analisi del costo di produzione atto a diventare Toscano IGT: un’analisi esplorativa*; 2) Informatore Agrario (2016), *Costi e mercato del vino, focus su Emilia-Romagna*. Dicembre 2016; 3) R.Pretolani, D.Rama (2017), *Il Sistema agro-alimentare della Lombardia*.

The work of E. Pomarici (2015), *Analisi del costo di produzione atto a diventare Toscano IGT: un'analisi esplorativa* was used to identify the cost allocation method (direct and indirect).

Furthermore, we referred to Pretolani and Rama (eds) (2017), *Il Sistema agro-alimentare della Lombardia* for the analysis on the performance of quality wine PDO (Protected Designation of Origin).

Lastly, we referred to Istat database to identify local yields and production of wine in the 2006-2017 period.

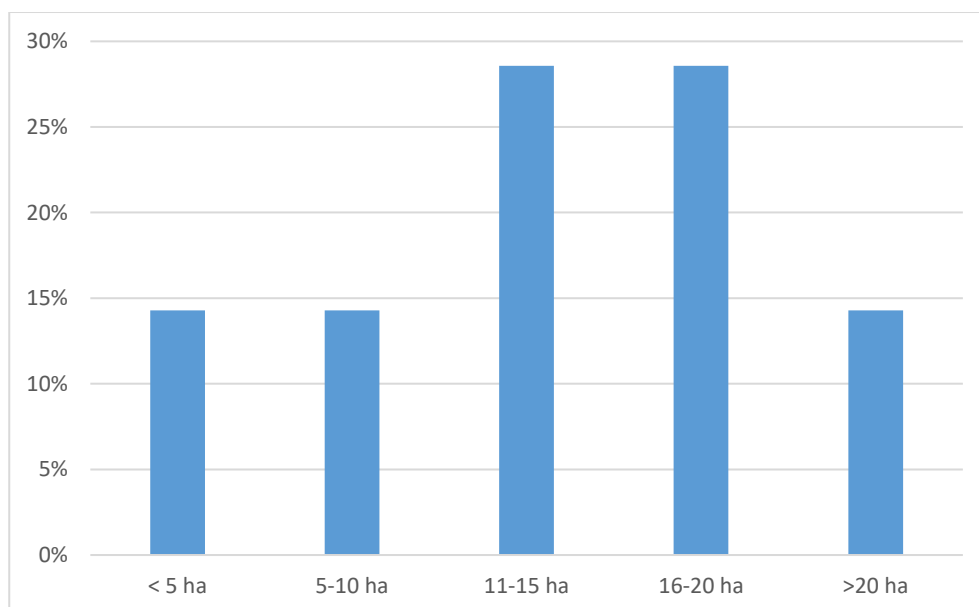
Moreover, this report present the final results of the comparison between production (yields and quality) and costs obtained with traditional agronomic techniques and the ones obtained applying the different demonstrative agronomic actions with the aim of increasing the supply of ecosystem services. The comparison has been developed with reference to the three cropping year 2017-2019.

2. Farm size distribution of the sample

The average extension of the areas cultivated in the S4W sample has a distribution that shows a greater frequency in the classes 11-15 ha and 16-20 ha, each representing around 30% of the respondents. Few respondents (around 14% of the sample) cultivate more than 20 hectares in 2018. In addition, 14% of respondents have an amount of vineyard that do not reach 5 hectares; another 14% have less than 11 hectares.

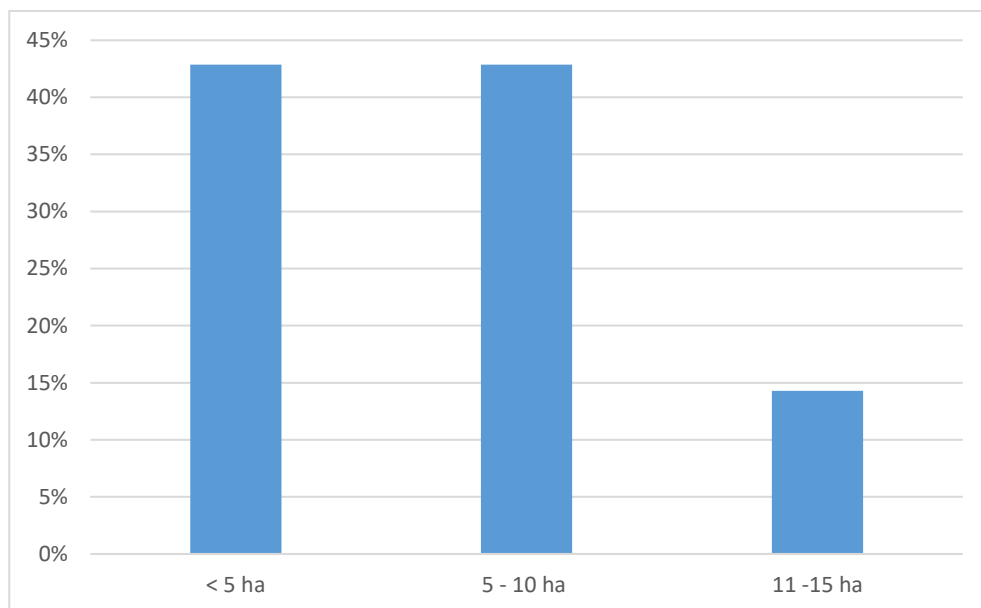
More in detail, the average extension of the respondents farms is equal to 15.2 hectares, with at least half of the area destined to grape production (in average, 52% of surfaces are destined to grape production). By analyzing the size of the vineyards, the average viticultural extensions are predominantly small, as those exceeding 10 hectares do not reach 15% of the sample. In fact, small surfaces are much more frequent: 44% of the sample does not reach 5 hectares of vineyards, and another 44% has areas between 5 and 10 hectares.

Graph 1 – Average area of total crops in the S4W sample



Source: UCSC elaboration of the survey

Graph 2 – Distribution of farms with reference to the average size in hectares



Source: UCSC elaboration of the survey

3. Vine-growing activity: evaluation of direct costs and local purchases

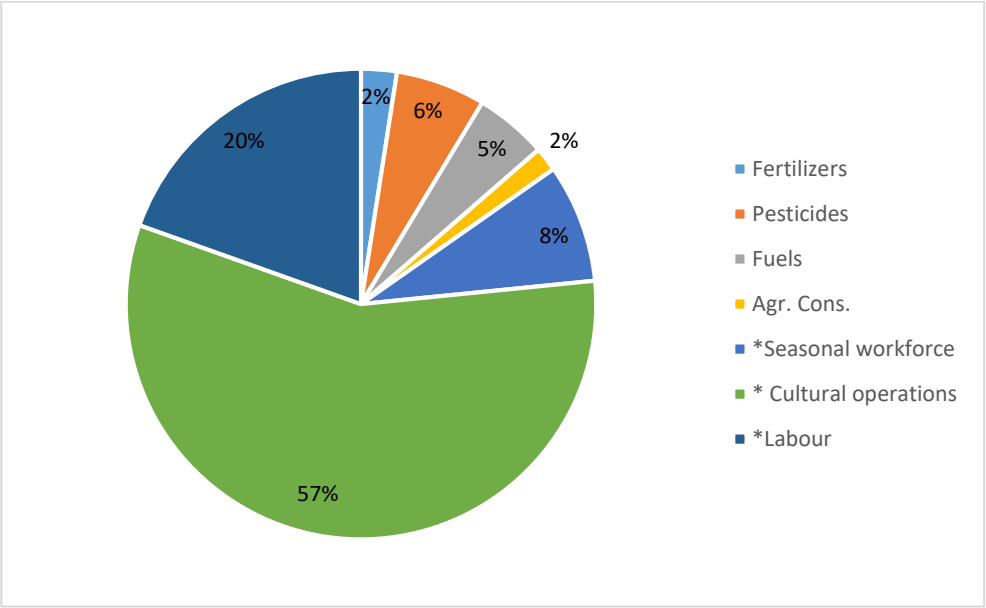
Once identified the extension reserved to the growing activity, in the second part of the inquiry we investigated the expenditure related to the viticulture, up to the harvest.

The graph below shows the average direct costs per hectare for the implementation of grape farming, declined in terms of: cultural operations, labor, seasonal workforce, agronomic consultancy and purchase of materials (fuels, fertilizers and pesticides).

The estimated cost per hectare of vineyard is on average € 6,137, of which 57% is destined to cultural operations, 20% to labor, 8% to seasonal workforce, 2% for agronomic consultancy, 5% for the purchase of fuels, and 8% for the purchase of agro-chemicals, respectively 6% for pesticides and 2% for fertilizers.

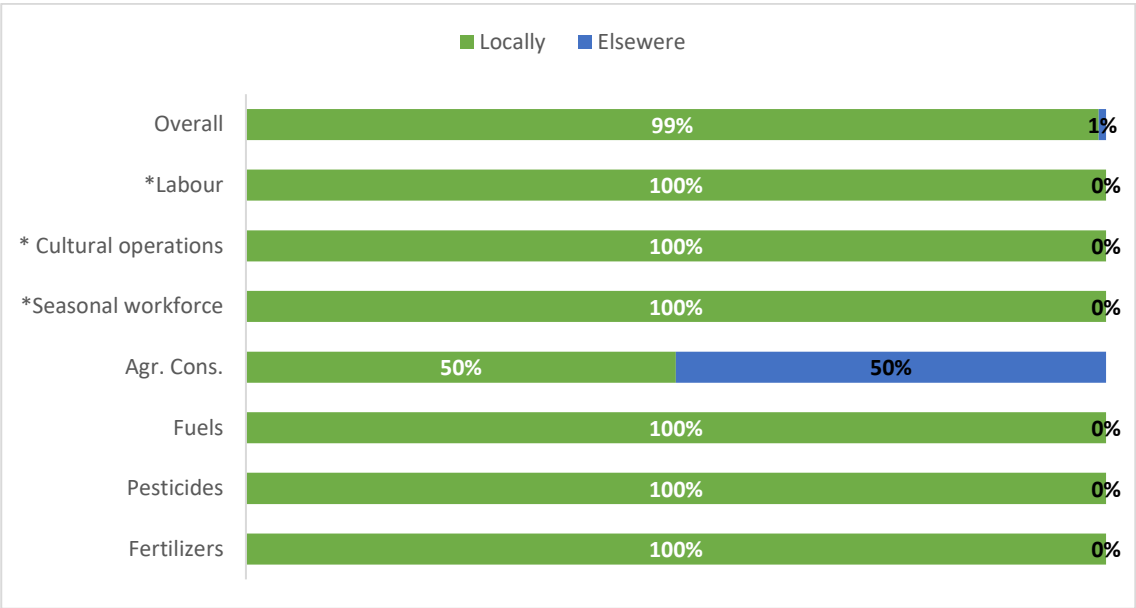
The present study seeks to quantify how much of the vine-growing activities have an impact on local economy (i.e. the provinces of Parma and Piacenza). According to the respondents, 99% of purchases made for the 2017–2018 campaign, directly linked to the vineyard, took place on the provincial territory in which the farm is located. All categories of costs are directly sourced in the local territory, except for the agronomic consultancy, that is sourced for one half outside the Province.

Graph 3 – Evaluation of direct costs per ha for vine-growing activities during 2018
(s4w sample, %)



Source: UCSC elaboration of the survey

Graph 4 – Purchasing made on local territory for the realization of vine-growing activity



Source: UCSC elaboration of the survey

4. Wine production: performances and direct cost for the enological activity of small-scale wine producers

In this part, the attention is focused on the evaluation of direct costs attributable to the winemaking activity. The estimate of the value for the purchase of production factors considered the monetary value spent for the realization of the overall winemaking activity.

To determine the unit cost of production for the wine production, the most important aspect to be taken into account is related to the production yields. In general, the production yield is highly diversified, depending on wine cultivars, and whether the grape-growing activity is located in the plain or in the mountain. Table 1 shows the yields of winemaking activity and the comparison between the S4W sample and the regional average of quality wine PDO (detailed records referred to Lombardia Region).

- Each record shows few lower average value for the S4W sample. The reason of the lower value in the sample is mainly due to the small-scale activities, especially if referred to the performance of quantity of grape harvested per hectare: 89.8 vs 112.8 (100kg per ha).
- Nevertheless, despite this situation of lower quantities of grape produced per vineyards, the performance in terms of quantity of wine per grape processed is quite similar to the other quality wine production: 0.58 vs 0.66 (hl per 100 kg).
- Even better the performance in terms of quantity of wine produced per hectare used in the grape growing activity: 54.4 vs 55.6 (hl per ha).

The data suggests that small-scale activities of the S4W sample are more efficient than the other regional quality wine productions. The data shows a good performance of wine production by quantities, determined by a better quality of grape, as well as a better efficiency in the harvest and processing phase.

Table 1 - Production of quality wine. Comparison of performances.

Wine-making performance (average)	S4W sample	Production of quality wine PDO
100kg/ha	89.8	112.8
hl/100kg	0.58	0.66
hl/ha	54.4	55.6

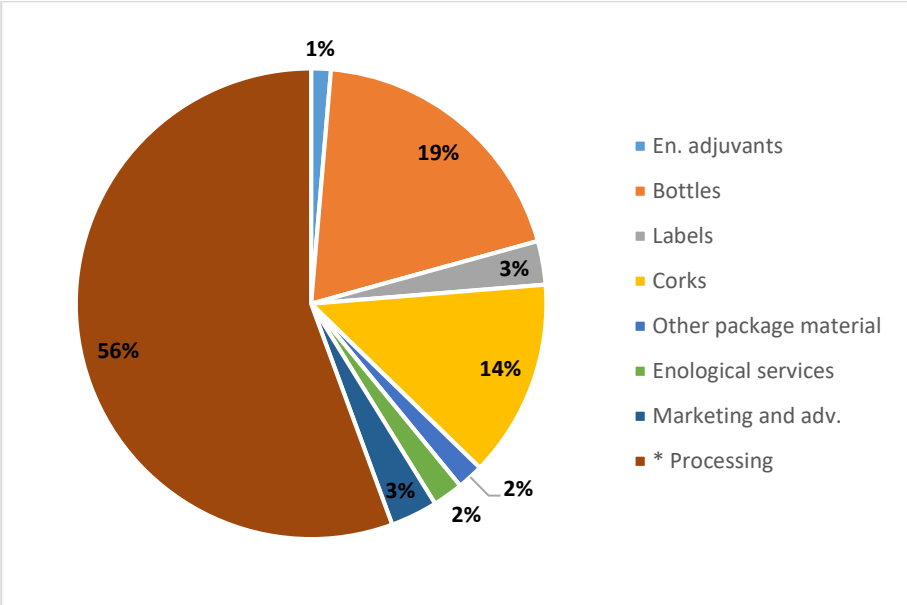
Source: UCSC elaboration of the survey and Pretolani R. and Rama D. (2017)

With reference to the costs related to the winemaking phase, the survey showed that the unit cost (72€ per hectoliter) is determined for 56% merely to processing activity. The cost incurred for bottles (19%) and corks (14%) is significant, followed by the ones for the labels (3%) and for marketing activities (3%).

Regarding the high incidence of the cost for bottles, the survey revealed a potential in terms of economic (and environmental) sustainability, which is achieved by the wineries that sell wine through the practice of returnable void. In fact, this practice allows a drastic reduction of costs in this productive phase, particularly suitable for those interviewed wineries selling directly to consumers.

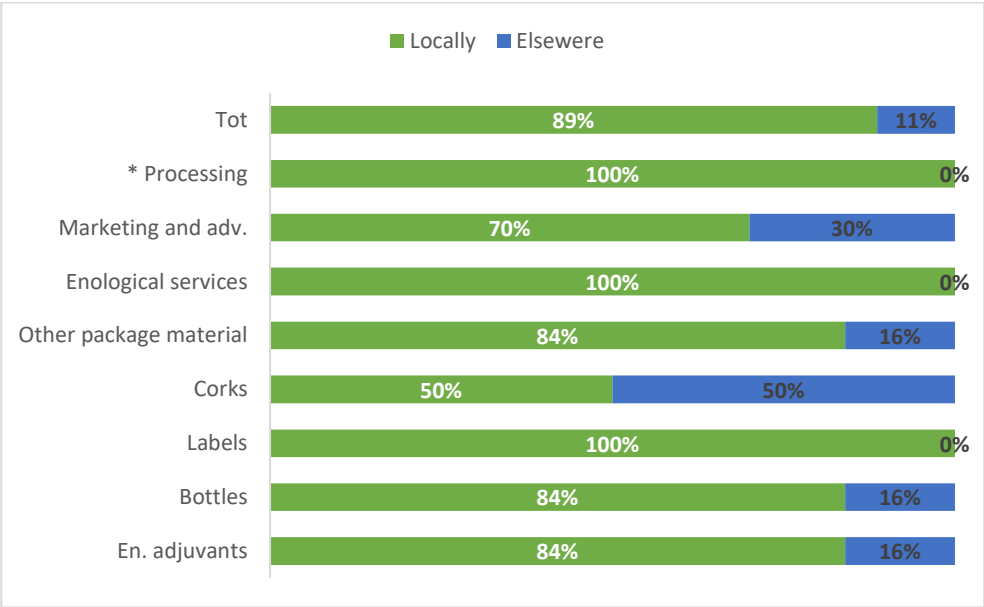
As regards the winemaking spending in the province territory in which the wineries are located, the preponderance of the purchases are realized at local level, for a weighted average of 89% on a unit cost of € 0.72 per liter.

Graph 5 – winemaking: structure of direct costs supported for wine production



Source: UCSC elaboration of the survey

Graph 6 – Purchasing made on local territory for the realization of wine-making activity



Source: UCSC elaboration of the survey

Table 2 – Cost structure of winemaking phase in small scale cellars of the area (Province of Parma and Piacenza)

<i>Unit cost, € per hl of wine</i>	<i>En. adjuvants</i>	<i>Bottles</i>	<i>Labels</i>	<i>Corks</i>	<i>Other packag e material</i>	<i>Enologi cal services</i>	<i>Marketi ng and adv.</i>	<i>* Process ing</i>	<i>Tot</i>
<i>Tot.</i>	0,97	13,92	2,16	9,76	1,29	1,50	2,33	40,00	71,94
<i>Locally purchased as % tot</i>	84%	84%	100%	50%	84%	100%	70%	100%	89%
<i>Tot. Local</i>	0,82	11,70	2,16	4,88	1,09	1,50	1,63	40,00	63,77

Source: UCSC elaboration of the survey and Informatore Agrario (2016)

5. Economic impact of wine value chain on the local economy

The analysis conducted led to the identification of costs incurred by the wineries interviewed located in the area of Parma and Piacenza. The costs have been identified to outline the economic activation generated on the local territory by these small-scale activities, and thus to highlight the positive impact directly produced on the local economy.

The results of the qualitative survey have proved to be in line with the official data, but unlike the latter, the survey managed to capture specific peculiarities related to the very small and small wineries and their economic impact on the territory.

In fact, to outline the economic impact of the wine growing activities, we have calculated the unitary cost per hectare of grape cultivated, and the costs per hectoliter for the production of wine. Additionally, according to the official data on production of the Istat database (2019) (see in the annex), we managed to capture the value directly generated by the realization of the wine growing activities in Parma and Piacenza Provinces. The results are reported in the table 4 “Estimation of the economic impact of wine growing activities in PR and PC provinces”.

Table 3 - Resume of structure of costs and local purchasing for winemaking activities in the provinces of Parma and Piacenza, S4W sample (2018)

S4W sample	€ per ha	% locally purchased
Vine-growing	6.137	99%
Fertilizers	151 €	100%
Pesticides	379 €	100%
Fuels	306 €	100%
Agr. Cons.	102 €	50%
*Seasonal workforce	500 €	100%
* Cultural operations	3.500 €	100%
*Labor	1.200 €	100%
	€ per hl	% locally purchased
Wine-making	72 €	89%
En. adjuvants	0,97 €	84%
Bottles	13,92 €	84%
Labels	2,16 €	100%
Corks	9,76 €	50%
Other package material	1,29 €	84%
Enological services	1,50 €	100%
Marketing and adv.	2,33 €	70%
* Processing	40,00 €	100%

* Referred to official literature (see sources)

Source: UCSC elaboration of the survey and Informatore Agrario (2016)

Table 4 - Estimation of the economic impact of vine-growing activities in the provinces of Parma and Piacenza

Vine-growing	Purchasing per ha of cultivated area (tot)	Locally purchased
PR+PC x €/ha	39.233.841 €	38.841.503 €
Wine-making	Purchasing per wine produced	Locally purchased
PR+PC x €/ql	31.035.528 €	27.621.620 €
Administration	Services	Locally purchased
PR+PC x €/ha	2.116.083 €	2.116.083 €

*PR and PC data are an average of 2015-2017 period

Source: UCSC elaboration of the survey and Informatore Agrario (2016).

6. Cost-benefit analysis of new soil management techniques

For the three cropping year 2017-2019, grape production has been measured in all test field, in order to collect data that could allow comparing, in all the farms considered and with respect to all different demonstrative practices, the effects of changes in soil management practices.

In table 5 all data are reported, with reference to the quantity of grape that has been produced and harvested and to its quality measured with the °Brix.

In table 6 the differences (positive or **negative**) have been calculated in order to clarify and synthetize main results. Note, in particular, the results calculated with reference to the three-year period and finally the signs and symbols presented in the last two columns. Results are not absolutely clear with respect to all techniques. This is due mainly to the fact that three years is a period too short to obtain stable e clear results.

The quality of grape, measured in °Brix, does not seem to be clearly affected in a negative way; in few cases it seems almost the same in the two cases (demonstrative vs traditional), in few other cases even slightly improved with new soil practices.

With reference to grape yields, instead, results are mixed and not conclusive.

For this reason, if we consider that farmers are more sensitive to the quantity produced than the quality, at lease in this area of the case study, the conclusion that one could derive from these data is that farmers would be quite skeptical and/or reluctant to introduce new soil management practices. However, if some support can be granted to grape producers through PES that can transfer to them the social value of the ES provided using these new more sustainable soil management practices, farmers decision could change radically.

In other words, these results support the possibility that new agronomic techniques that allow farmers to manage soil in vineyards in a more sustainable way, could be quite easily be implemented ONLY IF some support can be granted to them through appropriate and effective PES or public support. This conclusion can be easily supported looking at table 7, where a comparison among production cost increase, productivity changes and effects in terms of ES provision connected with different agronomic practices are shown. All sort of permanent grass cover, in particular, seems to be more economically sustainable if and only if ES are paid to farmers.

Table 5 - Grape growing surfaces and wine production in Pc and PR provinces during 2006-2017 period

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Average 2015-2017
Total Cultivated Area	Emilia Romagna	60.971	60.751	60.551	58.702	56.920	55.501	55.305	55.221	55.363	54.884	53.191	53.208	53.761
(ha)	Piacenza	6.531	6.577	6.562	6.440	6.298	5.917	5.903	5.876	6.421	6.370	5.323	5.075	5.589
	Parma	1.004	873	872	872	863	856	849	839	841	822	802	787	804
Production area	Emilia Romagna	56.193	56.496	56.320	55.224	53.536	51.998	52.039	51.150	51.075	50.518	49.627	49.880	50.008
(ha)	Piacenza	5.977	6.196	6.181	6.256	6.120	5.740	5.734	5.771	6.333	6.176	5.163	4.917	5.419
	Parma	948	827	826	824	816	805	800	792	786	776	756	781	771
Harvested grapes	Emilia Romagna	8.952.275	8.380.113	8.321.954	9.116.651	8.744.429	8.410.456	8.181.421	9.531.317	9.001.742	9.455.999	9.795.807	7.565.334	8.939.047
(100kg)	Piacenza	537.445	507.785	418.620	599.766	668.200	573.752	503.412	522.056	521.450	541.160	495.631	427.144	487.978
	Parma	122.172	97.528	74.286	85.232	80.031	76.034	72.628	122.480	106.430	98.185	93.607	131.798	107.863
Wine production	Emilia Romagna	6.767.816	6.253.181	6.340.061	6.952.351	6.600.841	5.803.382	5.643.085	6.716.950	6.957.879	6.840.784	7.164.589	5.457.014	6.487.462
(100kg)	Piacenza	392.000	391.000	327.000	418.860	468.200	409.000	356.300	370.120	369.350	398.110	348.942	312.686	353.246
	Parma	89.178	71.195	56.977	61.360	59.423	55.505	53.744	89.410	75.694	71.045	69.590	92.774	77.803

Source: UCSC elaboration of Istat 2019

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Table 5 – Grape production (quantity in 100 kg/ha and quality in °Brix): traditional soil management and demonstrative soil management (2017-2019)

Trial field	Traditional inter-row management	Demonstrative action		Traditional 2017		Demonstrative 2017		Traditional 2018		Demonstrative 2018		Traditional 2019		Demonstrative 2019	
			<i>plant density</i>	<i>Yield</i>	<i>Brix°</i>	<i>Yield</i>	<i>Brix°</i>	<i>Yield</i>	<i>Brix°</i>	<i>Yield</i>	<i>Brix°</i>	<i>Yield</i>	<i>Brix°</i>	<i>Yield</i>	<i>Brix°</i>
			<i>vine/ha</i>	<i>100 kg/ha</i>		<i>100 kg/ha</i>		<i>100 kg/ha</i>		<i>100 kg/ha</i>		<i>100 kg/ha</i>		<i>100 kg/ha</i>	
A	Natural green cover	permanent green cover	3333	159,0	23,1	115,3	24,1	156,3	22,9	211,0	21,7	107,0	23,1	133,7	24,1
B	Soil tillage	temporary green cover (green manure) with mainly legumes	3333	88,0	21,8	100,0	21,8	107,9	22,7	73,9	22,6	61,5	24,2	120,2	22,3
C	Soil tillage	permanent green cover (graminaceae and legumes)	2525	152,1	18,9	76,8	23,7	104,8	22,6	142,7	25,6	89,1	21,7	50,2	25,1
D	Soil tillage	temporary green cover (green manure) with mainly graminaceae	3344	100,7	22,3	144,5	21,5	207,3	17,7	197,3	18,5	250,1	20,4	225,1	20,4
E	Alternate row tillage	temporary green cover (green manure) with mainly graminaceae	3344	44,1	25,9	77,6	25,3	150,0	22,9	151,7	24,0	145,8	22,5	143,3	22,7
F	Soil tillage	permanent green cover (graminaceae and legumes) with distribution of the mowed biomass on the row for weed control	5682	0,0		0,0		124,1	19,9	124,8	20,3	187,6	21,5	210,7	20,6
G	Natural green cover	permant green cover (legumes)	6494	43,5	22,9	32,5	22,7	96,8	19,8	35,7	21,0	146,8	20,2	118,3	21,2
H		subsurface drainage	4348	115,7	23,1	99,1	23,3	251,1	22,8	172,1	22,4	130,4	23,6	207,0	23,5
I		subsurface drainage	3472	88,5	23,3	67,7	23,8	185,4	22,2	90,6	24,7	116,0	18,8	130,5	22,0

Source: UCSC elaboration of Istat 2019

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Table 6 –Grape production (quantity in 100 kg/ha and quality in °Brix): difference between demonstrative soil management and traditional management (2017-2019)

Trial field	Traditional inter-row management	Demonstrative action	D-T_17		D-T_18		D-T_19		D-T_AVG17-19		Yields	Brix
			100kg/ha	brix	100kg/ha	brix	100kg/ha	brix	100kg/ha	brix		
A	Natural grass cover	Permanent grass cover	-43,66	1,0	54,66	-1,18	26,66	1,01	12,55	0,3	+	=
B	Soil tillage	Green manure (mainly legumes)	12,00	0,0	-34,00	-0,1	58,76	-1,9	12,25	-0,7	+	-
C	Soil tillage	Permanent grass cover (graminaceae and legumes)	-75,37	4,8	37,88	3	-38,83	3,4	-25,44	3,7	--	+
D	Soil tillage	Green manure (mainly graminaceae)	43,81	-0,8	-10,03	0,8	-25,08	0	2,90	0,0	=	=
E	Alternate row tillage	Green manure (mainly graminaceae)	33,44	-0,6	1,67	1,1	-2,54	0,2	10,86	0,2	+	=
F	Soil tillage	Permanent grass cover (graminaceae and legumes), cuts on the row	-	-	0,74	0,4	23,18	-0,9	11,96	-0,3	+	=
G	Natural grass cover	Permanent grass cover (legumes)	-11,04	-0,2	-61,04	1,24	-28,51	0,94	-33,53	0,7	--	+
H		Subsurface drainage	-16,52	0,1	-79,05	-0,4	76,52	-0,1	-6,35	-0,1	-	=
I		Subsurface drainage	-20,83	0,5	-94,79	2,5	14,58	3,2	-33,68	2,1	--	+

Source: UCSC elaboration of Istat 2019

Deliverable: Cost-benefit evaluation*Table 7 – Overall comparison of costs and benefits between traditional soil management and demonstrative agronomic practices*

Trial field	Demonstrative agronomic practices	REVENUES		COSTS (€/ha)			ECOSYSTEM SERVICES				
		Yields (quantity)	Brix (quality)	Technical operations	Seeds	Total cost increase	Erosion	Water	CO2	Biodiversity	Landscape
A	Permanent grass cover	+	=	240	311	551	++	++	++	+	++
B	Green manure (mainly legumes)	+	-	330	138	468	+	+	+	+	+
C	Permanent (graminaceae and legumes)	-	+	240	190	430	++	++	++	++	++
D	Green manure (mainly graminaceae)	-	=	330	204	534	+	+	+	+	+
E	Green manure (mainly graminaceae)	+	=	330	204	534	+	+	+	+	+
F	Permanent (graminaceae and legumes) with cuttings on the row	+	=	240	190	430	++	++	++	++	++
G	Permanent grass cover (legumes)	--	--	240	455	695	++	++	++	++	++
H	Subsurface drainage	-	-	5.130	-	5.130	+	+	-	-	-
I	Subsurface drainage	--	=	5.130	-	5.130	+	+	-	-	-

Source: UCSC elaboration of Istat 2019.

