Introduction of new oLIVE crop management practices focused on CLIMAte change mitigation and adaptation

oLIVE-CLIMA - LIFE11 ENV/GR/000942

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Life Cycle Analysis on GHG emissions and other Environmental impacts

Action	C5
Version	Final
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oLIVE CLIMA 50% funded by the LIFE11 + Programme of the European Union

Terms and abbreviations

1. ‘Control’ olive groves. The 60, in all, groves that were left to the usual practices, at farmer’s choice
2. Intervention olive groves. The other 60 groves that received the interventions of oLIVE CLIMA project
3. RF stands for Rain-Fed (non-irrigated) olive groves.

Other abbreviations are given in section 3.3 on environmental impact categories

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1. Summary

This report summarises the environmental performance for the years 2013 - 2017 (from March 2013 to Febr. 2017) of the 120 olive fields located in Greece and included in the of oLIVE-CLIMA Project. Performance has been calculated through a Life Cycle Assessment approach, according to the ILCD method, in an effort to converge with the Product Environmental Footprint (PEF) he category rules (CRs) for which are at the final stage of their development by the Commission, expected to be finalized in the beginning of 2018. So, although this is a final report, in case that significant modifications are introduced in the ILCD method or in the PEFCR, a new version will be published up to end of June 2018

This report benefits from the respective analysis that has taken place during the preceding years of the project, hence it is the final one to be delivered encompassing all the years of implementation of oLIVE-CLIMA project. It encompasses the average picture for the field phase LCIA in olive oil production, including the temporal variation of the last 3-4 years of data.

The results confirm earlier findings that there is significant potential for improved environmental performance of oLIVECLIMA olive groves. In addition, recent developments with regard PEF have a strong positive effect on the carbon footprint of olive oil, benefiting from credits due to the long-term storage of carbon in the wood of the permanent structure of olive trees, above and underground. In spite of how exceptional this 'gift' is for the image -and maybe marketing value- of olive oil, the passive character of carbon credits deserves strong policy attention. The truly active environmental efforts needed to enhance the sustainability of olive crop may be neglected, worsening further the semi-abandonment trend observed in some areas of Greece.

Comparison performance between the actual control olive groves with the intervention ones is not followed because of the excessively high uncertainty -due to spatial variability- of almost each variable that affects performance (e.g. fertilization, yields, tree age and density, irrigation etc). However, the usefulness of the control olive groves was very significant, as they gave to the olive growers the picture of Business As Usual (BAU) against the interventions. In spite of reliable quantification of the differences, these were visually obvious, e.g. the difference in plant cover of soil, erosion after a heavy rain, pruning effect on the shape of trees etc.

Performance is examined in a virtual olive grove to which the effect of each intervention is quantified. In addition, the effect of carbon credits is also added. All assumptions used in this course are presented.

The results show that a "carbon negative olive oil" is feasible, hence consumption of olive oil can be proposed as a climate mitigation action taken by the consumers.

2. Introduction

Apart from the removal of CO_2 from atmosphere, and the emission of CO_2 and other greenhouse gases (GHG) of biogenic nature, emissions occur from fuels of fossil origin during the olive oil production phase, linked directly to farming operations in the 'field stage' such as fertilizers use, energy use, etc. However, from a Life Cycle perspective the emissions have to be accounted from the upstream production phase of the materials and the equipment. Depending on the scope of the Life Cycle study it can extend from the field stage to cover also the industrial stage (extraction phase and packing phase) and the transportation stage. The latter two stages are also important. The extraction phase is characterized by the emission of Oil Mill Waste Water which presently is the most significant point-source of pollution related to olive oil production in Greece.
The packing phase emissions depend a lot on the packing material (glass, tin or plastic), a choice that has to be made after consideration of the target performance of the final product in the market.

The goal of Action C5 is to identify the main environmental burdens of current management practices and the sources of each of the environmental impacts in the field stage only, based only on the emissions in that stage, i.e. up to the time that olive fruit is delivered to the mill for extraction of the olive oil. So, it is a "cradle to gate", in spite of the fact that the olive oil miller is a service provider to the olive grower. This means that the olive grower retains the responsibility for the environmental performance of olive oil mill, and sometimes of the next downstream phases, i.e. storage, packing, and transportation to wholesale platforms for distribution to retailers and consumers.

However, the present study is restricted only to the field phase, because the interventions planned in the project refer only to the crop. The basic objective of the project has been to transfer as much as possible of the atmospheric carbon (dioxide) to soil, where a significant proportion would be considered to be stored (out of the carbon cycle) giving equivalent credits to olive oil. i.e. a lower, more attractive carbon footprint.

The methods to achieve this objective was through practices, some of which taken from organic agriculture (green manure, composting) some others known but restricted in use, such as wood shredding (instead of burning in the field), zero tillage, systematic pruning and use of olive oil mill water as fertilizer.

Another approach of the project in LCA terms was to reduce environmental (principally carbon) footprint, by using the by-products of olive crop for energy and nutrients provision, reducing thus the need for extraction of fossil fuels and nutrient rich mines. As the analysis is attributional, this has been tackled through the calculations of the respective "avoided (or substituted) products", resulting in net reduction of the carbon footprint (see also Chapter 5 on "avoided products).

The objective was to reach a value of carbon footprint which -with extra effort- could become negative! Then, the cost implied for this effort could be co-examined with the potential (market) benefit of a carbon negative olive oil, to formulate a marketing proposition to olive growers, via EPD.

3. Goal of the study

The present study is the conclusive one for the project LIFE11 ENV/GR/000942 oLIVE CLIMA and includes the following goals:

(i) To determine the environmental footprint of the olive fruit phase of olive oil.

(ii) To compare the environmental performance per hectare, between the three areas.

(iii) To examine the effect of various practices on the environmental footprint indicators.

(iv) To examine the effect of credits for long term carbon storage in olive groves' soil and wood.

(v) To align with the PEF effort.

(vi) To detect potential problems in utilizing the results of the LCA analysis.

(vii) To propose solutions with regard the applicability of oLIVE CLIMA in large scale.

4. Scope of the study

4.1 Functional/declared unit and reference flow

The functional unit is one hectare of olive grove. The use of 1 Kg of olive fruit was mostly avoided, due to the uncertainty of the -biennial- yields.

4.2 System boundaries

The system boundaries are presented in the diagram 1 below. This is a cradle to gate approach, i.e. inputs from nature (cradle), to outputs and emissions back to nature, up to the point of the delivery of the olive fruit to the olive oil mill (gate).

The horizontal line in Fig. 1, separating the field phase from the industrial (processing) phase is crossed by not only olive fruit, downwards, but upwards too, when leaves and 3-phase olive oil mill waste water is returned in the olive-groves as quasi-fertilizers. Composting, in the course of the project was tested in two areas, a) in the yard of oil mills, in Peza and Mirabello and b) in olive groves in Nileas. As discussed in Chapter 7 (Conclusions), the first of these two options has significant advantages. If this solution prevails, then shredded wood will also possibly cross the border, to contribute to composting.

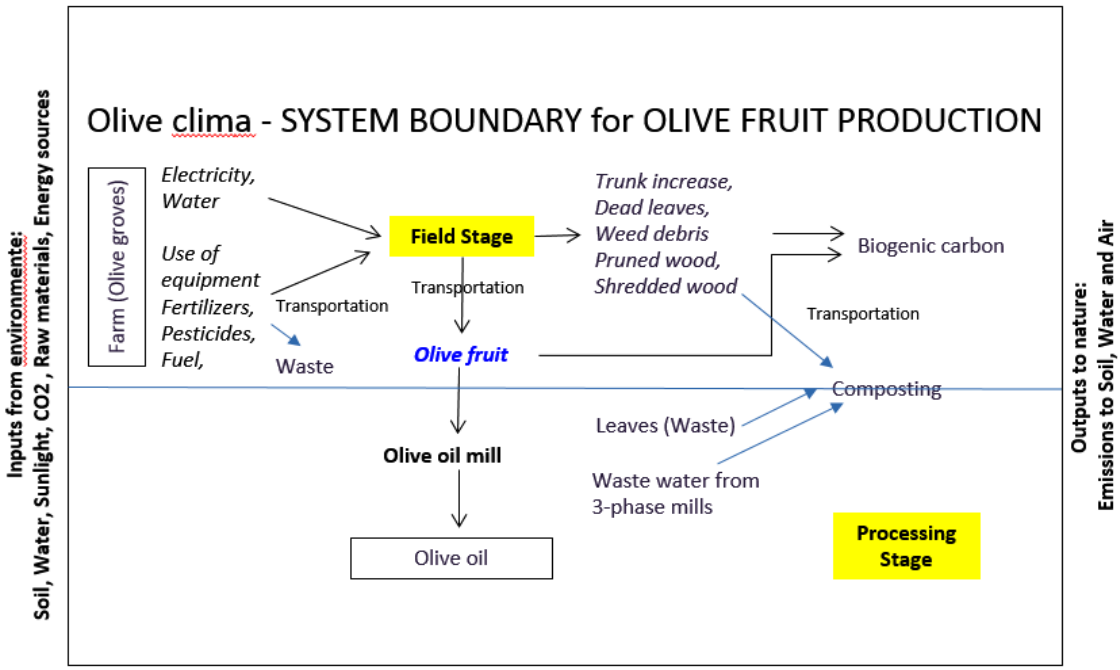

***Figure 1** System boundary for olive fruit production*

In Table 1, the processes ('entities') included in the 'Field' life cycle stage are provided, each with its inputs and outputs. The processes refer primarily per hectare, i.e. to the area of land which provides the fruit to be used for the extraction of olive oil.

Table 1 - Model used for the LCA

Olive Fruit Production
Field Stage

Yearly Production Cycle

INPUTS		OUTPUTS
Fertilizers Shredded wood Compost, Manure Green manure	**Fertilization**	1 treated Ha Packaging waste
Machinery use, Energy Lubricants	**Pruning**	1 treated Ha Pruned wood (Kg) Wood waste Wood burning
Machinery use, Energy, Transport (fuels) Lubricants	**Soil & Weed management**	1 treated Ha
PPPs, Machinery use, Energy, Transport (fuel etc)	**Plant Protection & Herbicides**	1 treated Ha Packaging waste
Pump use, Water, Electricity	**Irrigation**	1 treated Ha Pipe plastic waste
Machinery use, Energy, Transport Lubricants, Ancillary materials (sacks & nets)	**Harvesting**	1 harvested Ha Ancillary material waste.

This LCA report is focused on 120 olive groves located in three areas (Merabello and Peza in Crete, and Nileas in Peloponnese) as shown in the map of Figure2.

In each of the three areas 40 olive groves were selected. Twenty of them continued receiving the treatments according to the usual practice in the area (BAU), so they were named 'Control" olive groves, whilst the other 20 received the specific interventions that had been designed by the project oLIVE CLIMA. Thus, they were named 'Intervention' olive groves.

Figure 2 Map of the three areas, in Peloponnese (Nileas) and in Crete (Peza and Merabello)

Large variation occurs between the two areas, i.e. Peloponnese (Nileas) and Crete (Peza and Mirabello), especially on average yearly precipitation (~780mm in Nileas, ~480mm in Crete), but also due to the size of individual olive groves. In Crete, social reasons have led to a higher degree of fragmentation of farmers' properties, as shown in Fig. 3.

What is seen in Figure 3 is only the size of olive-groves, not the size of a farmer's property. In fact, a farmer in Crete usually possesses a larger number of olive-groves (even more than 20) which are scattered around in a large area, whilst in Nileas area, it is rare that an olive grower possesses more than 5-6 olive groves. This is a possible reason why an olive grower in Crete does not see biennial bearing as a problem, as the available manpower in each year can focus on a fewer olive groves, in more concentrated area every year.

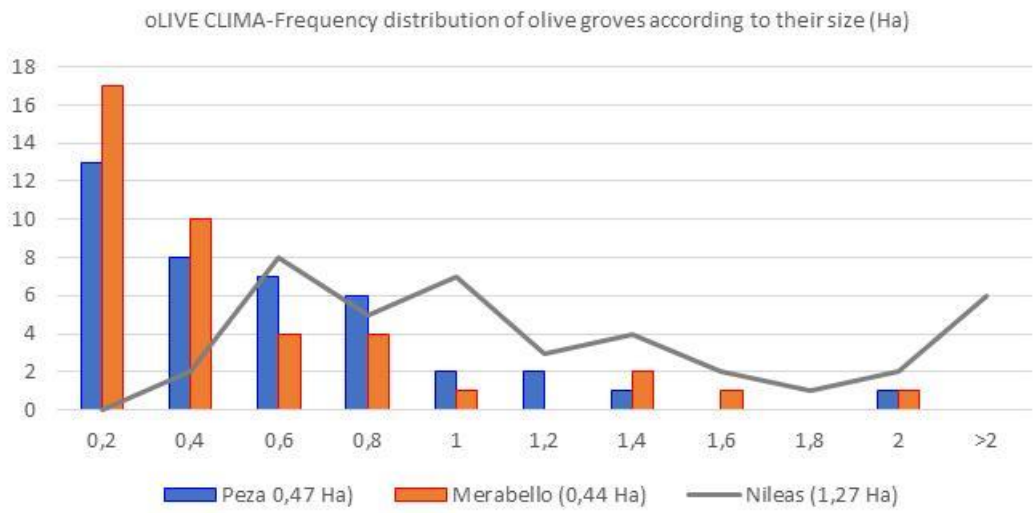

Figure 3 Olive groves' size distribution

5. Material and Methods

The interventions consisted of the following practices, as compared to the traditional ones in each area:

1. Pruned wood shredding, instead of burning it in bonfires in the olive groves.
2. Small scale composting of organic material (leaves from the olive oil mills, potentially also oil mill waste water and pruned wood). Composting had not practiced so far, at all.
3. Introduction of a specific pruning pattern focused primarily to enhance exposure to light (photosynthesis oriented) and aeration of the foliage, and to achieve equal yearly production. The practices established before, focused mainly on the facilitation of harvesting and considered as inescapable both, the low yield/Ha and the bienniality of bearing.
4. Enrichment of the flora (new practice) on the floor of the olive groves with winter vegetation, by broadcasting a seed mix based on legumes and cereals. Before that, it was common to see olive groves with floor weed cover in winter, less than 40%.
5. Zero cultivation, instead of mechanical cultivation with tine harrows or rotavators.

For the -attributional- LCA in this report the ILCD using Simapro v8.02, software and Ecoinvent v3 datasets. This approach was selected as an attempt to align with the "Product Environmental Footprint Category Rules Guidance" v6.2 and with the PEFCR for olive oil. As this PEFCR is to be finalized in early 2018 with new datasets expected, for the integrity of alignment there may be needed updates of the current study, if significant changes are identified.

Special concern in relation to the above is noted on the choice of substitution, as regards the multi-functionality of the olive trees[1], i.e. the fact that beyond olive oil, they produce also pruned wood, which has been used for millennia as fuel for heating farmers houses. Since, in an arbitrary way, substitution is more apt to consequential rather than attributional LCA, a clarification is expected in the final PEFCR on how to handle this issue. For the moment -as we are informed by the partner RodaxAgro through which the OLIVECLIMA project participates in the development of the PEFCR for olive oil, the PEFCR[2] recommendation for agriculture includes substitution, in line with the LEAP approach (FAO:

[1] Mulifunctionality of olive trees is unquestionnable; the trees traditionally are used in the rural economy not only for their main products i.e. the fruits and olive oil, but also to furnish wood for a number of uses, one of which is fuel for heating and cooking. Acceptance of this aspect is significant because it may mean that the production system (olive grove) and the primary product can be credited with the amount of fossil fuel that would otherwise be extraxted to cover the needs for cooking and heating. So, if this approach is accepted, the credit gained for olive oil would be equal to the amount of substituted fossil fuel, provided that attributional LCA is implemented (to attribute the credit to the product olive oil).

[2] although it also suggests an 95% to 5% allocation to fruit and pruned wood respectively. We have considered this as a second choice according to ISO 14044 which sets a priority on system expansion over allocation, whenever possible.

Environmental performance of animal feeds supply chains Guidelines for quantification-draft for public consultation-2014).

Each entity of the model presented in Table 1, is comprised by the unit processes for the production of the material inputs and related emissions, as well as for activities like transportation, spraying etc, based on the Life Cycle Inventory (LCI) provided by the partner RodaxAgro (see Chapter 5.1 for data collection).

- ***Selection of olive groves – limitations for grouping and stratification***

The following three factors were taken in account during the selection of olive groves, so as to achieve a scope as close to been representative as possible,

- Irrigation: Irrigated plots (66) and rainfed plots (54).
- Type of farming: Organic plots (31) of which only 3 in Merabello, and conventional ones (89)
- Size of olive groves (see also Fig.3) :Small plots, i.e. <0,5 Ha (61), and larger plots than that (59), albeit unevenly distributed as the 75% of the plots in Merabello are small, whilst 85% in Nileas they are relatively large.

In addition to the above, other factors played a significant role in 'individualization' of the olive groves. Grouping and stratification was not used, either because it was to complicated to take them in account, e.g. age of trees, planting density, soil properties, exposure to adverse weather and to invasions of pests and diseases, plant health and pruning history, farming practices out of the project's scope, i.e. plant protection, etc.) A second reason was that the numbers of olive groves with each attribute was grossly insufficient for a decent comparison taking in account the extremely high standard variation (uncertainty) of each of the factors.

It should be noted that among the above factors, two played a quite significant role during the course of the project. First, adverse weather observed twice in Crete, i.e. warm wind in late spring in 2013, leading to extensive and almost full loss of production, and heavy winter snow, mostly in Peza in end of 2016. Second, serious attacks of olive fly in 2016 in Crete and gloeosporium fruit wilt in Chora (2016-17). These phenomena increased further the spatial variability of both inputs and yield, making comparisons between olive groves or between groups of olive groves (like control and interventions) not possible. In effect, all olive groves -statistically- belong to a single, inseparable population. This is the reason that the investigation of the effect of the interventions was dealt theoretically by a virtual olive grove, and not empirically by comparison of the actually recorded variables.

Although quantitative comparisons could not be made, the role of control olive groves was significant, for olive growers to compare the effort for the interventions vs the controls and mainly to convincingly demonstrate the absence of any adverse effect from e.g. the use of olive oil mill waste water or compost during the course of the project.

- **Virtual olive grove and the effect of interventions**

The virtual olive grove consists of the values recorded per area from 2013-2017 for each olive grove, which were then averaged over all 40 olive groves, as one (population) group. Some exceptions are discussed in Chapetr 5.2 (Assumptions).

The effect of interventions on the virtual olive grove's performance was examined by using the actual average values recorded for the 20 olive groves of the 'intervention' group, in each area. Among the interventions the wood shredding vs burning was examined in detail. For composting no adequate datasets are available in literature, especially for the emissions during the composting process, especially under the scale used in the project. It has been asked in the context of PEFCR and it is likely that datasets will be available by EC. The same applies for green manure / local flora enhancement, for which the uncertainty of all variables (rate of germination under zero tillage varied, the amount of seed mix per hectare also varied, as it was added only as complementary to indigenous flora, so it differed from olive grove to olive grove). For pruning, the major effect is yields which is examined in LCA terms. Lastly, the effect of zero tillage remains to be examined with the long term carbon storage is soi, for which non conclusive data exist so far.

5.1 Data collection and quality assessment

Data used for the LCA are sourced from the Life Cycle Inventory (LCI) and the processed activity data sheets e.g. for pruning, soil management included in the files EMS and CALCLIMA, merged in one file provided by the partner RODAXAGRO the partner in charge of the system and data quality.

5.2 Life Cycle Inventory used

The Life Cycle Inventory for the virtual olive grove is presented in Table 2. The detailed inventory for each of the 120 olive groves is presented in Appendix 3.

5.3 Data gaps

There are several known data gaps, mainly due to the lack of appropriate datasets in the literature. The missing information is quite critical for the conclusions of an LCA study, so effort will be needed in the future to address the data gaps that are highlighted below:

- Proportion of debris-wood left on the ground that enters the soil, under conditions of zero tillage. Literature so far deals with the fate of weed-stubble and wood, after incorporation in cultivated soil.
- Fate of soil organic carbon inside zero-tilled soil, by appropriate adaptation of RothC model.
- Emissions of N_2O from soil due to zero tillage (unlikely, due to dry climate, but has to be tested).
- Emissions (chemical, heat, water) of small farm-scale composting process (not industrial).
- Emissions of N compounds due to the application of poultry manure, as well as of the olive mill waste- water applied in the olive groves directly or through the compost.

- Rate of increase in Kg/y of carbon permanently stored (see Chapter 5.2 Assumptions).
- Actual consumption of fossil fuels for agricultural machinery operating under geek olive-culture conditions (steep mud roads to reach olive groves), terrain with slope, etc. From sample checking it seems that the consumption per hectare may be significantly higher than the one considered in Ecoinvent database for agricultural machinery. To overcome this uncertainty, we took the risk of double counting, i.e. to add to the use of machinery the diesel used, whenever reliable data existed.
- An unexpected data gap also exists for electricity consumption for irrigation in Peza area, as the water provider is local municipality with quite poor recording system. The value 30.7 kWh for electricity use, has been reached by an assumption.

Also, two qualitative gaps exist.

- Production of the specific seeds used for drilling the cover crop.
- Pump use for water abstraction (as agricultural equipment) and pipeline network wearing-off in

5.4 Assumptions

- Transportation of the harvest crews: Different yield from olive grove to olive grove, variable daily availability of crews (mostly immigrants) difficulty of olive growers to keep exact records at the peak of harvest, and variable means of transport (mostly passenger cars, but also trailers and even tractors) created high uncertainty with regard the km for transportation of the harvest crews. So, the most accurate recordings were extrapolated on the basis of yield per hectare, to the value of 5,15 Km/ton of olive fruit, by passenger car.

- Irrigation electricity Peza: Data were scarce and mostly inaccurate, due to poor recording by the municipality that provides irrigation water to the olive growers. Hence, the ratio of kWh / m3 from Merabello was used, as geographically they were the closest usable data of quite good quality. The importance of this assumption is small for Peza, because there is water scarcity in this area, so irrigation is limited, both as frequency and as volume of water / Ha.

- On the contrary, all the assumptions that follow, refer to factors to which environmental performance is extremely sensitive. Thus, clarification of these factors is referred to in Chapter 7 (Conclusions and recommendations) as a need for further (research / standardization) work, necessary for the robustness of the conclusions.

- Primary and secondary wood weight: Direct measurement of primary wood per olive grove was inaccurate, as this wood is removed immediately after pruning (risk of theft) by various parties, i.e. the olive grove owner, the pruning subcontractor etc. Based on sample measurements by the agronomists, it was calculated that in most instances primary wood corresponds to about 25% of the -measured- secondary wood weight. The latter was frequently measured after shredding and transport of the wood chips to the composting area. So, its volume and weight were assessed with relative accuracy and was found in good agreement with the measurements

by the agronomists. However, 50% of the assessed weight was deducted as moisture content in the calculations for avoided heating oil.

- Rate of permanent carbon storage in the permanent olive tree structure. Two assumptions have been made on that: A) that trees grow in a linear way up to 100 years, and after. B) that a century old tree has a dry weight at least 1000 Kg in its permanent structure, i.e. the roots and the trunk that remains after the repeated pruning in the 100 years of the tree's life. Taking these to assumptions a step further, the following calculations are made for carbon credit:

According to the measured moisture and carbon content (24,2% and 54,4%, respectively) 1000 Kg dry wood corresponds to ~1500 Kg CO_2-eq/tree of this age which equals to 15 Kg CO_2-eq/ y/tree deductible as credit on a year basis from the final olive oil footprint (full life cycle). The credit to olive oil produced per hectare of olive trees is calculated as follows:

$$C=15*N*A/Y$$

Where:

C = Credit in Kg CO_2-eq/Kg olive oil

N = Number of trees per hectare

A = Age, as fraction of 100 years (e.g. for trees aged 60 years, A= 0,6)

Y = Yield in Kg olive oil / Hectare

For carbon credit, the two following rules apply:

- Only the carbon that is present at the time of the study can be used for calculations, i.e. not the prospective one e.g. to be stored if special farming practices are to be followed in the future.
- Carbon present at the time of the study will count only if according to the normal course of events has a total lifetime exceeding 100 years (including past life).

- ✓ Thermal equivalence of pruned and shredded wood chips: to heating oil. The exact ratio of thermal value of wood to that of oil is 43% when pellets are adequately compressed and dry. However, in order to overcome uncertainty with regard to measured wood mass after pruning, especially its moisture content when they are shredded (non-standardized procedure), as well as the difference between heating oil burning, and wood burning (often partly incomplete) a moderate value of 22% was temporarily used for calculation of the avoided fuel in the present study

- ✓ Amount of nutrients present in the shredded wood that can be taken up by the roots of the plants (olive and others). As shredded wood is broadcasted on the olive grove floor (under zero tillage regime), the basic nutrients (N,P,K), after being released by dissipation of the wood chips, may be used up by the roots, or be lost in the air (N), or by runoff and leaching. It has been assumed that 50% of the nutrients are lost before reaching the roots.

Table 2 **Life Cycle Inventory for the Virtual Olive groves.** Note that asterisks denote values obtained by assumptions, as doubts have been raised during the quality control by RodaxAgro**.**

	Merabello	Peza	Nileas
FERTILIZERS			
Fertiliser (N) chemical (Kg/Ha)	29,36	50,72	48,37
Fertiliser (P) chemical (Kg/Ha)	5,49	12,03	17,78
Fertiliser (K) chemical(Kg/Ha)	8,22	20,36	35,48
Fertilizers (tKm/Ha) - Transport, freight, inland waterways, barge {GLO}| market for | Alloc Def, U (tKm/Ha)	21,57	0,00	0,00
Transport, fuel, freight, lorry 16-32 metric ton, EURO4 {GLO}| market for | Alloc Def, U (tKm/Ha)	52,24	77,23	68,08
Transport, tractor and trailer, agricultural {GLO}| market for | Alloc Def, U (tKm/Ha)	7,58	12,28	4,48
PRUNING			
Petrol chain saw, two-stroke blend {GLO}| market for | Alloc Def,U (Kg/Ha)	2,17	1,71	1,84
Lubricating oil -chain saw- {GLO}| market for | Alloc Def, U Kg/Ha	0,11	0,64	0,05
Diesel {Europe without Switzerland}| market for | Alloc Def, U for shredder and smasher (Kg/Ha)	5,22	4,17	14,04
Pruned wood (tKm/Ha)-Transport, tractor and trailer, agricultural {GLO}| market for | Alloc Def, U (tKm/Ha)	1,44	0,00	2,51
Transport, fuel, freight, lorry 16-32 metric ton, EURO4 {GLO}| market for | Alloc Def, U (tKm/Ha)	4,38	3,81	3,15
Wood Waste - Wood mass for burning in bonefire (Kg/Ha)	194,63	622,17	486,46
Chain sawing I (IDEMAT 2001) (Hr/Ha)	3,37	5,69	6,23
Smasher operation (Hr/Ha)	2,64	1,71	0,47
Chopper operation (Hr/Ha)	0,216	0,582	0,574
SOIL MANAGEMENT			
Tillage, ploughing/CH U (Ha/Ha)	0,001	0,000	0,000
Tillage, rotary cultivator/CH U (Ha/Ha)	0,002	0,062	0,157
Goose foot cultivator (=Tine cultivator - Ha/Ha)	0,003	0,000	0,040
Mowing, by rotary mower/CH U (Ha/Ha)	0,002	0,016	0,836
Tillage, harrowing, by spring tine harrow/CH U (Ha/Ha)	0,002	0,092	0,008
Harrow (Ha/Ha)	0,000	0,000	0,000
Hand-held ripper (= mower - Ha/Ha)	0,01	0,08	0,41
Diesel {Europe without Switzerland}| market for | Alloc Def, U (Kg/Ha)	2,789	12,745	9,868
HERBICIDE TREATMENTS			
Glyphosate, at regional storehouse/RER U (Kg a.i /Ha)	0,003	0,015	0,001
Water, well, in ground used for spray solution - (m3/Ha)	0,00	0,80	0,25
Diesel {Europe without Switzerland}| market for | Alloc Def, U for spraying - (Kg/Ha)	0,00	2,15	0,64
Transport, fuel, freight, lorry 16-32 metric ton, EURO4 {GLO}| market for | Alloc Def, U (tKm/Ha)	0,15	2,25	0,35
Transport, tractor and trailer, agricultural {GLO}| market for | Alloc Def, U (tKm/Ha)	0,00	0,03	0,01
Packaging waste, plastic -(Kg/Ha)	0,01	0,14	0,01

	Merabello	Peza	Nileas
PLANT PROTECTION			
Pesticide unspecified, at regional storehouse/RER U (Kg a.i./Ha)	0,06	0,25	0,12
Water, well, in ground used for spray solution - (m3/Ha)	0,17	0,33	0,40
Diesel {Europe without Switzerland}| market for | Alloc Def, U (Kg/Ha)	1,33	3,03	2,62
Transport, fuel, freight, lorry 16-32 metric ton, EURO4 {GLO}| market for | Alloc Def, U (tKm/Ha)	0,67	2,38	1,09
Packaging waste, plastic -(Kg/Ha)	0,03	0,12	0,02
IRRIGATION			
Water (m3/Ha)	845,28	53,52	184,97
Diesel {Europe without Switzerland}| market for | Alloc Def, U (Kg/Ha)	0,00	1,65	12,60
Electricity, low voltage, production GR, at grid/GR U (KWh/Ha)	345,96	30,70*	166,75
Transport, fuel, freight, lorry 16-32 metric ton, EURO4 {GLO}| market for | Alloc Def, U (tKm/Ha)	0,00	0,58	4,41
Transport, tractor and trailer, agricultural {GLO}| market for | Alloc Def, U (tKm/Ha)	0,00	0,01	0,06
HARVEST			
Transport of crews: Transport, passenger car, EURO 4 {RER}| market for | Alloc Def, U (Km/Ha)	10,55*	13,27*	33,36*
Nets-Polyethylene, low density, granulate {GLO}| market for | Alloc Def, U (Kg/Ha)	1,38	1,38	1,38
Yarn, jute sacks {GLO}| Kg/Hamarket for | Alloc Def, U (Kg/Ha)	2,14	2,14	2,14
Petrol chain saw, two-stroke blend {GLO}| market for | Alloc Def,U (Kg/Ha)	0,00	0,11	3,02
Petrol vibrator, two-stroke blend {GLO}| market for | Alloc Def,U (Kg/Ha)	8,43	10,73	7,89
Lubricating oil -vibrator- {GLO}| market for | Alloc Def, U (Kg/Ha)	0,00	1,65	0,00
Lubricating oil -chain saw- {GLO}| market for | Alloc Def, U (Kg/Ha)	0,00	0,00	0,09
Diesel {Europe without Switzerland}| market for | Alloc Def, U (Kg/Ha)	10,08	7,71	7,99
Transport of olive fruit, tractor and trailer, agricultural {GLO}| market for | Alloc Def, Ur (TKm/Ha)	10,25	12,88	32,39
Transport, fuel, freight, lorry 16-32 metric ton, EURO4 {GLO}| market for | Alloc Def, U (tKm/Ha)	2,27	4,37	3,90

6. Results and Discussion

The results of the LCA study are presented for each of the 3 areas separately. They include Option 1, i.e. the BAU scenario, followed by the effect of the intervention of wood shredding, with two alternative uses of the shredded wood, i.e. Option 2, i.e. to replace fossil fuels with shredded wood chips, and Option 3, i.e. to replace fertilizers, by spreading the shredded wood chips on the olivegrove floor.

6.1 Impact categories

The ILCD method used in the present report examines 16 impact categories (Table 3).

Table 3 – The Impact categories used in the report.

Impact category	Unit
1. Climate change	kg CO2 eq
2. Ozone depletion	kg CFC-11 eq
3. Human toxicity, cancer effects	CTUh
4. Human toxicity, non-cancer effects	CTUh
5. Particulate matter	kg PM2.5 eq
6. Ionizing radiation HH	kBq U235 eq
7. Ionizing radiation E (interim)	CTUe
8. Photochemical ozone formation	kg NMVOC eq
9. Acidification	molc H+ eq
10. Terrestrial eutrophication	molc N eq
11. Freshwater eutrophication	kg P eq
12. Marine eutrophication	kg N eq
13. Freshwater ecotoxicity	CTUe
14. Land use	kg C deficit
15. Water resource depletion	m3 water eq
16. Mineral, fossil & ren. resource depletion	kg Sb eq

As some changes are still expected until the finalization of the PEF pilot phase, by the end of 2017 – ealy 2018, we declined to use at this stage normalization and weighing factors, hence the results are based only on the characterization factors.

Selected results are discussed hereafter. Detailed results per area are presented in Appendix 1.

The results presented in Figures 4, 5 and 6 refer to each of the 16 impact categories of Table 3 (see chapter 6.1). Negative values are justified by the basic avoidance of fossil fuels even at the Option 1 level, as large wood usage of fuels is an 'inherent' attribute of olive growing, i.e. it is not credited to the project.

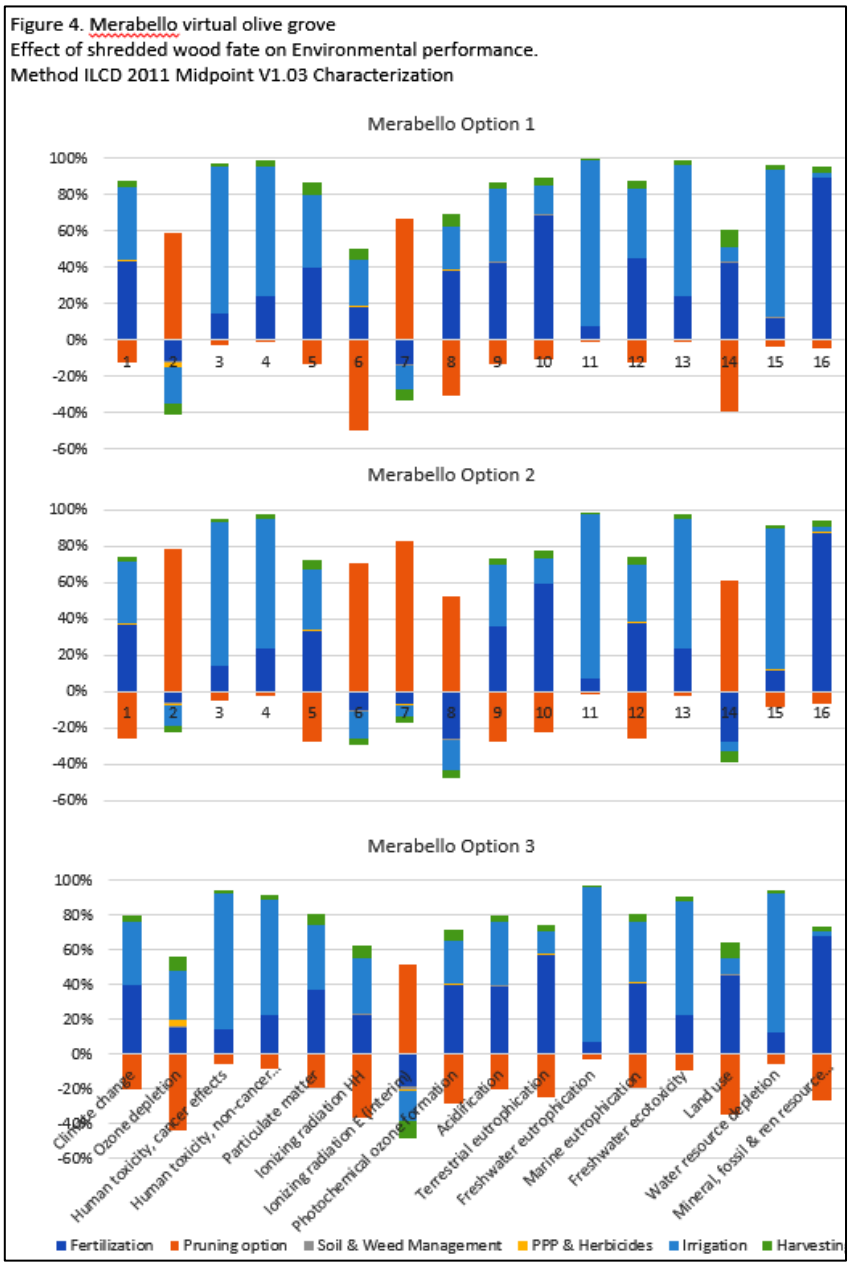

Figure 4 – Relative impact of the various practices (fertilization, pruning, soil weed management, PPP herbicides, irrigation harvest) within each of the 16 impact categories considered At the Merabello site.

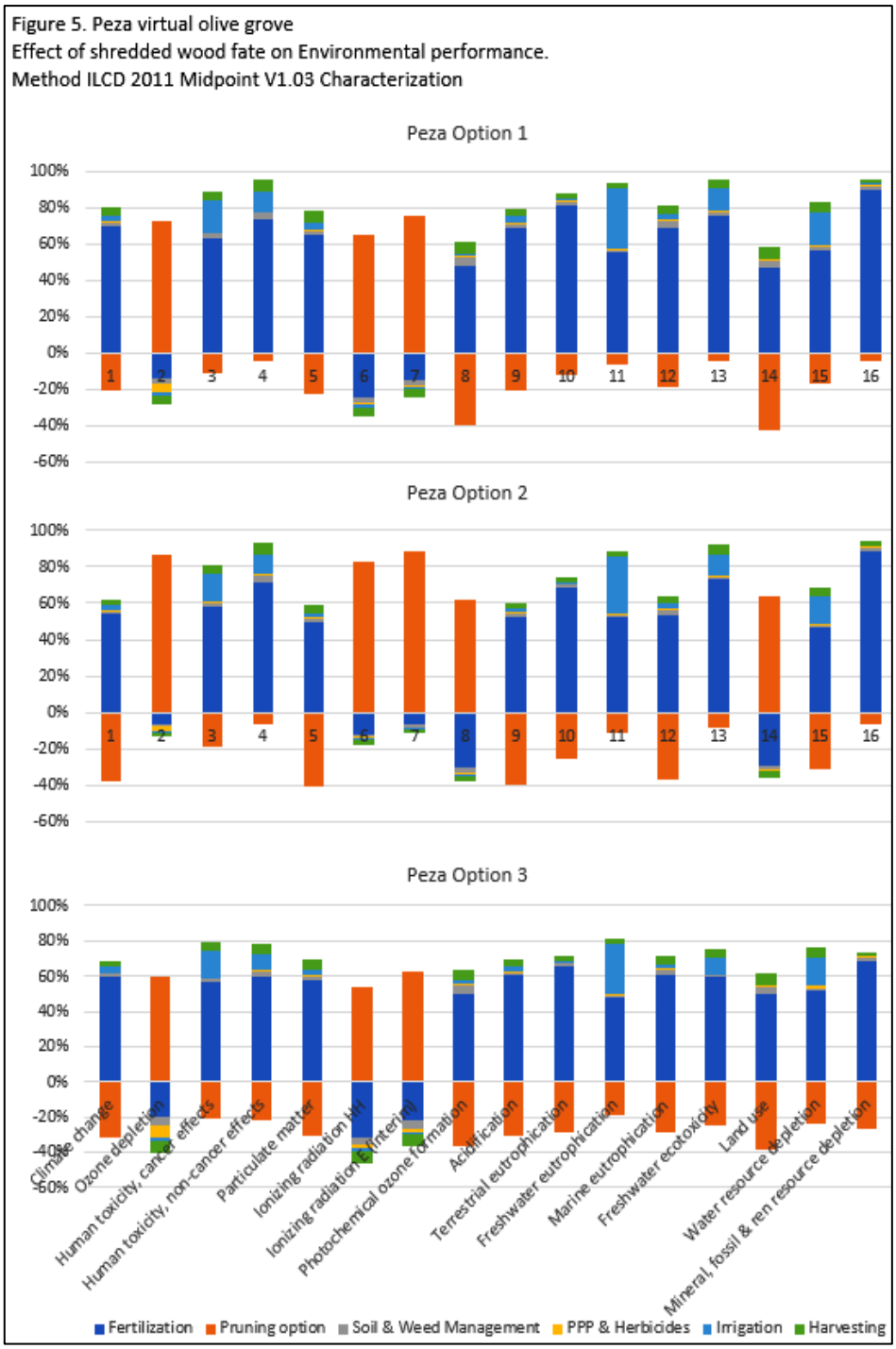

Figure 5 – Relative impact of the various practices (fertilization, pruning, soil weed management, PPP herbicides, irrigation harvest) within each of the 16 impact categories considered at the Peza site.

Figure 6 – Relative impact of the various practices (fertilization, pruning, soil weed management, PPP herbicides, irrigation harvest) within each of the 16 impact categories considered at the Nileas site.

Isolating in Figure 7 Global Warming Potential as a core impact category for oLIVE CLIMA project, we examined the effect of the various options in achieving the second main objective of the project (the first being to maximize long term storage of carbon in soil) i.e. to reduce the "carbon footprint of olive oil" measured as the emitted Kg of CO_2-equivalent/Ha, by implementing the project's practices. Reduction of carbon footprint is desired as a vehicle to liaise the (properly produced) olive oil, with the widespread information reaching consumers on Climate Change. As PEF is expected to allow benchmarking of olive oils based on environmental performance, the comparisons between the options 1, 2 and 3 that follow, should be interpreted as a means to transform the project's practices to a commercial benefit for producers. So, as shown in Fig. 7, performance improvement is apparently enhanced more with Option 2, i.e. when the shredded wood replaces fossil fuels, then when it replaces fertilizers in Option 3.

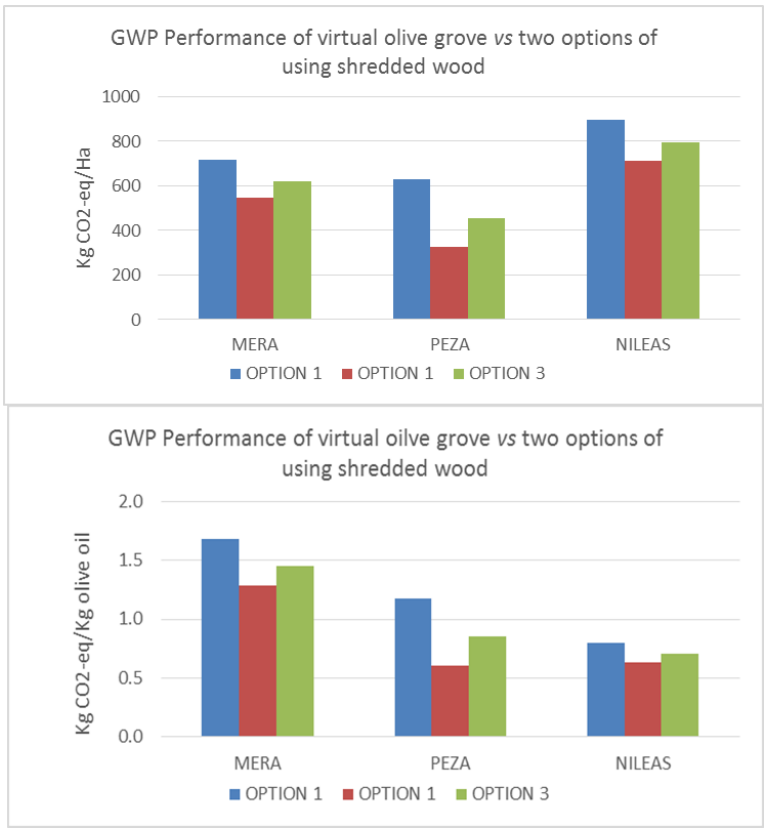

Figure 7 – Global Warming Potential estimated at three sites under 3 cultivation scenario as per ha (upper panel) and per kg olive oil (bottom panel).

Option 1 includes a 'baseline' use of wood (primary, >6cm in diameter) as fuel, replacing fossil fuel in a Business As Usual practice. as shown in figure 4 for Merabello and in figures 5 and 6 for Peza and Nileas, respectively, exhibits a beneficial effect of replacement of fossil fuels by the primary wood, used in stoves, fireplaces etc.

The benefit increases, when the shredded wood is added to the fuel replacement, as in Option 2, but less in Option 3. The improvement is higher in Peza, due to the fact that the pruned wood available to replace fossil fuels (instead of bonfire) is the highest among the three groups, as shown in Table 2. So, we can assume that performance is dependent on the biomass removed every year by pruning, i.e. on the quality of pruning and its effectiveness to increase photosynthesis and balance fruit to vegetative growth, under the environmental circumstances prevailing in the area (soil, precipitations etc).

The obviously lower performance of Nileas, i.e. higher value for the GWP indicator, is reversed when the results are examined as contribution of the field phase to the overall carbon footprint of olive oil, i.e. when they are expressed per Kg of olive oil. This reversal is due to the differences in yield of olive oil per hectare, which in the case of Nileas is almost double that of the Cretan farmers' groups.

As shown in the LCI data in Appendix 2, the 4 year average yield in Merabello is 425 Kg olive oil/Ha, in Peza 532,6 Kg/Ha, while in Nileas it is 1118 Kg/Ha. So, yield is the second factor to which environmental performance is very sensitive, and -like wood production- it is strongly dependent on the quality of pruning. It should be noted that in Nileas summer pruning is very common, contrary to the two Cretan groups where it is not practiced at all.

A third factor to which the results are quite sensitive is the fertilization, especially with N., as shown when this was replaced by the nutrients contained in the wood chips.

Lastly, the overall environmental performance of olive oil will be altered dramatically by the carbon credits, due to the age of the olive grove. Following the calculation of Chapter 5.4 (Assumptions), for an olive grove of 60 years with 180 trees /Ha, producing 1000 Kg of olive oil / Ha, the credit is calculated to be 1,62 Kg CO_2-eq. For Nileas under Option 2 (lowest footprint / Kg) this could mean that with careful down-stream management, i.e. less than 1000 gr CO_2-eq for oil mill, packaging and transportation, a carbon negative product would not be at all unlikely.

A consequence of the introduction of carbon credits for olive oil due to long term storage in the wood of olive trees is that it balances the bias towards super-intensive, higher-yield olive orchards plantations. These plantations produce much more olive oil per hectare, with a disproportionate increase in inputs, so as the denominator (yield) is higher, they exhibit a lower footprint. But, as the yield is higher, the credit per kilo olive oil is reduced. So, in the example mentioned above, a 15 years super-intensive plantation with 300 trees/Ha and producing 3000 Kg of olive oil / Ha, would justify for only 0,225 Kg CO_2-eq/Kg olive oil.

This raises a core issue on traceability of olive oil to the data used for the calculation of the PEF, which Is quite a challenge, given the uncertainties prevailing in field agriculture. On the other hand, PEF could become a significant tool for environmental improvement, but especially for permanent removal of

CO_2 from the atmosphere. A possible scheme towards this direction -if traceability is guaranteed- could be to encourage olive growers to set as target the improvement of the environmental performance of the olive groves, i.s to move gradually to the first bar of the distribution chart for each area, as shown in Figures 8 and 9.

7. Conclusions and Recommendations

Life Cycle Assessment, based on the Life Cycle Inventory provided to us, showed that the practices proposed by the project can greatly help olive oil producers to improve the environmental performance of their olive oil, and capitalize on that by market promotion. This opportunity is greatly enhanced by PEF, expected to be launched in early 2018.

Performance improvement for olive oil can be achieved by a) partial avoidance of N production, e.g. when using shredded wood as fertilizers replacement, b) partial avoidance of fossil fuel extraction -if accepted- by using the pruned wood as fuel replacement (something that the economic crisis of the recent years in Greece, has encouraged), c) by carbon credits obtained through the long term storage of carbon in the tree wood, d) increase of soil organic matter (SOM) by zero tillage and by the addition of organic material like compost, and e) enhancement of soil biodiversity, interlinked with increased SOM. It is expected that PEF will offer the opportunity to highlight the results of the LCA in a number of environmental impact categories, like Climate Change, Water depletion, Land Use, and hopefully Biodiversity.

As for the working practices to achieve the above, the core conclusion that emerges is that pruning is the primary key. It helps producing more wood mass in Kg/Ha to replace fuel, in parallel to producing more olive oil /Ha. So, better results -economic too- do not come from intensification of inputs, but from training olive growers on how to improve pruning.

- Under zero tillage, the proportion of added organic material that enters the soil, as opposed to being lost as CO_2, N_2O, NH_3 etc. is still unknown, especially if it differs under various regimes of top soil biodiversity (especially earthworms).
- Optimization of green manure synthesis and –linked to it- timing of nitrogen mineralization, in relation to olive trees needs and to threat of leaching is to be explored.
- Emissions of composting process (dataset), especially at small scale are to be measured.

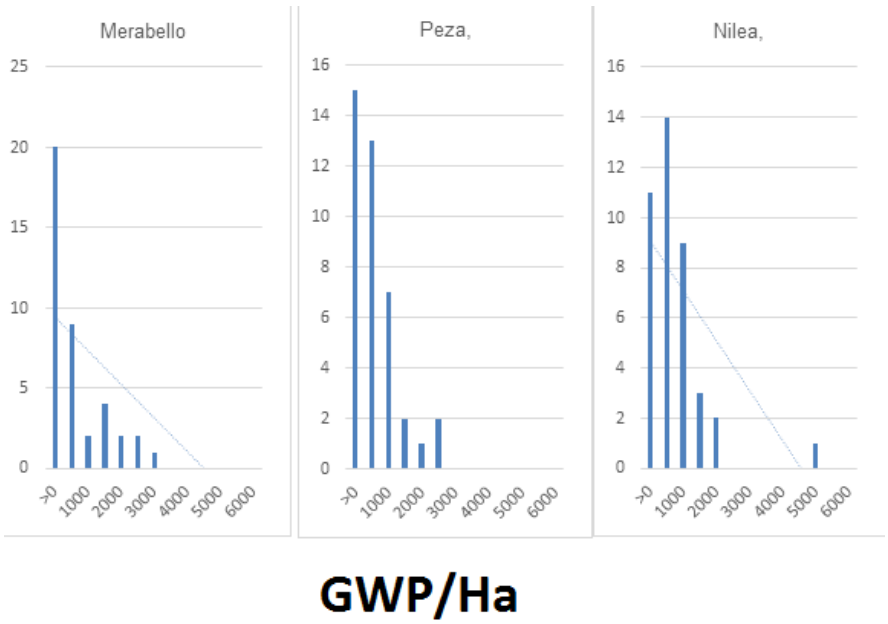

Figure 8 - 2013-2016 Average distribution of parcels according to GWP/Ha (up to the gate of oil mill) at the three locations studied.

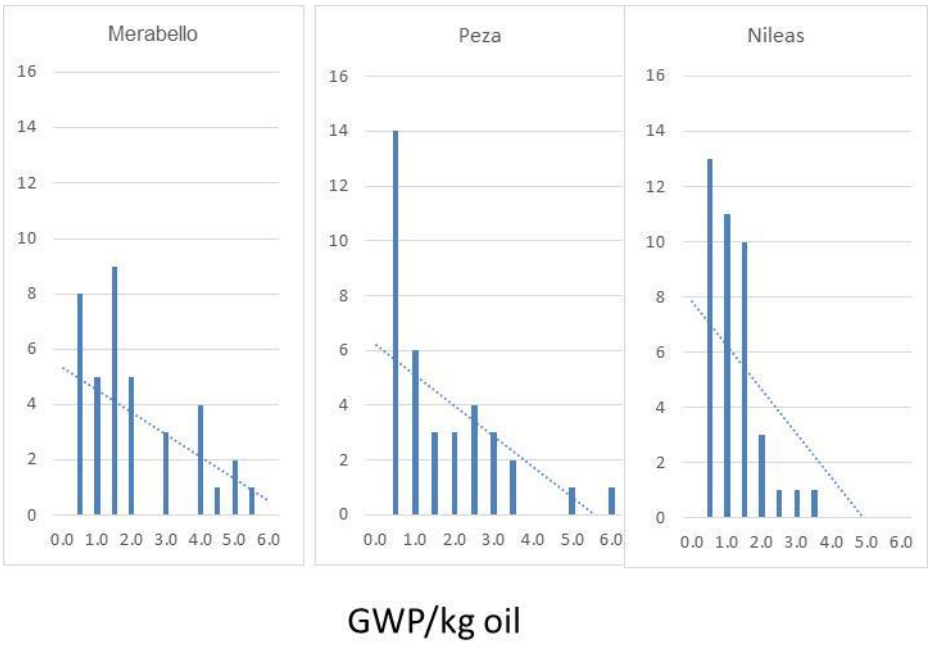

Figure 9 - 2013-2016 Average distribution of parcels according to GWP/kg oil for the three locations studied.

8. Appendix 1

Results of Life Cycle Assessment for business as Usual and two options of using shredded wood chips

Table 4.1 MERABELLO Option 1 Business As Usual – Results per hectare

IMPACT CATEGORY	Unit	Total	Fertilization	Pruning	Soil & Weed Management	Chemicla Weed Control & Plant Protection	Irrigation	Harvesting
Climate change	kg CO2 eq	7,15E+02	4,14E+02	-1,17E+02	1,59E+00	2,20E+00	3,78E+02	3,66E+01
Ozone depletion	kg CFC-11 eq	-1,61E-05	1,01E-05	-5,30E-05	6,93E-07	2,14E-06	1,85E-05	5,36E-06
Human toxicity, cancer effects	CTUh	7,21E-05	1,11E-05	-1,92E-06	2,82E-08	7,01E-08	6,14E-05	1,42E-06
Human toxicity, non-cancer effects	CTUh	4,11E-04	1,01E-04	-5,56E-06	1,44E-07	4,84E-07	3,01E-04	1,33E-05
Particulate matter	kg PM2.5 eq	4,06E-01	2,22E-01	-7,55E-02	1,02E-03	1,70E-03	2,21E-01	3,65E-02
Ionizing radiation HH	kBq U235 eq	4,55E-01	1,64E+01	-4,55E+01	5,95E-01	4,36E-01	2,32E+01	5,30E+00
Ionizing radiation E (interim)	CTUe	-1,46E-04	5,75E-05	-2,94E-04	3,85E-06	2,19E-06	5,45E-05	3,02E-05
Photochemical ozone formation	kg NMVOC eq	1,09E+00	1,07E+00	-8,65E-01	1,19E-02	1,10E-02	6,73E-01	1,86E-01
Acidification	molc H+ eq	4,77E+00	2,77E+00	-8,44E-01	1,16E-02	1,95E-02	2,57E+00	2,55E-01
Terrestrial eutrophication	molc N eq	9,86E+00	8,54E+00	-1,27E+00	1,89E-02	2,62E-02	2,00E+00	5,47E-01
Freshwater eutrophication	kg P eq	9,82E-01	7,38E-02	-8,08E-03	1,14E-04	6,54E-04	9,09E-01	6,74E-03
Marine eutrophication	kg N eq	7,44E-01	4,38E-01	-1,17E-01	1,74E-03	3,33E-03	3,69E-01	4,96E-02
Freshwater ecotoxicity	CTUe	1,04E+04	2,60E+03	-1,41E+02	2,17E+00	1,84E+01	7,69E+03	2,65E+02
Land use	kg C deficit	2,42E+02	4,84E+02	-4,45E+02	5,95E+00	3,84E+00	9,01E+01	1,03E+02
Water resource depletion	m3 water eq	8,46E+02	1,14E+02	-3,46E+01	4,73E-01	1,61E+00	7,44E+02	1,96E+01
Mineral, fossil & ren resource depletion	kg Sb eq	3,30E-02	3,21E-02	-1,51E-03	2,31E-05	1,74E-04	9,83E-04	1,27E-03

Table 4.2 MERABELLO Option 2 Shredded wood replaces fossil fuels - Results per hectare

IMPACT CATEGORY	Unit	Total	Fertilization	Pruning	Soil & Weed Management	Chemicla Weed Control & Plant Protection	Irrigation	Harvesting
Climate change	kg CO2 eq	5,46E+02	4,14E+02	-2,86E+02	1,59E+00	2,20E+00	3,78E+02	3,66E+01
Ozone depletion	kg CFC-11 eq	-9,48E-05	1,01E-05	-1,32E-04	6,93E-07	2,14E-06	1,85E-05	5,36E-06
Human toxicity, cancer effects	CTUh	7,04E-05	1,11E-05	-3,62E-06	2,82E-08	7,01E-08	6,14E-05	1,42E-06
Human toxicity, non-cancer effects	CTUh	4,08E-04	1,01E-04	-8,83E-06	1,44E-07	4,84E-07	3,01E-04	1,33E-05
Particulate matter	kg PM2.5 eq	2,99E-01	2,22E-01	-1,82E-01	1,02E-03	1,70E-03	2,21E-01	3,65E-02
Ionizing radiation HH	kBq U235 eq	-6,66E+01	1,64E+01	-1,13E+02	5,95E-01	4,36E-01	2,32E+01	5,30E+00
Ionizing radiation E (interim)	CTUe	-5,83E-04	5,75E-05	-7,32E-04	3,85E-06	2,19E-06	5,45E-05	3,02E-05
Photochemical ozone formation	kg NMVOC eq	-2,07E-01	1,07E+00	-2,16E+00	1,19E-02	1,10E-02	6,73E-01	1,86E-01
Acidification	molc H+ eq	3,53E+00	2,77E+00	-2,09E+00	1,16E-02	1,95E-02	2,57E+00	2,55E-01
Terrestrial eutrophication	molc N eq	7,88E+00	8,54E+00	-3,25E+00	1,89E-02	2,62E-02	2,00E+00	5,47E-01
Freshwater eutrophication	kg P eq	9,73E-01	7,38E-02	-1,65E-02	1,14E-04	6,54E-04	9,09E-01	6,74E-03
Marine eutrophication	kg N eq	5,62E-01	4,38E-01	-2,99E-01	1,74E-03	3,33E-03	3,69E-01	4,96E-02
Freshwater ecotoxicity	CTUe	1,03E+04	2,60E+03	-2,83E+02	2,17E+00	1,84E+01	7,69E+03	2,65E+02
Land use	kg C deficit	-4,11E+02	4,84E+02	-1,10E+03	5,95E+00	3,84E+00	9,01E+01	1,03E+02
Water resource depletion	m3 water eq	8,01E+02	1,14E+02	-7,92E+01	4,73E-01	1,61E+00	7,44E+02	1,96E+01
Mineral, fossil & ren resource depletion	kg Sb eq	3,23E-02	3,21E-02	-2,29E-03	2,31E-05	1,74E-04	9,83E-04	1,27E-03

Table 4.3 MERABELLO Option 3 Shredded wood replaces fertilizers - Results per hectare

IMPACT CATEGORY	Unit	Total	Fertilization	Pruning	Soil & Weed Management	Chemicla Weed Control & Plant Protection	Irrigation	Harvesting
Climate change	kg CO2 eq	6,19E+02	4,14E+02	-2,14E+02	1,59E+00	2,20E+00	3,78E+02	3,66E+01
Ozone depletion	kg CFC-11 eq	8,21E-06	1,01E-05	-2,87E-05	6,93E-07	2,14E-06	1,85E-05	5,36E-06
Human toxicity, cancer effects	CTUh	6,99E-05	1,11E-05	-4,13E-06	2,82E-08	7,01E-08	6,14E-05	1,42E-06
Human toxicity, non-cancer effects	CTUh	3,79E-04	1,01E-04	-3,72E-05	1,44E-07	4,84E-07	3,01E-04	1,33E-05
Particulate matter	kg PM2.5 eq	3,64E-01	2,22E-01	-1,17E-01	1,02E-03	1,70E-03	2,21E-01	3,65E-02
Ionizing radiation HH	kBq U235 eq	1,89E+01	1,64E+01	-2,70E+01	5,95E-01	4,36E-01	2,32E+01	5,30E+00
Ionizing radiation E (interim)	CTUe	-1,05E-05	5,75E-05	-1,59E-04	3,85E-06	2,19E-06	5,45E-05	3,02E-05
Photochemical ozone formation	kg NMVOC eq	1,19E+00	1,07E+00	-7,62E-01	1,19E-02	1,10E-02	6,73E-01	1,86E-01
Acidification	molc H+ eq	4,20E+00	2,77E+00	-1,42E+00	1,16E-02	1,95E-02	2,57E+00	2,55E-01
Terrestrial eutrophication	molc N eq	7,38E+00	8,54E+00	-3,74E+00	1,89E-02	2,62E-02	2,00E+00	5,47E-01
Freshwater eutrophication	kg P eq	9,60E-01	7,38E-02	-3,03E-02	1,14E-04	6,54E-04	9,09E-01	6,74E-03
Marine eutrophication	kg N eq	6,54E-01	4,38E-01	-2,08E-01	1,74E-03	3,33E-03	3,69E-01	4,96E-02
Freshwater ecotoxicity	CTUe	9,49E+03	2,60E+03	-1,09E+03	2,17E+00	1,84E+01	7,69E+03	2,65E+02
Land use	kg C deficit	3,13E+02	4,84E+02	-3,74E+02	5,95E+00	3,84E+00	9,01E+01	1,03E+02
Water resource depletion	m3 water eq	8,27E+02	1,14E+02	-5,33E+01	4,73E-01	1,61E+00	7,44E+02	1,96E+01
Mineral, fossil & ren resource depletion	kg Sb eq	2,18E-02	3,21E-02	-1,27E-02	2,31E-05	1,74E-04	9,83E-04	1,27E-03

Table 5.1 PEZA Option 1 Business As Usual - Results per hectare

IMPACT CATEGORY	Unit	Total	Fertilization	Pruning	Soil & Weed Management	Chemicla Weed Control & Plant Protection	Irrigation	Harvesting
Climate change	kg CO2 eq	6,28E+02	7,31E+02	1,85E+01	-2,09E+02	7,35E+00	3,86E+01	4,17E+01
Ozone depletion	kg CFC-11 eq	-5,81E-05	1,79E-05	3,77E-06	-9,43E-05	6,76E-06	1,65E-06	6,10E-06
Human toxicity, cancer effects	CTUh	2,48E-05	2,00E-05	7,69E-07	-3,42E-06	2,38E-07	5,49E-06	1,69E-06
Human toxicity, non-cancer effects	CTUh	2,23E-04	1,78E-04	9,06E-06	-9,93E-06	1,66E-06	2,70E-05	1,70E-05
Particulate matter	kg PM2.5 eq	3,43E-01	3,99E-01	1,36E-02	-1,35E-01	5,73E-03	1,97E-02	4,01E-02
Ionizing radiation HH	kBq U235 eq	-3,80E+01	2,96E+01	3,46E+00	-8,09E+01	1,62E+00	2,07E+00	6,08E+00
Ionizing radiation E (interim)	CTUe	-3,53E-04	1,02E-04	2,10E-05	-5,24E-04	8,52E-06	4,87E-06	3,43E-05
Photochemical ozone formation	kg NMVOC eq	8,59E-01	1,90E+00	1,65E-01	-1,54E+00	4,11E-02	6,11E-02	2,29E-01
Acidification	molc H+ eq	4,21E+00	4,98E+00	1,50E-01	-1,51E+00	6,62E-02	2,29E-01	2,88E-01
Terrestrial eutrophication	molc N eq	1,44E+01	1,53E+01	4,73E-01	-2,27E+00	9,60E-02	1,82E-01	6,14E-01
Freshwater eutrophication	kg P eq	2,14E-01	1,35E-01	2,67E-03	-1,43E-02	2,06E-03	8,06E-02	7,77E-03
Marine eutrophication	kg N eq	7,20E-01	7,86E-01	4,35E-02	-2,10E-01	1,16E-02	3,32E-02	5,58E-02
Freshwater ecotoxicity	CTUe	5,58E+03	4,62E+03	6,70E+01	-2,50E+02	5,20E+01	7,62E+02	3,28E+02
Land use	kg C deficit	3,02E+02	8,92E+02	6,30E+01	-7,93E+02	1,52E+01	8,17E+00	1,16E+02
Water resource depletion	m3 water eq	2,49E+02	2,10E+02	6,42E+00	-6,16E+01	5,26E+00	6,61E+01	2,27E+01
Mineral, fossil & ren resource depletion	kg Sb eq	5,90E-02	5,81E-02	1,22E-03	-2,68E-03	5,52E-04	9,05E-05	1,72E-03

Table 5.2 PEZA Option 2 Shredded wood replaces fossil fuels - Results per hectare

IMPACT CATEGORY	Unit	Total	Fertilization	Pruning	Soil & Weed Management	Chemicla Weed Control & Plant Protection	Irrigation	Harvesting
Climate change	kg CO2 eq	3,25E+02	7,31E+02	-5,12E+02	1,85E+01	7,35E+00	3,86E+01	4,17E+01
Ozone depletion	kg CFC-11 eq	-1,99E-04	1,79E-05	-2,35E-04	3,77E-06	6,76E-06	1,65E-06	6,10E-06
Human toxicity, cancer effects	CTUh	2,17E-05	2,00E-05	-6,50E-06	7,69E-07	2,38E-07	5,49E-06	1,69E-06
Human toxicity, non-cancer effects	CTUh	2,17E-04	1,78E-04	-1,61E-05	9,06E-06	1,66E-06	2,70E-05	1,70E-05
Particulate matter	kg PM2.5 eq	1,52E-01	3,99E-01	-3,26E-01	1,36E-02	5,73E-03	1,97E-02	4,01E-02
Ionizing radiation HH	kBq U235 eq	-1,58E+02	2,96E+01	-2,01E+02	3,46E+00	1,62E+00	2,07E+00	6,08E+00
Ionizing radiation E (interim)	CTUe	-1,13E-03	1,02E-04	-1,31E-03	2,10E-05	8,52E-06	4,87E-06	3,43E-05
Photochemical ozone formation	kg NMVOC eq	-1,46E+00	1,90E+00	-3,86E+00	1,65E-01	4,11E-02	6,11E-02	2,29E-01
Acidification	molc H+ eq	1,97E+00	4,98E+00	-3,74E+00	1,50E-01	6,62E-02	2,29E-01	2,88E-01
Terrestrial eutrophication	molc N eq	1,09E+01	1,53E+01	-5,83E+00	4,73E-01	9,60E-02	1,82E-01	6,14E-01
Freshwater eutrophication	kg P eq	1,99E-01	1,35E-01	-2,94E-02	2,67E-03	2,06E-03	8,06E-02	7,77E-03
Marine eutrophication	kg N eq	3,93E-01	7,86E-01	-5,37E-01	4,35E-02	1,16E-02	3,32E-02	5,58E-02
Freshwater ecotoxicity	CTUe	5,32E+03	4,62E+03	-5,09E+02	6,70E+01	5,20E+01	7,62E+02	3,28E+02
Land use	kg C deficit	-8,66E+02	8,92E+02	-1,96E+03	6,30E+01	1,52E+01	8,17E+00	1,16E+02
Water resource depletion	m3 water eq	1,69E+02	2,10E+02	-1,42E+02	6,42E+00	5,26E+00	6,61E+01	2,27E+01
Mineral, fossil & ren resource depletion	kg Sb eq	5,76E-02	5,81E-02	-4,12E-03	1,22E-03	5,52E-04	9,05E-05	1,72E-03

Table 5.3 PEZA Option 3 Shredded wood replaces fertilizers - Results per hectare

IMPACT CATEGORY	Unit	Total	Fertilization	Pruning	Soil & Weed Management	Chemicla Weed Control & Plant Protection	Irrigation	Harvesting
Climate change	kg CO2 eq	4,54E+02	7,31E+02	-3,83E+02	1,85E+01	7,35E+00	3,86E+01	4,17E+01
Ozone depletion	kg CFC-11 eq	-1,63E-05	1,79E-05	-5,25E-05	3,77E-06	6,76E-06	1,65E-06	6,10E-06
Human toxicity, cancer effects	CTUh	2,08E-05	2,00E-05	-7,40E-06	7,69E-07	2,38E-07	5,49E-06	1,69E-06
Human toxicity, non-cancer effects	CTUh	1,67E-04	1,78E-04	-6,63E-05	9,06E-06	1,66E-06	2,70E-05	1,70E-05
Particulate matter	kg PM2.5 eq	2,68E-01	3,99E-01	-2,10E-01	1,36E-02	5,73E-03	1,97E-02	4,01E-02
Ionizing radiation HH	kBq U235 eq	-6,51E+00	2,96E+01	-4,94E+01	3,46E+00	1,62E+00	2,07E+00	6,08E+00
Ionizing radiation E (interim)	CTUe	-1,20E-04	1,02E-04	-2,91E-04	2,10E-05	8,52E-06	4,87E-06	3,43E-05
Photochemical ozone formation	kg NMVOC eq	1,01E+00	1,90E+00	-1,38E+00	1,65E-01	4,11E-02	6,11E-02	2,29E-01
Acidification	molc H+ eq	3,16E+00	4,98E+00	-2,55E+00	1,50E-01	6,62E-02	2,29E-01	2,88E-01
Terrestrial eutrophication	molc N eq	1,00E+01	1,53E+01	-6,71E+00	4,73E-01	9,60E-02	1,82E-01	6,14E-01
Freshwater eutrophication	kg P eq	1,74E-01	1,35E-01	-5,39E-02	2,67E-03	2,06E-03	8,06E-02	7,77E-03
Marine eutrophication	kg N eq	5,55E-01	7,86E-01	-3,75E-01	4,35E-02	1,16E-02	3,32E-02	5,58E-02
Freshwater ecotoxicity	CTUe	3,90E+03	4,62E+03	-1,93E+03	6,70E+01	5,20E+01	7,62E+02	3,28E+02
Land use	kg C deficit	4,17E+02	8,92E+02	-6,78E+02	6,30E+01	1,52E+01	8,17E+00	1,16E+02
Water resource depletion	m3 water eq	2,15E+02	2,10E+02	-9,58E+01	6,42E+00	5,26E+00	6,61E+01	2,27E+01
Mineral, fossil & ren resource depletion	kg Sb eq	3,91E-02	5,81E-02	-2,26E-02	1,22E-03	5,52E-04	9,05E-05	1,72E-03

Table 6.1 NILEAS Option 1 Business As Usual - Results per hectare

IMPACT CATEGORY	Unit	Total	Fertilization	Pruning	Soil & Weed Management	Chemicla Weed Control & Plant Protection	Irrigation	Harvesting
Climate change	kg CO2 eq	8,97E+02	7,45E+02	-1,29E+02	4,40E+01	3,29E+00	1,85E+02	4,92E+01
Ozone depletion	kg CFC-11 eq	-1,82E-05	1,83E-05	-5,92E-05	4,61E-06	2,64E-06	8,94E-06	6,42E-06
Human toxicity, cancer effects	CTUh	5,36E-05	2,12E-05	-2,13E-06	2,24E-06	9,30E-08	2,96E-05	2,61E-06
Human toxicity, non-cancer effects	CTUh	3,92E-04	1,76E-04	-6,02E-06	3,83E-05	5,96E-07	1,45E-04	3,82E-05
Particulate matter	kg PM2.5 eq	5,20E-01	4,24E-01	-8,42E-02	3,33E-02	2,46E-03	1,06E-01	3,83E-02
Ionizing radiation HH	kBq U235 eq	4,26E+00	3,20E+01	-5,08E+01	4,70E+00	8,70E-01	1,12E+01	6,27E+00
Ionizing radiation E (interim)	CTUe	-1,30E-04	1,07E-04	-3,29E-04	2,56E-05	4,98E-06	2,63E-05	3,53E-05
Photochemical ozone formation	kg NMVOC eq	2,03E+00	1,97E+00	-9,44E-01	4,04E-01	2,01E-02	3,25E-01	2,61E-01
Acidification	molc H+ eq	6,31E+00	5,30E+00	-9,26E-01	3,61E-01	2,83E-02	1,24E+00	3,11E-01
Terrestrial eutrophication	molc N eq	1,80E+01	1,63E+01	-1,33E+00	1,32E+00	4,17E-02	9,66E-01	7,12E-01
Freshwater eutrophication	kg P eq	5,95E-01	1,49E-01	-9,04E-03	7,91E-03	7,43E-04	4,38E-01	8,70E-03
Marine eutrophication	kg N eq	1,08E+00	8,32E-01	-1,23E-01	1,21E-01	4,77E-03	1,78E-01	6,59E-02
Freshwater ecotoxicity	CTUe	9,15E+03	4,76E+03	-1,53E+02	2,11E+02	1,82E+01	3,75E+03	5,73E+02
Land use	kg C deficit	8,20E+02	9,98E+02	-4,97E+02	1,28E+02	8,30E+00	4,35E+01	1,40E+02
Water resource depletion	m3 water eq	5,78E+02	2,34E+02	-3,87E+01	1,62E+01	2,05E+00	3,42E+02	2,29E+01
Mineral, fossil & ren resource depletion	kg Sb eq	6,92E-02	6,23E-02	-1,69E-03	4,42E-03	1,94E-04	4,75E-04	3,47E-03

Table 6.2 NILEAS Option 2 Shredded wood replaces fossil fuels - Results per hectare

IMPACT CATEGORY	Unit	Total	Fertilization	Pruning	Soil & Weed Management	Chemicla Weed Control & Plant Protection	Irrigation	Harvesting
Climate change	kg CO2 eq	7,13E+02	7,45E+02	-3,13E+02	4,40E+01	3,29E+00	1,85E+02	4,92E+01
Ozone depletion	kg CFC-11 eq	-1,04E-04	1,83E-05	-1,45E-04	4,61E-06	2,64E-06	8,94E-06	6,42E-06
Human toxicity, cancer effects	CTUh	5,18E-05	2,12E-05	-3,93E-06	2,24E-06	9,30E-08	2,96E-05	2,61E-06
Human toxicity, non-cancer effects	CTUh	3,89E-04	1,76E-04	-9,25E-06	3,83E-05	5,96E-07	1,45E-04	3,82E-05
Particulate matter	kg PM2.5 eq	4,04E-01	4,24E-01	-2,00E-01	3,33E-02	2,46E-03	1,06E-01	3,83E-02
Ionizing radiation HH	kBq U235 eq	-6,87E+01	3,20E+01	-1,24E+02	4,70E+00	8,70E-01	1,12E+01	6,27E+00
Ionizing radiation E (interim)	CTUe	-6,05E-04	1,07E-04	-8,04E-04	2,56E-05	4,98E-06	2,63E-05	3,53E-05
Photochemical ozone formation	kg NMVOC eq	6,26E-01	1,97E+00	-2,35E+00	4,04E-01	2,01E-02	3,25E-01	2,61E-01
Acidification	molc H+ eq	4,96E+00	5,30E+00	-2,28E+00	3,61E-01	2,83E-02	1,24E+00	3,11E-01
Terrestrial eutrophication	molc N eq	1,58E+01	1,63E+01	-3,48E+00	1,32E+00	4,17E-02	9,66E-01	7,12E-01
Freshwater eutrophication	kg P eq	5,86E-01	1,49E-01	-1,80E-02	7,91E-03	7,43E-04	4,38E-01	8,70E-03
Marine eutrophication	kg N eq	8,80E-01	8,32E-01	-3,21E-01	1,21E-01	4,77E-03	1,78E-01	6,59E-02
Freshwater ecotoxicity	CTUe	9,00E+03	4,76E+03	-3,05E+02	2,11E+02	1,82E+01	3,75E+03	5,73E+02
Land use	kg C deficit	1,11E+02	9,98E+02	-1,21E+03	1,28E+02	8,30E+00	4,35E+01	1,40E+02
Water resource depletion	m3 water eq	5,29E+02	2,34E+02	-8,70E+01	1,62E+01	2,05E+00	3,42E+02	2,29E+01
Mineral, fossil & ren resource depletion	kg Sb eq	6,84E-02	6,23E-02	-2,49E-03	4,42E-03	1,94E-04	4,75E-04	3,47E-03

Table 6.3 NILEAS Option 3 Shredded wood replaces replaces fertilizers - Results per hectare

IMPACT CATEGORY	Unit	Total	Fertilization	Pruning	Soil & Weed Management	Chemicla Weed Control & Plant Protection	Irrigation	Harvesting
Climate change	kg CO2 eq	7,94E+02	7,45E+02	-2,32E+02	4,40E+01	3,29E+00	1,85E+02	4,92E+01
Ozone depletion	kg CFC-11 eq	1,09E-05	1,83E-05	-3,01E-05	4,61E-06	2,64E-06	8,94E-06	6,42E-06
Human toxicity, cancer effects	CTUh	5,13E-05	2,12E-05	-4,50E-06	2,24E-06	9,30E-08	2,96E-05	2,61E-06
Human toxicity, non-cancer effects	CTUh	3,57E-04	1,76E-04	-4,08E-05	3,83E-05	5,96E-07	1,45E-04	3,82E-05
Particulate matter	kg PM2.5 eq	4,77E-01	4,24E-01	-1,27E-01	3,33E-02	2,46E-03	1,06E-01	3,83E-02
Ionizing radiation HH	kBq U235 eq	2,65E+01	3,20E+01	-2,85E+01	4,70E+00	8,70E-01	1,12E+01	6,27E+00
Ionizing radiation E (interim)	CTUe	3,27E-05	1,07E-04	-1,66E-04	2,56E-05	4,98E-06	2,63E-05	3,53E-05
Photochemical ozone formation	kg NMVOC eq	2,18E+00	1,97E+00	-7,95E-01	4,04E-01	2,01E-02	3,25E-01	2,61E-01
Acidification	molc H+ eq	5,70E+00	5,30E+00	-1,53E+00	3,61E-01	2,83E-02	1,24E+00	3,11E-01
Terrestrial eutrophication	molc N eq	1,53E+01	1,63E+01	-4,03E+00	1,32E+00	4,17E-02	9,66E-01	7,12E-01
Freshwater eutrophication	kg P eq	5,70E-01	1,49E-01	-3,34E-02	7,91E-03	7,43E-04	4,38E-01	8,70E-03
Marine eutrophication	kg N eq	9,82E-01	8,32E-01	-2,19E-01	1,21E-01	4,77E-03	1,78E-01	6,59E-02
Freshwater ecotoxicity	CTUe	8,11E+03	4,76E+03	-1,20E+03	2,11E+02	1,82E+01	3,75E+03	5,73E+02
Land use	kg C deficit	9,17E+02	9,98E+02	-4,01E+02	1,28E+02	8,30E+00	4,35E+01	1,40E+02
Water resource depletion	m3 water eq	5,58E+02	2,34E+02	-5,82E+01	1,62E+01	2,05E+00	3,42E+02	2,29E+01
Mineral, fossil & ren resource depletion	kg Sb eq	5,68E-02	6,23E-02	-1,41E-02	4,42E-03	1,94E-04	4,75E-04	3,47E-03

9. Appendix 2

Main elementary flows[3] and main responsible processes for the 3 most important impact categories,

- Climate change
- Water Depletion
- Freshwater Ecotoxicity

Data refer to: M1, M3, P1, P3, N1 and P3, i.e.

(**M**)erabello, (**P**)eza and (**N**)ileas

For Option **1** and Option **3** (see page 17)

Note: Only flows and processes that represent >80% of the impact are shown.

3 Flows of primary material crossing the system boundary, i.e. coming from nature and returning to nature.

Merabello 1	Climate change (kg CO2-eq)			Elementary flows accounting for at least 80 of the impact						
Substance	Compartment	Total 715,18	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all compartments					413,7	-117,0	1,6	2,2	378,0	36,6
Carbon dioxide, fossil	Air	481,24	67,3%	67,3%	181,3	-96,6	1,3	1,9	361,3	32,0
Dinitrogen monoxide	Air	201,26	28,1%	95,4%	197,6	-0,4	0,0	0,1	3,2	0,8
Methane, biogenic	Air	25,61	3,6%	99,0%	25,2	0,0	0,0	0,0	0,1	0,3
Methane, fossil	Air	4,97	0,7%	99,7%	8,8	-19,9	0,3	0,2	12,3	3,3
Sulfur hexafluoride	Air	1,16	0,2%	99,9%	0,2	0,0	0,0	0,0	1,0	0,0
Carbon dioxide, land transformation	Air	0,52	0,1%	99,9%	0,4	0,0	0,0	0,0	0,1	0,1

M erabello 3	Climate change (kg CO2-eq)			Elementary flows accounting for at least 80 of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all compartments		618,64			413,7	-213,5	1,6	2,2	378,0	36,6
Carbon dioxide, fossil	Air	468,82	75,8%	75,8%	181,3	-109,0	1,3	1,9	361,3	32,0
Dinitrogen monoxide	Air	117,59	19,0%	94,8%	197,6	-84,1	0,0	0,1	3,2	0,8
Methane, biogenic	Air	17,66	2,9%	97,6%	25,2	-8,0	0,0	0,0	0,1	0,3
Methane, fossil	Air	12,66	2,0%	99,7%	8,8	-12,2	0,3	0,2	12,3	3,3
Sulfur hexafluoride	Air	1,14	0,2%	99,9%	0,2	-0,1	0,0	0,0	1,0	0,0
Carbon dioxide, land transformation	Air	0,40	0,1%	99,9%	0,4	-0,1	0,0	0,0	0,1	0,1

Peza 1	Climate change (kg CO2-eq)			Elementary flows accounting for at least 80 of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all compartments		628,13			730,8	18,5	-208,8	7,3	38,6	41,7
Dinitrogen monoxide	Air	345,32	55,0%	55,0%	344,6	0,1	-0,7	0,2	0,3	0,8
Carbon dioxide, fossil	Air	244,22	38,9%	93,9%	320,0	16,6	-172,5	6,3	37,1	36,6
Methane, biogenic	Air	49,29	7,8%	101,7%	49,0	0,0	0,0	0,0	0,0	0,3

Peza 3	Climate change (kg CO2-eq)			Elementary flows accounting for at least 80 of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all compartments		453,6			730,8	-383,4	18,5	7,3	38,6	41,7
Carbon dioxide, fossil	Air	219,2	48,3%	48,3%	320,0	-197,5	16,6	6,3	37,1	36,6
Dinitrogen monoxide	Air	197,1	43,4%	91,8%	344,6	-149,0	0,1	0,2	0,3	0,8
Methane, biogenic	Air	35,2	7,8%	99,5%	49,0	-14,1	0,0	0,0	0,0	0,3
Methane, fossil	Air	0,7	0,2%	99,7%	15,7	-22,3	1,7	0,8	1,1	3,7
Carbon dioxide, land transformation	Air	0,6	0,1%	99,8%	0,8	-0,3	0,0	0,0	0,0	0,1
Sulfur hexafluoride	Air	0,3	0,1%	99,9%	0,3	-0,1	0,0	0,0	0,1	0,0

Nileas 1	Climate change (kg CO2-eq)			Elementary flows accounting for at least 80 of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all compartments		896,7			744,5	-129.4	44,0	3,3	185,0	49,2
Carbon dioxide, fossil	Air	485,1	54,1%	54,1%	326,8	-106,7	40,8	2,8	177,0	44,4
Dinitrogen monoxide	Air	341,0	38,0%	92,1%	338,8	-0,5	0,4	0,1	1,5	0,6
Methane, biogenic	Air	60,9	6,8%	98,9%	60,7	0,0	0,0	0,0	0,0	0,2
Methane, fossil	Air	7,1	0,8%	99,7%	16,5	-22,2	2,7	0,4	5,9	3,8
Carbon dioxide, land transformation	Air	1,0	0,1%	99,8%	0,9	0,0	0,0	0,0	0,0	0,0
Sulfur hexafluoride	Air	0,8	0,1%	99,9%	0,3	-0,1	0,0	0,0	0,5	0,0

Nnileas 3	Climate change (kg CO2-eq)			Elementary flows accounting for at least 80 of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all compartments		618,64			413,7	-213,5	1,6	2,2	378,0	36,6
Carbon dioxide, fossil	Air	468,82	75,8%	75,8%	181,3	-109,0	1,3	1,9	361,3	32,0
Dinitrogen monoxide	Air	117,59	19,0%	94,8%	197,6	-84,1	0,0	0,1	3,2	0,8
Methane, biogenic	Air	17,66	2,9%	97,6%	25,2	-8,0	0,0	0,0	0,1	0,3
Methane, fossil	Air	12,66	2,0%	99,7%	8,8	-12,2	0,3	0,2	12,3	3,3
Sulfur hexafluoride	Air	1,14	0,2%	99,9%	0,2	-0,1	0,0	0,0	1,0	0,0
Carbon dioxide, land transformation	Air	0,40	0,1%	99,9%	0,4	-0,1	0,0	0,0	0,1	0,1

M1 Water depletion (m3 water eq) Elementary flows accounting for at least 80 of the impact

Substance	Compartment	Total	%	Sum	Fertilization	Pruning	Soil & Weed Management	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all compartments		845,5			114,1	-34,6	0,5	1,6	744,4	19,6
Water, turbine use, unspecified natural origin, BG	Raw	412,4	48,8%	48,8%	2,3	-1,8	0,0	0,0	411,6	0,3
Water, turbine use, unspecified natural origin, GR	Raw	176,9	20,9%	69,7%	0,1	-0,1	0,0	0,0	176,9	0,0
Water, groundwater consumption	Raw	97,7	11,6%	81,3%	0,0	0,0	0,0	0,0	97,7	0,0
Water, turbine use, unspecified natural origin, RoW	Raw	23,9	2,8%	84,1%	19,7	-1,3	0,0	0,1	2,7	2,7
Water, turbine use, unspecified natural origin, CN	Raw	23,6	2,8%	86,9%	21,8	-3,1	0,0	0,3	1,8	2,8
Water, turbine use, unspecified natural origin, IT	Raw	23,6	2,8%	89,7%	2,6	-2,1	0,0	0,0	22,7	0,3

M3 Water depletion (m3 water eq) Elementary flows accounting for at least 80 of the impact

Substance	Compartment	Total	%	Sum	Fertilization	Pruning	Soil & Weed Management	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all compartments		826,8			114,1	-53,3	0,5	1,6	744,4	19,6
Water, turbine use, unspecified natural origin, BG	Raw	412,6	49,9%	49,9%	2,3	-1,7	0,0	0,0	411,6	0,3
Water, turbine use, unspecified natural origin, GR	Raw	176,9	21,4%	71,3%	0,1	-0,1	0,0	0,0	176,9	0,0
Water, groundwater consumption	Raw	97,7	11,8%	83,1%	0,0	0,0	0,0	0,0	97,7	0,0
Water, turbine use, unspecified natural origin, IT	Raw	23,7	2,9%	86,0%	2,6	-2,0	0,0	0,0	22,7	0,3
Water, turbine use, unspecified natural origin, CN	Raw	18,6	2,3%	88,2%	21,8	-8,1	0,0	0,3	1,8	2,8
Water, turbine use, unspecified natural origin, IT	Raw	23,6	2,8%	89,7%	2,6	-2,1	0,0	0,0	22,7	0,3

Peza 1	Water depletion (m3 water eq)			Elementary flows accounting for at least 80 of the impact					
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all compartments		248,9			209,9	6,4	-61,6	5,3	66,1	22,7
Water, turbine use, unspecified natural origin, CN	Raw	41,2	16,6%	16,6%	41,0	1,2	-5,7	1,0	0,2	3,6
Water, turbine use, unspecified natural origin, BG	Raw	38,0	15,3%	31,8%	4,1	0,2	-3,3	0,1	36,5	0,3
Water, turbine use, unspecified natural origin, RoW	Raw	37,6	15,1%	47,0%	35,1	1,0	-2,3	0,4	0,2	3,2
Water, cooling, unspecified natural origin, SA	Raw	34,2	13,8%	60,7%	35,6	1,0	-5,6	1,0	0,2	2,1
Water, turbine use, unspecified natural origin, US	Raw	17,1	6,9%	67,6%	17,8	0,5	-2,6	0,5	0,1	1,0
Water, turbine use, unspecified natural origin, GR	Raw	15,8	6,3%	73,9%	0,2	0,0	-0,2	0,0	15,7	0,0
Water, turbine use, unspecified natural origin, IN	Raw	11,9	4,8%	78,7%	5,3	0,1	-0,8	0,1	0,0	7,1
Water, groundwater consumption	Raw	8,7	3,5%	82,2%	0,0	0,0	0,0	0,0	8,7	0,0

Peza 3	Water depletion (m3 water eq)			Elementary flows accounting for at least 80 of the impact					
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all compartments		214,6			209,9	-95,8	6,4	5,3	66,1	22,7
Water, turbine use, unspecified natural origin, BG	Raw	38,2	17,8%	17,8%	4,1	-3,1	0,2	0,1	36,5	0,3
Water, turbine use, unspecified natural origin, CN	Raw	32,3	15,0%	32,8%	41,0	-14,6	1,2	1,0	0,2	3,6
Water, turbine use, unspecified natural origin, RoW	Raw	27,6	12,9%	45,7%	35,1	-12,3	1,0	0,4	0,2	3,2

Water, cooling, unspecified natural origin, SA	Raw	26,7	12,5%	58,2%	35,6	-13,2	1,0	1,0	0,2	2,1
Water, turbine use, unspecified natural origin, GR	Raw	15,8	7,4%	65,5%	0,2	-0,2	0,0	0,0	15,7	0,0
Water, turbine use, unspecified natural origin, US	Raw	13,3	6,2%	71,7%	17,8	-6,5	0,5	0,5	0,1	1,0
Water, turbine use, unspecified natural origin, IN	Raw	10,8	5,0%	76,7%	5,3	-1,9	0,1	0,1	0,0	7,1
Water, groundwater consumption	Raw	8,7	4,0%	80,8%	0,0	0,0	0,0	0,0	8,7	0,0

Nileas 1 Water depletion (m3 water eq) Elementary flows accounting for at least 80 of the impact

Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all compartments		577,6			233,7	-38,7	16,2	2,0	341,6	22,9
Water, turbine use, unspecified natural origin, BG	Raw	201,3	34,8%	34,8%	4,3	-2,0	0,3	0,1	198,3	0,3
Water, turbine use, unspecified natural origin, GR	Raw	85,4	14,8%	49,6%	0,2	-0,1	0,0	0,0	85,2	0,0
Water, turbine use, unspecified natural origin, CN	Raw	53,0	9,2%	58,8%	47,7	-3,5	3,4	0,4	0,9	4,2
Water, cooling, unspecified natural origin, SA	Raw	44,4	7,7%	66,5%	41,5	-3,6	2,8	0,3	0,8	2,5
Water, turbine use, unspecified natural origin, RoW	Raw	44,4	7,7%	74,2%	35,9	-1,5	2,9	0,1	1,3	5,6
Water, groundwater consumption	Raw	30,0	5,2%	79,3%	0,0	0,0	0,0	0,0	30,0	0,0
Water, turbine use, unspecified natural origin, US	Raw	22,2	3,8%	83,2%	20,8	-1,7	1,3	0,2	0,4	1,2

Nileas 3	Water depletion (m3 water eq)			Elementary flows accounting for at least 80 of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all compartments		558,1			233,7	-58,2	16,2	2,0	341,6	22,9
Water, turbine use, unspecified natural	Raw	201,5	36%	36%	4,3	-1,8	0,3	0,1	198,3	0,3
Water, turbine use, unspecified natural	Raw	85,4	15%	51%	0,2	-0,1	0,0	0,0	85,2	0,0
Water, turbine use, unspecified natural	Raw	47,6	9%	60%	47,7	-9,0	3,4	0,4	0,9	4,2
Water, cooling, unspecified natural	Raw	39,9	7%	67%	41,5	-8,1	2,8	0,3	0,8	2,5
Water, turbine use, unspecified natural	Raw	38,2	7%	74%	35,9	-7,6	2,9	0,1	1,3	5,6
Water, groundwater consumption	Raw	30,0	5%	79%	0,0	0,0	0,0	0,0	30,0	0,0
Water, turbine use, unspecified natural	Raw	19,8	4%	83%	20,8	-4,0	1,3	0,2	0,4	1,2

Merabello 1	Freshwater ecotoxicity (CTUe)			Elementary flows accounting for at least 80 of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all compartments		10431,7			2602,2	-140,8	2,2	18,4	7685,2	264,6
Zinc	Water	4752,2	45,6%	45,6%	1260,2	-64,3	0,9	5,6	3499,2	50,6
Copper	Water	1656,9	15,9%	61,4%	728,0	-21,6	0,3	2,6	858,1	89,5
Nickel	Water	1247,0	12,0%	73,4%	69,6	-12,3	0,2	0,6	1180,6	8,4
Vanadium	Water	1019,9	9,8%	83,2%	88,0	-6,9	0,1	3,3	882,8	52,6
Chromium VI	Water	630,0	6,0%	89,2%	88,2	-16,3	0,2	0,6	545,0	12,3
Arsenic	Water	259,8	2,5%	91,7%	41,2	-2,1	0,0	0,2	218,6	2,0
Antimony	Water	238,5	2,3%	94,0%	87,3	-2,3	0,0	0,5	130,4	22,5

Merabello 3	Freshwater ecotoxicity (CTUe)			Elementary flows accounting for at least 80 of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all compartments		9485,5			2602,2	-1087,1	2,2	18,4	7685,2	264,6
Zinc	Water	4281,3	45%	45%	1260,2	-535,2	0,9	5,6	3499,2	50,6
Copper	Water	1364,7	14%	60%	728,0	-313,8	0,3	2,6	858,1	89,5
Nickel	Water	1231,1	13%	73%	69,6	-28,2	0,2	0,6	1180,6	8,4
Vanadium	Water	995,4	10%	83%	88,0	-31,4	0,1	3,3	882,8	52,6
Chromium VI	Water	614,2	6%	89%	88,2	-32,1	0,2	0,6	545,0	12,3
Arsenic	Water	244,6	3%	92%	41,2	-17,3	0,0	0,2	218,6	2,0
Barium	Water	126,7	1%	96%	9,2	-1,5	0,1	0,1	117,4	1,4
Cobalt	Water	107,0	1%	97%	8,9	-3,7	0,0	0,0	101,1	0,6

Peza 1 Freshwater ecotoxicity (CTUe) Elementary flows accounting for at least 80 of the impact

Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all		5581,3			4621,8	67,0	-250,0	52,0	762,1	328,5
Zinc	Water	2547,3	45,6%	45,6%	2236,4	30,2	-113,8	18,2	311,0	65,1
Copper	Water	1472,3	26,4%	72,0%	1287,2	13,2	-38,0	8,2	79,4	122,4
Vanadium	Water	353,7	6,3%	78,4%	153,6	2,6	-12,2	4,4	150,3	55,0
Nickel	Water	224,2	4,0%	82,4%	125,2	4,4	-21,8	1,8	104,8	9,8
Chromium VI	Water	200,4	3,6%	86,0%	157,2	6,7	-29,0	2,0	48,7	14,7
Antimony	Water	197,0	3,5%	89,5%	154,3	1,7	-4,1	1,3	14,7	29,1
Arsenic	Water	93,3	1,7%	93,3%	73,5	1,1	-3,8	0,6	19,5	2,5
Chlorpyrifos	Soil	70,5	1,3%	94,5%	70,5	0,0	-0,2	0,0	0,1	0,0

Peza 3 Freshwater ecotoxicity (CTUe) Elementary flows accounting for at least 80 of the impact

Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all compartments		3897,5			4621,8	-1933,7	67,0	52,0	762,1	328,5
Zinc	Water	1709,6	43,9%	43,9%	2236,4	-951,4	30,2	18,2	311,0	65,1
Copper	Water	953,1	24,5%	68,3%	1287,2	-557,3	13,2	8,2	79,4	122,4
Vanadium	Water	309,8	7,9%	76,3%	153,6	-56,0	2,6	4,4	150,3	55,0
Nickel	Water	195,6	5,0%	81,3%	125,2	-50,4	4,4	1,8	104,8	9,8
Chromium VI	Water	171,8	4,4%	85,7%	157,2	-57,6	6,7	2,0	48,7	14,7
Antimony	Water	135,4	3,5%	89,2%	154,3	-65,6	1,7	1,3	14,7	29,1
Vanadium	Air	71,3	1,8%	91,0%	123,4	-60,6	0,6	0,4	5,8	1,6

Nileas 1	Freshwater ecotoxicity (CTUe)			Elementary flows accounting for at least 80 of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all compartments		9154,9			4758,3	-153,3	210,9	18,2	3748,3	572,5
Zinc	Water	4113,8	45%	45%	2300,5	-71,9	97,0	6,5	1686,2	95,6
Copper	Water	2020,2	22%	67%	1312,3	-24,2	40,3	2,8	415,3	273,6
Nickel	Water	712,6	8%	75%	132,4	-13,7	12,4	0,7	568,8	12,0
Vanadium	Water	684,2	7%	82%	150,9	-7,7	7,7	1,4	466,2	65,7
Chromium VI	Water	451,4	5%	87%	162,6	-18,2	19,8	0,8	262,8	23,7
Antimony	Water	286,9	3%	90%	156,9	-2,6	5,8	0,4	64,6	61,7

Nileas 3	Freshwater ecotoxicity (CTUe)			Elementary flows accounting for at least 80 of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all compartments		8107,31			4758,336	-1200,93	210,9256	18,19379	3748,267	572,5188
Zinc	Water	3592,1	44,3%	44,3%	2300,5	-593,7	97,0	6,5	1686,2	95,6
Copper	Water	1695,7	20,9%	65,2%	1312,3	-348,7	40,3	2,8	415,3	273,6
Nickel	Water	695,3	8,6%	73,8%	132,4	-31,0	12,4	0,7	568,8	12,0
Vanadium	Water	657,2	8,1%	81,9%	150,9	-34,7	7,7	1,4	466,2	65,7
Chromium VI	Water	434,5	5,4%	87,3%	162,6	-35,1	19,8	0,8	262,8	23,7
Antimony	Water	248,4	3,1%	90,3%	156,9	-41,1	5,8	0,4	64,6	61,7

Merabello 1	Climate change (kg CO2-eq)			Processes responsible for >80% of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all processes		715,2			413,7	-117,0	1,6	2,2	378,0	36,6
Electricity, high voltage {GR}| electricity production, lignite | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	229,8	76%	76%	0,2	-0,1	0,0	0,0	229,7	0,0
Nitric acid, without water, in 50% solution state {RoW}| nitric acid production, product in 50% solution state | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	124,1	19%	95%	124,1	0,0	0,0	0,0	0,0	0,0
Nitric acid, without water, in 50% solution state {RER}| nitric acid production, product in 50% solution state | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	61,3	3%	98%	61,3	0,0	0,0	0,0	0,0	0,0
Electricity, high voltage {GR}| electricity production, oil | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	42,5	2%	100%	0,0	0,0	0,0	0,0	42,5	0,0

Merabello 3	Climate change (kg CO2-eq)			Processes responsible for >80% of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all processes		618,6			413,7	-213,5	1,6	2,2	378,0	36,6
Electricity, high voltage {GR}| electricity production, lignite | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	229,8	76%	76%	0,2	-0,1	0,0	0,0	229,7	0,0
Nitric acid, without water, in 50% solution state {RoW}| nitric acid production, product in 50% solution state | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	70,6	19%	95%	124,1	-53,6	0,0	0,0	0,0	0,0
Electricity, high voltage {GR}| electricity production, oil | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	42,5	3%	98%	0,0	0,0	0,0	0,0	42,5	0,0
Nitric acid, without water, in 50% solution state {RER}| nitric acid production, product in 50% solution state | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	34,9	2%	100%	61,3	-26,5	0,0	0,0	0,0	0,0

Peza 1	Climate change (kg CO2-eq)			Processes responsible for >80% of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all processes		628,1			730,8	18,5	-208,8	7,3	38,6	41,7
Nitric acid, without water, in 50% solution state {RoW}| nitric acid production, product in 50% solution state | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	215,0	76%	76%	214,9	0,0	-0,1	0,1	0,0	0,0
Nitric acid, without water, in 50% solution state {RER}| nitric acid production, product in 50% solution state | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	106,2	19%	95%	106,1	0,0	0,0	0,0	0,0	0,0
Nitrogen fertiliser, as N {GLO}| field application of compost | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	44,7	3%	98%	44,7	0,0	0,0	0,0	0,0	0,0
Ammonia, liquid {RER}| ammonia production, partial oxidation, liquid | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	44,6	2%	100%	44,5	0,0	0,0	0,0	0,0	0,0

Peza 3	Climate change (kg CO2-eq)			Processes responsible for >80% of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all processes		453,6			730,8	-383,4	18,5	7,3	38,6	41,7
Nitric acid, without water, in 50% solution state {RoW}| nitric acid production, product in 50% solution state | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	120,1	76%	76%	214,9	-94,9	0,0	0,1	0,0	0,0
Nitric acid, without water, in 50% solution state {RER}| nitric acid production, product in 50% solution state | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	59,3	19%	95%	106,1	-46,9	0,0	0,0	0,0	0,0
Ammonia, liquid {RER}| ammonia production, partial oxidation, liquid | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	25,0	3%	98%	44,5	-19,6	0,0	0,0	0,0	0,0
Nitrogen fertiliser, as N {GLO}| field application of compost | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	24,7	2%	100%	44,7	-20,0	0,0	0,0	0,0	0,0

Nileas 1	Climate change (kg CO2-eq)			Processes responsible for >80% of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all processes		896,7			744,5	-129,4	44,0	3,3	185,0	49,2
Nitric acid, without water, in 50% solution state {RoW}| nitric acid production, product in 50% solution state | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	207,6	76%	76%	207,6	0,0	0,0	0,0	0,0	0,0
Electricity, high voltage {GR}| electricity production, lignite | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	110,9	19%	95%	0,3	-0,1	0,0	0,0	110,7	0,0
Nitric acid, without water, in 50% solution state {RER}| nitric acid production, product in 50% solution state | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	102,5	3%	98%	102,5	0,0	0,0	0,0	0,0	0,0
Ammonia, liquid {RER}| ammonia production, partial oxidation, liquid | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	43,2	2%	100%	43,2	0,0	0,0	0,0	0,0	0,0

Nileas 3	Climate change (kg CO2-eq)			Processes responsible for >80% of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all processes		793,7			744,5	-232,3	44,0	3,3	185,0	49,2
Nitric acid, without water, in 50% solution state {RoW}| nitric acid production, product in 50% solution state | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	148,0	76%	76%	207,6	-59,6	0,0	0,0	0,0	0,0
Electricity, high voltage {GR}| electricity production, lignite | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	110,9	19%	95%	0,3	-0,1	0,0	0,0	110,7	0,0
Nitric acid, without water, in 50% solution state {RER}| nitric acid production, product in 50% solution state | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	73,1	3%	98%	102,5	-29,5	0,0	0,0	0,0	0,0
Potassium fertiliser, as K2O {GLO}| field application of compost | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	42,8	2%	100%	42,8	0,0	0,0	0,0	0,0	0,0

Merabello 1	Water depletion (m3 water eq)			Processes responsible for >80% of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all processes		845,5			114,1	-34,6	0,5	1,6	744,4	19,6
Electricity, high voltage {BG}| electricity production, hydro, run-of-river | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	412,4	76%	76%	2,3	-1,8	0,0	0,0	411,6	0,3
Electricity, high voltage {GR}| electricity production, hydro, run-of-river | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	169,2	19%	95%	0,1	-0,1	0,0	0,0	169,2	0,0
Electricity, high voltage {IT}| electricity production, hydro, run-of-river | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	97,7	3%	98%	0,0	0,0	0,0	0,0	97,7	0,0
Electricity, high voltage {RoW}| electricity production, hydro, run-of-river | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	22,7	2%	100%	18,8	-1,1	0,0	0,1	2,6	2,4

Merabello 3	Water depletion (m3 water eq)			Processes responsible for >80% of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all processes		826,8			114,1	-53,3	0,5	1,6	744,4	19,6
Electricity, high voltage {BG}| electricity production, hydro, run-of-river | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	412,6	76%	76%	2,3	-1,7	0,0	0,0	411,6	0,3
Electricity, high voltage {GR}| electricity production, hydro, run-of-river | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	169,2	19%	95%	0,1	-0,1	0,0	0,0	169,2	0,0
Electricity, high voltage {FR}| electricity production, hydro, run-of-river | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	97,7	3%	98%	0,0	0,0	0,0	0,0	97,7	0,0
Electricity, high voltage {IT}| electricity production, hydro, run-of-river | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	22,9	2%	100%	2,5	-1,9	0,0	0,0	21,9	0,3

Peza 1	Water depletion (m3 water eq)			Processes responsible for >80% of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all processes		248,9			209,9	6,4	-61,6	5,3	66,1	22,7
Electricity, high voltage {BG}| electricity production, hydro, run-of-river | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	38,0	76%	76%	4,1	0,2	-3,3	0,1	36,5	0,3
Electricity, high voltage {RoW}| electricity production, hydro, run-of-river | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	35,9	19%	95%	33,4	1,0	-2,0	0,3	0,2	2,9
Electricity, high voltage {SA}| electricity production, oil | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	34,2	3%	98%	35,6	1,0	-5,6	1,0	0,2	2,1
Electricity, high voltage {CN}| electricity production, hydro, run-of-river | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	26,8	2%	100%	26,6	0,7	-3,7	0,7	0,1	2,4

Peza 3	Water depletion (m3 water eq)			Processes responsible for >80% of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all processes		214,6			209,9	-95,8	6,4	5,3	66,1	22,7
Electricity, high voltage {BG}| electricity production, hydro, run-of-river | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	38,2	76%	76%	4,1	-3,1	0,2	0,1	36,5	0,3
Electricity, high voltage {SA}| electricity production, oil | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	26,7	19%	95%	35,6	-13,2	1,0	1,0	0,2	2,1
Electricity, high voltage {RoW}| electricity production, hydro, run-of-river | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	26,2	3%	98%	33,4	-11,7	1,0	0,3	0,2	2,9
Electricity, high voltage {CN}| electricity production, hydro, run-of-river | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	21,0	2%	100%	26,6	-9,5	0,7	0,7	0,1	2,4

Nileas 1	Water depletion (m3 water eq)			Processes responsible for >80% of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all processes		577,6			233,7	-38,7	16,2	2,0	341,6	22,9
Electricity, high voltage {BG}| electricity production, hydro, run-of-river | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	201,3	76%	76%	4,3	-2,0	0,3	0,1	198,3	0,3
Electricity, high voltage {GR}| electricity production, hydro, run-of-river | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	81,7	19%	95%	0,2	-0,1	0,0	0,0	81,5	0,0
Electricity, high voltage {SA}| electricity production, oil | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	44,4	3%	98%	41,5	-3,6	2,8	0,3	0,8	2,5
Electricity, high voltage {RoW}| electricity production, hydro, run-of-river | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	42,2	2%	100%	33,9	-1,3	2,8	0,1	1,2	5,3

Nileas 3	Water depletion (m3 water eq)			Processes responsible for >80% of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all processes		558,1			233,7	-58,2	16,2	2,0	341,6	22,9
Electricity, high voltage {BG}| electricity production, hydro, run-of-river | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	201,5	76%	76%	4,3	-1,8	0,3	0,1	198,3	0,3
Electricity, high voltage {GR}| electricity production, hydro, run-of-river | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	81,7	19%	95%	0,2	-0,1	0,0	0,0	81,5	0,0
Electricity, high voltage {SA}| electricity production, oil | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	39,8	3%	98%	41,5	-8,1	2,8	0,3	0,8	2,5
Electricity, high voltage {RoW}| electricity production, hydro, run-of-river | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	36,2	2%	100%	33,9	-7,2	2,8	0,1	1,2	5,3

Merabello 1	Freshwater ecotoxicity (CTUe)			Processes responsible for >80% of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all processes		10431,7			2602,2	-140,8	2,2	18,4	7685,2	264,6
Spoil from lignite mining {GLO}| treatment of, in surface landfill | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	5165,0			51,2	-22,5	0,3	0,7	5126,6	8,7
Sulfidic tailing, off-site {GLO}| treatment of | Alloc Def, U	As above	1820,4	76%	76%	1473,7	-26,1	0,4	4,3	336,9	31,3
Lignite ash {CH}| treatment of, sanitary landfill | Alloc Def, U	As above	921,7	19%	95%	6,2	-2,5	0,0	0,1	916,8	1,1
Lignite ash {CH}| treatment of, municipal incineration | Alloc Def, U	As above	760,6	3%	98%	5,1	-2,1	0,0	0,1	756,6	0,9
Scrap copper {RoW}| treatment of, municipal incineration | Alloc Def, U	As above	204,2	0%	100%	18,3	-2,7	0,0	0,1	129,7	58,7

Merabello 3	Freshwater ecotoxicity (CTUe)			Processes responsible for >80% of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all processes		9485,5			2602,2	-1087,1	2,2	18,4	7685,2	264,6
Spoil from lignite mining {GLO}| treatment of, in surface landfill | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	5159,7	76%	76%	51,2	-27,8	0,3	0,7	5126,6	8,7
Sulfidic tailing, off-site {GLO}| treatment of | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	1221,3	19%	95%	1473,7	-625,3	0,4	4,3	336,9	31,3
Lignite ash {CH}| treatment of, sanitary landfill | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	920,9	3%	98%	6,2	-3,3	0,0	0,1	916,8	1,1
Lignite ash {CH}| treatment of, municipal incineration | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	760,0	2%	100%	5,1	-2,7	0,0	0,1	756,6	0,9

Peza 1	Freshwater ecotoxicity (CTUe)			Processes responsible for >80% of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all processes		5581,3			4621,8	67,0	-250,0	52,0	762,1	328,5
Sulfidic tailing, off-site {GLO}| treatment of | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	2682,1	76%	76%	2610,2	28,4	-45,7	13,7	30,0	45,5
Scrap steel {CH}| treatment of, municipal incineration | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	805,2	19%	95%	791,7	5,3	-11,7	4,6	2,2	13,1
Spoil from lignite mining {GLO}| treatment of, in surface landfill | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	523,4	3%	98%	92,8	3,2	-39,9	2,3	454,9	10,1
Spoil from hard coal mining {GLO}| treatment of, in surface landfill | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	186,0	2%	100%	180,6	7,7	-35,7	4,3	3,1	26,1

Peza 3	Freshwater ecotoxicity (CTUe)			Processes responsible for >80% of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all processes		3897,5			4621,8	-1933,7	67,0	52,0	762,1	328,5
Sulfidic tailing, off-site {GLO}| treatment of | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	1619,1	76%	76%	2610,2	-1108,6	28,4	13,7	30,0	45,5
Spoil from lignite mining {GLO}| treatment of, in surface landfill | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	513,3	19%	95%	92,8	-50,0	3,2	2,3	454,9	10,1
Scrap steel {CH}| treatment of, municipal incineration | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	467,1	3%	98%	791,7	-349,8	5,3	4,6	2,2	13,1
Spoil from hard coal mining {GLO}| treatment of, in surface landfill | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	158,1	2%	100%	180,6	-63,7	7,7	4,3	3,1	26,1

Nileas 1	Freshwater ecotoxicity (CTUe)			Processes responsible for >80% of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all processes		9154,9			4758,3	-153,3	210,9	18,2	3748,3	572,5
Sulfidic tailing, off-site {GLO}| treatment of | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	2985,3	76%	76%	2665,2	-29,4	99,0	4,7	162,4	83,5
Spoil from lignite mining {GLO}| treatment of, in surface landfill | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	2563,9	19%	95%	99,4	-25,1	7,1	0,9	2470,0	11,6
Scrap steel {CH}| treatment of, municipal incineration | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	839,3	3%	98%	797,3	-7,6	14,7	1,5	11,2	22,2
Lignite ash {CH}| treatment of, sanitary landfill | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	453,3	2%	100%	12,1	-2,8	0,8	0,1	441,7	1,5

Nileas 3	Freshwater ecotoxicity (CTUe)			Processes responsible for >80% of the impact						
Substance	Compartment	Total	%	Sum	Fertili-zation	Pruning	Soil & Weed Manage-ment	Chemical Weed Control & Plant Protection	Irrigation	Harvesting
Total of all processes		8107,3			4758,3	-1200,9	210,9	18,2	3748,3	572,5
Spoil from lignite mining {GLO}| treatment of, in surface landfill | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	2558,9	76%	76%	99,4	-30,2	7,1	0,9	2470,0	11,6
Sulfidic tailing, off-site {GLO}| treatment of | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	2319,4	19%	95%	2665,2	-695,3	99,0	4,7	162,4	83,5
Scrap steel {CH}| treatment of, municipal incineration | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	627,7	3%	98%	797,3	-219,2	14,7	1,5	11,2	22,2
Lignite ash {CH}| treatment of, sanitary landfill | Alloc Def, U	Ecoinvent 3 - allocation, default - unit	452,5	2%	100%	12,1	-3,6	0,8	0,1	441,7	1,5

10. Appendix 3

Life Cycle Inventory per olive grove

			LCI / olive grove		**Merambello: Average values per parcel for all the years - Control p.1**																
				Control	*24,47*	*5,18*	*8,70*	*0,22*	*49,28*	*34,47*	*48,85*	*1,55*	*0,65*	*0,16*	*0,18*	*1,36*	*0,04*	*2,23*	*381,1*	*1,92*	*0,13*	*0,00*
				Treated	34,25	5,80	7,74	0,18	2491,6	8,66	55,63	13,61	3,69	0,05	10,25	1,52	1,74	6,53	8,13	4,82	5,16	0,43
				ALL	29,4	5,49	8,22	0,20	1270	21,57	52,24	7,58	2,17	0,11	5,22	1,44	0,89	4,38	194,6	3,37	2,64	0,22
					FERTILIZATION								PRUNING									
paecel code	Hectares	μάρτυρας Control/εφαρμογή Interv.	Organic/Conventional	Irrigated/Rainfed	Fertiliser (N) chemical Kg/Ha	Fertiliser (P) chemical (Kg/Ha)	Fertiliser (K) chemical(Kg/Ha)	Disposal, plastics, mixture, 15.3% water, to muni	Kg of Compost/Ha	Transportation of fertilizers (tKm/Ha) - Operatior	Transport, lorry >16t, fleet average/RER U	Transportation of fertilizers (tKm/Ha) - EVOO -20	Petrol, two-stroke blend, at regional storage/RER	1 kg Lubricating oil, at plant/RER U	Diesel, at refinery/RER U for weed / secondary bi	Transportation of pruned wood (tKm/Ha)-Transp	Transport, barge/RER U (tKm/Ha)(Fuels)	Transport, lorry >16t, fleet average/RER U	Wood Waste - Wood mass for burning in bonefi	1 hr Chain sawing I (IDEMAT 2001)	Smasher operation (Hr/Ha)	Chopper operation (Hr/Ha)
103,04	0,2	Control	Convent.	RF	0,00	0,00	0,00	0,00	0	0,00	0,00	0,00	2,89	0,01	0,00	0,50	0,00	3,74	281	0,95	0,00	0,00
234,14	0,2	Control	Convent.	RF	49,35	0,00	0,00	0,24	0	0,00	82,25	1,18	0,00	0,00	0,00	0,00	0,00	0,00	275	0,69	0,00	0,00
222,04	0,08	Control	Convent.	RF	0,00	0,00	0,00	0,00	0	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0	0,00	0,00	0,00
103,06	0,1	Control	Convent.	RF	0,00	0,00	0,00	0,00	0	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0	0,00	0,00	0,00
103,09	0,15	Control	Convent.	RF	0,00	0,00	0,00	0,00	0	0,00	0,00	0,00	2,75	0,01	0,00	0,00	0,00	4,75	167	0,42	0,00	0,00
209,02	0,15	Control	Convent.	RF	18,67	9,33	22,67	0,13	0	0,00	46,67	0,67	0,00	0,00	0,00	0,00	0,00	0,00	467	1,17	0,00	0,00
234,15	0,3	Control	Convent.	RF	34,61	0,00	0,00	0,13	0	0,00	47,19	0,67	0,00	0,00	0,00	0,00	0,00	0,00	0	0,00	0,00	0,00
233,07	0,23	Control	Convent.	RF	0,00	0,00	0,00	0,00	0	0	0	0,00	1,00	0,25	0,00	2,72	0,00	1,47	40	2,10	0,00	0,00
238,02	0,46	Control	Convent.	RF	13,29	0,00	0,00	0,06	0	7	17	0,32	1,25	0,00	0,00	2,17	0,70	0,11	125	1,40	0,00	0,00
136,03	2	Control	Organic	RF	0,00	0,00	0,00	0,00	0	0	0	0,00	1,25	0,00	0,16	0,75	0,00	0,16	0	0,66	0,00	0,00
206,02	0,04	Control	Convent.	IRR	95,97	50,47	39,97	0,28	688	0	97	4,83	1,34	2,85	0,00	3,00	0,00	32,63	4588	14,00	1,86	0,00
203,10	0,4	Control	Convent.	IRR	59,83	11,51	0,03	0,32	0	40	76	1,58	1,42	0,05	0,00	12,50	0,00	0,96	217	6,79	0,00	0,00
222,08	0,05	Control	Convent.	IRR	32,50	0,00	0,00	0,14	0	48	7	0,68	0,00	0,00	0,00	0,00	0,00	0,00	0	0,00	0,00	0,00
101,03	0,1	Control	Organic	IRR	31,00	10,00	50,00	0,40	0	35	111	2,00	0,00	0,00	0,00	0,00	0,00	0,00	0	0,00	0,00	0,00
232,07	0,14	Control	Convent.	IRR	18,75	17,86	26,79	0,23	0	0	81	1,16	0,00	0,00	0,00	0,00	0,00	0,00	0	0,00	0,00	0,00
232,10	0,19	Control	Convent.	IRR	11,05	0,00	0,00	0,05	0	0	18	0,26	0,00	0,00	0,46	0,00	0,00	0,00	528	1,32	0,00	0,00
206,08	0,26	Control	Convent.	IRR	4,47	4,47	4,47	0,03	298	0	10	1,64	0,00	0,00	0,00	1,19	0,00	0,55	298	1,79	0,80	0,00
233,02	0,3	Control	Convent.	IRR	42,50	0,00	30,00	0,53	0	35	154	2,63	0,00	0,00	0,00	0,00	0,00	0,00	417	3,33	0,00	0,00
233,04	0,35	Control	Convent.	IRR	17,14	0,00	0,00	1,67	0	525	143	12,11	0,00	0,00	0,00	3,11	0,00	0,00	200	3,14	0,00	0,00
203,11	1	Control	Convent.	IRR	60,28	0,03	0,03	0,24	0	0	85	1,22	1,04	0,04	3,05	1,25	0,00	0,28	22	0,68	0,00	0,00

	Merambello: Average values per parcel for all the years - Control p.2																				
Control	*0,00*	*0,00*	*0,01*	*0,00*	*0,00*	*0,00*	*0,01*	*3,54*	*0,00*	*0,01*	*0,00*	*0,00*	*0,29*	*0,03*	*0,06*	*0,13*	*1,06*	*0,12*	*0,71*	*0,01*	*0,04*
Treated	0,00	0,00	0,00	0,00	0,00	0,00	0,02	2,04	0,00	0,00	0,00	0,00	0,00	0,00	0,07	0,21	1,60	0,29	0,62	0,00	0,03
ALL	0,00	0,00	0,00	0,00	0,00	0,00	0,01	2,79	0,00	0,00	0,00	0,00	0,15	0,01	0,06	0,17	1,33	0,20	0,67	0,01	0,03
	SOIL MANAGEMENT									HERBICIDE TREATMENTS					PLANT PROTECTION						
pacel/ code	1 ha Tillage, ploughing/CH U	1 ha Tillage, rotary cultivator/CH U (of project Ec	EVOO Goose foot cultivator (Kg Tractor+equipm	1 ha Mowing, by rotary mower/CH U	1 ha Tillage, harrowing, by spring tine harrow/Ch	Harrow - Fuel consumption (Kg Tractor+equipm	Hand-held ripper (Kg equipment / Ha for all treat	Fuel consumption all (Kg Petrol - Diesel oil/Ha)	Lubricating oil, at plant/RER U (Kg/Ha)	Glyphosate, at regional storehouse/RER U (Kg a.i.	Water, well, in ground used for spray solution -	Diesel, at refinery/RER U for spraying - (Kg/Ha)	Transport, lorry >16t, fleet average/RER U (Kg/Hi	Packaging waste, plastic -(Kg/Ha)	1 kg Pesticide unspecified, at regional storehous	Water, well, in ground used for spray solution - (	1 kg Diesel, at refinery/RER U (Kg/Ha)	Transport Barge / RER U (tKm/Ha)	Transport, lorry >16t, fleet average/RER U (Tkm/	EVOO - Transport, tractor and trailer greek olive:	1 kg Disposal, plastics, mixture, 15.3% water, to r
103,04	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
234,14	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,12	0,29	5,35	1,61	0,59	0,00	0,01
222,04	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
103,06	0,00	0,00	0,00	0,03	0,00	0,00	0,00	1,84	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
103,09	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
209,02	0,04	0,04	0,00	0,00	0,00	0,00	0,00	22,11	0,00	0,00	0,00	0,00	0,00	0,00	0,08	0,08	1,03	0,00	0,39	0,00	0,00
234,15	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,03	0,07	1,28	0,00	0,47	0,00	0,00
233,07	0,00	0,00	0,00	0,00	0,00	0,00	0,06	1,60	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
238,02	0,00	0,00	0,00	0,00	0,00	0,00	0,12	1,60	0,00	0,00	0,00	0,00	0,00	0,00	0,47	0,09	2,56	0,31	0,80	0,00	0,02
136,03	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,05	0,48	0,00	0,80	0,01	0,06
206,02	0,00	0,00	0,00	0,00	0,00	0,00	0,02	2,38	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
203,10	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,22	0,81	1,32	0,23	0,50	0,00	0,02
222,08	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,10	0,00	0,00	5,83	0,53	0,00	0,18	2,11	0,00	2,25	0,02	0,14
101,03	0,00	0,00	0,03	0,00	0,00	0,00	0,00	24,57	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
232,07	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
232,10	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
206,08	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
233,02	0,00	0,00	0,00	0,00	0,08	0,00	0,00	6,14	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,30	2,71	0,00	4,07	0,04	0,29
233,04	0,00	0,00	0,09	0,00	0,00	0,00	0,00	10,53	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,28	2,81	0,00	3,90	0,04	0,27
203,11	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,22	0,55	1,51	0,30	0,47	0,00	0,02

	Merambello: Average values per parcel for all the years - Control p.3																		
Control	*602,98*	*0,00*	*224,94*	*0,00*	*0,00*	*0,00*	*1810,4*	*385,15*	*8,04*	*37,80*	*9,32*	*0,00*	*8,92*	*0,00*	*0,00*	*12,29*	*9,05*	*1,79*	*2,47*
Treated	1087,6	0,00	466,99	0,00	0,00	0,00	2287,8	465,43	6,87	33,17	11,78	0,00	7,95	0,00	0,00	7,87	11,44	1,86	2,07
ALL	845,3	0,00	346,0	0,00	0,00	0,00	2049	425	7,44	35,42	10,55	0,00	8,43	0,00	0,00	10,08	10,25	1,82	2,27
	IRRIGATION						HARVEST												
pacel code	Water (m3/Ha)	1 kg Diesel, at refinery/RER U (Kg/Ha)	Electricity, low voltage, production GR, at grid/G	Transport Barge / RER U (tKm/Ha)	Transport, lorry >16t, fleet average/RER U (tKm/I	EVOO - Transport, tractor and trailer greek olive:	Kg Olivefruit / Ha	Kg Oliveoil / Ha	Area per Kg of Olive fruit (m2/Kg)	Area per Kg of Olive oil (m2/Kg)	Transport of crews (tkM/Ha)	Petrol, two-stroke blend, at regional storage/RER	Kg petrol for vibrator / Ha	1 kg Lubricating oil, at plant/RER U	Kg lubricant for chain saw / Ha	Diesel, at refinery/RER U (Kg/Ha)	Transport of olive fruit tractor & trailer (TKm/Ha	Transport Barge / RER U (tKm/Ha)	Transport, lorry >16t, fleet average/RER U (tKm/I
103,04	0,00	0,00	0,00	0,00	0,00	0,00	1832,5	399,60	5,46	25,03	9,44	0,00	22,71	0,00	0,00	10,44	9,16	0,00	7,95
234,14	0,00	0,00	0,00	0,00	0,00	0,00	3165,0	539,27	3,16	18,54	16,30	0,00	13,36	0,00	0,00	5,53	15,83	0,94	4,54
222,04	0,00	0,00	0,00	0,00	0,00	0,00	1875,0	416,67	5,33	24,00	9,66	0,00	3,25	0,00	0,00	3,90	9,38	0,00	1,14
103,06	0,00	0,00	0,00	0,00	0,00	0,00	2107,5	430,78	4,74	23,21	10,85	0,00	16,41	0,00	0,00	12,36	10,54	3,08	3,47
103,09	0,00	0,00	0,00	0,00	0,00	0,00	1503,3	341,60	6,65	29,27	7,74	0,00	12,87	0,00	0,00	13,19	7,52	0,00	4,51
209,02	0,00	0,00	0,00	0,00	0,00	0,00	2061,7	630,00	4,85	15,87	10,62	0,00	6,14	0,00	0,00	5,90	10,31	2,84	1,06
234,15	0,00	0,00	0,00	0,00	0,00	0,00	1154,7	234,42	8,66	42,66	5,95	0,00	4,61	0,00	0,00	2,21	5,77	0,00	1,61
233,07	0,00	0,00	0,00	0,00	0,00	0,00	421,7	92,39	23,71	108,24	2,17	0,00	4,41	0,00	0,00	14,43	2,11	3,09	0,36
238,02	0,00	0,00	0,00	0,00	0,00	0,00	740,2	171,95	13,51	58,16	3,81	0,00	3,70	0,00	0,00	3,75	3,70	0,00	1,29
136,03	0,00	0,00	0,00	0,00	0,00	0,00	1613,2	358,04	6,20	27,93	8,31	0,00	5,69	0,00	0,00	9,89	8,07	1,15	1,99
206,02	1140,0	0,00	684,00	0,00	0,00	0,00	4816,3	858,57	2,08	11,65	24,80	0,00	20,60	0,00	0,00	41,87	24,08	4,50	5,81
203,10	2028,1	0,00	738,64	0,00	0,00	0,00	2518,0	592,56	3,97	16,88	12,97	0,00	7,73	0,00	0,00	8,85	12,59	3,22	1,51
222,08	0,00	0,00	0,00	0,00	0,00	0,00	0,0	0,00	n/a	n/a	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
101,03	600,00	0,00	360,00	0,00	0,00	0,00	3375,0	775,00	2,96	12,90	17,38	0,00	23,74	0,00	0,00	68,78	16,88	11,67	4,69
232,07	421,43	0,00	160,29	0,00	0,00	0,00	2435,5	478,27	4,11	20,91	12,54	0,00	7,99	0,00	0,00	11,59	12,18	0,00	2,80
232,10	363,16	0,00	156,79	0,00	0,00	0,00	1160,8	234,50	8,61	42,64	5,98	0,00	2,99	0,00	0,00	1,16	5,80	0,00	1,05
206,08	257,12	0,00	154,27	0,00	0,00	0,00	377,9	74,39	26,46	134,43	1,95	0,00	1,31	0,00	0,00	2,81	1,89	0,00	0,46
233,02	873,33	0,00	322,50	0,00	0,00	0,00	1772,5	384,17	5,64	26,03	9,13	0,00	7,06	0,00	0,00	10,45	8,86	2,11	1,57
233,04	907,14	0,00	338,57	0,00	0,00	0,00	790,7	164,29	12,65	60,87	4,07	0,00	2,37	0,00	0,00	2,21	3,95	0,00	0,83
203,11	5469,3	0,00	1583,7	0,00	0,00	0,00	2487,2	526,54	4,02	18,99	12,81	0,00	11,41	0,00	0,00	16,55	12,44	3,22	2,80

LCI / olive grove — **Merambello: Average values per parcel for all the years - interventions p.1**

					FERTILIZATION								PRUNING								
paecel code	Hectares	μάρτυρας Control/εφαρμογή Interv.	Organic/Conventional	Irrigated/Rainfed	Fertiliser (N) chemical Kg/Ha	Fertiliser (P) chemical (Kg/Ha)	Fertiliser (K) chemical(Kg/Ha)	Disposal, plastics, mixture, 15.3% water, to mur	Kg of Compost/Ha	Transportation of fertilizers (tKm/Ha) - Operatic	Transport, lorry >16t, fleet average/RER U	Transportation of fertilizers (tKm/Ha) - Transpo	Petrol, two-stroke blend, at regional storage/RE	1 kg Lubricating oil, at plant/RER U	Diesel, at refinery/RER U for weed / secondary l	Transportation of pruned wood (tKm/Ha)-Tran	Transport, barge/RER U (tKm/Ha)(Fuels)	Transport, lorry >16t, fleet average/RER U	Wood Waste - Wood mass for burning in bone	1 hr Chain sawing I (IDEMAT 2001)	Smasher operation (Hr/Ha)	Chopper operation (Hr/Ha)
206,10	0,18	Interv.	Convent.	RF	13,50	0,00	10,00	0,08	2389	0,00	29,17	12,36	1,07	0,02	2,28	0,00	0,86	6,09	0	2,26	2,49	0,35
240,01	0,15	Interv.	Convent.	IRR	62,50	37,50	37,50	0,43	2692	0,00	151,7	15,63	0,91	0,00	7,04	0,00	2,07	4,52	0	4,11	5,90	0,33
234,11	0,45	Interv.	Convent.	RF	52,22	0,00	0,00	0,25	2172	0,00	88,04	12,12	3,48	0,06	7,31	11,27	0,00	6,88	0	8,81	4,15	0,35
166,07	0,473	Interv.	Convent.	RF	0,00	0,00	0,00	0,00	1535	0,00	0,00	7,68	1,70	0,03	13,68	0,82	0,98	4,91	0	2,04	1,92	0,22
209,01	0,6	Interv.	Convent.	RF	18,75	0,00	0,00	0,10	1879	0,00	36,46	9,92	5,19	0,07	10,44	1,08	1,81	7,81	0	4,59	5,02	0,50
238,05	0,65	Interv.	Convent.	RF	9,62	0,00	0,00	0,05	1219	0,00	16,15	6,33	2,63	0,05	16,25	0,91	1,07	5,14	0	2,11	2,21	0,17
136,02	0,8	Interv.	Organic	RF	0,00	0,00	0,00	0,00	2797	0,00	0,00	13,98	8,28	0,15	10,46	1,56	3,58	6,00	163	6,23	8,70	0,08
234,04	0,8	Interv.	Convent.	RF	34,45	0,00	0,00	0,16	1292	0,00	57,42	7,28	3,70	0,07	13,61	1,63	0,00	5,27	0	2,56	2,01	0,25
234,06	1,4	Interv.	Convent.	RF	5,38	0,00	0,00	0,03	216	0,00	9,04	1,21	0,80	0,01	2,99	0,84	0,00	3,16	0	0,63	0,27	0,03
234,08	0,2	Interv.	Convent.	RF	59,37	0,00	0,00	0,29	2244	0,00	99,85	12,65	1,38	0,02	1,08	10,08	0,00	6,45	0	8,19	4,09	0,35
222,07	0,05	Interv.	Convent.	IRR	25,00	12,50	12,50	0,13	4250	45,50	7,15	21,90	0,44	0,01	3,73	0,00	1,55	7,68	0	2,65	2,14	0,59
206,09	0,163	Interv.	Convent.	IRR	4,00	0,00	14,15	0,03	4000	0,00	10,77	20,15	1,78	0,03	5,66	0,00	1,43	8,79	0	3,72	3,77	0,65
206,12	0,2	Interv.	Convent.	IRR	36,75	36,75	36,75	0,25	4350	0,00	85,75	22,98	2,50	0,04	5,67	0,00	2,71	9,77	0	6,05	7,09	0,85
175,03	0,21	Interv.	Convent.	IRR	100,2	0,00	0,00	0,38	4101	39,17	98,60	22,39	2,05	0,04	4,83	2,24	2,95	8,45	0	5,91	6,56	0,46
180,01	0,25	Interv.	Convent.	IRR	39,58	13,88	13,88	0,25	4750	0,00	86,30	24,98	1,59	0,00	7,01	0,00	2,79	5,27	0	5,31	5,95	0,10
203,16	0,4	Interv.	Convent.	IRR	43,50	0,03	0,03	0,18	2069	0,00	62,46	11,24	2,32	0,00	7,15	0,00	2,52	4,80	0	4,86	7,51	0,28
233,03	0,4	Interv.	Convent.	IRR	0,00	0,00	30,00	0,10	2500	35,00	5,50	18,00	3,56	0,06	32,52	0,00	0,39	7,56	0	4,15	3,45	0,89
203,14	0,8	Interv.	Convent.	IRR	53,72	0,03	0,03	0,21	1953	0,00	74,49	10,83	8,72	0,16	29,38	0,00	6,87	9,67	0	10,70	14,01	1,17
203,17	1,4	Interv.	Convent.	IRR	70,45	15,28	0,00	0,45	1743	53,49	113,1	10,97	13,82	0,25	23,89	0,00	1,05	8,22	0	5,76	6,51	0,86
203,15	1,6	Interv.	Convent.	IRR	55,99	0,03	0,03	0,23	1680	0,00	80,78	9,55	7,96	0,00	0,00	0,00	2,13	4,11	0	5,79	9,38	0,15

Merambello: Average values per parcel for all the years - Interventions p.2

	SOIL MANAGEMENT									HERBICIDE TREATMENTS					PLANT PROTECTION						
pæcel/ code	1 ha Tillage, ploughing/CH U	1 ha Tillage, rotary cultivator/CH U (of project E	EVOO Goose foot cultivator (Kg Tractor+equipr	1 ha Mowing, by rotary mower/CH U	1 ha Tillage, harrowing, by spring tine harrow/C	Harrow - Fuel consumption (Kg Tractor+equipn	Hand-held ripper (Kg equipment / Ha for all tre	Fuel consumption all (Kg Petrol - Diesel oil/Ha)	Lubricating oil, at plant/RER U (Kg/Ha)	Glyphosate, at regional storehouse/RER U (Kg a	Water, well, in ground used for spray solution -	Diesel, at refinery/RER U for spraying - (Kg/Ha)	Transport, lorry >16t, fleet average/RER U (Kg/I	Packaging waste, plastic - (Kg/Ha)	1 kg Pesticide unspecified, at regional storehou	Water, well, in ground used for spray solution -	1 kg Diesel, at refinery/RER U (Kg/Ha)	Transport Barge / RER U (tKm/Ha)	Transport, lorry >16t, fleet average/RER U (Tkm	EVOO - Transport, tractor and trailer greek oliv	1 kg Disposal, plastics, mixture, 15.3% water, to
206,10	0,00	0,00	0,00	0,00	0,00	0,00	0,05	3,69	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
240,01	0,00	0,04	0,00	0,00	0,00	0,00	0,00	24,57	0,00	0,00	0,00	0,00	0,00	0,00	0,04	0,10	1,41	0,00	0,53	0,00	0,00
234,11	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,05	0,16	2,72	0,64	0,44	0,00	0,00
166,07	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
209,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,08	0,08	1,03	0,00	0,39	0,00	0,00
238,05	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,13	0,04	1,75	0,00	0,66	0,00	0,00
136,02	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,02	0,48	0,00	0,46	0,00	0,03
234,04	0,00	0,00	0,00	0,00	0,00	0,00	0,20	3,69	0,00	0,00	0,00	0,00	0,00	0,00	0,08	0,19	2,70	0,52	0,55	0,00	0,00
234,06	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,05	0,13	2,02	0,27	0,51	0,00	0,00
234,08	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,16	0,35	5,98	1,84	0,63	0,00	0,01
222,07	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,18	2,11	0,00	2,25	0,02	0,14
206,09	0,00	0,00	0,00	0,00	0,00	0,00	0,04	3,69	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
206,12	0,00	0,00	0,00	0,00	0,00	0,00	0,05	3,69	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
175,03	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
180,01	0,00	0,00	0,00	0,06	0,00	0,00	0,00	1,47	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
203,16	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,22	0,55	2,48	0,64	0,52	0,00	0,02
233,03	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,30	2,71	0,00	4,07	0,04	0,29
203,14	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,22	0,81	2,09	0,51	0,55	0,00	0,02
203,17	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,20	0,76	2,17	0,71	0,38	0,00	0,02
203,15	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,21	0,55	2,29	0,57	0,51	0,00	0,02

Merambello: Average values per parcel for all the years - Interventions p.3

	IRRIGATION						HARVEST												
paece/ code	Water (m3/Ha)	1 kg Diesel, at refinery/RER U (Kg/Ha)	Electricity, low voltage, production GR, at grid/	Transport Barge / RER U (tKm/Ha)	Transport, lorry >16t, fleet average/RER U (tKm	EVOO - Transport, tractor and trailer greek oliv	Kg Olivefruit / Ha	Kg Oliveoil / Ha	Area per Kg of Olive fruit (m2/Kg)	Area per Kg of Olive oil (m2/Kg)	Transport of crews (tkM/Ha)	Petrol, two-stroke blend, at regional storage/RE	Kg petrol for vibrator / Ha	1 kg Lubricating oil, at plant/RER U	Kg lubricant for chain saw / Ha	Diesel, at refinery/RER U (Kg/Ha)	Transport of olive fruit tractor & trailer (TKm/H	Transport Barge / RER U (tKm/Ha)	Transport, lorry >16t, fleet average/RER U (tKm
206,10	0,00	0,00	0,00	0,00	0,00	0,00	1625,0	283,76	6,15	35,24	8,37	0,00	5,90	0,00	0,00	11,61	8,13	2,18	1,39
240,01	970,00	0,00	473,10	0,00	0,00	0,00	6800,0	1208,3	1,47	8,28	35,02	0,00	24,57	0,00	0,00	14,94	34,00	5,06	5,70
234,11	0,00	0,00	0,00	0,00	0,00	0,00	1660,7	407,16	6,02	24,56	8,55	0,00	3,07	0,00	0,00	2,70	8,30	0,42	1,01
166,07	0,00	0,00	0,00	0,00	0,00	0,00	1158,1	257,01	8,64	38,91	5,96	0,00	10,11	0,00	0,00	6,03	5,79	0,94	2,88
209,01	0,00	0,00	0,00	0,00	0,00	0,00	2344,8	530,83	4,26	18,84	12,08	0,00	6,76	0,00	0,00	2,95	11,72	1,66	1,73
238,05	0,00	0,00	0,00	0,00	0,00	0,00	1257,7	285,00	7,95	35,09	6,48	0,00	5,86	0,00	0,00	2,26	6,29	0,16	1,98
136,02	0,00	0,00	0,00	0,00	0,00	0,00	1946,0	432,71	5,14	23,11	10,02	0,00	6,91	0,00	0,00	11,90	9,73	1,36	2,42
234,04	0,00	0,00	0,00	0,00	0,00	0,00	1431,9	298,53	6,98	33,50	7,37	0,00	4,03	0,00	0,00	1,80	7,16	0,69	1,07
234,06	0,00	0,00	0,00	0,00	0,00	0,00	260,0	50,93	38,46	196,35	1,34	0,00	0,72	0,00	0,00	0,95	1,30	0,20	0,18
234,08	0,00	0,00	0,00	0,00	0,00	0,00	2923,8	569,31	3,42	17,57	15,06	0,00	10,59	0,00	0,00	6,64	14,62	1,74	2,89
222,07	0,00	0,00	0,00	0,00	0,00	0,00	1500,0	333,33	6,67	30,00	7,73	0,00	2,60	0,00	0,00	3,12	7,50	0,00	0,91
206,09	769,23	0,00	461,54	0,00	0,00	0,00	3561,5	712,57	2,81	14,03	18,34	0,00	10,75	0,00	0,00	21,18	17,81	4,03	2,51
206,12	761,46	0,00	456,85	0,00	0,00	0,00	4836,3	882,16	2,07	11,34	24,91	0,00	13,20	0,00	0,00	13,99	24,18	4,58	3,19
175,03	412,72	0,00	247,63	0,00	0,00	0,00	1398,8	293,04	7,15	34,13	7,20	0,00	5,14	0,00	0,00	8,65	6,99	2,25	1,17
180,01	1624,6	0,00	1648,9	0,00	0,00	0,00	1980,9	518,97	5,05	19,27	10,20	0,00	8,04	0,00	0,00	7,00	9,90	1,91	1,73
203,16	2018,8	0,00	732,00	0,00	0,00	0,00	2348,4	394,02	4,26	25,38	12,09	0,00	3,69	0,00	0,00	3,46	11,74	0,00	1,29
233,03	802,5	0,00	375,75	0,00	0,00	0,00	1185,6	271,88	8,43	36,78	6,11	0,00	3,45	0,00	0,00	2,49	5,93	0,27	1,14
203,14	2996,9	0,00	1052,3	0,00	0,00	0,00	2631,0	512,77	3,80	19,50	13,55	0,00	16,02	0,00	0,00	16,63	13,15	3,22	4,41
203,17	5901,8	0,00	1954,8	0,00	0,00	0,00	3071,9	697,78	3,26	14,33	15,82	0,00	11,67	0,00	0,00	12,24	15,36	3,22	2,89
203,15	5493,8	0,00	1937,0	0,00	0,00	0,00	1833,7	368,48	5,45	27,14	9,44	0,00	5,88	0,00	0,00	6,89	9,17	3,22	0,87

					Peza: Average values per parcel for all the years - Control p.1															
					FERTILIZATION								PRUNING							
				Control	*52,66*	*11,88*	*24,02*	*0,25*	*0,00*	*0,00*	*88,00*	*1,63*	*0,91*	*0,33*	*0,61*	*0,00*	*0,00*	*2,12*	*1176*	*5,47*	*0,39*	*0,10*
				Treated	48,78	12,18	16,71	0,19	724,3	0,00	66,46	22,92	2,50	0,94	7,73	0,00	0,00	5,51	68,43	5,91	3,04	1,06
				ALL	50,7	12,0	20,4	0,2	362	0,0	77,2	12,3	1,7	0,6	4,2	0,0	0,0	3,8	622	5,7	1,7	0,6
paecel code	Hectares	μάρτυρας Control/εφαρμογή Interv.	Organic/Conventional	Irrigated/Rainfed	Fertiliser (N) chemical Kg/Ha	Fertiliser (P) chemical (Kg/Ha)	Fertiliser (K) chemical(Kg/Ha)	Disposal, plastics, mixture, 15.3% water, to munic	Kg of Compost/Ha	Transportation of fertilizers (tKm/Ha) - Operation	Transport, lorry >16t, fleet average/RER U	Transportation of fertilizers (tKm/Ha) - EVOO -201	Petrol, two-stroke blend, at regional storage/RER	1 kg Lubricating oil, at plant/RER U	Diesel, at refinery/RER U for weed / secondary bra	Transportation of pruned wood (tKm/Ha)-Transpo	Transport, barge/RER U (tKm/Ha)(Fuels)	Transport, lorry >16t, fleet average/RER U	Wood Waste - Wood mass for burning in bonefire	1 hr Chain sawing I (IDEMAT 2001)	Smasher operation (Hr/Ha)	Chopper operation (Hr/Ha)
501,01	0,88	Control	Convent.	IRR	38,07	6,92	13,84	0,20	0	0,00	69,21	0,99	0,50	0,50	0,00	0,00	0,00	0,33	914	6,40	0,00	0,00
102,05	0,25	Control	Organic	RF	0,00	0,00	30,00	0,10	0	0,00	35,00	8,00	5,00	1,00	0,00	0,00	0,00	6,43	1444	3,61	0,00	0,00
104,02	0,14	Control	Convent.	IRR	87,75	25,31	35,44	0,41	0	0,00	143,4	2,05	2,00	0,50	0,00	0,00	0,00	4,82	1337	3,34	0,00	0,00
104,01	0,17	Control	Convent.	IRR	66,91	19,30	27,02	0,31	0	0,00	109,4	1,56	2,00	0,50	0,00	0,00	0,00	3,97	1020	2,55	0,00	0,00
107,05	0,25	Control	Convent.	RF	21,00	21,00	21,00	0,14	0	0,00	49,0	0,70	0,00	0,00	0,00	0,00	0,00	0,00	2023	7,38	0,00	0,00
108,01	0,09	Control	Convent.	RF	54,25	0,00	0,00	0,26	0	0,00	90,4	1,29	0,00	0,00	0,00	0,00	0,00	0,00	2487	9,08	0,00	0,00
120,13	0,09	Control	Convent.	RF	123,8	16,04	32,08	0,60	0	0,00	211,6	3,02	0,69	0,69	0,00	0,00	0,00	4,40	1326	10,18	0,00	0,00
504,05	0,23	Control	Convent.	RF	70,61	12,17	36,52	0,35	0	0,00	121,7	1,74	0,00	0,00	0,00	0,00	0,00	0,00	502	1,26	0,00	0,00
117,19	0,13	Control	Convent.	RF	15,23	5,54	6,92	0,07	0	0,00	24,2	0,35	0,41	0,05	0,00	0,00	0,00	0,92	1462	4,80	0,00	0,00
117,21	0,32	Control	Convent.	IRR	60,94	18,16	38,09	0,29	0	0,00	102,5	1,46	1,25	0,20	11,00	0,00	0,00	1,20	2472	8,13	0,00	0,00
123,02	0,46	Control	Organic	RF	0,00	0,00	0,00	0,00	0	0,00	0,0	0,00	2,25	0,75	0,00	0,00	0,00	9,19	0	6,30	3,88	0,86
505,03	0,24	Control	Convent.	IRR	0,00	0,00	0,00	0,00	0	0,00	0,0	0,00	0,00	0,00	0,00	0,00	0,00	0,00	1011	7,09	0,00	0,00
506,01	0,25	Control	Convent.	IRR	81,20	34,80	69,60	0,46	0	0,00	162,4	2,32	0,00	0,00	0,00	0,01	0,00	0,00	2447	6,12	0,00	0,00
128,10	0,11	Control	Convent.	RF	59,45	10,36	34,36	0,33	0	0,00	114,5	1,64	0,25	0,13	0,00	0,00	0,00	0,95	790	2,88	0,00	0,00
507,02	0,15	Control	Convent.	RF	36,84	0,00	0,00	0,08	0	0,00	28,0	0,40	0,00	0,00	0,00	0,00	0,00	0,00	0	1,55	0,00	0,00
508,10	0,43	Control	Convent.	RF	0,00	0,00	0,00	0,00	0	0,00	0,0	0,00	1,84	0,37	0,75	0,00	0,00	1,38	1629	4,07	0,00	0,00
142,11	0,17	Control	Convent.	IRR	117,6	22,06	52,94	0,53	0	0,00	186,3	2,66	0,08	0,02	0,00	0,00	0,00	1,52	425	6,20	3,82	1,21
510,03	0,12	Control	Convent.	IRR	91,25	0,00	0,00	0,25	0	0,00	87,5	1,25	0,50	0,50	0,00	0,00	0,00	2,40	903	10,07	0,00	0,00
510,06	0,2	Control	Convent.	IRR	70,00	25,00	45,00	0,35	0	0,00	122,5	1,75	1,00	1,00	0,00	0,00	0,00	2,88	722	5,56	0,00	0,00
510,07	0,15	Control	Convent.	IRR	58,33	20,83	37,50	0,29	0	0,00	102,1	1,46	0,50	0,50	0,36	0,00	0,00	1,92	603	2,89	0,00	0,00

	Peza: Average values per parcel for all the years - Control p.2																				
	SOIL MANAGEMENT									HERBICIDE TREATMENTS					PLANT PROTECTION						
Control	*0,00*	*0,05*	*0,00*	*0,00*	*0,01*	*0,00*	*0,07*	*12,80*	*0,00*	*0,02*	*1,38*	*2,91*	*3,43*	*0,22*	*0,22*	*0,31*	*3,00*	*0,00*	*2,21*	*0,02*	*0,11*
Treated	0,00	0,07	0,00	0,03	0,17	0,00	0,09	12,69	0,00	0,01	0,21	1,38	1,08	0,05	0,29	0,36	3,06	0,00	2,55	0,02	0,14
338,2	0,0	0,1	0,0	0,0	0,1	0,0	0,1	12,7	0,0	0,0	0,8	2,1	2,3	0,1	0,3	0,3	3,0	0,0	2,4	0,0	0,1
piece/ code	1 ha Tillage, ploughing/CH U	1 ha Tillage, rotary cultivator/CH U (of project Ecol	EVOO Goose foot cultivator (Kg Tractor+equipmen	1 ha Mowing, by rotary mower/CH U	1 ha Tillage, harrowing, by spring tine harrow/CH U	Harrow - Fuel consumption (Kg Tractor+equipmen	Hand-held ripper (Kg equipment / Ha for all treatr	Fuel consumption all (Kg Petrol - Diesel oil/Ha)	Lubricating oil, at plant/RER U (Kg/Ha)	Glyphosate, at regional storehouse/RER U (Lt/Ha)	Water, well, in ground used for spray solution - (m	Diesel, at refinery/RER U for spraying - (Kg/Ha)	Transport, lorry >16t, fleet average/RER U (Kg/Ha	Packaging waste, plastic -(Kg/Ha)	1 kg Pesticide unspecified, at regional storehouse/	Water, well, in ground used for spray solution - (m	1 kg Diesel, at refinery/RER U (Kg/Ha)	Transport Barge / RER U (tKm/Ha)	Transport, lorry >16t, fleet average/RER U (Tkm/H	EVOO - Transport, tractor and trailer greek olives (	1 kg Disposal, plastics, mixture, 15.3% water, to m
501,01	0,00	0,00	0,00	0,00	0,00	0,00	0,66	3,14	0,00	0,00	0,21	1,41	0,71	0,02	0,04	0,37	2,55	0,00	1,02	0,01	0,01
102,05	0,00	0,06	0,00	0,00	0,00	0,00	0,00	6,63	0,00	0,00	0,61	0,00	0,00	0,00	0,02	0,34	2,79	0,00	1,10	0,00	0,01
104,02	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01	23,28	12,04	5,49	0,12	0,39	0,32	4,32	0,00	2,14	0,01	0,06
104,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01	1,20	10,37	4,90	0,12	0,39	0,32	4,32	0,00	2,14	0,01	0,06
107,05	0,00	0,13	0,00	0,00	0,00	0,00	0,00	18,09	0,00	0,01	0,22	11,80	4,83	0,06	0,00	0,00	0,00	0,00	0,00	0,00	0,00
108,01	0,00	0,05	0,00	0,00	0,00	0,00	0,05	36,52	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
120,13	0,00	0,07	0,00	0,00	0,00	0,00	0,00	24,14	0,00	0,00	0,56	0,00	0,00	0,00	0,00	0,56	2,46	0,00	0,92	0,00	0,01
504,05	0,00	0,17	0,00	0,00	0,00	0,00	0,00	18,79	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,33	7,70	0,00	2,74	0,00	0,00
117,19	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01	0,00	8,56	4,33	0,12	0,00	0,00	0,00	0,00	0,00	0,00	0,00
117,21	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,02	0,00	11,75	5,75	0,15	0,25	0,63	2,77	0,00	1,19	0,00	0,02
123,02	0,00	0,23	0,00	0,00	0,12	0,00	0,00	18,77	0,00	0,00	0,12	0,00	0,00	0,00	0,96	0,68	5,93	0,00	8,11	0,09	0,55
505,03	0,00	0,06	0,00	0,00	0,00	0,00	0,12	24,27	0,00	0,00	0,67	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
506,01	0,00	0,13	0,00	0,00	0,06	0,00	0,00	22,26	0,00	0,01	0,00	0,89	0,95	0,06	0,17	0,14	1,77	0,00	0,77	0,00	0,01
128,10	0,00	0,06	0,00	0,00	0,00	0,00	0,00	17,34	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
507,02	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,30	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
508,10	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,42	0,00	1,40	41,69	3,77	0,00	0,00	0,00	0,00	0,00	0,00	0,00
142,11	0,00	0,00	0,00	0,09	0,04	0,00	0,00	7,46	0,00	0,00	0,00	0,00	0,00	0,00	0,51	1,38	6,39	0,00	3,23	0,01	0,09
510,03	0,00	0,06	0,00	0,00	0,00	0,00	0,12	27,71	0,00	0,00	0,52	0,00	0,00	0,00	0,53	0,39	6,61	0,00	8,48	0,09	0,56
510,06	0,00	0,00	0,00	0,00	0,00	0,00	0,30	9,30	0,00	0,00	0,00	0,00	0,00	0,00	0,53	0,26	5,75	0,00	8,17	0,09	0,56
510,07	0,00	0,00	0,00	0,00	0,00	0,00	0,23	21,59	0,00	0,00	0,00	0,00	0,00	0,00	0,53	0,39	6,61	0,00	4,22	0,03	0,17

	Peza: Average values per parcel for all the years - Control p.3																		
	IRRIGATION						HARVEST												
Control	48,07	0,17	2,18	0,00	0,06	0,00	2801,7	569,11	5,86	32,42	14,43	0,15	12,45	2,11	0,00	7,41	14,01	0,00	5,15
Treated	58,97	3,14	2,95	0,00	1,10	0,02	2351,1	496,02	7,35	32,13	12,11	0,06	9,00	1,18	0,00	8,00	11,76	0,00	3,58
338,2	53,5	1,7	2,6	0,0	0,6	0,0	2576	532,6	6,6	32,3	13,3	0,1	10,7	1,6	0,0	7,7	12,9	0,0	4,4
paece/ code	Water (m3/Ha)	1 kg Diesel, at refinery/RER U (Kg/Ha)	Electricity, low voltage, production GR, at grid/GR	Transport Barge / RER U (tKm/Ha)	Transport, lorry >16t, fleet average/RER U (tKm/H	EVOO - Transport, tractor and trailer greek olives (	Kg Olivefruit / Ha	Kg Oliveoil / Ha	Area per Kg of Olive fruit (m2/Kg)	Area per Kg of Olive oil (m2/Kg)	Transport of crews	Petrol, two-stroke blend, at regional storage/RER	Kg petrol for vibrator / Ha	1 kg Lubricating oil, at plant/RER U	Kg lubricant for chain saw / Ha	Diesel, at refinery/RER U (Kg/Ha)	Transport of olive fruit tractor & trailer (TKm/Ha)	Transport Barge / RER U (tKm/Ha)	Transport, lorry >16t, fleet average/RER U (tKm/H
501,01	76,36	3,35	1,58	0,00	1,17	0,02	3895,3	776,31	2,57	12,88	20,06	0,00	14,03	3,23	0,00	21,93	19,48	0,00	6,04
102,05	0,00	0,00	0,00	0,00	0,00	0,00	1684,7	381,94	5,94	26,18	8,68	0,00	12,29	3,79	0,00	7,03	8,42	0,00	5,63
104,02	344,75	0,00	16,42	0,00	0,00	0,00	2325,6	544,41	4,30	18,37	11,98	0,00	17,10	2,53	0,00	4,10	11,63	0,00	6,87
104,01	299,50	0,00	14,72	0,00	0,00	0,00	1773,3	415,13	5,64	24,09	9,13	0,00	13,04	1,93	0,00	3,13	8,87	0,00	5,24
107,05	0,00	0,00	0,00	0,00	0,00	0,00	1180,0	232,00	8,47	43,10	6,08	0,00	11,55	0,00	0,00	8,85	5,90	0,00	4,04
108,01	0,00	0,00	0,00	0,00	0,00	0,00	1666,7	211,11	6,00	47,37	8,58	0,00	12,28	0,00	0,00	8,19	8,33	0,00	4,30
120,13	0,00	0,00	0,00	0,00	0,00	0,00	4095,6	742,90	2,44	13,46	21,09	0,00	8,03	3,11	0,00	5,97	20,48	0,00	3,90
504,05	0,00	0,00	0,00	0,00	0,00	0,00	4469,2	820,32	2,24	12,19	23,02	0,00	18,81	2,28	0,00	7,35	22,35	0,00	7,38
117,19	0,00	0,00	0,00	0,00	0,00	0,00	4855,7	970,94	2,06	10,30	25,01	0,00	16,94	5,25	0,00	13,84	24,28	0,00	7,77
117,21	220,81	0,00	9,62	0,00	0,00	0,00	5098,5	1005,0	1,96	9,95	26,26	0,00	21,41	4,98	0,00	9,53	25,49	0,00	9,23
123,02	0,00	0,00	0,00	0,00	0,00	0,00	3414,4	701,09	2,93	14,26	17,58	0,00	6,68	1,48	0,00	3,90	17,07	0,00	2,86
505,03	0,00	0,00	0,00	0,00	0,00	0,00	1622,1	270,10	6,16	37,02	8,35	3,07	17,40	0,00	0,00	7,99	8,11	0,00	7,17
506,01	0,00	0,00	0,00	0,00	0,00	0,00	360,0	52,17	27,78	191,67	1,85	0,00	4,91	0,91	0,00	0,89	1,80	0,00	2,04
128,10	0,00	0,00	0,00	0,00	0,00	0,00	1003,6	179,55	9,96	55,70	5,17	0,00	6,70	0,00	0,00	8,05	5,02	0,00	2,35
507,02	0,00	0,00	0,00	0,00	0,00	0,00	2670,9	1000,2	3,74	10,00	13,75	0,00	18,97	3,03	0,00	8,40	13,35	0,00	7,70
508,10	0,00	0,00	0,00	0,00	0,00	0,00	725,6	156,74	13,78	63,80	3,74	0,00	4,28	1,06	0,00	1,03	3,63	0,00	1,87
142,11	20,00	0,00	1,20	0,00	0,00	0,00	3523,7	610,88	2,84	16,37	18,15	0,00	16,77	4,63	0,00	13,98	17,62	0,00	7,49
510,03	0,00	0,00	0,00	0,00	0,00	0,00	3029,6	595,42	3,30	16,79	15,60	0,00	6,14	0,00	0,00	3,69	15,15	0,00	2,15
510,06	0,00	0,00	0,00	0,00	0,00	0,00	3127,5	639,39	3,20	15,64	16,11	0,00	10,00	1,95	0,00	4,43	15,64	0,00	4,18
510,07	0,00	0,00	0,00	0,00	0,00	0,00	5512,0	1076,7	1,81	9,29	28,39	0,00	11,64	2,08	0,00	5,90	27,56	0,00	4,80

LCI / olive grove | **Peza: Average values per parcel for all the years - Interventions p.1**

					FERTILIZATION								PRUNING								
paecel code	Hectares	μάρτυρας Control/εφαρμογή Interv.	Organic/Conventional	Irrigated/Rainfed	Fertiliser (N) chemical Kg/Ha	Fertiliser (P) chemical (Kg/Ha)	Fertiliser (K) chemical(Kg/Ha)	Disposal, plastics, mixture, 15.3% water, to municipal ir	Kg of Compost/Ha	Transportation of fertilizers (tKm/Ha) - Operation barge	Transport, lorry >16t, fleet average/RER U	Transportation of fertilizers (tKm/Ha) - EVOO -2012-13	Petrol, two-stroke blend, at regional storage/RER U (Kg	1 kg Lubricating oil, at plant/RER U	Diesel, at refinery/RER U for weed / secondary branch s	Transportation of pruned wood (tKm/Ha)-Transport, tra	Transport, barge/RER U (tKm/Ha)(Fuels)	Transport, lorry >16t, fleet average/RER U	Wood Waste - Wood mass for burning in bonefire - 201	1 hr Chain sawing I (IDEMAT 2001)	Smasher operation (Hr/Ha)	Chopper operation (Hr/Ha)
501,02	0,12	Interv.	Convent.	IRR	33,69	6,13	12,25	0,18	0	0,00	61,3	11,32	0,00	0,00	3,75	0,00	0,00	0,93	2	3,08	1,90	0,42
502,18	0,98	Interv.	Convent.	IRR	38,17	9,25	18,54	0,18	1380	0,00	62,8	33,31	0,00	0,00	6,25	0,00	0,00	1,19	0	5,38	3,32	1,42
502,03	0,76	Interv.	Convent.	IRR	67,84	8,82	17,83	0,31	173	0,00	109,5	26,29	0,00	0,00	12,25	0,00	0,00	2,55	0	5,06	3,12	1,33
503,02	2	Interv.	Convent.	IRR	28,13	16,88	0,00	0,11	0	0,00	39,4	6,82	2,68	1,43	3,61	0,00	0,00	2,47	135	3,95	2,44	0,41
503,01	0,62	Interv.	Convent.	IRR	35,99	21,59	0,00	0,14	0	0,00	50,38	10,81	1,07	0,57	10,00	0,00	0,00	2,54	173	7,30	3,12	0,52
504,04	0,5	Interv.	Convent.	RF	46,40	10,80	32,50	0,21	200	0,00	73,50	27,06	1,75	0,44	6,00	0,00	0,00	7,38	0	4,27	3,41	0,95
123,01	0,65	Interv.	Organic	RF	0,00	0,00	0,00	0,00	1154	0,00	0,00	15,39	6,00	4,31	11,25	0,00	0,00	7,35	0	4,87	3,00	1,28
505,04	1,2	Interv.	Convent.	IRR	3,82	0,26	0,87	0,00	1840	0,00	0,00	34,73	17,00	5,13	4,50	0,00	0,00	7,92	0	6,17	2,17	0,32
506,10	0,43	Interv.	Convent.	IRR	35,93	11,98	23,95	0,24	0	0,00	83,84	23,73	1,75	0,44	16,23	0,00	0,00	4,62	0	4,32	3,89	0,86
179,12	1,11	Interv.	Organic	RF	0,00	0,00	0,00	0,00	0	0,00	0,00	12,39	0,00	0,00	10,43	0,00	0,00	4,53	0	6,62	3,10	1,32
179,15	0,74	Interv.	Organic	RF	0,00	0,00	0,00	0,00	0	0,00	0,00	11,82	0,00	0,00	9,70	0,00	0,00	4,36	0	6,56	3,07	1,31
179,16	0,55	Interv.	Organic	RF	0,00	0,00	0,00	0,00	0	0,00	0,00	22,73	0,00	0,00	13,11	0,00	0,00	5,46	0	6,56	3,07	1,31
179,20	1,21	Interv.	Organic	RF	0,00	0,00	0,00	0,00	0	0,00	0,00	12,40	0,00	0,00	3,00	0,00	0,00	3,36	0	4,30	2,01	0,86
507,08	0,53	Interv.	Convent.	IRR	48,12	2,77	3,39	0,10	1357	0,00	36,11	30,90	6,25	1,81	2,00	0,00	0,00	5,88	0	7,33	3,43	1,47
507,09	0,21	Interv.	Convent.	IRR	40,35	3,35	5,33	0,07	1757	0,00	23,68	35,93	4,13	1,13	13,29	0,00	0,00	9,72	0	4,46	2,09	0,89
141,01	0,78	Interv.	Organic	RF	0,00	0,00	0,00	0,00	0	0,00	0,00	11,22	0,00	0,00	17,22	0,00	0,00	5,28	0	4,49	2,10	0,90
509,06	0,53	Interv.	Convent.	IRR	137,0	78,8	104,0	0,8	0,0	0,0	269,8	15,65	6,75	1,00	2,61	0,00	0,00	13,95	790	6,27	3,86	0,86
142,12	0,27	Interv.	Convent.	IRR	173,7	31,9	103,6	0,7	1372	0,0	249,2	35,90	0,16	0,03	4,75	0,00	0,00	3,19	267	7,81	4,81	1,79
510,04	0,15	Interv.	Convent.	IRR	193,4	27,3	11,1	0,5	3889	0,0	167,4	61,44	1,00	1,00	4,75	0,00	0,00	13,65	0	12,33	4,44	1,90
510,02	0,61	Interv.	Convent.	IRR	93,1	13,8	0,7	0,3	1364	0,0	102,2	18,54	1,50	1,50	0,00	0,00	0,00	3,83	0	7,03	2,53	1,08

Peza: Average values per parcel for all the years - Interventions p.2

	SOIL MANAGEMENT									HERBICIDE TREATMENTS					PLANT PROTECTION						
poece/ code	1 ha Tillage, ploughing/CH U	1 ha Tillage, rotary cultivator/CH U (of project Ecoinven	EVOO Goose foot cultivator (Kg Tractor+equipmen	1 ha Mowing, by rotary mower/CH U	1 ha Tillage, harrowing, by spring tine harrow/CH U	Harrow - Fuel consumption (Kg Tractor+equipment / Ha	Hand-held ripper (Kg equipment / Ha for all treatment	Fuel consumption all (Kg Petrol - Diesel oil/Ha)	Lubricating oil, at plant/RER U (Kg/Ha)	Glyphosate, at regional storehouse/RER U (Lt/Ha)	Water, well, in ground used for spray solution - (m3/Ha	Diesel, at refinery/RER U for spraying - (Kg/Ha)	Transport, lorry >16t, fleet average/RER U (Kg/Ha)	Packaging waste, plastic - (Kg/Ha)	1 kg Pesticide unspecified, at regional storehouse/RER	Water, well, in ground used for spray solution - (m3/Ha	1 kg Diesel, at refinery/RER U (Kg/Ha)	Transport Barge / RER U (tKm/Ha)	Transport, lorry >16t, fleet average/RER U (Tkm/Ha)	EVOO - Transport, tractor and trailer greek olives (tKm/	1 kg Disposal, plastics, mixture, 15.3% water, to munici
501,02	0,00	0,00	0,00	0,00	0,00	0,00	0,03	1,54	0,00	0,01	0,00	5,10	2,37	0,05	0,04	0,20	1,19	0,00	0,68	0,00	0,02
502,18	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,02	0,00	10,08	5,63	0,19	0,51	0,51	5,73	0,00	2,52	0,01	0,05
502,03	0,00	0,57	0,00	0,00	0,00	0,00	0,00	18,31	0,00	0,00	0,03	0,00	0,00	0,00	0,51	0,51	6,68	0,00	2,85	0,01	0,05
503,02	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,02	0,31	0,81	1,80	0,14	1,06	0,59	4,52	0,00	3,13	0,02	0,14
503,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,04	0,00	0,81	3,75	0,32	1,19	0,64	4,68	0,00	3,42	0,03	0,16
504,04	0,00	0,25	0,00	0,00	0,00	0,00	0,00	15,56	0,00	0,01	1,73	1,77	1,32	0,06	0,00	0,32	3,98	0,00	1,43	0,00	0,00
123,01	0,00	0,33	0,00	0,00	0,00	0,00	0,00	14,33	0,00	0,00	0,94	0,00	0,00	0,00	0,96	0,45	4,97	0,00	7,00	0,08	0,48
505,04	0,00	0,00	0,00	0,30	0,00	0,00	0,60	18,86	0,00	0,00	0,08	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
506,10	0,00	0,32	0,00	0,00	0,11	0,00	0,00	34,04	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
179,12	0,00	0,00	0,00	0,00	0,83	0,00	0,00	21,80	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,54	2,79	0,00	5,81	0,07	0,44
179,15	0,00	0,00	0,00	0,00	0,56	0,00	0,00	32,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,40	1,66	0,00	3,70	0,04	0,28
179,16	0,00	0,00	0,00	0,00	0,41	0,00	0,00	25,72	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,26	1,34	0,00	1,86	0,02	0,13
179,20	0,00	0,00	0,00	0,00	0,91	0,00	0,00	19,67	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,23	1,08	0,00	1,35	0,01	0,09
507,08	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	1,13	0,75	0,03	0,00	0,11	0,83	0,00	0,30	0,00	0,00
507,09	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	1,13	0,75	0,03	0,00	0,11	1,05	0,00	0,37	0,00	0,00
141,01	0,00	0,00	0,00	0,00	0,59	0,00	0,00	22,10	0,00	0,00	0,07	0,00	0,00	0,00	0,00	0,25	0,85	0,00	0,56	0,00	0,02
509,06	0,00	0,00	0,00	0,13	0,00	0,00	0,00	1,74	0,00	0,01	0,04	2,41	2,14	0,12	0,00	0,00	0,00	0,00	0,00	0,00	0,00
142,12	0,00	0,00	0,00	0,14	0,07	0,00	0,00	10,87	0,00	0,00	0,00	0,00	0,00	0,00	0,51	1,38	6,59	0,00	3,30	0,01	0,09
510,04	0,00	0,00	0,00	0,00	0,00	0,00	0,19	10,60	0,00	0,02	0,94	4,43	3,01	0,13	0,53	0,39	6,61	0,00	4,22	0,03	0,17
510,02	0,00	0,00	0,00	0,00	0,00	0,00	0,92	6,62	0,00	0,00	0,00	0,00	0,00	0,00	0,53	0,39	6,61	0,00	8,49	0,09	0,56

Peza: Average values per parcel for all the years - Interventions p.3

	IRRIGATION						HARVEST												
paece/ code	Water (m3/Ha)	1 kg Diesel, at refinery/RER U (Kg/Ha)	Electricity, low voltage, production GR, at grid/GR U (KW	Transport Barge / RER U (tKm/Ha)	Transport, lorry >16t, fleet average/RER U (tKm/Ha)	EVOO - Transport, tractor and trailer greek olives (tKm/H	Kg Olivefruit / Ha	Kg Oliveoil / Ha	Area per Kg of Olive fruit (m2/Kg)	Area per Kg of Olive oil (m2/Kg)	Transport of crews	Petrol, two-stroke blend, at regional storage/RER U (Kg/H	Kg petrol for vibrator / Ha	1 kg Lubricating oil, at plant/RER U	Kg lubricant for chain saw / Ha	Diesel, at refinery/RER U (Kg/Ha)	Transport of olive fruit tractor & trailer (TKm/Ha)	Transport Barge / RER U (tKm/Ha)	Transport, lorry >16t, fleet average/RER U (tKm/Ha)
501,02	0,00	0,00	0,00	0,00	0,00	0,00	4157,7	831,46	2,41	12,03	21,41	0,00	22,52	3,79	0,00	46,57	20,79	0,00	9,21
502,18	0,00	0,00	0,00	0,00	0,00	0,00	3850,2	775,69	2,60	12,89	19,83	0,00	7,71	1,86	0,00	7,45	19,25	0,00	3,35
502,03	0,00	0,00	0,00	0,00	0,00	0,00	1389,9	296,52	7,19	33,72	7,16	0,00	4,39	1,20	0,00	4,66	6,95	0,00	1,96
503,02	432,14	29,88	21,60	0,00	10,46	0,15	4278,5	1097,2	2,34	9,11	22,03	0,00	12,60	1,25	0,00	11,68	21,39	0,00	4,85
503,01	454,04	32,94	21,60	0,00	11,53	0,16	5408,4	1216,3	1,85	8,22	27,85	0,00	13,03	1,25	0,00	12,58	27,04	0,00	5,00
504,04	0,00	0,00	0,00	0,00	0,00	0,00	3177,6	598,35	3,15	16,71	16,36	0,00	13,63	2,41	0,00	5,31	15,89	0,00	5,62
123,01	0,00	0,00	0,00	0,00	0,00	0,00	2911,2	602,35	3,43	16,60	14,99	0,00	5,48	1,75	0,00	3,06	14,56	0,00	2,53
505,04	12,08	0,00	0,73	0,00	0,00	0,00	1345,0	257,26	7,44	38,87	6,93	1,23	9,01	0,00	0,00	3,69	6,72	0,00	3,58
506,10	0,00	0,00	0,00	0,00	0,00	0,00	332,8	97,73	30,04	102,32	1,71	0,00	4,71	0,00	0,00	5,66	1,66	0,00	1,65
179,12	0,00	0,00	0,00	0,00	0,00	0,00	660,3	157,21	15,15	63,61	3,40	0,00	2,66	0,00	0,00	2,39	3,30	0,00	0,93
179,15	0,00	0,00	0,00	0,00	0,00	0,00	950,7	226,35	10,52	44,18	4,90	0,00	3,98	0,00	0,00	3,59	4,75	0,00	1,39
179,16	0,00	0,00	0,00	0,00	0,00	0,00	576,5	137,27	17,34	72,85	2,97	0,00	2,68	0,00	0,00	2,41	2,88	0,00	0,94
179,20	0,00	0,00	0,00	0,00	0,00	0,00	1479,4	341,27	6,76	29,30	7,62	0,00	6,71	0,00	0,00	6,60	7,40	0,00	2,35
507,08	115,00	0,00	6,90	0,00	0,00	0,00	1545,2	267,08	6,47	37,44	7,96	0,00	8,62	0,86	0,00	3,46	7,73	0,00	3,32
507,09	115,00	0,00	6,90	0,00	0,00	0,00	2899,3	521,29	3,45	19,18	14,93	0,00	12,66	1,08	0,00	5,47	14,50	0,00	4,81
141,01	0,00	0,00	0,00	0,00	0,00	0,00	1178,0	265,45	8,49	37,67	6,07	0,00	5,57	0,00	0,00	4,99	5,89	0,00	1,95
509,06	0,00	0,00	0,00	0,00	0,00	0,00	1737,7	374,25	5,75	26,72	8,95	0,00	11,59	1,29	0,00	8,35	8,69	0,00	4,51
142,12	34,81	0,00	1,20	0,00	0,00	0,00	4788,7	941,06	2,09	10,63	24,66	0,00	14,65	4,36	0,00	14,12	23,94	0,00	6,65
510,04	0,00	0,00	0,00	0,00	0,00	0,00	1406,5	289,52	7,11	34,54	7,24	0,00	7,55	0,81	0,00	2,95	7,03	0,00	2,93
510,02	16,39	0,00	0,00	0,00	0,00	0,00	2949,2	626,88	3,39	15,95	15,19	0,00	10,28	1,68	0,00	5,08	14,75	0,00	4,18

					Nileas: Average values per parcel for all the years - Control p.1																
					FERTILIZATION								PRUNING								
				Control	*45,51*	*18,87*	*33,62*	*0,24*	*0,00*	*0,00*	*84,28*	*2,33*	*0,75*	*0,03*	*4,45*	*1,36*	*0,00*	*1,46*	*732,7*	*3,83*	*0,13*	*0,10*
				Treated	51,24	16,68	37,33	0,15	914,1	0,00	51,88	6,63	2,92	0,08	23,64	3,65	0,00	4,83	240,2	8,63	0,81	1,05
				ALL	48,4	17,8	35,5	0,2	457	0,0	68,1	4,5	1,8	0,1	14,0	2,5	0,0	3,1	486	6,2	0,5	0,6
paecel code	Hectares	μάρτυρας Control/εφαρμογή Interv.	Organic/Conventional	Irrigated/Rainfed	Fertiliser (N) chemical Kg/Ha	Fertiliser (P) chemical (Kg/Ha)	Fertiliser (K) chemical(Kg/Ha)	Disposal, plastics, mixture, 15.3% water, to munic	Kg of Compost/Ha	Transportation of fertilizers (tKm/Ha) - Operation	Transport, lorry >16t, fleet average/RER U	Transportation of fertilizers (tKm/Ha) - EVOO - 201	Petrol, two-stroke blend, at regional storage/RER	1 kg Lubricating oil, at plant/RER U	Diesel, at refinery/RER U for weed / secondary bra	Transportation of pruned wood (tKm/Ha)-Transpo	Transport, barge/RER U (tKm/Ha)(Fuels)	Transport, lorry >16t, fleet average/RER U	Wood Waste - Wood mass for burning in bonefire	1 hr Chain sawing I (IDEMAT 2001)	Smasher operation (Hr/Ha)	Chopper operation (Hr/Ha)
8,02	0,4	Control	Organic	RF	21,58	21,58	69,50	0,13	0	0,00	47,16	3,37	1,19	0,02	0,00	3,61	0,00	6,39	0	7,97	0,00	0,46
41,04	0,5	Control	Convent.	RF	90,34	19,43	34,58	0,28	0	0,00	97,13	1,98	0,00	0,00	0,00	0,00	0,00	0,00	210	0,88	0,00	0,00
43,02	0,56	Control	Convent.	RF	42,99	12,90	48,38	0,22	0	0,00	78,58	1,37	0,00	0,00	0,00	1,19	0,00	0,00	1338	4,90	0,00	0,00
30,01	0,45	Control	Organic	RF	19,56	19,56	44,61	0,28	0	0,00	99,46	3,87	0,00	0,00	0,00	0,00	0,00	0,00	1791	4,48	0,00	0,00
23,01	0,7	Control	Convent.	RF	94,07	13,71	12,00	0,32	0	0,00	112,5	1,61	1,00	0,02	0,00	2,81	0,00	0,38	589	2,88	0,00	0,00
55,05	0,81	Control	Organic	RF	11,11	11,11	9,72	0,00	0	0,00	0,0	1,43	0,00	0,00	8,50	0,00	0,00	0,00	710	1,77	0,00	0,00
17,03	0,99	Control	Organic	RF	8,59	8,59	7,51	0,00	0	0,00	0,0	1,07	1,00	0,02	0,00	0,00	0,00	2,93	182	1,52	0,00	0,00
20,02	1,01	Control	Organic	RF	0,00	0,00	31,19	0,81	0	0,00	283,7	4,05	0,00	0,00	0,00	1,30	0,00	0,00	1222	3,70	0,00	0,00
23,02	1,8	Control	Convent.	RF	127,9	14,22	24,60	0,44	0	0,00	153,4	2,19	6,25	0,13	0,00	4,17	0,00	0,92	917	4,38	0,00	0,00
48,01	1,9	Control	Convent.	RF	0,00	0,00	0,00	0,00	0	0,00	0,0	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0	0,09	0,00	0,00
27,03	0,4	Control	Convent.	IRR	257,1	85,00	131,3	1,36	0	0,00	476,9	6,81	1,00	0,25	2,59	1,17	0,00	0,84	1938	5,43	0,00	0,00
10,02	0,45	Control	Organic	IRR	26,00	26,00	49,42	0,09	0	0,00	31,1	3,69	0,00	0,00	1,76	0,00	0,00	1,78	1396	5,49	0,00	0,21
59,05	0,46	Control	Convent.	IRR	82,98	17,40	17,47	0,27	0	0,00	95,2	1,83	0,00	0,00	9,60	1,49	0,00	1,19	807	3,96	0,00	0,48
10,05	0,53	Control	Organic	IRR	34,53	34,53	61,34	0,10	0	0,00	36,3	4,83	0,00	0,00	2,50	0,00	0,00	5,61	2212	8,13	0,00	0,33
17,07	0,69	Control	Organic	IRR	11,59	11,59	10,14	0,00	0	0,00	0,0	1,45	0,00	0,00	0,25	2,03	0,00	1,12	174	1,45	0,00	0,00
17,10	0,8	Control	Organic	IRR	9,38	9,38	8,20	0,00	0	0,00	0,0	1,17	0,00	0,00	0,00	0,00	0,00	0,10	393	0,98	0,00	0,00
180,11	0,82	Control	Convent.	IRR	0,00	0,00	0,00	0,00	0	0,00	0,0	0,00	0,00	0,00	1,75	0,00	0,00	0,00	140	1,78	2,57	0,00
180,06	0,99	Control	Convent.	IRR	0,00	0,00	0,00	0,01	0	0,00	1,8	0,03	0,00	0,00	0,00	0,00	0,00	0,55	164	1,99	0,00	0,00
98,02	1,32	Control	Convent.	IRR	45,45	45,45	36,36	0,35	0	0,00	122,0	1,74	0,00	0,00	44,16	3,55	0,00	0,00	473	2,96	0,00	0,00
8,04	2	Control	Organic	IRR	27,00	27,00	76,20	0,14	0	0,00	50,40	4,10	4,63	0,09	17,80	5,95	0,00	7,45	0	11,94	0,00	0,51

	Nileas: Average values per parcel for all the years - Control p.2																				
	SOIL MANAGEMENT									HERBICIDE TREATMENTS					PLANT PROTECTION						
Control	*0,00*	*0,12*	*0,08*	*0,49*	*0,02*	*0,00*	*0,16*	*10,24*	*0,00*	*0,00*	*0,41*	*0,57*	*0,33*	*0,01*	*0,09*	*0,43*	*2,98*	*0,00*	*1,18*	*0,00*	*0,01*
Treated	0,00	0,20	0,00	1,18	0,00	0,00	0,66	9,49	0,00	0,00	0,09	0,71	0,38	0,01	0,16	0,36	2,26	0,00	1,00	0,00	0,02
ALL	0,0	0,2	0,0	0,8	0,0	0,0	0,4	9,9	0,0	0,0	0,2	0,6	0,4	0,0	0,1	0,4	2,6	0,0	1,1	0,0	0,0
parcel code	1 ha Tillage, ploughing/CH U	1 ha Tillage, rotary cultivator/CH U (of project Ecol	EVOO Goose foot cultivator (Kg Tractor+equipmen	1 ha Mowing, by rotary mower/CH U	1 ha Tillage, harrowing, by spring tine harrow/CH	Harrow - Fuel consumption (Kg Tractor+equipmen	Hand-held ripper (Kg equipment / Ha for all treatr	Fuel consumption all (Kg Petrol - Diesel oil/Ha)	Lubricating oil, at plant/RER U (Kg/Ha)	Glyphosate, at regional storehouse/RER U (Lt/Ha)	Water, well, in ground used for spray solution - (n	Diesel, at refinery/RER U for spraying - (Kg/Ha)	Transport, lorry >16t, fleet average/RER U (Kg/Ha	Packaging waste, plastic - (Kg/Ha)	1 kg Pesticide unspecified, at regional storehouse/	Water, well, in ground used for spray solution - (m	1 kg Diesel, at refinery/RER U (Kg/Ha)	Transport Barge / RER U (tKm/Ha)	Transport, lorry >16t, fleet average/RER U (TKm/H	EVOO - Transport, tractor and trailer greek olives (	1 kg Disposal, plastics, mixture, 15.3% water, to m
8,02	0,00	0,00	0,00	0,50	0,00	0,00	0,10	11,47	0,00	0,00	0,00	0,00	0,00	0,00	0,16	0,13	1,00	0,00	0,46	0,01	0,01
41,04	0,00	0,00	0,00	0,25	0,00	0,00	0,00	7,37	0,00	0,00	0,00	0,00	0,00	0,00	0,01	0,15	4,74	0,00	1,66	0,00	0,00
43,02	0,00	0,00	0,00	0,42	0,00	0,00	0,00	6,19	0,00	0,01	0,09	1,31	1,09	0,06	0,15	1,43	0,00	0,00	0,21	0,00	0,02
30,01	0,00	0,34	0,00	0,00	0,00	0,00	0,00	18,09	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
23,01	0,00	0,00	0,18	0,53	0,00	0,00	0,00	7,46	0,00	0,01	0,00	2,93	1,65	0,06	0,02	0,96	8,73	0,00	3,22	0,00	0,01
55,05	0,00	0,00	0,00	0,81	0,00	0,00	0,20	6,21	0,00	0,00	5,06	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
17,03	0,00	0,00	0,00	0,74	0,00	0,00	0,25	10,58	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
20,02	0,00	1,01	0,00	0,51	0,00	0,00	0,00	13,51	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
23,02	0,00	0,00	0,45	0,90	0,00	0,00	0,00	5,44	0,00	0,01	0,00	3,30	2,01	0,08	0,03	1,10	9,87	0,00	3,63	0,00	0,02
48,01	0,00	0,00	0,00	0,48	0,00	0,00	0,00	1,94	0,00	0,00	0,13	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
27,03	0,00	0,00	0,00	0,20	0,00	0,00	0,20	16,57	0,00	0,00	0,69	0,00	0,00	0,00	0,15	0,50	0,00	0,00	0,17	0,00	0,02
10,02	0,00	0,00	0,00	0,34	0,00	0,00	0,11	16,24	0,00	0,00	0,00	0,00	0,00	0,00	0,21	0,44	6,17	0,00	2,63	0,01	0,04
59,05	0,00	0,00	0,00	0,00	0,00	0,00	0,12	2,80	0,00	0,00	2,17	3,80	1,71	0,03	0,35	1,36	14,15	0,00	5,32	0,01	0,03
10,05	0,00	0,00	0,00	0,40	0,00	0,00	0,13	15,00	0,00	0,00	0,00	0,00	0,00	0,00	0,18	0,42	6,09	0,00	2,55	0,01	0,04
17,07	0,00	0,35	0,00	0,35	0,00	0,00	0,00	15,02	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
17,10	0,00	0,00	0,00	0,60	0,00	0,00	0,20	7,05	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,08	0,38	0,00	0,17	0,00	0,00
180,11	0,00	0,00	0,00	0,00	0,00	0,00	0,41	0,75	0,00	0,00	0,02	0,00	0,02	0,00	0,05	0,45	0,85	0,00	0,40	0,00	0,01
180,06	0,00	0,00	0,00	0,25	0,00	0,00	0,00	1,94	0,00	0,00	0,00	0,00	0,03	0,00	0,05	0,45	0,85	0,00	0,40	0,00	0,01
98,02	0,00	0,66	0,99	0,00	0,33	0,00	0,00	23,10	0,00	0,00	0,09	0,00	0,00	0,00	0,21	0,85	5,33	0,00	2,08	0,00	0,02
8,04	0,00	0,00	0,00	2,50	0,00	0,00	1,50	18,15	0,00	0,00	0,00	0,00	0,00	0,00	0,23	0,19	1,51	0,00	0,69	0,00	0,02

	Nileas: Average values per parcel for all the years - Control p.3																		
	IRRIGATION						HARVEST												
Control	*201,50*	*20,26*	*144,33*	*0,00*	*7,09*	*0,10*	*6527,16*	*######*	*2,58*	*14,85*	*33,61*	*3,15*	*9,15*	*0,00*	*0,10*	*7,52*	*32,64*	*0,00*	*4,34*
Treated	168,43	4,93	189,16	0,00	1,73	0,02	6429,26	1094,4	1,94	11,14	33,11	2,90	6,62	0,00	0,09	8,46	32,15	0,00	3,36
ALL	185,0	12,6	166,7	0,0	4,4	0,1	6478,2	1118	2,3	13,0	33,4	3,0	7,9	0,0	0,1	8,0	32,4	0,0	3,9
parcel code	Water (m3/Ha)	1 kg Diesel, at refinery/RER U (Kg/Ha)	Electricity, low voltage, production GR, at grid/GR	Transport Barge / RER U (tKm/Ha)	Transport, lorry >16t, fleet average/RER U (tKm/H	EVOO - Transport, tractor and trailer greek olives (	Kg Oliverfuit / Ha	Kg Oliveoil / Ha	Area per Kg of Olive fruit (m2/Kg)	Area per Kg of Olive oil (m2/Kg)	Transport of crews	Petrol, two-stroke blend, at regional storage/RER	Kg petrol for vibrator / Ha	1 kg Lubricating oil, at plant/RER U	Kg lubricant for chain saw / Ha	Diesel, at refinery/RER U (Kg/Ha)	Transport of olive fruit tractor & trailer (TKm/Ha)	Transport Barge / RER U (tKm/Ha)	Transport, lorry >16t, fleet average/RER U (tKm/H
8,02	0,00	0,00	0,00	0,00	0,00	0,00	1579,3	281,1	6,33	35,57	8,13	0,65	1,39	0,00	0,07	1,42	7,90	0,00	0,7
41,04	0,00	0,00	0,00	0,00	0,00	0,00	7282,4	1302,0	1,37	7,68	37,50	6,09	14,23	0,00	0,15	7,72	36,41	0,00	7,1
43,02	0,00	0,00	0,00	0,00	0,00	0,00	13285,7	2328,0	0,75	4,30	68,42	4,91	10,20	0,00	0,12	7,47	66,43	0,00	5,3
30,01	0,00	0,00	0,00	0,00	0,00	0,00	7276,7	1137,8	1,37	8,79	37,47	3,48	4,66	0,00	0,09	12,49	36,38	0,00	2,8
23,01	0,00	0,00	0,00	0,00	0,00	0,00	8960,7	1662,5	1,12	6,02	46,15	1,09	4,27	0,00	0,03	2,11	44,80	0,00	1,8
55,05	0,00	0,00	0,00	0,00	0,00	0,00	5338,8	742,4	1,87	13,47	27,50	4,73	8,38	0,00	0,12	6,79	26,69	0,00	4,6
17,03	0,00	0,00	0,00	0,00	0,00	0,00	4698,8	884,2	2,13	11,31	24,20	2,11	3,48	0,00	0,05	0,37	23,49	0,00	1,9
20,02	0,00	0,00	0,00	0,00	0,00	0,00	3207,9	504,2	3,12	19,83	16,52	1,97	3,51	0,00	0,05	1,78	16,04	0,00	1,9
23,02	0,00	0,00	0,00	0,00	0,00	0,00	13815,0	2454,7	0,72	4,07	71,15	10,19	53,43	0,00	0,25	7,38	69,08	0,00	22,3
48,01	0,00	0,00	0,00	0,00	0,00	0,00	2508,4	475,8	3,99	21,02	12,92	1,74	4,22	0,00	0,04	1,66	12,54	0,00	2,1
27,03	937,50	0,00	1379,9	0,00	0,00	0,00	11845,0	1942,5	0,84	5,15	61,00	5,91	5,99	0,00	0,15	11,82	59,23	0,00	4,2
10,02	850,00	184,38	0,00	0,00	64,53	0,92	6751,4	1133,5	1,48	8,82	34,77	2,69	13,30	0,00	0,07	18,72	33,76	0,00	5,6
59,05	250,00	0,00	220,11	0,00	0,00	0,00	6542,4	1229,9	1,53	8,13	33,69	1,17	3,75	0,00	0,03	9,62	32,71	0,00	1,7
10,05	804,25	175,33	123,16	0,00	61,37	0,88	8296,9	1591,7	1,21	6,28	42,73	1,87	16,46	0,00	0,05	22,27	41,48	0,00	6,4
17,07	130,43	0,00	77,93	0,00	0,00	0,00	1353,8	248,3	7,39	40,27	6,97	0,60	0,90	0,00	0,01	0,23	6,77	0,00	0,5
17,10	400,00	0,00	556,24	0,00	0,00	0,00	3485,9	630,2	2,87	15,87	17,95	1,22	2,11	0,00	0,03	1,19	17,43	0,00	1,1
180,11	0,00	0,00	63,68	0,00	0,00	0,00	1404,3	231,7	7,12	43,16	7,23	0,94	2,62	0,00	0,02	1,00	7,02	0,00	1,2
180,06	0,00	0,00	0,00	0,00	0,00	0,00	2246,0	391,4	4,45	25,55	11,57	1,77	4,03	0,00	0,04	1,99	11,23	0,00	2,0
98,02	450,76	45,59	165,34	0,00	15,96	0,23	11969,3	2274,9	0,84	4,40	61,64	6,81	19,11	0,00	0,17	6,34	59,85	0,00	9,1
8,04	207,00	0,00	300,27	0,00	0,00	0,00	8694,4	1372,7	1,15	7,28	44,78	3,10	6,98	0,00	0,38	28,13	43,47	0,00	3,6

		LCI / olive grove		Nileas: Average values per parcel for all the years - Interventions p.1																
				FERTILIZATION								PRUNING								
Hectares	μάρτυρας Control/εφαρμογή Interv.	Organic/Conventional	Irrigated/Rainfed	Fertiliser (N) chemical Kg/Ha	Fertiliser (P) chemical (Kg/Ha)	Fertiliser (K) chemical(Kg/Ha)	Disposal, plastics, mixture, 15.3% water, to municipal incinerat	Kg of Compost/Ha	Transportation of fertilizers (tKm/Ha) - Operation barge RER U	Transport, lorry >16t, fleet average/RER U	Transportation of fertilizers (tKm/Ha) - EVOO -2012-13- Tran	Petrol, two-stroke blend, at regional storage/RER U (Kg/Ha)	1 kg Lubricating oil, at plant/RER U	Diesel, at refinery/RER U for weed / secondary branch smash	Transportation of pruned wood (tKm/Ha)-Transport, tractor	Transport, barge/RER U (tKm/Ha)(Fuels)	Transport, lorry >16t, fleet average/RER U	Wood Waste - Wood mass for burning in bonefire -2012-13-	1 hr Chain sawing I (IDEMAT 2001)	Smasher operation (Hr/Ha)	Chopper operation (Hr/Ha)
0,86	Interv.	Organic	RF	70,30	34,14	40,80	0,01	1890	0,00	4,07	13,42	1,38	0,03	11,22	4,22	0,00	6,83	0	8,55	0,00	2,08
1,1	Interv.	Convent.	RF	21,59	3,31	5,57	0,01	1023	0,00	3,18	5,16	2,38	0,05	30,54	3,00	0,00	3,73	0	6,89	0,00	1,39
1,1	Interv.	Convent.	IRR	84,23	28,57	35,75	0,32	1091	0,00	111,0	7,04	3,88	0,08	23,08	4,43	0,00	9,53	0	12,58	0,00	1,58
1,27	Interv.	Convent.	RF	133,7	22,65	43,33	0,35	787	0,00	121,3	6,47	2,00	0,04	16,50	2,17	0,00	6,04	295	9,06	0,89	2,37
1,3	Interv.	Convent.	RF	36,85	19,12	43,87	0,08	981	0,00	26,92	7,50	2,00	0,04	58,50	5,40	0,00	4,34	385	8,53	0,00	1,52
2,2	Interv.	Organic	RF	43,26	22,31	70,34	0,14	1159	0,00	48,70	9,07	6,31	0,13	20,44	6,75	0,00	8,99	0	12,75	0,00	1,09
3	Interv.	Organic	RF	17,93	8,42	24,48	0,06	517	0,00	20,48	3,83	2,50	0,05	11,10	4,04	0,00	2,33	417	6,27	0,00	0,39
1,3	Interv.	Convent.	RF	52,12	1,13	4,13	0,09	769	0,00	32,31	4,31	2,88	0,06	54,69	3,13	0,00	3,23	0	5,80	0,00	1,02
4,37	Interv.	Organic	IRR	28,74	20,37	28,28	0,22	458	0,00	77,69	5,86	3,13	0,06	6,11	1,23	0,00	4,07	0	6,57	1,93	0,43
0,53	Interv.	Organic	IRR	37,74	24,62	47,05	0,08	708	0,00	26,42	6,86	1,00	0,02	12,22	2,36	0,00	4,07	560	9,31	2,12	0,36
0,8	Interv.	Convent.	IRR	25,63	1,84	6,56	0,00	1250	0,00	0,00	6,25	1,25	0,03	16,69	2,83	0,00	5,14	0	8,99	0,00	1,40
1	Interv.	Organic	IRR	20,15	1,50	39,28	0,11	1025	0,00	39,38	5,69	1,25	0,03	8,94	2,09	0,00	5,50	703	11,98	3,09	0,28
1,2	Interv.	Convent.	IRR	107,1	17,89	70,10	0,48	833	0,00	166,5	6,55	4,00	0,54	14,98	3,67	0,00	3,31	156	6,73	0,00	0,44
1,5	Interv.	Convent.	IRR	36,8	10,26	13,23	0,11	767	0,00	39,7	4,40	1,75	0,04	19,15	3,43	0,00	3,40	0	7,49	2,34	1,08
2,06	Interv.	Convent.	IRR	117,9	4,69	7,29	0,32	631	0,00	113,7	5,16	2,25	0,05	120,4	2,94	0,00	3,17	387	7,25	0,00	1,17
3,5	Interv.	Organic	IRR	53,63	33,88	114,6	0,23	1093	0,00	81,9	10,67	12,13	0,24	24,93	10,96	0,00	11,57	0	17,01	0,00	1,40
3,78	Interv.	Organic	IRR	14,22	10,84	26,46	0,05	231	0,00	18,5	2,77	3,13	0,06	11,98	2,66	0,00	2,26	472	5,10	1,07	1,13
1,52	Interv.	Organic	IRR	26,51	11,12	13,27	0,00	855	0,00	0,0	5,51	2,50	0,05	3,75	1,39	0,00	2,88	237	5,54	0,71	0,00
0,87	Interv.	Organic	IRR	48,28	30,20	30,60	0,00	1006	0,00	0,0	8,62	1,63	0,03	7,50	3,53	0,00	1,83	276	6,55	1,16	0,32
0,6	Interv.	Convent.	RF	48,08	26,75	81,63	0,30	1208	0,00	106,0	7,56	1,13	0,02	0,00	2,88	0,00	4,37	917	9,73	2,81	1,53

Nileas: Average values per parcel for all the years - Interventions p.2

	SOIL MANAGEMENT									HERBICIDE TREATMENTS					PLANT PROTECTION						
paece/ code	1 ha Tillage, ploughing/CH U	1 ha Tillage, rotary cultivator/CH U (of project Ecoinvent unit	EVOO Goose foot cultivator (Kg Tractor+equipment / Ha for a	1 ha Mowing, by rotary mower/CH U	1 ha Tillage, harrowing, by spring tine harrow/CH U	Harrow - Fuel consumption (Kg Tractor+equipment / Ha for a	Hand-held ripper (Kg equipment / Ha for all treatment times)	Fuel consumption all (Kg Petrol - Diesel oil/Ha)	Lubricating oil, at plant/RER U (Kg/Ha)	Glyphosate, at regional storehouse/RER U (Lt/Ha)	Water, well, in ground used for spray solution - (m3/Ha) (Kn	Diesel, at refinery/RER U for spraying - (Kg/Ha)	Transport, lorry >16t, fleet average/RER U (Kg/Ha)	Packaging waste, plastic -(Kg/Ha)	1 kg Pesticide unspecified, at regional storehouse/RER U (Kg/	Water, well, in ground used for spray solution - (m3/Ha) (Knc	1 kg Diesel, at refinery/RER U (Kg/Ha)	Transport Barge / RER U (tKm/Ha)	Transport, lorry >16t, fleet average/RER U (Tkm/Ha)	EVOO - Transport, tractor and trailer greek olives (tKm/Ha)	1 kg Disposal, plastics, mixture, 15.3% water, to municipal inc
40,04	0,00	0,00	0,00	0,00	0,00	0,00	0,65	5,43	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,02	0,00	0,00	0,00	0,00	0,00
58,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01	0,00	2,77	2,26	0,12	0,02	1,00	5,04	0,00	1,88	0,00	0,01
200,01	0,00	0,00	0,00	1,38	0,00	0,00	0,83	11,73	0,00	0,00	0,01	0,00	0,16	0,01	0,27	1,24	0,00	0,00	0,30	0,00	0,03
41,03	0,00	0,64	0,00	0,00	0,00	0,00	0,32	5,13	0,00	0,00	0,00	0,46	0,23	0,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00
73,02	0,00	0,00	0,00	0,98	0,00	0,00	0,00	7,97	0,00	0,00	0,90	0,00	0,00	0,00	0,19	0,16	1,34	0,00	0,83	0,01	0,03
8,01	0,00	0,00	0,00	2,20	0,00	0,00	1,65	11,78	0,00	0,00	0,00	0,00	0,00	0,00	0,26	0,20	1,64	0,00	0,75	0,00	0,02
21,01	0,00	0,00	0,00	1,50	0,00	0,00	1,50	7,13	0,00	0,00	0,00	0,00	0,00	0,00	0,12	0,20	0,24	0,00	0,35	0,00	0,02
211,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01	1,22	0,54	0,01	0,00	0,10	1,01	0,00	0,36	0,00	0,00
30,04	0,00	3,28	0,00	2,19	0,00	0,00	1,09	11,99	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
10,03	0,00	0,00	0,00	0,40	0,00	0,00	0,13	15,00	0,00	0,00	0,00	0,00	0,00	0,00	0,18	0,42	6,09	0,00	2,55	0,01	0,04
180,10	0,00	0,00	0,00	0,00	0,00	0,00	0,40	3,84	0,00	0,00	0,02	0,00	0,03	0,00	0,08	0,54	1,29	0,00	0,58	0,00	0,01
10,04	0,00	0,00	0,00	0,75	0,00	0,00	0,25	15,42	0,00	0,00	0,00	0,00	0,00	0,00	0,18	0,15	1,03	0,00	0,68	0,00	0,03
27,04	0,00	0,00	0,00	0,60	0,00	0,00	0,60	16,57	0,00	0,00	0,79	0,00	0,00	0,00	0,02	0,21	0,00	0,00	0,04	0,00	0,00
180,08	0,00	0,00	0,00	0,38	0,00	0,00	0,38	3,23	0,00	0,00	0,00	0,00	0,02	0,00	0,05	0,45	0,85	0,00	0,40	0,00	0,01
59,01	0,00	0,00	0,00	0,52	0,00	0,00	0,52	1,34	0,00	0,01	0,00	9,71	4,40	0,09	0,21	1,32	17,04	0,00	6,20	0,00	0,02
8,03	0,00	0,00	0,00	6,13	0,00	0,00	3,50	20,53	0,00	0,00	0,00	0,00	0,00	0,00	0,21	0,17	1,38	0,00	0,63	0,00	0,01
55,03	0,00	0,00	0,00	3,78	0,00	0,00	0,95	4,85	0,00	0,00	0,00	0,00	0,00	0,00	0,88	0,27	2,53	0,00	1,29	0,01	0,04
17,04	0,00	0,00	0,00	1,14	0,00	0,00	0,38	10,53	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,16	0,81	0,00	0,35	0,00	0,01
12,01	0,00	0,00	0,00	1,31	0,00	0,00	0,00	34,13	0,00	0,00	0,00	0,00	0,00	0,00	0,49	0,18	4,00	0,00	2,44	0,01	0,10
44,01	0,00	0,00	0,00	0,45	0,00	0,00	0,15	3,22	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,48	0,92	0,00	0,37	0,00	0,00

Nileas: Average values per parcel for all the years - Interventions p.3

	IRRIGATION						HARVEST											
pacel code	Water (m3/Ha)	1 kg Diesel, at refinery/RER U (Kg/Ha)	Electricity, low voltage, production GR, at grid/GR U (KWh/Ha	Transport Barge / RER U (tKm/Ha)	Transport, lorry >16t, fleet average/RER U (tKm/Ha)	EVOO - Transport, tractor and trailer greek olives (tKm/Ha)	Kg Olivefruit / Ha	Kg Oliveoil / Ha	Area per Kg of Olive fruit (m2/Kg)	Area per Kg of Olive oil (m2/Kg)	Transport of crews	Petrol, two-stroke blend, at regional storage/RER U (Kg/Ha)	Kg petrol for vibrator / Ha	1 kg Lubricating oil, at plant/RER U	Kg lubricant for chain saw / Ha	Diesel, at refinery/RER U (Kg/Ha)	Transport of olive fruit tractor & trailer (TKm/Ha)	Transport Barge / RER U (tKm/Ha)	Transport, lorry >16t, fleet average/RER U (tKm/Ha)
40,04	0,00	0,00	0,00	0,00	0,00	0,00	6812,8	1069,0	1,47	9,35	35,09	1,44	4,99	0,00	0,04	1,72	34,06	0,00	2,26
58,01	0,00	0,00	0,00	0,00	0,00	0,00	9792,3	1639,9	1,02	6,10	50,43	1,95	4,85	0,00	0,05	4,16	48,96	0,00	2,40
200,01	0,00	0,00	0,00	0,00	0,00	0,00	6238,3	926,8	1,60	10,79	32,13	2,21	7,02	0,00	0,05	8,05	31,19	0,00	3,25
41,03	0,00	0,00	0,00	0,00	0,00	0,00	6548,5	1108,6	1,53	9,02	33,72	4,71	10,78	0,00	0,12	9,16	32,74	0,00	5,46
73,02	0,00	0,00	0,00	0,00	0,00	0,00	11189,2	1998,2	0,89	5,00	57,62	3,39	10,15	0,00	0,08	2,52	55,95	0,00	4,77
8,01	0,00	0,00	0,00	0,00	0,00	0,00	4241,8	702,9	2,36	14,23	21,85	2,22	2,36	0,00	0,12	1,70	21,21	0,00	1,64
21,01	0,00	0,00	0,00	0,00	0,00	0,00	4740,8	896,9	2,11	11,15	24,42	4,55	11,93	0,00	0,11	7,00	23,70	0,00	5,81
211,01	0,00	0,00	0,00	0,00	0,00	0,00	1642,3	324,4	6,09	30,82	8,46	0,35	1,42	0,00	0,01	5,04	8,21	0,00	0,62
30,04	0,00	0,00	0,00	0,00	0,00	0,00	5658,4	999,6	1,77	10,00	29,14	3,90	10,77	0,00	0,10	26,71	28,29	0,00	5,17
10,03	306,60	70,97	246,32	0,00	24,84	0,35	7374,1	1315,3	1,36	7,60	37,98	2,06	11,89	0,00	0,05	15,44	36,87	0,00	4,90
180,10	0,00	0,00	65,28	0,00	0,00	0,00	2817,5	528,1	3,55	18,93	14,51	1,69	4,61	0,00	0,04	3,07	14,09	0,00	2,22
10,04	118,75	27,66	65,28	0,00	9,68	0,14	7820,0	1240,8	1,28	8,06	40,27	3,69	8,45	0,00	0,09	5,31	39,10	0,00	4,28
27,04	479,17	0,00	684,95	0,00	0,00	0,00	4381,3	727,1	2,28	13,75	22,56	1,61	2,10	0,00	0,04	5,84	21,91	0,00	1,31
180,08	383,33	0,00	258,20	0,00	0,00	0,00	3355,0	545,0	2,98	18,35	17,28	2,15	4,30	0,00	0,05	3,28	16,78	0,00	2,28
59,01	368,93	0,00	338,59	0,00	0,00	0,00	9013,1	1584,1	1,11	6,31	46,42	1,54	4,36	0,00	0,04	11,69	45,07	0,00	2,08
8,03	195,43	0,00	283,48	0,00	0,00	0,00	9170,8	1459,6	1,09	6,85	47,23	3,23	5,52	0,00	0,34	19,61	45,85	0,00	3,18
55,03	563,49	0,00	585,64	0,00	0,00	0,00	4170,5	730,1	2,40	13,70	21,48	2,89	5,23	0,00	0,07	3,35	20,85	0,00	2,87
17,04	355,26	0,00	430,18	0,00	0,00	0,00	8846,0	1649,1	1,13	6,06	45,56	4,80	4,51	0,00	0,12	1,77	44,23	0,00	3,30
12,01	597,70	0,00	825,32	0,00	0,00	0,00	7655,2	1380,2	1,31	7,25	39,42	5,51	4,98	0,00	0,14	5,65	38,28	0,00	3,72
44,01	0,00	0,00	0,00	0,00	0,00	0,00	7117,5	1062,1	1,40	9,42	36,66	4,05	12,22	0,00	0,10	28,14	35,59	0,00	5,73


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