

Improving agribusinesses in the Balkan region in the framework of environmentally sustainable strategies

The cases of a winery and a vegetable processing company

¹Doula, M.K., ¹Kavasilis, S., ²Zorpas, A.A. ¹Troyanos, Y., ¹Kolovos, Ch., ¹Papadopoulos, A., ¹Roukounaki, E., ¹Kosmidis, S.

¹Benaki Phytopathological Institute, Department of Phytopathology, Lab of Non Parasitic Diseases, 8 Stef. Delta, 14561 Kifissia, Greece, email: <u>mdoula@otenet.gr</u>, tel: +302108180321
²Open University of Cyprus, Faculty and Pure of Applied Science, Environmental Conservation and Management, Laboratory of Chemical Engineering and Engineering Sustainability, Giannou Kranidioti, 33, P.O. Box 12794, 2252, Latsia, Nicosia, Cyprus



Carbon labeling for agricultural products is gaining importance



Purchasing will be affected by carbon labels:

"Our study indicates that when consumers receive appropriate guidance about embodied carbon emissions, they may adjust purchasing preferences and favour green-labelled goods, collectively representing about 5% of total purchases." Vanclay et al (2010)



The target: Farms with the lowest possible water, carbon and waste footprint

The three main outputs

- Common Balkan Protocol, namely "Balkan protocol for sustainable farms and production of labeled products with low environmental footprint"
- A web-based application tool, namely ROAD, to assist protocol integration into farms production lines and procedures. The tool will allow monitoring, measurement and calculation of water-, waste and carbon footprint in all steps of the production line (from field to the market).
- A ready-to-implement "Roadmap for sustainable Balkan farms" and governmental instruments in terms of reduction of waste/water/carbon footprint of the Balkan agricultural sector



Project co-funded by the European Union and National Funds of the participating countries

icipating countries



A winery in Naoussa, located in Central Macedonia, Greece and a vegetable processing company in Kavadarci, North Macedonia were selected.





Studying of processes and procedures started in September 2018, aiming at improving the sustainability level of the companies and reducing their carbon, water and waste footprint.

Kir-Yianni S.A Ktima Kir-Yianni (Kir-Yianni Winery)

ini Esta κυρ-Γιάννη







Stage 4: Destemmer and Sorting





Stage 3-Sorting



Stage 7-Maturation













Stage 8-Wines mixing and Bottling



Stage 9: Packaging - Storage







- Cultivation practices (!!!!)
- Vehicles and fuels (transports only inside the area for this case)
- Combustions (for heat or other purposes)
- Energy consumption
- Water sources and grey water discharge
- Waste discharge
- Refrigerators
- Materials used (glass, plastic, metal, corks, paper, wood) and materials recycled
- Renewable energy sources (sun, water, air)
- others





Peper paste making plant

1st stage – FIELD



2nd stage-From field to the processing plant-ELAVATOR and SHORTING BELT





3rd stage-ROASTING



5th stage-STORAGE - REFRIGERATOR



4th stage-WASHING ROASTED PEPPERS



6^h stage-KITCHEN-STAINLESS STIRRER-BOILER-PULP MAKING





7th Stage- Filling MASCHINE FOR PULP





8TH stage-BOTTLES STERILIZATION

10TH stage STORAGE AND OTHER auxiliary areas



9th Stage-LABELING PALLETIZING



Balkan-Mediterranean BalkanRoad





BalkanRoad



	Main agronomic characteristic	s and LC Invent	ory data of the grape cu	Main characteristics and LCI data of the wine production/Vinification					
Life Cycle Analysis	*Characteristics	Linit*	Grane	Origin/data quality	Characteristics/LCI data	Unit*	PDO Red Wine	Origin/data quality	
	characteristics	Onit	Grape	Origin/ data quality	Grape to Wine Yield	kg/L	1.67 (1.25 for FU)		
	Cultivar		Xinomavro		Operation (Duration)	days y ¹	300		
	Vine age	years	30		Density	plants ha-1	400		
	Density	plants ha ⁻¹	400		Production capacity (Grapes processing)	tyi	25 Winery 6 Bottling	Survey	
	Grape Yield**	t ha' ¹	9.4		Production capacity (FU)	bottles $\gamma^{\rm S}$	8,000		
Interreg	Harvest period	-	August - October	Survey	Total power of mechanical equipment	kW	18 Winery 5 Bottling		
Agricultural Product: Rod Wine – Ktima Kyr Yianni	Irrigation technique	-	Surface/Sub-surface drip irrigation		Bottling				
			June-July (1-2 times		Wine	mi,	750		
Rampista: 0.75 L bottle	Irrigation period	-	per year)		Glass	kg	0.57		
Variety : 100% Xinomavro (old vines)	Fertilizers application rate				Cork	8	4.2	Survey/Ecoinvent	
Market Value: 14.17 euro Ageing: 10.15 years	N (ac N)	- ka had	200	Suprau/Ecologia	Capsule	8	1.3		
Celtaring: 218 months in 225 L and 500 L French and American oak casks plus further ageing in bottle for another 6 months		Ng na	200	Survey/cconvent	Packaging	8	1.1		
TosterCrip characteristics. Rare aromatic complexity with interior tanini structure and robust acidity	F (as F ₂ O ₅) K (as K ₂ O)	kg ha '	200	Survey/Ecoinvent	Corrugated cardboard box (six-bottle)	8	50		
	Pesticides application rate				Wooden pallet	kg	0.0160	Survey/Ecoinvent	
Analytical Data SIX 2.42 5.4 pt 2.7 No	Fungicides	L ha ⁻¹	32	Survey/Ecoinvent	Plastic film	8	0.7		
kuda ai Taratti Yana kusha Penda	Insecticides	L ha ^{.1}	3.2	Survey/Ecoinvent	Distibution				
Andly Andly Enger inter	Other				Number of pallets per truck	number	33		
					Number of boxes per pallet	number	100		
	Sultur	kg ha''	30	Survey/Ecoinvent	Number of bottles per box	number	6	Survey/Ecoinvent	
	Irrigation water	m³ ha¹	450	Survey/Ecoinvent, Agribalyse	Transport to shipment point Other	km	94.1		
	Flactedate	MI had	1 000	Survey/Ecoinvent,	Water	L	0.25	Survey/Ecoinvent,	
	Electricity	wu na .	1,800	(PPC, 2017)	Electricity	MU	0.67	Survey/Ecoinvent, (PPC, 2017)	
	Diesel consumption	L ha'*	210	Survey/Ecoinvent	Diesel consumption	ι	0.06	Survey/Ecoinvent	
	Lubricants	L haʻ ¹	6.3	Survey/Ecoinvent	Lubricants	ι	0.02	Survey/Ecoinvent	



Life Cycle Analysis

The impact assessment of the production of 0.75L red wine from the pilot agribusiness in Greece (phases of classification and characterization defined by the standards of ISO 14040-14044 series)

Impact for each category and cumulative energy demand of the red wine production investigated

Impact Category	Unit	Value
Acidification potential (AP)	kg SO₂-eq·FU ⁻¹	1,98E-02
Eutrophication potential (EP)	kg PO₄-eq·FU ⁻¹	5,62E-03
Global warming potential (GWP) (100 years)	kg CO ₂ -eq·FU ⁻¹	1,10E+00
Ozone depletion potential (ODP)	kg CFC-11-eq·FU ⁻¹	2,21E-07
Photochemical ozone creation potential (POCP)	kg C₂H₄-eq·FU ⁻¹	4,48E-04
Cumulative energy demand (CED)	MJ·FU -1	2,13E+01
FU: Functional unit = one 0.75 L bottle of red wine - Xine	omavro variety	

According to the LCA results, the production of one 0.75 L bottle of red wine from the Greek pilot site

- consumes 21.3 MJ and
- releases 1.1 kg CO₂-eq
- 1 kg of buttermilk in Canada
- 1 kg of yogurt in Canada releases 1.5 kg CO₂
- A new car releases 0.12Kg CO2/km....9 km)



LCA - Significant conclusions

BalkanRoad

Contribution analysis revealed that among studied phases, the highest contribution impact was assigned for the grape cultivation **phase.** This result is mainly attributed to the high CO_2 and N_2O emissions given off during the fertilizers' manufacture and volatilization and leaching of nitrogenous compounds from N-based fertilizers' application.

The phase of **bottling had the second highest** contribution to impact categories, due to energy consumption for the production of glass bottles and other bottling accessories (cork stoppers, caps and paper labels)



Impacts characterization results of red wine's life-cycle from cradle to winery gate; Relative contribution of impact category indicators among each phase production

Packaging processes prior to distribution showed important contributions for GWP (18%) and AP (15%). In the case of ODP, the packaging phase was responsible for 17% of the cumulative impact (third contributor) due to emissions of Halon and R114 used for the production of cardboard boxes.



The ROAD tool-A web app

BalkanRoad

A software for the calculation of water, waste and carbon footprint of the production line



Why BalkanROAD tool....

Because

- It is adjusted to the particularities of Balkan-med agribusinesses
- It is user friendly, providing a visualized interface to "build your agribusiness", assisting the calculation for each separate area and processing line
- Provides alternatives to reduce the footprint and develop future plan for the enterprise
- It provides cultivation consultancy and reuse of organic residues on soil

	Electricity Conservation: GHG Savings from Electricity Conservation												
	On this tab, a user can select a state or national version of the non-baseload output emissions rate for calculating GHG emission reductions from electricity conservation. These rates are from eGRID (EPA's Emission and Generation Resource Integrated Database). "Non-baseload" refers to the output emissions rate of GHG gases (CO ₂ , CH ₄ , and N ₂ O) from combustion generators, weighted towards those that operate during peak demand. "Non-baseload" excludes emission rates from nuclear, hydro, geothermal, solar, and wind generators because they operate at full capacity even during baseload (low) demand. Peak demand is what is affected by energy efficiency and clean energy projects.												
	Electricity Concentration Off Data												
Type of Electricity Conservation	Electricity Conservation CFL Bulbs Other												
How to use this tab: Instructions to obtain MTCO2e		Select a state or U.S. National to apply the state's emission factor or the national emissions factor. Enter the annual amount of electricity conserved and choose unit from the drop-down menu. The next column converts all units to kWh. The final column displays the reduction in MTCO ₂ e.											
		MTCO ₂ e = Electricity const the eGRID non-baseload of National rate: 0.000709 M State rate: (0.000071 to (For national and state for	erved * (ki output emit ATCO ₂ e/kW 0.001131 M nulas and o	Vh/user-specified units)* (n ssion rate [MTCO ₂ e/kWh]) fh MTCO ₂ e/kWh) defails see Notes below.	ational or state value of	MTCO ₂ e = Number of bulk bulb)* (national or state v baseload output emission MTCO ₂ e/kWh) The rest of the description Electricity Conservation.	is * (49 kwh per year/ alue of the eGRID non- rate, expressed in is the same as for						
Calculation Description	Both national and state versions of the rate (the eGRID non-baseload output emission rate) cover three gases: CO ₂ emissions factor (MTCO ₂ e/kWh) + CH ₄ emissions factor (MTCO ₂ e/kWh) + N ₂ O emissions factor (MTCO ₂ e/kWh).												
	U.S. (Select)	Electricity Conserved (Input value)	reported (Select)	Electricity Conserved (kwh)	GHG Reduction (MTCO ₂ e)	replacing conventional bulbs	GHG Reduction (MTCO ₂ e)	Input	GHG Reduction (MTCO ₂ e)				
Example		GQ Co. worked with a faci electricity through a conse	lity in North rvation act	Carolina that has conserve wity.	ed 10,000 kwh of	GQ Co. replaced a total of lightbulbs with CFL bulbs i one year.	f 1,000 conventional n 8 NC facilities during						
	NC	10.000	kwh	10.000	8,464	1.000	41,472						
Total Input- All Projects													
Project 1													
Project 2													
Project 3													
Project 4													
Project 5							100 C						
Project 6				-									
Project 7													
Project 8					100 C		100 C 100 C 100 C						
Project 9													
Project 10				the second s	100 C 100		100 C 100						
Color Key													
User enters value													
User selects option from drop-													
down menu													

and the second se		Real Andrea P	mahifing mi	to the test	a december i											and an end of the	-
001 610	ταγωγή Σχέ	οιο Διαταξη	σελίδας Τύτ	τοι Δεσομέν	α Αναθεωρη	τοη προβολ	η								12 K	οινή χρήση	0
ľ Å	Arial	~ 10	w A* A*	= = =	÷~ 8	Αναδίπλωση κειμ	utvou	Γενική	×	E • E	- -	· 🚟 • 5	💌 · İ	∑ Autó ∑ Dius	ματη άθροιση 👻	<u>6</u> 7 ~	
vau 🔩	B <i>I</i> <u>∪</u>	• 🗆 • 2	<u>∧</u> ~ <u>∧</u> ~	$\mathbb{R} \cong \mathbb{R}$	1 I I	Συγχώνευση και ι	κεντρόρισμα ν	¤ 8 • % 9	58 48	ντό άρους ως	φοποίηση Στυλ πίνακα κελιών	Εισογωγή Δι	αγραφή Μαρφοπο	hση × Anal	kaleń v	Ταξινόμηση και φίληρο	Euau
- ‡ - ×	$\sqrt{f_x}$																
A		c	0	E.	1	0	н		3	ĸ	L		N	0	P	0	
heet 2: HFC /	and PFC Emission	a from Refrigeration	AC Equipment: Life	cycle Stage Appro	sch for Users												
Emissions																	
nissions are amin	asions that are produced	from the operation of any	controlled or owned anti	w.													
wel to determine t	The following factors for eac Refrigerant and to fill real Refrigerant and to fill real Total Michael of the eac Total Michael of the eac Total original fail over the Total original fail charge of Refrigerant recovered from Refrigerant recovered from Refrigerant recovered from	chrolingenert used er eguipment agement variafitted to use this agement variafitted to use this er eguipment fredringe aggioment fredringe aggioment fredringe aggioment m saufument that is netrafitted is m saufument that is netrafitted	ndrigerant 6 Vis roftigerant away from this roftigerant to 1 away from this roftigerant to	e diferent refrigerent a different refrigerent													
ovides CAVPs for	different refrigerants as an	velorance.															
state in the final r	sport if different values t	than the default factors are	a used, including their sou	rta.													
r code																	
r sode: 1 user entery:																	
ter sociale ny user entery: user entry: stue:								1									
nter sode: tory user entery: d user entry: todae: southet value: tycle Stage Ap	proach: Emission	s from Users of Air (Conditioning and Rat	tigeration Equipme	nt			•									
r sode y van oftry aar oftry dae sidet value cle Stage Ap Sep 1	oproach: Emission Ster 2	s from Users of Air C Step 3	Conditioning and Ra	trigeration Equipme	evit Step 6	Sec.7	She B	Dec 1	See 1	Sing.11	5mp 12	5mp 13	5mp 14	5mp 15	Dec 1	Ship 17	
r sole ry use entry user entry due user the sole sole Stage Ap Sho 1 Environment and	sproach: Emission Stel 2 Refigerent Too	s from Users of Air 0	Conditioning and Ra	bigeration Equipme (No.5 station Emissions Jologr	nt Sing 6 anni	5mp.7	Step 8 Use Emission (bg)	5mc 9	Step 10 Final Use	Step. 11 and Disposal Emissions.	Step 12 Mogramal	5mp 13	5mp 14	Since 15	Die 1	5kg.17	-
r sode ry uar erky: uar erky: doe uater solar cle Stage Ap Stop 1 Esciencet.act 2 A	sproach: Emission Step 2 Religence Type 9	s from Users of Air (9mc) C	Conditioning and Ra Sing 4 D	bigeration Equipme Stop 5 shtten Emissiona Jologe E	off Sing 6 ensi r	9mc7 0	Sing 8 Use Emissions (kg) H	510.9	Step 10 Final Use J	Sing: 11 and Disposed Emissions : K	Step 12 Megrami L Radigarant recovered	Sine 13	Ding 14	Sine 15 Envir O	Step 16 there P	5mg-17	
ry user orkey ouer orkey ouer orky obscinet value role Stage Ap Stop 1 Ecolomistic and 1 A yes of Air Microsoling and drigonation	oproach: Emission Sng 2 Satisaret Tare D	s from Users of Air (Stop) C. Refigured used to 10	Conditioning and Re Step 4 Inst D Refrigerent used to fill Multiplement instruction	Figeration Equipme Inc.5 date Enteriors John E Total ful sharps of new explormed units this	nel Sing 6 real r Tand full sharps of rejulyment individual to	Step 7 0 Total installation Emissions	Shee 8 Use Embadona (haj) H Rahigasant used to service applyment (used service and receiver)	Step 9 r Original total full charge of apagement that as	fing 12 Final Use 2 Total angument resolution anguptum this anguptum this	fing.11 unit Disposed Emissions: K Rafrigarant recovered	Sing 12 bitogramst Kathiganat recovered from equipment returbled any from the entitiest	Dec 13 W Total Find Use and Dispesal Embedoes	Step 14 N Refrigerent Emissions (Mogrami)	Sec 15 Designed Convention Factor	Step 16 storm p OWP of Ratigerant Tota 1	Step 17	-
render under entern and entry: And under And under Stop 1 Decement and A per of Air forwing and forwing and forwing and speed air	sproach: Emissions Stigaret Tae B Rehistoret Dael	s Rom Users of Air O 910-7 C Ruligenet used is 18 set abatemet	Conditioning and Ra Sing 4 D Refrigurant under to different une this officered	bigeration Equipme Days 5 alation Environ 2010gr E Statistic charge of new explorment using this mitigenet	off Stop 6 and r Total full-sharps of repopurated totartised to use this unbigated	Step 7 Q Total installation Emissions Q+C+D+E+F	Sing 8 Use Emissions (bg) H Ratingenet used to sarciar supplement (bg) receiling and rethread	Step 9	Step 10 Final Use 4 Tatal original full charge dequipment to a d'Imeri antigenet.	Dep 11 end Discosed Emissions : K Refrigerent movemed From refring, resultment	fing 12 Mingrand L Rafigarat nonvent from equipment into adigate this adigate	Since 13 $\label{eq:second} W$ To shall Final Use and Disposal Embeddens $M = (+, 1, \infty, 1_{\rm e})$	fing 14 N Rothgarat Emissions (Mogrand) N + © - H + M	Sec 15 0 Conversion Faster Decrembingment	Step 16 p ONP of Ratigerant Step Table 1	Dep 17 Q CO3-Equivalent Ententions (source Q + N x Q x P	
render under entry: our entry: her net under sind under Sind 1 Sinder Sind 1 Sinder Sind 1 Sinder Si	sproach: Emission 96:2 Stituent Tee 9 Refigeret Geel 200-156	s ham Users of Air C	Conditioning and Re Step 4 D Refrigurent coad to fit repiperent incontract to one bits of second	Bigeration Equipme Inc.5 E E Total full charge of new explorement using bits refigurent	Sing 5 mell r Total full sharps of repayment information are bits of special	Step 7 9 State insulation Entersons 0+ 5+ D : E : F 00	Stop 8 Une Disalations (Dat) H Refinguence (used to ansource apolynemic (used ansource of colorade	Dec P I Criginal total full charge of equipment that is writing or all this phase writing	Step 10 Find Um 7 Tatal original full obargo of equipment start starting and your bin softward. Softward	Dec 11 erd Titgend Enhances K Fahligened movement Fran Selfing spigment	Sep 12 Mispanel L Rahiparat recovered from expansion control and say from control and say fro	Dep 10 W Total Find Use and Dispetal Enhances M+1+J+X+1, 500	Step 14 N Retrigerent Emissions (Mogram) N + S = H + M	Sec 15 Brit O Convention Flatter (Convention Flatter (Convention Flatter (Convention Flatter)	Step 11 p OWP of Radigenet Step Table 1 130	Step 17 Q 600-Equivalent Emissions prome Q = N1 C 1 P	0 F-
rode your entry and entry and obse designed obse Cle Stage Ap Sho 1 Devicement and A pe of Air Moning and Devicement	oproach: Emission Stej 2 Editared Tate Rafigered Date HTC: 15te HTC: 25te	s from Users of Air O Sec3 C Religned cart to 18 ms religned	Conditioning and Re Stry 4 D Refrigerent used to fill repriment nontheast to used bits of based	bigeration Equipme Inc.5 E E Sota full charge of new equipment using this mitiated	Ing 6 mail r Test full sharps of reputation introduced to use this indigenest	5%27 0 7 stat bestation Emission 0 + C + D - E - F 6X 6X	Sing 8 Une Emission (Ng) H Refigurant used to sarche supplement (our contrast of subarget contrast of subarget con	Step 9 1 Conjunal total full design of spopmane that is writted or solid is other written	Sing 10 Find Line 2. Tatal original full design and original full design and space that and spac	She 11 and Disease Echivity at Kalingstad movement From online, exclosered	Sing 12 Mingrent L Rahigarant nooveral from expansion then expansion the addigarant to a different official	Since 10 M Total Final Use and Disposal Embeddens M = 1 + J + X + 1, COX	Sing 14 N Retrigerant Emissions (Mingrant) N = Q = 21 + M Q = 0	Dep 15 Emil O Conversion Faster Decrembingment 1 20E-00 1 20E-00	Step 39 stores pr CWP of Radigenet Ster Table 1 5.30 5.30	Step 17 Q CO3-Quivatert Bittations (some G+N x Q x P	o o = =
r code: 1 var entry: are entry: are entry: are entry: are entry: cle Stage Ag Stop 1 A ges of Alz folgenation boltmeth	Sep 2 SetSarect Tax Ref.Sarect Tax Ref.Sarect Dash McT. Sale MCT. Sale MCT. 2006 R-4004	Room Users of Air O	Sendificating and Re Step 4 Inst D Refrigerent updated to different updated to different	bigeration Equipme Inc.5 default Invision Johge E Statute of Lange of Lee explorement using the configurent	NT	5mp 7 9 7 start installation Emissions 0 + C + D - E - F 000 0 000	Step 8 Une Emissions (bg) H Bolingenet used to service supplement (or manual of an encomp, receiling and colleage 0	Size 2 1 Original total full charge of approach that is writing or writing to safet	Step 10 Find Um J. Tarial original find sharps despition that a different antigenet to a different softwared.	Stop 11 and Disease Enhances K Radiogenet movemed From string, modered	Sing 52 Magazini K. Rafiganet recovered from equipment ret-ortical away from this adapted affected of Species	Step 1) W Total Final Use and Disposal Enhances M = 1 + J × X · J. 600 600 600	$\begin{array}{c} 5 mp \ 54 \\ \hline N \\ \hline N \\ Holfsgarant Emissions (Mogram) \\ H + \oplus H + M \\ 5 m \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\$	Ster 15 Correspond Factor Decembling efficient 1.055-02 1.055-02	Step 19 dons p Sont Path Sparset Sont Table 1 530 4,321 9	State 17 Q. COD-Equivations G.= N.1.Q.1.P	0 0 0 2
or loade in some energy observer of the some some energy observer of the some some of Air Strate of Air Strategy and Air Strategy and Air Strategy and Air Strategy and Air Strategy and Air Strategy and Strategy and Strate	spreach: Emission Ste 2 Selfamet Tax Butlanet Used MCC 196 Selfamet Used Belfamet Used Belfamet Used Belfamet Used	s ham Users of Air C	Conditioning and Re Stop 4 D Refrigerent react to 8 superior reaction for your this ortigened	Ingeration Equipme Ing: 5 E E Fact A drange of new representation of the refraced	Sing 6 med r Transfel of surgered your blin ordinance	5 mo 7 0 5 stat installation Envention 0 = C + D - 5 - 7 6 00 0 00 0 00 0 00	Step 8 Use Eminators (bg) H Rodigarene cond to account of paper rect (or recaring a condition of the recaring a condition of the condition of the condition of the condition of the condition of the condition of the condition of the condition of the condition of the condition of the condition of the condition of the condition of the condition of	Sinc.9 r Chipined touri full observations are supposed that is writing or water to subserve writing	Stop 10 Final Une / Tradial edgester site sharper anay Youn Disa editionent is a diffuent editionent	Day 11 ord Discost Emission : K Balagerant recovered From Selfing Readment	See 12 Magamat L Safegaran towards Have applicated this addigarant to a attract oblastical	5000-10 W Next Filed Use and Disposed Filedeens M = 1 + J - X - 1, 600 600 600 600	500 51 N Parligerest Embalons (blogrand) N = 0 = H + M 0.000 0.000 0.000 0.000	5mc 15 0 Correction Faster Descentibility 1.00E-00 1.00E-00 1.00E-00	Sec 1 p OVP of Rafigurant Sec Table 1 Sec Table 1 Sec Table 1 Sec Table 1 Sec Table 1 Sec Sec Sec Sec Sec Sec Sec Sec Sec Sec	Step 17 Q CO3-Equivation G = N x Q x P	2 0 0 0 J
v roda ny use orbry use orbry due cite Stage Ap Stop 1 Reviewent and A yee of Ar Stagement	sproach: Emission Steg 2 Safiganet Tase 9 Hafriganet Dael HEC-15te	s from Users of Air 0 Sec3 C Religned cart to 18 ms religned	Cenditioning and Ra Start D Retrigonation of the Million and Million of the Mi	Bigeration Equipme Inc.5 dates Divisions biling E Total full charge of new explorement with sense	NT	5%07 9 5 stat insulation Binasons 9 = C + D - E - F 600 600 600 600 600 600 600 600 600 60	Sing 8 Une Emission (bg) H Refigurant used to anniha supposed (bit results) and subarged contained of the second second contained of the second second contained of the second second contained of the second second second contained second second second second contained second second second second contained second second second second contained second second second second second contained second second second second second second contained second second second second second contained second second second second second second second contained second br>second second sec	Sing 9 1 Congrinal total full dramp of regional total to designed total to entities	Sing 10 Final Unit J. Tatal original full design and provide the set and provide the s	Dec 11 and Decese Echesions K Refrageated recovered From relating explorem	Step 52 biogramit L Barligarant recovered Hore registrant Hits utiligarant to a different offsanant	Sile: 13 W Testal Final Das and Disposal Environment M = 1 + J. R. L. 600 600 600 600	5%92 14 N Refriguencet Environment (Notingerment) N = © 1 × 14 × 14 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	0e:15 Cerverile: Fatur Decretis: Negati 1.06:0 1.06:0 1.06:0 1.06:0	500.5 p 007-of Radigarant See Table 1 1.00 4.00 1.00	Sine 17 Q CO3-Equivalent Emails a participant Q = N x Q x P	
r solar offer n solar offer an entry due and offer and solar Stop 1 Stop 1 Devicement and A pare of Arr Missening and Agention Ballment	September 2 Settlement Ture Refrigerent Dare Refrigerent Dare Settlement Dare Refrigerent D	Room Users of Air O	Conditioning and Re Step 4 D Performances to different use this officered	bigeration Equipme Inc.3 default Invision Johge E Sotal full charge of new explorement using this printiation!	nt Stop 4 P Total full-sharps of spectral should be added some this of spectral	9	Sign 8 Une Eminations (bg) H Bolingament used to samcles applysment (bg) resulting and solveget o	Size 9 1 0 Original total full charge of approach that is active or well to the entropy of a size full	Step 10 Find Um J. Tatal ophysical fluid sharped any from the dispose the addressed software of a	Ing.11 and Disposed Echinetras K Refrigance movement from SOVia moderant	Sing 12 Magamat L Rafigerand recovered from equipment relationary from the officered and from different on Space	Sine 13 W Total Final Use and Disposal Environment M = 1 + 3 + 3 + 1 + 3 + 3 + 1 + 3 + 3 + 1 + 3 + 3	50mg 54 N N Forfigurent Emissions (biograms) N + © = 14 + M 5.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	386:15 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	500 % 0007 of Raligenet 5007 of Raligenet 5007 of Raligenet 5007 of Raligenet 500 500 500 500 500 500 500 50	Sing 17 Q CO3-Equivalent Dematoria futura Q+N x 0 x P	
r solar minutes in a second se	nproach: Emission Stell Britianet Tax Britianet Used StrC 196 StrC 296 Britianet Used Britianet Britianet Used Britianet Briti	bum Users of Air 0 Sec.7 C Sec.9 C Sec.9 C Sec.9 C	Conditioning and Re Step 4 D Refigurent used to 50 Refigurent for the objects	triperation Equipme Ing.5 e E Testering of new mylametric using this refraced	Sing 4 Sing 4 pr Transf during of your Unit during of your Uni during of your Unit duri	5kg 7 9 3 dat installation Emeans 0 = C + D : E : F 60 00 00 00 00 00 00	Sing 8 Use Emission (bg) H Soldgement used 16 sorting explorated (bg) regaring a first explorated common of the memory regaring a for other common of the sorting common of the	Size 0 r Conjune total full charge and expressed that is writing at writing to writing to writing at writing to writing to writing to writing to writing to writing to writing to writing to writing to writing to writing to writing to writing to writing to writing to writing to writing to writing to writing t	Stop 10 Final Use / Tradial edgebra free bland barge of the designed free designed analytics free definients antiquent to a diffuent antiquent	Sup 11 ord Discost Emission 1 × Refigured movement from softing molecost	See 12 Magamat L Safegarant concerned have explorated three statements of garant into adfigurant to a affined of garant	5000-10 10 mm 10 mm	500 51 N N=Grigerset Embeddes (blogrand) N=G ≥ H + M 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	5mc 15 Correction Faster Descendbingent 1.05E-0 1.05E-0 1.05E-0 1.05E-0 1.05E-0 1.05E-0 1.05E-0	Sec 1 p OVP of Rafigurant Sec Table 1 Sec Table 1 Sec Table 1 Sec Table 1 Sec Sec Sec Sec Sec Sec Sec Sec Sec Sec	3mg 17 Q 603 Equivalent Senstein Fanton Q+11 x 2x P	
er soke ry use antrop one antrop date obser cols Stage Ag Stop 1 Endesmet ant Append Ag Append Ag Append Ag Append Ag	sproach: Emission Ste 2 Safarnet Tase Baharnet Used MC-1394 MC-1394 A-COM R-400 R-400 R-400	s from Users of Air 0 Step3 C Refigured coal to 18 on polymort	Conditioning and Ra Refigurent over to fill Refigurent over to fill and this influence	Bigeration Equipme Inc.5 etition. Division. Division E Total full charge of new explorement only this subfarmed	NI Story 6	3%67 9 5 stat insulation Binearons 0 + C + D - E - F 600 0 00 0 00 0 00 0 00 0 00 0 00 0 0	Sing 8 Une Emission (bg) H Balligated used to annihe supposed (ball exactly a set online) California Californi	Sing 9 Sing 9 1 Congrinal total full dramp of reprinted total to entities entities	Sing 10 Final Une J. Tatal original full design and explanation to utilitat and provide the Unit and States of the Unit of States of	Dec 11 and Decess Echesions K Refraced recovered From relifications	Step 52 blogneni k. Rafigarent norvered thus estimation this utilization this utilization this utilization this utilization	- 3her 19 - 3her 19 - 34 - 54dd Final Das and - 50ge-and Environment - 40 - 10 - 10 - 10 - 500 - 50	Sing 14 N Refriguence Environment (Many arms) N Sing 14 Sing 24 Sing 24	300:15 Cerventie Faster 0 000008Megaet 100:00 100:00 100:00 100:00 100:00 100:00 100:00 100:00 100:00	500.9 p 2007 of Rafigueset 300 Table 1 500 Table 1 500 500 500 500 500 500 500 50	Sing 17 Q CO3-Equivalent Exercises Trans	
v rode ry use why , use why , one why , one why , one why Cla Stage Ap Stop 1	Strep 2 SetSareet Tax 8 SetSareet Tax 9 SetCome 9 SetCom	Room Users of Air O	Certificating and Re Stop 4 D Performances to different user this officience	bigeration Equipme Inc.3 default Invision Johge E Sotarful charge of new explorement using this printigeomet.	et Seg. 6 27 Total full-sharps of segments into strates to see this of secaral	9	Site 8 Une Eministre (bg) H Boliganet und 1s sandet ante recovery resulting and solveget C	Size 9 	Step 10 Find Ute J. Tata departed for design designers to a different addigenet to a different addigenet to a different addigenet.	Inc.11 and Disposed Echineters. K Reinigenet movement from Schlag systemet	Jing 17 Megenet L Rafigerent recovered from expander recollisted any fisca diffused onlyaced.	5mc 13 W Total Final Use and Dispetal Finitetion M + 1 + J × 1 × 1,1 600	5 mg 54 N Refrigurant Emissions (http://www.i 4.50 0.00 0.00 0.00 0.00 0.00 0.00 0.00	38e 15 Coronalise Faster Dennesilver 1.085-0 1.085-0 1.085-0 1.085-0 1.085-0 1.085-0 1.085-0 1.085-0 1.085-0 1.085-0	5m % P 00P of Ratigenet 5m Table 1 5.30 5.0	Sing 17 Q COS-Equivalent Generation Jamma Q+Nx 0 x P	
er soder ry use entry use entry use entry use entry (cle Stage Ag Big 1 Big 1	spreach: Emission Style 2 Selfamet Tax B Selfamet Used SFC 196 SFC 296 SFC 296	bum Users of Air O Buc 7 C C fullipent und to H Set Applicated	Conditioning and Re Step 4 D Refigurent used to 50 numerical to 50 use this objected	triperation Equipme Ing 5 e F Fact has based on the second refused of the refused of the refused of the	Step 4 Step 4 rest r Tunist full observe of seven total configurated r	0 mp 7 0 1 at a houddran Emeren 0 = C + D : E · F 60 60 60 60 60 60 60 60 60 60	Sing 8 Use Enhances (ba) H Enhances (ba) H Participant used (b arrows) and participant answer of the participant answer of the participant participant (b) C C C C C C C C C C C C C C C C C C C	Big P i degrade total full degrad an expressed that is entitled or sold to other and the sold to other and t	Step 19 Final Use / Trial edgest for durings edgest for a during of edgest for a during of edges	Sep 11 ord Objected Embedded Redrigeneet recovered From relating, makement	See 12 Megenni L L Edisperat Incommod New explanation this addigenation addigenation	3000-13 10 400 - 100 -	500 51 N Parligenet Enhancion (blogrand) N = 0 = H + M 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	500 15 Correction Fatter Descention Fatter 1005-01 1005-01 1005-01 1005-01 1005-01 1005-01 1005-01	500 % p 0079 of faitigenet 300 Tells 1 500 50	2mg 17 Q 603 Equivalent Emergine Jones Q + NA 20.7	
kr solde rr sold entry solde entry solde solder solder pcle Stage Ag 20e 1 Exolutionsta A frage of Air difficung and A frage of Air difficung entry frage of Air difficung en	spreach: Emission Ste 2 Sritanut Tax B Mitanut Tax Sritanut Tax Sritan	s Rom Users of Air 0 Site 3 C Rafigurat coal to 18 on polymetric c	Cenditioning and Ra Base 4 D Refriguent could to fill and this influence with influence	Bigeration Equipme Inc.5 disto. Division. Diliga E Total full charge of new explorement onling this antigeneet	NI	3%07 9 5 stat insulation Binearons 0 + C + D - E - F 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Sing 8 Une Emission Page H Balingenet used to enrols supported (our enrols and subarge enrols and subarge en	Sing 9 Sing 9	Step 10 Final Use J. Trate objects to the step of experiment to a the strategy to a the strategy to a the strategy to a the strategy of the step strategy of the step step strategy of the step step strategy o	Dec 11 and Dracest Echations K Adinguated recovered Dram.nd/ing.explanael	Step 12 blogenet L L Rafigurent recovered over regiment the adigurent to a different objaces	- 30m 19 - 30m 19 - 30m and - 50m and - 50m and - 50m - 50	Step 14 N Refriguence Environment (Many anne) 1 0	300:15 Emil 0 Cerementes Faster 0.000008Megaet 1.000-0 1.000-0 1.000-0 1.000-0 1.000-0 1.000-0 1.000-0 1.000-0 1.000-0	500.5 p 0079 of Rafiguent 300 Tolor 1 300 Tolor 1	3mg 17 0 (03 Equivalent Schemenic Principal 0 + N 1 0 2 F	
vi rođe nji ute mitry oter mitry oter mitry oter Star 1 Residented and A Star 1 Residented and A Star 1 Star 1 Sta	900 2 500 2	Roon Users of Air O	Cerdificating and Re Stee 4 D Refriguent cost to 60 we this obtained	bigeration Equipme Inc.3 delta Division Diago E Statistic dispect of new explorement using this policies of	nt	9	Site 8 Une Eministre (kg) H Religenet und 1 sander supplisher (bg) Religenet (sold baget of the second second second control of the second second control of the second second control of the second second second control of the second second second control of the second second second second control of the second second second second second control of the second seco	Size 0	Sing 10 Final Line J. Trata object for the space and provide the object of the angle state of the second and space at a second second and space at a second second second and space at a second second second second second and space at a second sec	Dec 11 and Disposed Echinican K K K K K K K K K K K K K K K K K K K	Sing 12 Negrent L Rafigerent recovered true expenses recovered true expenses entry expenses entry expenses entry expenses entry expenses entry en	Sile: 13 M Total Find Use and Disperal Environm M + 1 + J + K + L 600	Sing 14 N Refrigurant Emissions (billingrami) N = C = 24 + M 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	386:15 Cerventis Fatur Danneskingert 1.05:01 1.05:01 1.05:01 1.05:01 1.05:01 1.05:01 1.05:01 1.05:01 1.05:01 1.05:01 1.05:01 1.05:01	5m 3 P 007 of Ratigenet 5m Table 1 5.30 5.0	Step 17 Q CO3-Equivalent Greations Journe Q+NxQxP	
vi rođel nji ute veliniji otar veliniji otar veliniji otar veliniji Stre 1 Bradanska sel A Stre 1 Bradanska sel A	Pproach: Emission 9%2 2 Referent Taxe 8 8 8 8 97 C 198 97 C 198 77 C 198 77 C 198 77	Brain Users of Air O Dro: 2 C C Fulligenet out to IB Sex Reviewer	Conditioning and Re Step 4 Inst D Refrigerent road to 40 and 10% of Spectral	trigeration Equipme Bop 5 E E Total total barge of new pulpment using the mitianeel	Step 4 Step 4 mel p Total fluid damps of your strain they are they	3mp 7 0 Tatgl bouldeton Emissions 0 - C + D - S - F 	Sign 8. Use Emissions (bg). H Foliogenet used to service supplement (bg), recalling .ed. subsequi- d c. 	Big 9 i i Chipping total full deep an appropriate that is antised or sold to ather antised or sold to ather antised or sold to ather antised or sold to a her antised or sold to ather antised or sold to a ather	Step 19	Sup 11	See 3 Meganet L L Selfsprest networked set explanate to a strategy to a	3000-13 14 1 17 201 (bas and Disposed Theoders M = 1 + J - X - 1, 0.00 0.	500 51 N Parigenet Emission (blogram Emission 000 000 000 000 000 000 000 000 000 00	596 15 Emilia Fatar Dannakhingeri 1.05 0 1.05 0	500 % p 000P of Rafigurant 300 Table 1 500 50	3mg 17 Q 603 Equivalent Senstein i parte 4 11 2 2 P	



в

C D

E

When entering activity data using energy units (e.g., mmBtu or GJ), please ensure you select the heating value metric these data are based on. For default emission factors, this tool applies Lower Heating Values, unless told otherwise. For a custom emission factor, it assumes that the activity data are on the same heating value basis as the emission factor.

н

L M N O

R S

			User supplied data	GHG emissions (tonnes)						
		Fuel type			Units	Heating value				All GHGs
Source ID	Sector	(e.g., solid fossil)	Fuel	Amount of fuel	(e.g., kg or kWh)	basis	CO ₂	CH4	N ₂ O	(tonnes CO ₂ e)
	Agriculture	Biomass	Biogasoline	56	kWh		0,014	2,016E-06	1,210E-07	0,014
		1	1	1	Total GHG emissions from fossil fuels (tonnes CO-e):					
							Total CO. emission	ines).	0.014	
						1	rour cogemission	a nom promoso (ibn	anos).	0,014
						1				



Welcome to AgroStrat

AgroStrat was successfully completed on 30 September 2017

AgroStrat had as main objective the development of an Integrated Management Scenario (IMaS) for the sustainable management of intensively cultivated Mediterranean areas, using as example the cultivation of *Pistacia vera* L. trees (*P. vera* L.), which are intensively cultivated in Aegina Island, Greece for the last 150 years, but also in other Greek and Mediterranean areas.

The project, during the 5 years of its duration, produced many innovative results, i.e. methodologies, web decisionmaking tools and strategic plans that have significant transferability potential. Focusing on the sustainability of intensively cultivated Mediterranean areas, AgroStrat addressed the issues of soil and water bodies protection, the promotion and adoption of good agricultural practices, the sustainable management of agricultural waste, as well as the sustainability of the rural environment as a whole, by working with those who are directly interested, i.e. the farmers and their associations as well as the local and regional authorities. Furthermore, the implementation of an innovative holistic Life Cycle Analysis (LCA) enabled (i) the analysis of the life cycle of pistachio production in the island of Aegina in terms of current cultivation practices, waste production and management methods, (ii) the definition of agronomic and environmental feasibility of applying agricultural waste on soil after composting and (iii) the identification of critical processes that are energy intensive and cause most environmental impacts; based on these outcomes sustainable actions were proposed and applied successfully at field scale. Also, in order to assess the socio-economic impact of the project an integrated socio-economic impact assessment was performed based on reliable key impact indicators that were continuously monitored during the project duration.

The IMaS although developed using the example of pistachio trees cultivation, it was structured in a such way that can be also implemented for other cultivation types and in other Med countries, thus ensuring its transferability. This is because the scenario proposes sustainable cultivation practices for Mediterranean areas under degradation/desertification risk, for sustainable soil and water monitoring and management, nutrients use, proper management of agricultural wastes for sustainable composition and use in expression and use of use for sustainable soil and water monitoring and management, nutrients use of use for sustainable for instance of agricultural wastes and the scenario properties and use in expression.



Central Management Monitoring System



The <u>Central Monitoring & Management Tool</u> (<u>CMMT</u>) is now available.

Cultivation Management Software



Cultivation Management Software is now available for download.



HOME PROJECT V CONSORTIUM V NEWS BLOG V CONTACT

https://balkanroad.eu

Towards farms with zero carbon-, waste- and water-footprint. Roadmap for sustainable management strategies for Balkan agricultural sector





Thank you Maria K. Doula

Benaki Phytopathological Institute, Department of Phytopathology, Lab of Non Parasitic Diseases, 8 Stef. Delta, 14561 Kifissia, Greece, email: <u>mdoula@otenet.gr</u>



