Interreg
Balkan-Mediterranean
BalkanRoad

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

The cases of a winery and a vegetable processing company

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Climatico 2019
Act on Climate in the Mediterranean

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

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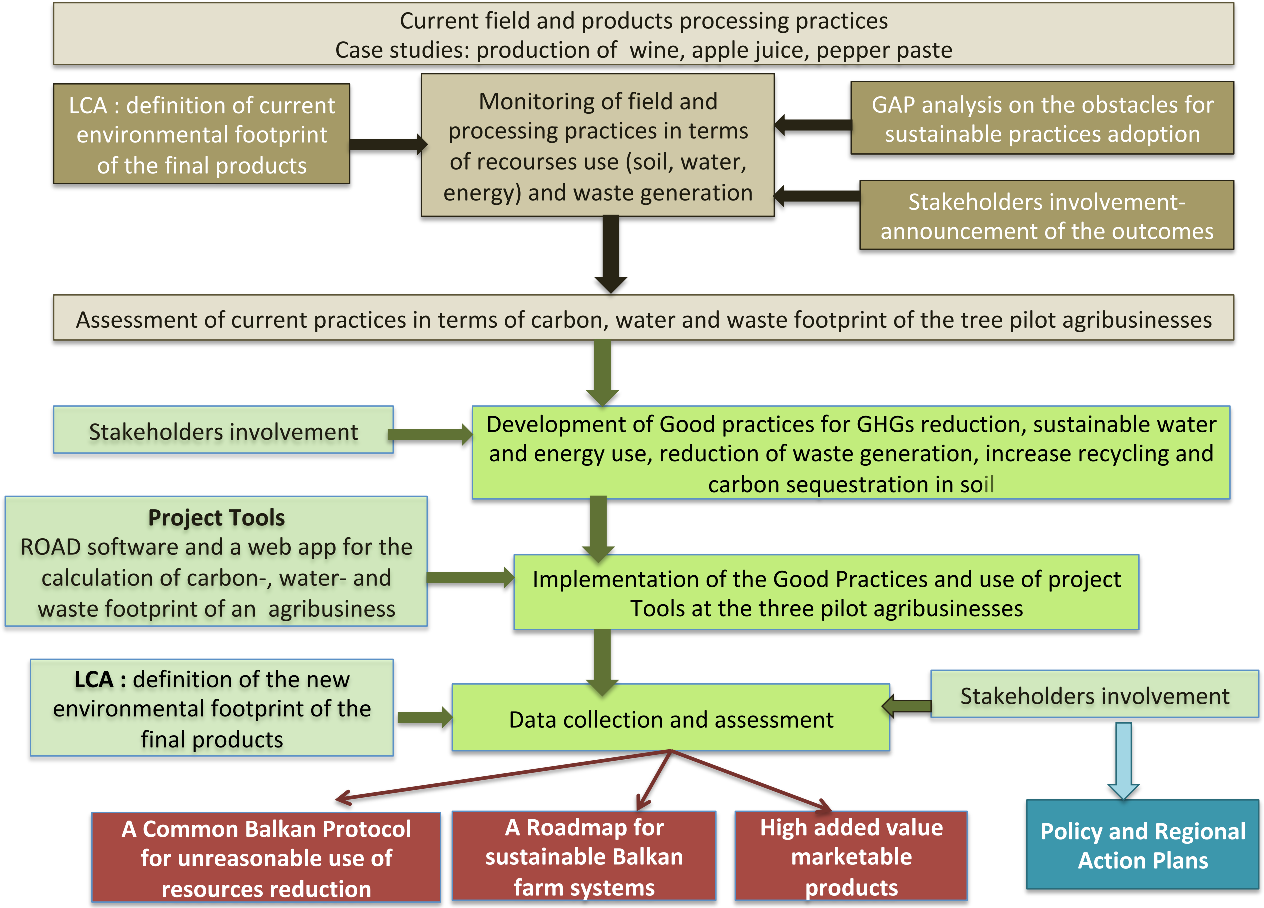
The INTERREG BalkanROAD project



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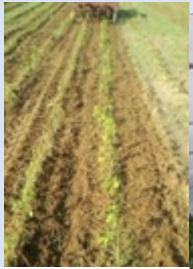
A winery in Naoussa, located in Central Macedonia, Greece and a vegetable processing company in Kavadarci, North Macedonia were selected.



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.

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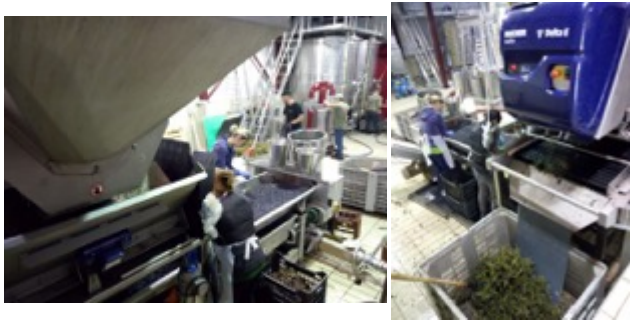
Stage 1-Cultivation-Harvesting

Stage 2-Grapes are transferred to the refrigerator

Stage 3-Sorting

Stage 4: Destemmer and Sorting



Stage 5-Grapes crushing

Stage 6-Fermentation

Stage 7-Maturation

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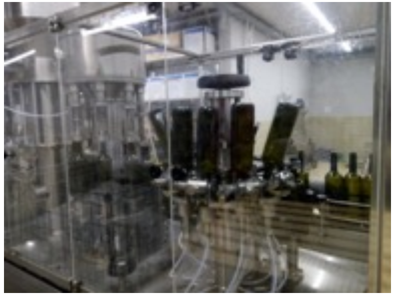
Stage 8-Wines mixing and Bottling





Stage 9: Packaging - Storage


Issues to consider

- 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

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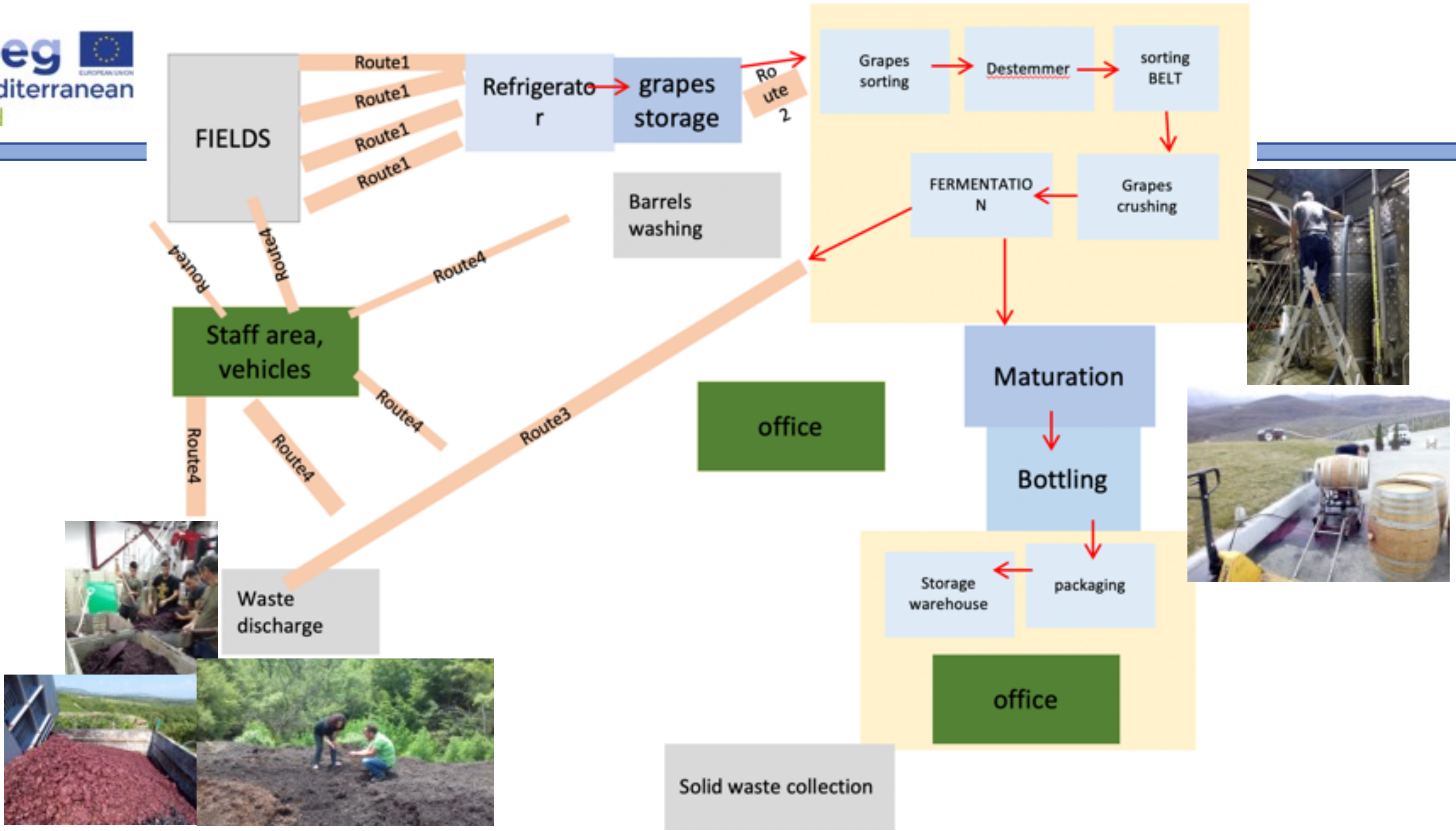

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Peper paste making plant

1st stage – FIELD

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

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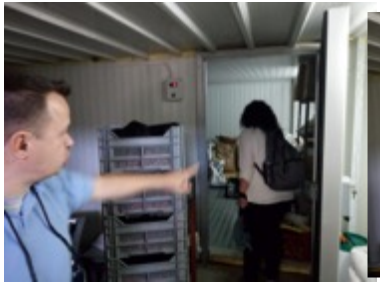
3rd stage-ROASTING


4th stage-WASHING ROASTED PEPPERS



5th stage-STORAGE - REFRIGERATOR




6h stage-KITCHEN-STAINLESS STIRRER-BOILER-PULP MAKING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7th Stage- Filling MASCHINE FOR PULP

8TH stage-BOTTLES STERILIZATION

9th Stage-LABELING PALLETIZING

10TH stage STORAGE AND OTHER auxiliary areas

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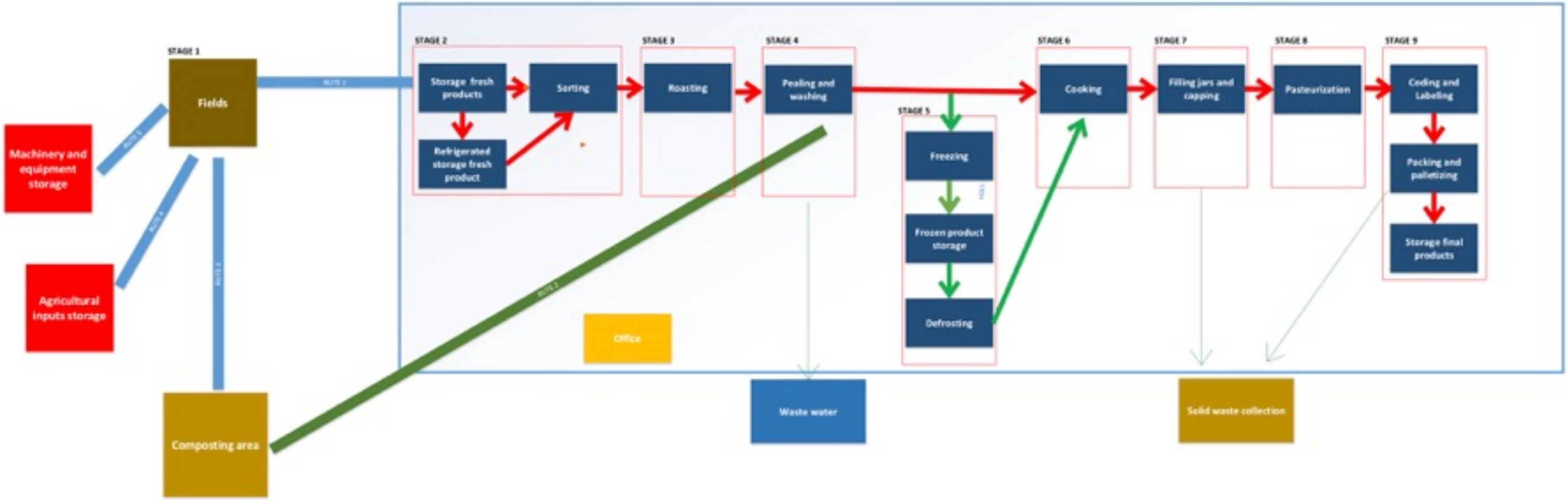
STAGE 1
Fields
Machinery and equipment storage
Agricultural inputs storage
Composting area
STAGE 2
Storage fresh products
Sorting
Refrigerated storage fresh product
STAGE 3
Roasting
STAGE 4
Pealing and washing
STAGE 5
Freezing
Frozen product storage
Defrosting
STAGE 6
Cooking
STAGE 7
Filling jars and capping
STAGE 8
Pasteurization
STAGE 9
Coding and Labeling
Packing and palletizing
Storage final products
Office
Waste water
Solid waste collection

Life Cycle Analysis

Main agronomic characteristics and LC Inventory data of the grape cultivation

Characteristics	Unit*	Grape	Origin/data quality
Cultivar	-	Xinomavro	
Vine age	years	30	
Density	plants ha^{-1}	400	
Grape Yield**	t ha^{-1}	9.4	
Harvest period	-	August - October	Survey
Irrigation technique	-	Surface/Sub-surface drip irrigation	
Irrigation period	-	June-July (1-2 times per year)	
Fertilizers application rate			
N (as N)	kg ha^{-1}	200	Survey/Ecoinvent
P (as P_2O_5)	kg ha^{-1}	-	
K (as K_2O)	kg ha^{-1}	200	Survey/Ecoinvent
Pesticides application rate			
Fungicides	L ha^{-1}	32	Survey/Ecoinvent
Insecticides	L ha^{-1}	3.2	Survey/Ecoinvent
Other			
Sulfur	kg ha^{-1}	30	Survey/Ecoinvent
Irrigation water	m^3 ha^{-1}	450	Survey/Ecoinvent, Agribalyse
Electricity	MJ ha^{-1}	1,800	Survey/Ecoinvent, (PPC, 2017)
Diesel consumption	L ha^{-1}	210	Survey/Ecoinvent
Lubricants	L ha^{-1}	6.3	Survey/Ecoinvent

Main characteristics and LCI data of the wine production/Vinification

Characteristics/LCI data	Unit*	PDO Red Wine	Origin/data quality
Grape to Wine Yield	kg / L	1.67 (1.25 for FU)	
Operation (Duration)	days y^{-1}	300	
Density	plants ha^{-1}	400	
Production capacity (Grapes processing)	t y^{-1}	25 Winery 6 Bottling	Survey
Production capacity (FU)	bottles y^{-1}	8,000	
Total power of mechanical equipment	kW	18 Winery 5 Bottling	
Bottling			
Wine	mL	750	
Glass	kg	0.57	
Cork	g	4.2	
Capsule	g	1.3	Survey/Ecoinvent
Sticky label	g	1.1	
Packaging			
Corrugated cardboard box (six-bottle)	g	50	
Wooden pallet	kg	0.0160	Survey/Ecoinvent
Plastic film	g	0.7	
Distibution			
Number of pallets per truck	number	33	
Number of boxes per pallet	number	100	
Number of bottles per box	number	6	Survey/Ecoinvent
Transport to shipment point	km	94.1	
Other			
Water	L	0.25	Survey/Ecoinvent,
Electricity	MJ	0.67	Survey/Ecoinvent, (PPC, 2017)
Diesel consumption	L	0.06	Survey/Ecoinvent
Lubricants	L	0.02	Survey/Ecoinvent

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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 SO_2-eq·FU^{-1}	1,98E-02
Eutrophication potential (EP)	kg PO_4-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 C_2H_4-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 – Xinomavro 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 CO_2-eq

- 1 kg of buttermilk in Canada
- 1 kg of yogurt in Canada releases 1.5 kg CO_2
- A new car releases 0.12Kg CO2/km…..9 km)

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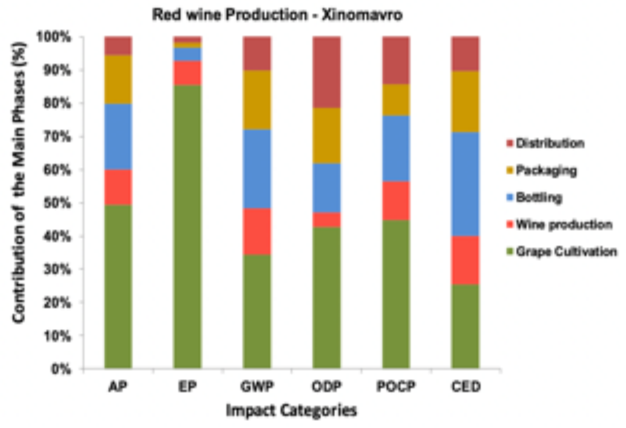
LCA - Significant conclusions

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.

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The ROAD tool-A web app

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

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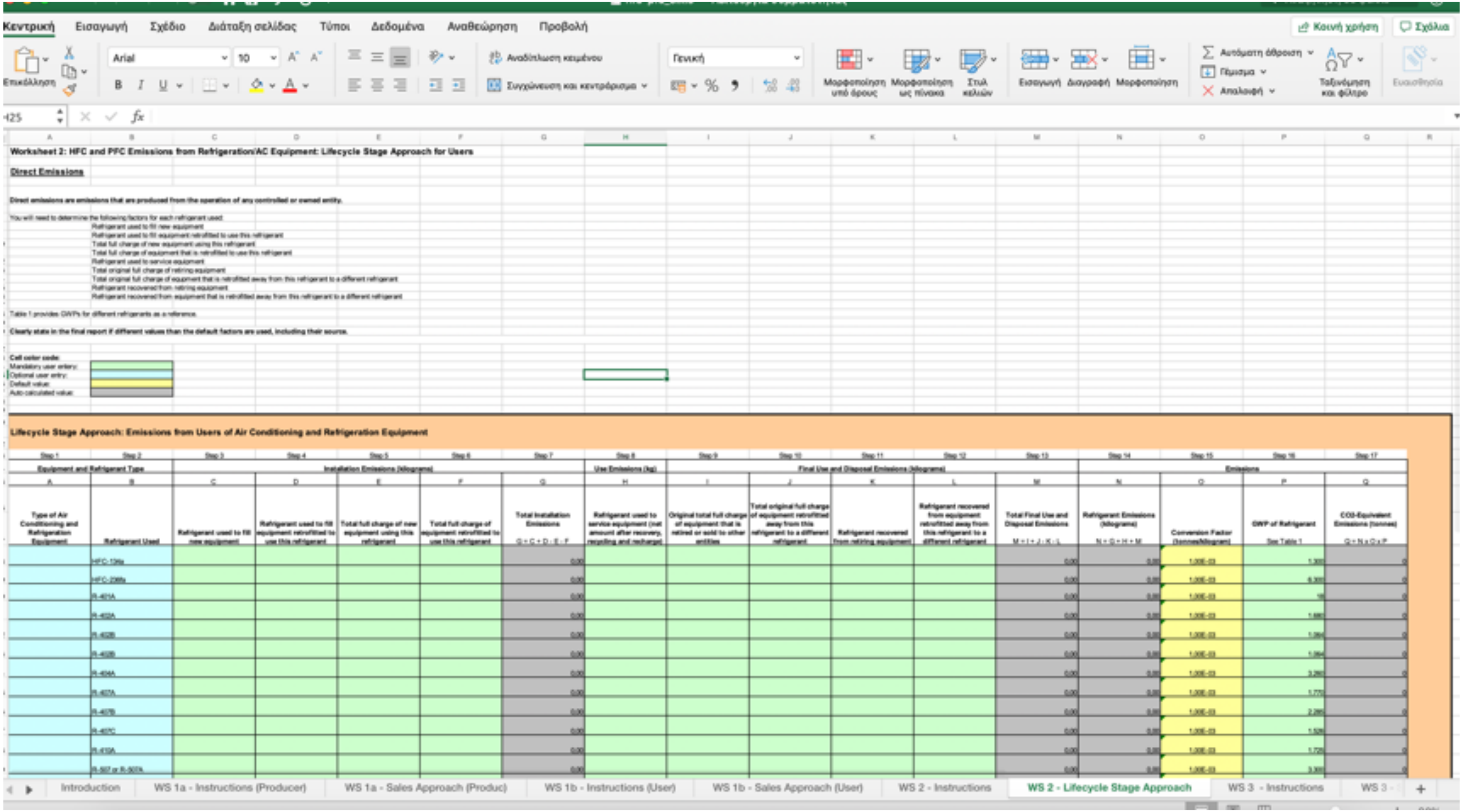
Electricity Conservation: GHG Savings from Electricity Conservation

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_2O) 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.

Type of Electricity Conservation		Electricity Conservation				CFL Bulbs		Other	
How to use this tab: Instructions to obtain $MTCO_2e$		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 $MTCO_2e$.				*Same directions as for the Electricity Conservation columns.*		If using another calculator to provide results, please provide your methodology and source in this section and enter in your values below.	
Calculation Description		$MTCO_2e$ = Electricity conserved * (kWh/user-specified units) * (national or state value of the eGRID non-baseload output emission rate [$MTCO_2e$/kWh]) National rate: 0.000709 $MTCO_2e$/kWh State rate: (0.000071 to 0.001131 $MTCO_2e$/kWh) *For national and state formulas and details see Notes below.* Both national and state versions of the rate (the eGRID non-baseload output emission rate) cover three gases: CO_2 emissions factor ($MTCO_2e$/kWh) + CH_4 emissions factor ($MTCO_2e$/kWh) + N_2O emissions factor ($MTCO_2e$/kWh).				$MTCO_2e$ = Number of bulbs * (49 kwh per year/ bulb) * (national or state value of the eGRID non-baseload output emission rate, expressed in $MTCO_2e$/kWh) *The rest of the description is the same as for Electricity Conservation.*			
	State or U.S. (Select)	Electricity Conserved (Input value)	Unit reported (Select)	Electricity Conserved (kwh)	GHG Reduction ($MTCO_2e$)	Number of CFL bulbs replacing conventional bulbs	GHG Reduction ($MTCO_2e$)	Input	GHG Reduction ($MTCO_2e$)
Example		GQ Co. worked with a facility in North Carolina that has conserved 10,000 kwh of electricity through a conservation activity.				GQ Co. replaced a total of 1,000 conventional lightbulbs with CFL bulbs in 8 NC facilities during one year.			
	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				-	-		-		
Project 6				-	-		-		
Project 7				-	-		-		
Project 8				-	-		-		
Project 9				-	-		-		
Project 10				-	-		-		

Color Key
User enters value
User selects option from drop-down menu



Worksheet 2: HFC and PFC Emissions from Refrigeration/AC Equipment: Lifecycle Stage Approach for Users

Direct Emissions

Direct emissions are emissions that are produced from the operation of any controlled or owned entity.

You will need to determine the following factors for each refrigerant used:

- Refrigerant used to fill new equipment
- Refrigerant used to fill equipment retrofitted to use this refrigerant
- Total full charge of new equipment using this refrigerant
- Total full charge of equipment that is retrofitted to use this refrigerant
- Refrigerant used to service equipment
- Total original full charge of retiring equipment
- Total original full charge of equipment that is retrofitted away from this refrigerant to a different refrigerant
- Refrigerant recovered from retiring equipment
- Refrigerant recovered from equipment that is retrofitted away from this refrigerant to a different refrigerant

Table 1 provides GWPs for different refrigerants as a reference.

Clearly state in the final report if different values than the default factors are used, including their source.

Cell color code:

Mandatory user entry:

Optional user entry:

Default value:

Auto-calculated value:

Lifecycle Stage Approach: Emissions from Users of Air Conditioning and Refrigeration Equipment

Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8
Equipment and Refrigerant Type		Installation Emissions (kilograms)					Use Emissions (kg)
A	B	C	D	E	F	G	H
Type of Air Conditioning and Refrigeration Equipment	Refrigerant Used	Refrigerant used to fill new equipment	Refrigerant used to fill equipment retrofitted to use this refrigerant	Total full charge of new equipment using this refrigerant	Total full charge of equipment retrofitted to use this refrigerant	Total Installation Emissions G = C + D - E - F	Refrigerant used to service equipment (net amount after recovery, recycling and recharge)
	HFC-134a					0.00	
	HFC-236fa					0.00	
	R-401A					0.00	
	R-402A					0.00	
	R-402B					0.00	
	R-402B					0.00	
	R-404A					0.00	
	R-407A					0.00	
	R-407B					0.00	
	R-407C					0.00	
	R-410A					0.00	
	R-507 or R-507A					0.00	

Step 2	Step 9	Step 10	Step 11	Step 12	Step 13	Step 14	Step 15	Step 16	Step 17
	Final Use and Disposal Emissions (kilograms)					Emissions			
B	I	J	K	L	M	N	O	P	Q
Refrigerant Used	Original total full charge of equipment that is retired or sold to other entities	Total original full charge of equipment retrofitted away from this refrigerant to a different refrigerant	Refrigerant recovered from retiring equipment	Refrigerant recovered from equipment retrofitted away from this refrigerant to a different refrigerant	Total Final Use and Disposal Emissions M = I + J - K - L	Refrigerant Emissions (kilograms) N = G + H + M	Conversion Factor (tonnes/kilogram)	GWP of Refrigerant See Table 1	CO2-Equivalent Emissions (tonnes) Q = N x O x P
HFC-134a					0.00	0.00	1.00E-03	1,300	0
HFC-236fa					0.00	0.00	1.00E-03	6,300	0
R-401A					0.00	0.00	1.00E-03	18	0
R-402A					0.00	0.00	1.00E-03	1,680	0
R-402B					0.00	0.00	1.00E-03	1,064	0
R-402B					0.00	0.00	1.00E-03	1,064	0
R-404A					0.00	0.00	1.00E-03	3,260	0
R-407A					0.00	0.00	1.00E-03	1,770	0
R-407B					0.00	0.00	1.00E-03	2,285	0
R-407C					0.00	0.00	1.00E-03	1,526	0
R-410A					0.00	0.00	1.00E-03	1,725	0
R-507 or R-507A					0.00	0.00	1.00E-03	3,300	0

Introduction | WS 1a - Instructions (Producer) | WS 1a - Sales Approach (Produc) | WS 1b - Instructions (User) | WS 1b - Sales Approach (User) | WS 2 - Instructions | WS 2 - Lifecycle Stage Approach | WS 3 - Instructions

GREENHOUSE
GAS PROTOCOL

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.

User supplied data							GHG emissions (tonnes)			
Source ID	Sector	Fuel type (e.g., solid fossil)	Fuel	Amount of fuel	Units (e.g., kg or kWh)	Heating value basis	CO_2	CH_4	N_2O	All GHGs (tonnes CO_2e)
	Agriculture	Biomass	Biogasoline	56	kWh		0,014	2,016E-06	1,210E-07	0,014
							Total GHG emissions from fossil fuels (tonnes CO_2e):			0,000
							Total CO_2 emissions from biomass (tonnes):			0,014

AgroStrategies

http://www.agrostrat.gr

Sustainable strategies for the improvement of seriously degraded agricultural areas: The example of Pistachia vera L

With the contribution of the LIFE + financial instrument of the European Union

English
Ελληνικά

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Welcome to AgroStrat

Search

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 decision-making 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 (recycling, disposal, composting and use in agricultural sector, potential use of wastewater for irrigation, potential

Central Management Monitoring System

The Central Monitoring & Management Tool (CMMT) is now available.

Cultivation Management Software

Cultivation Management Software is now available for download.

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https://balkanroad.eu

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

BalkanRoad Project

Παρακολούθηση αργότερα Κοινοποίηση

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Thank you

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Project Partners

Benaki Phytopathological Institute (BPI)
Lead Partner

Institute for Mediterranean Studies (IMS)

American Farm School Post Secondary Educational and Training Association (AFS)

Open University of Cyprus (OUC)

Association of Agri-Environmental Farmers (AAEF)

Agricultural University of Tirana (AUT)

Macedonian Organic Producers Federation (MOPF)

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