

Spanish Pilot Plant - SPP



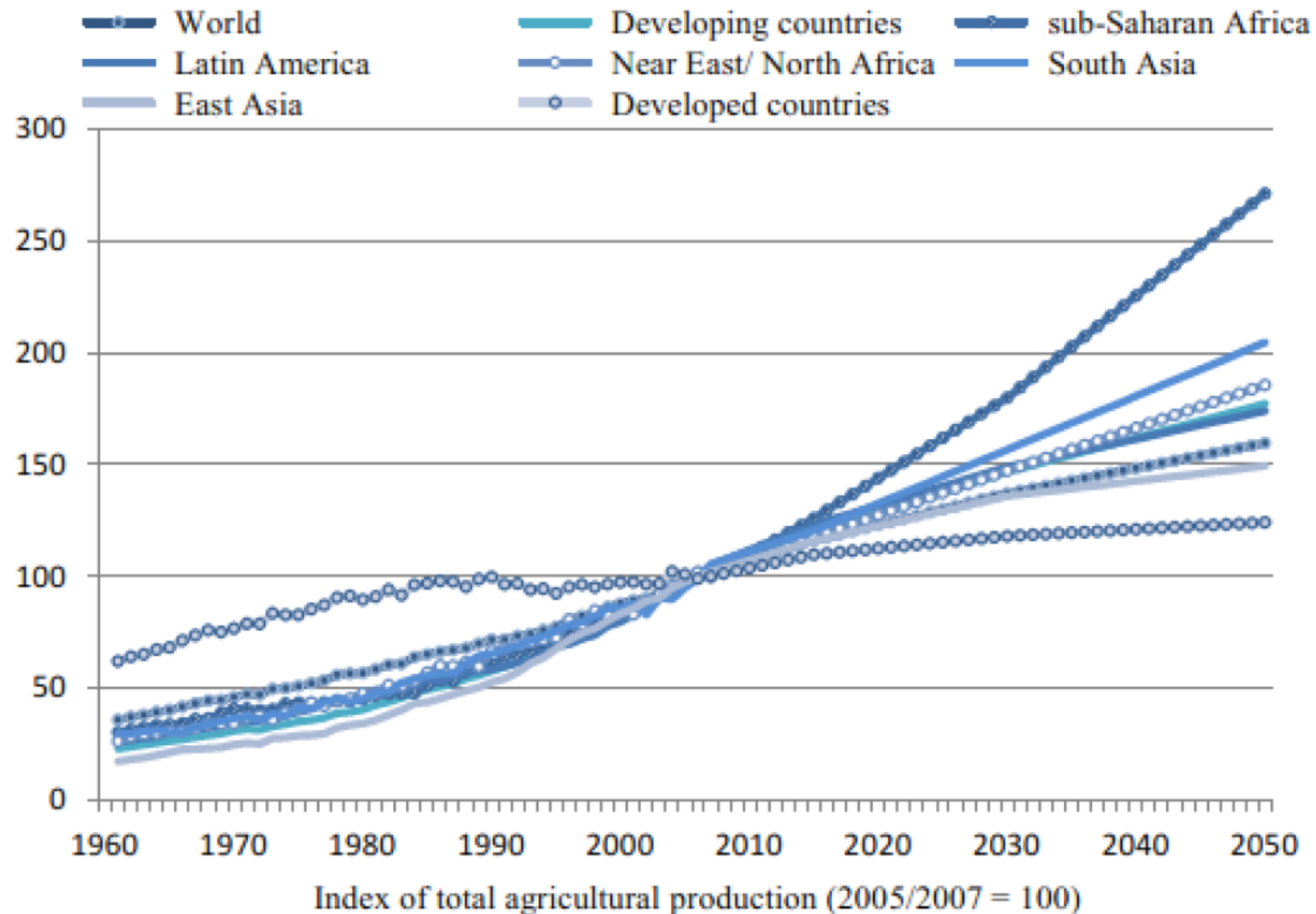
From by-products to food ingredients and bio-fertilizers

Antonio Cruz-Bañeres - INDULLEIDA 09/23/2021

WHY AGROINDUSTRIAL PILOT PLANTS?

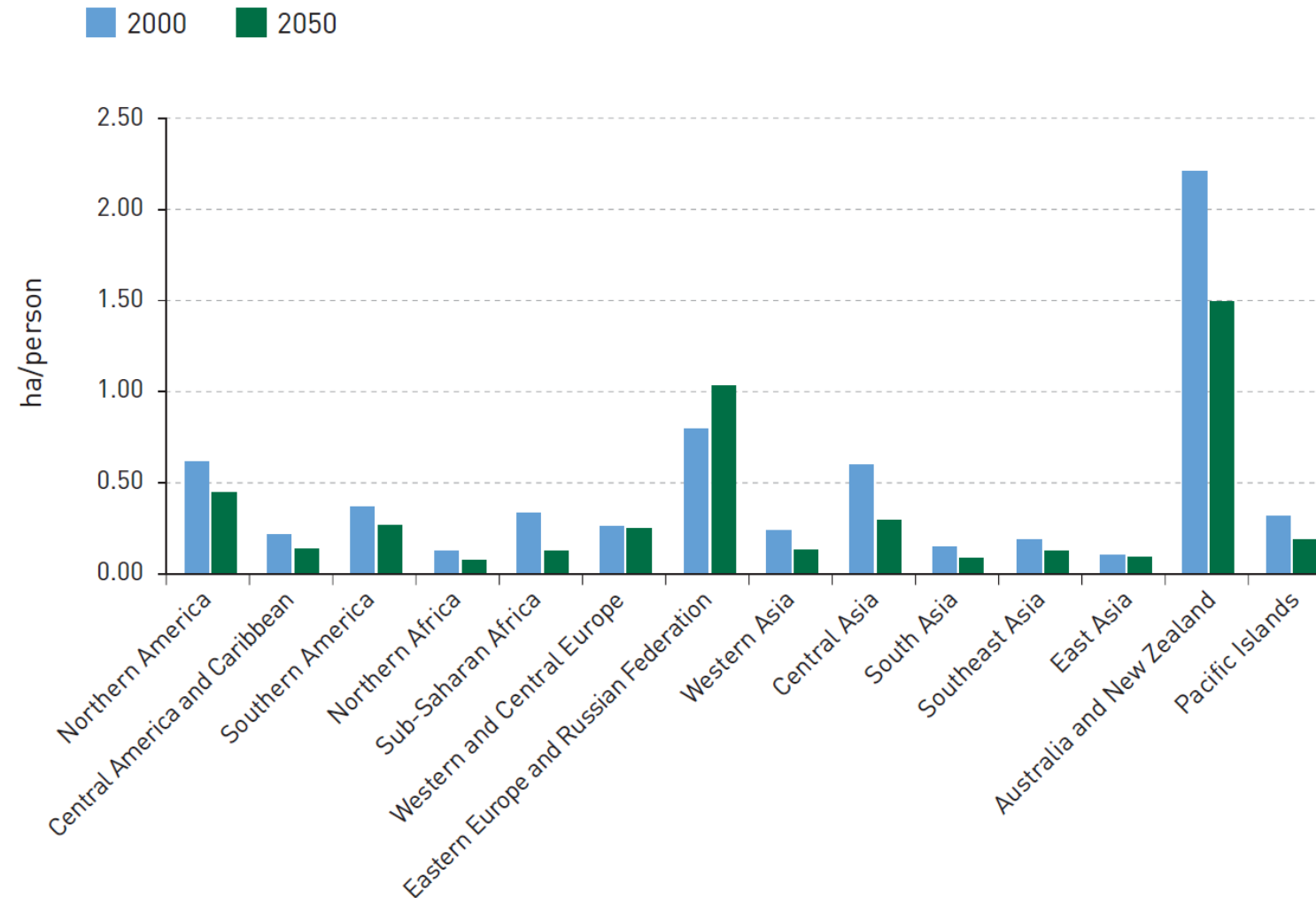
- *One third* of *food is wasted* globally: *1.300 MT/year*.
- Europe wastes *89 MT/year*: *180 kg/year* per European citizen.
- *European Union* is the *first global food exporter* and the second global importer after EEUU.

FOOD PRODUCTION (FAO)



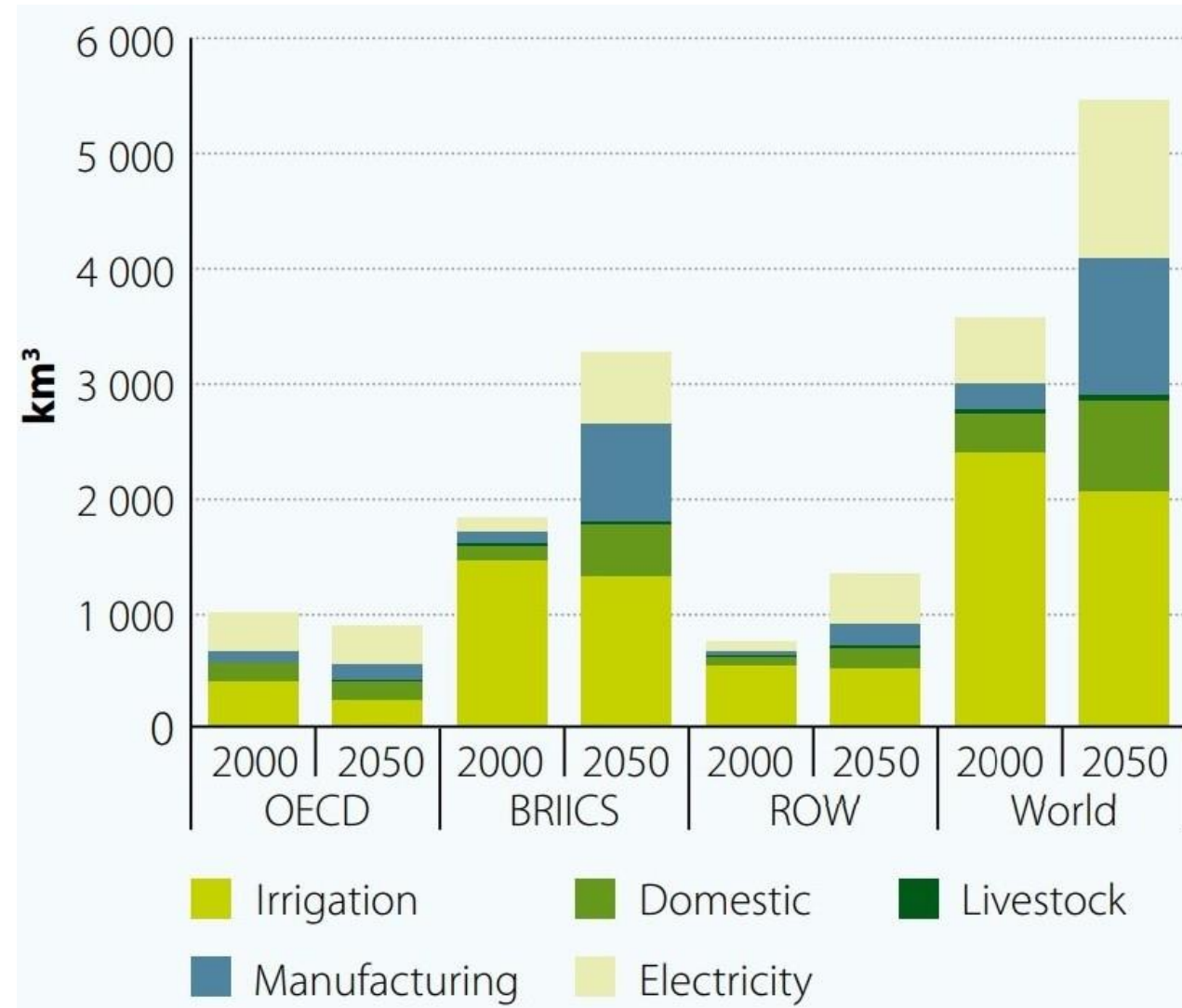
FOOD PRODUCTION VS NATURAL RESOURCES

Cultivated land per capita (FAO)



FOOD PRODUCTION VS NATURAL RESOURCES

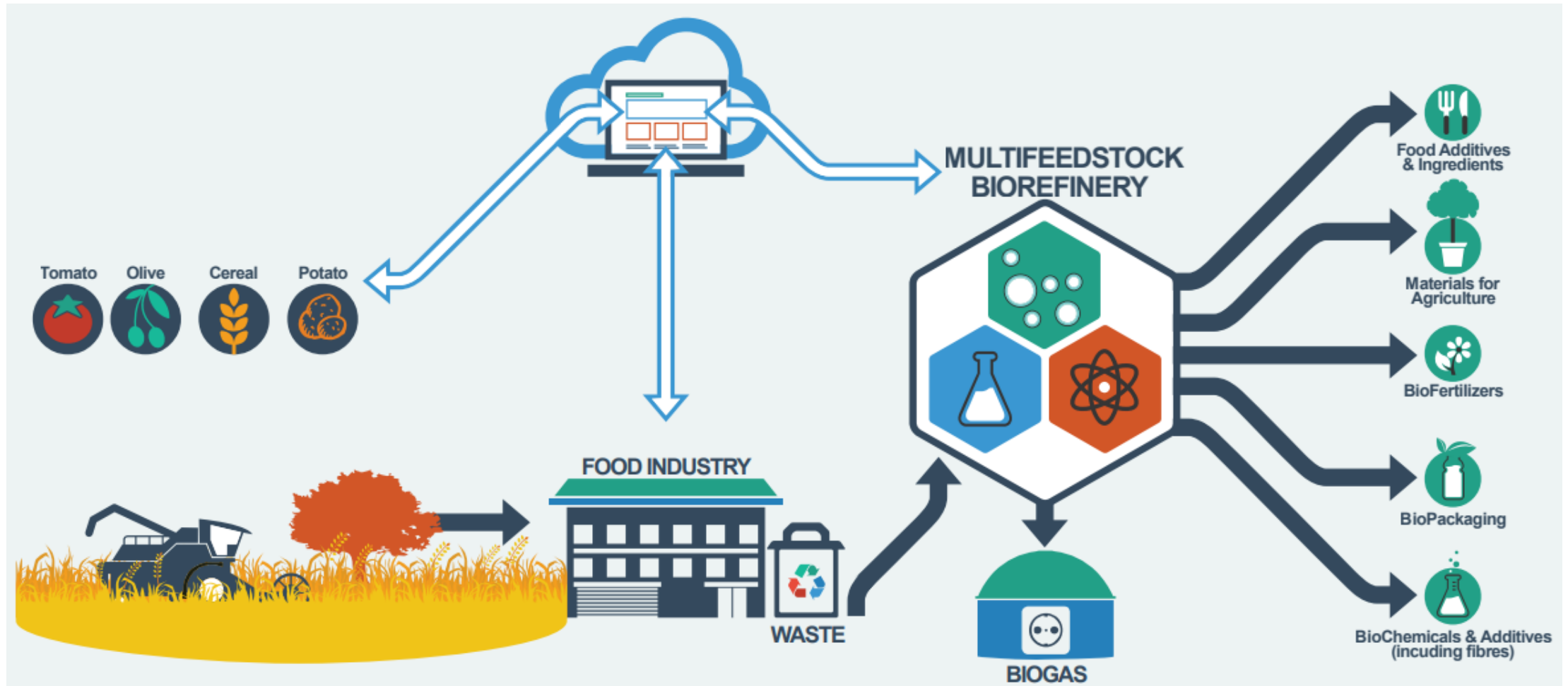
Global water demand (UNESCO)



BIOECONOMY GOALS

- Incorporate *new processing technologies*, *preserving organoleptic and nutritional properties*.
- Incorporate in the *new food ingredients* convenience and functionality, promoting *consumers health*.
- Promote a *value chain problem solving approach*.
- *Improve* natural resources use *efficiency* (water, soil,...).
- *Intensify* production and *sustainability*.
- *Minimize food waste recovering* residues and *by-products*.

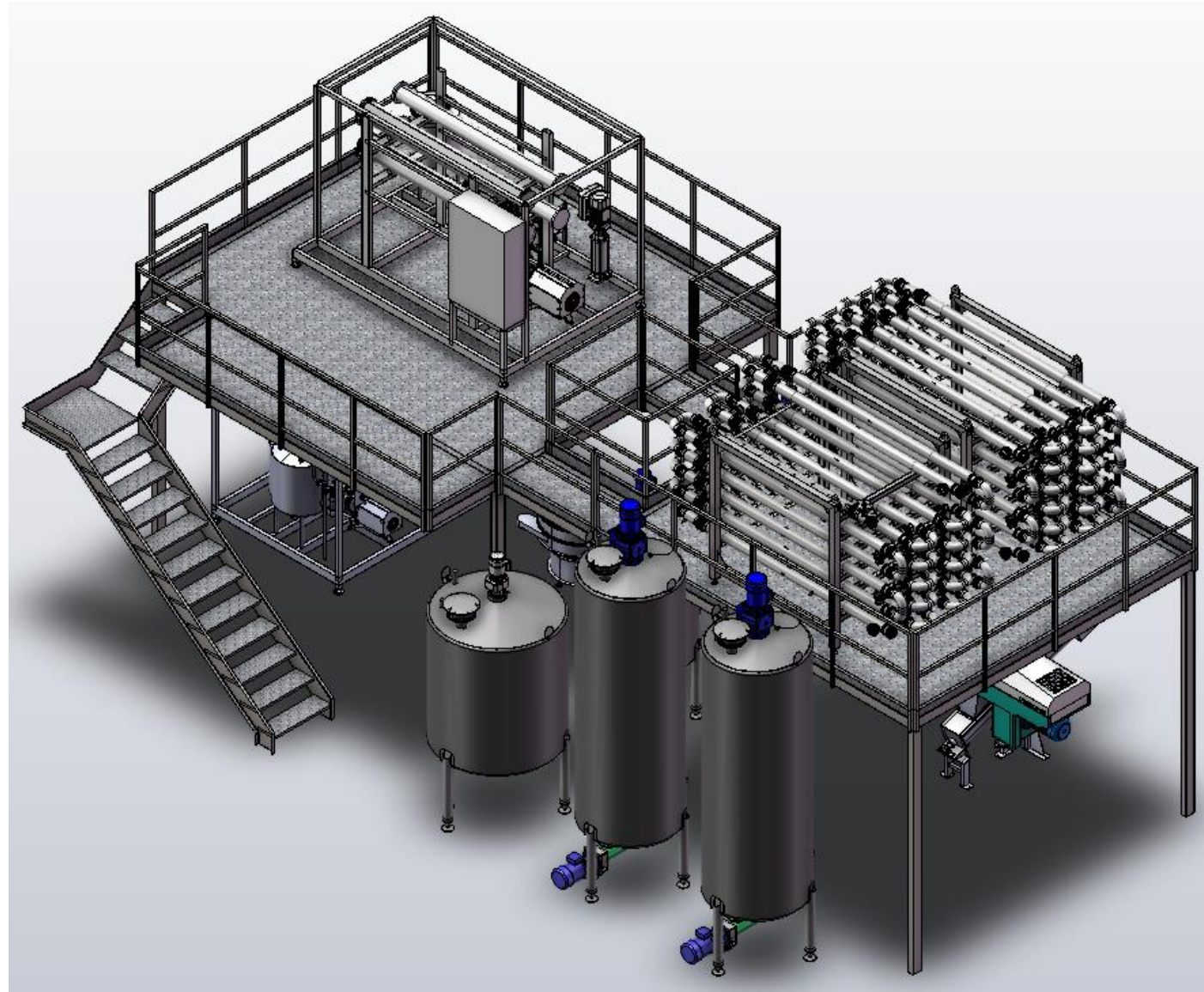
AGRIMAX OBJECTIVES: NEW PRODUCTS AND PROCESSING TECHNOLOGIES



SPP BIOECONOMIC KEY RESULTS AND ACHIEVEMENTS

- ✓ Multi-feedstock and multi-product TRL-7 pilot plant: demonstrated feasible in an operative industrial environment.
- ✓ Scale-up industrial plant modeled.
- ✓ 8 Added value TRL-7 food ingredients *in cascade*: natural polyphenols, carotenoids and aromas from olive oil and fresh tomatoes' by-products.
- ✓ 2 enhanced TRL-7 raw materials from olive oil by-products for: bio-fertilizers and bio-stimulants.
- ✓ Zero waste: just water 'emissions' after processing by-products.

SPP ENGINEERING



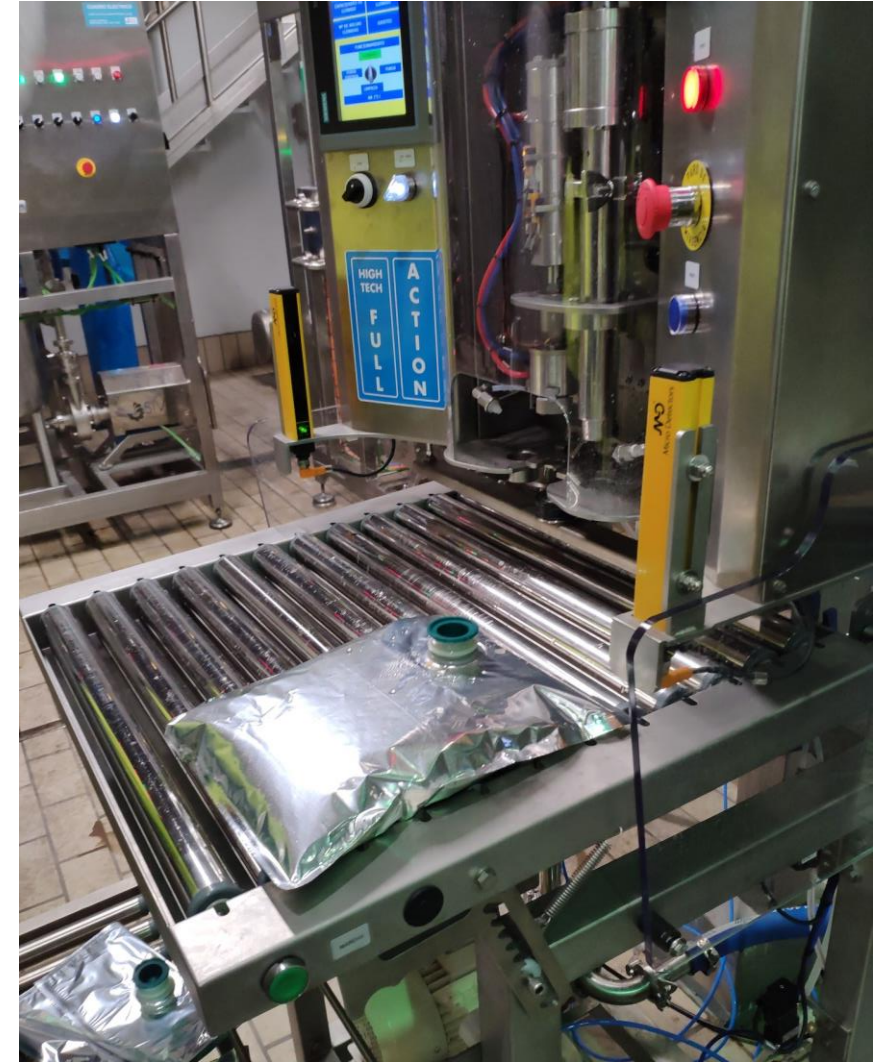
SPP BUILDING



SPP START-UP TRIALS



OLIVE POMACE INITIAL TRIALS



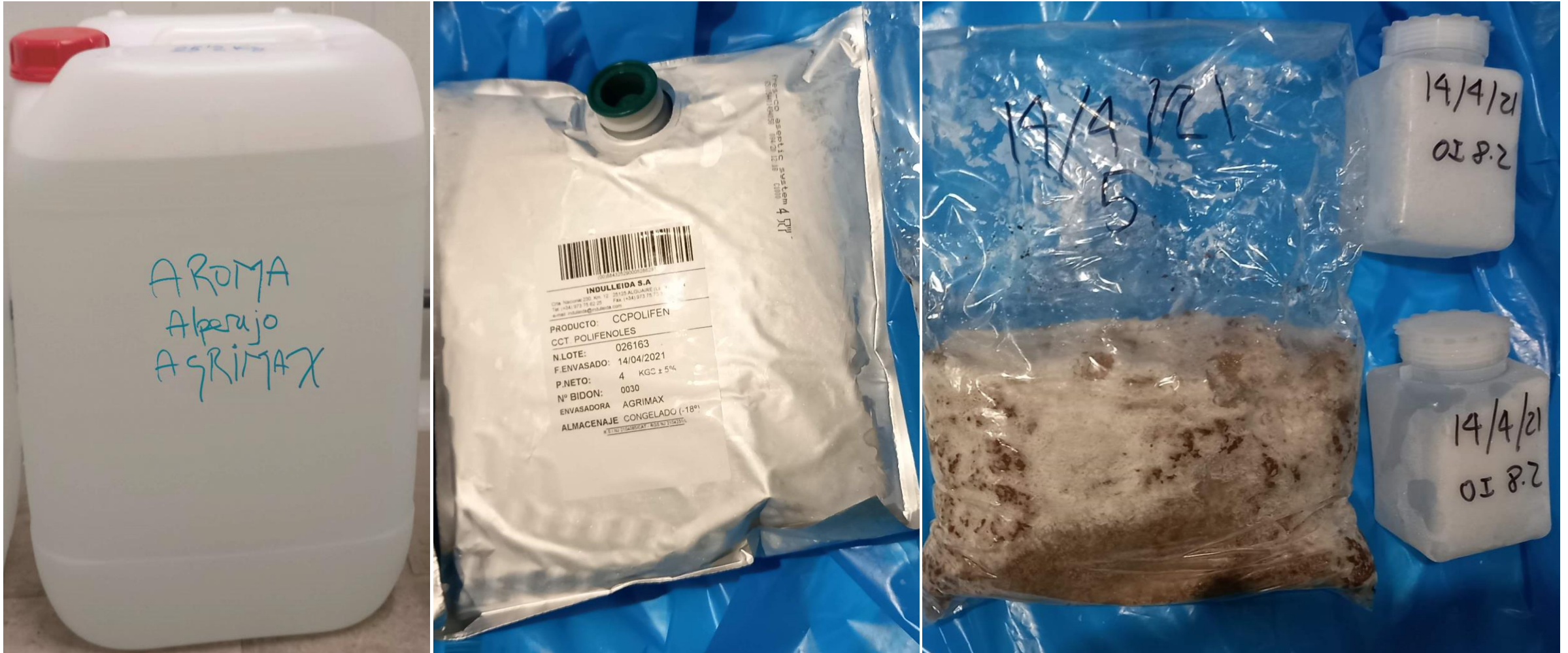
SPP OLIVE POMACE *INITIAL* *NEW* INGREDIENTS & BY-PRODUCTS



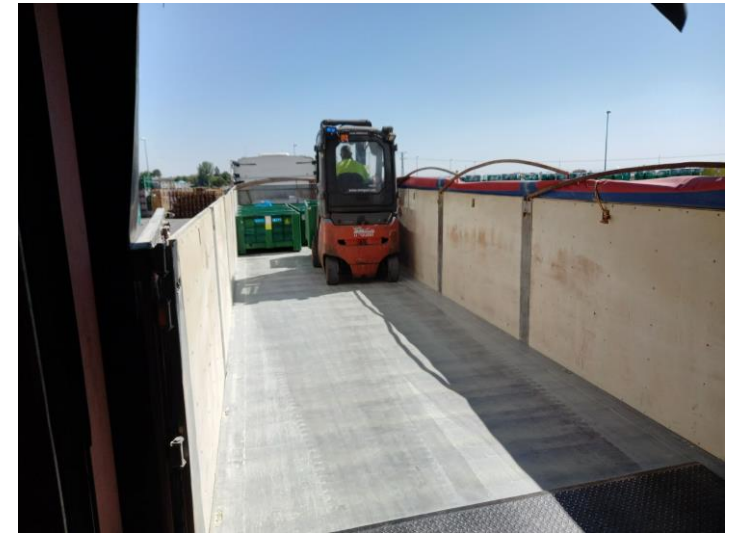
SPP ACHIEVING *BIOECONOMIC* PROCESSING TRIALS



SPP OLIVE POMACE *NEW BIOECONOMIC* INGREDIENTS & BY-PRODUCTS



OLIVE POMACE SPP BIOECONOMIC BY-PRODUCTS FOR BIO-FERTILIZERS



REJECTED FRESH TOMATOES TRIALS



REJECTED FRESH TOMATO TRIALS



REJECTED FRESH TOMATO TRIALS



REJECTED FRESH TOMATOES BIOECONOMIC FOOD INGREDIENTS



SPP BIOECONOMIC FOOD INGREDIENTS EXTRACTION TECHNICAL YIELDS

- *Olive pomace* bio-active food ingredients recovery yield: **85 %**
 - *Hydroxytyrosol.*
 - *Oleuropein.*
 - *Ferulic acid.*
- *Rejected tomatoes* bio-actives food ingredients recovery yield: **67 %**
 - *Lycopene.*
 - *β -carotene.*
 - *Ferulic acid.*

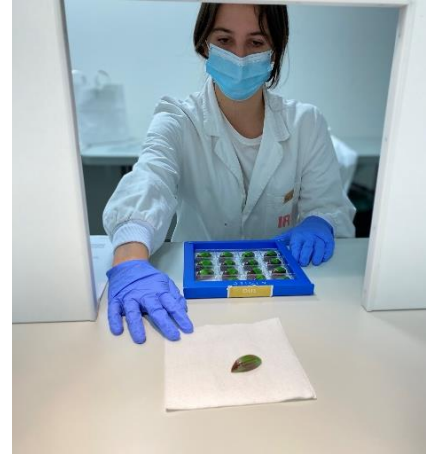
SPP BIOECONOMIC INGREDIENTS & BY-PRODUCTS APPLICATIONS



OLIVE POMACE

REJECTED TOMATOES

SPP OLIVE & TOMATO BIOECONOMIC INGREDIENTS APPLICATIONS TASTES



SPP OLIVE BIOECONOMIC INGREDIENTS FORMATS

Dehydrated format food ingredients from by-products demonstrated feasible.



SPP SCALE UP MODELING TRIALS: *parameters*

OLIVE
POMACE



REJECTED
TOMATOES



SPP SCALED UP BIOECONOMIC MODEL

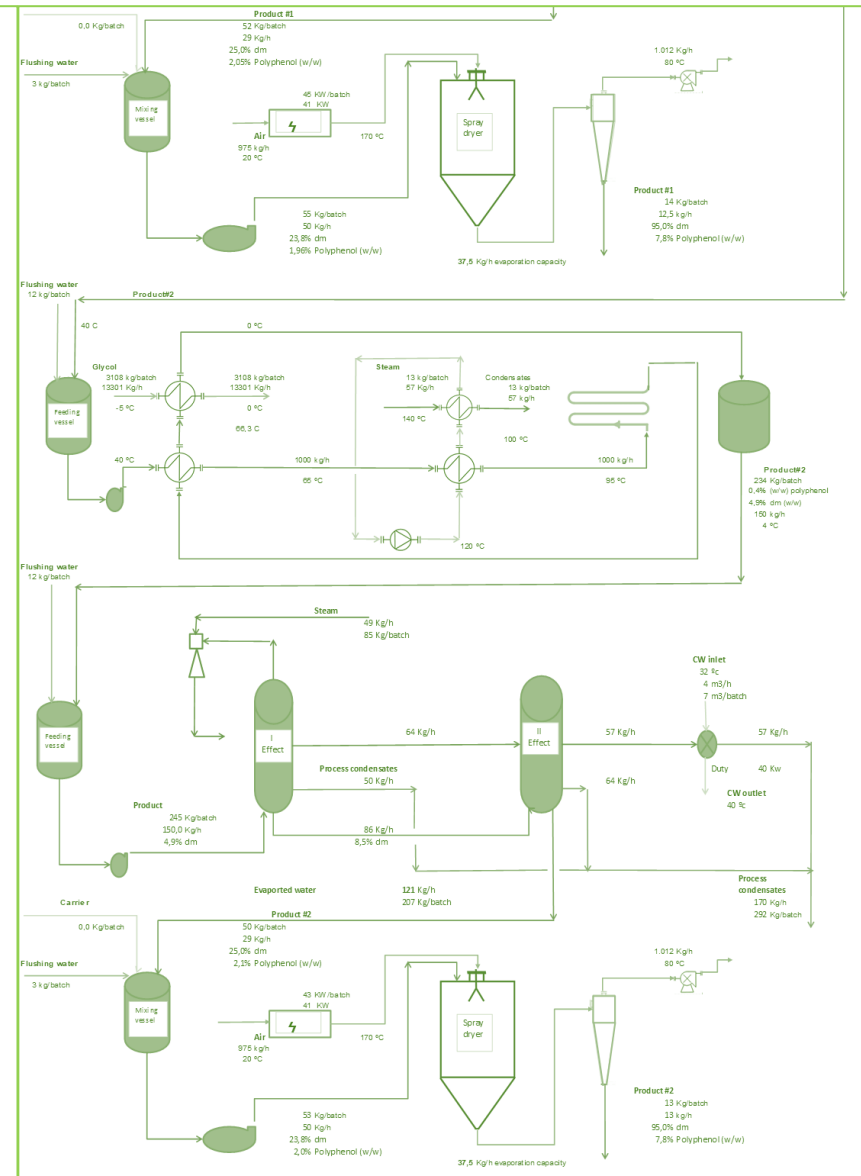
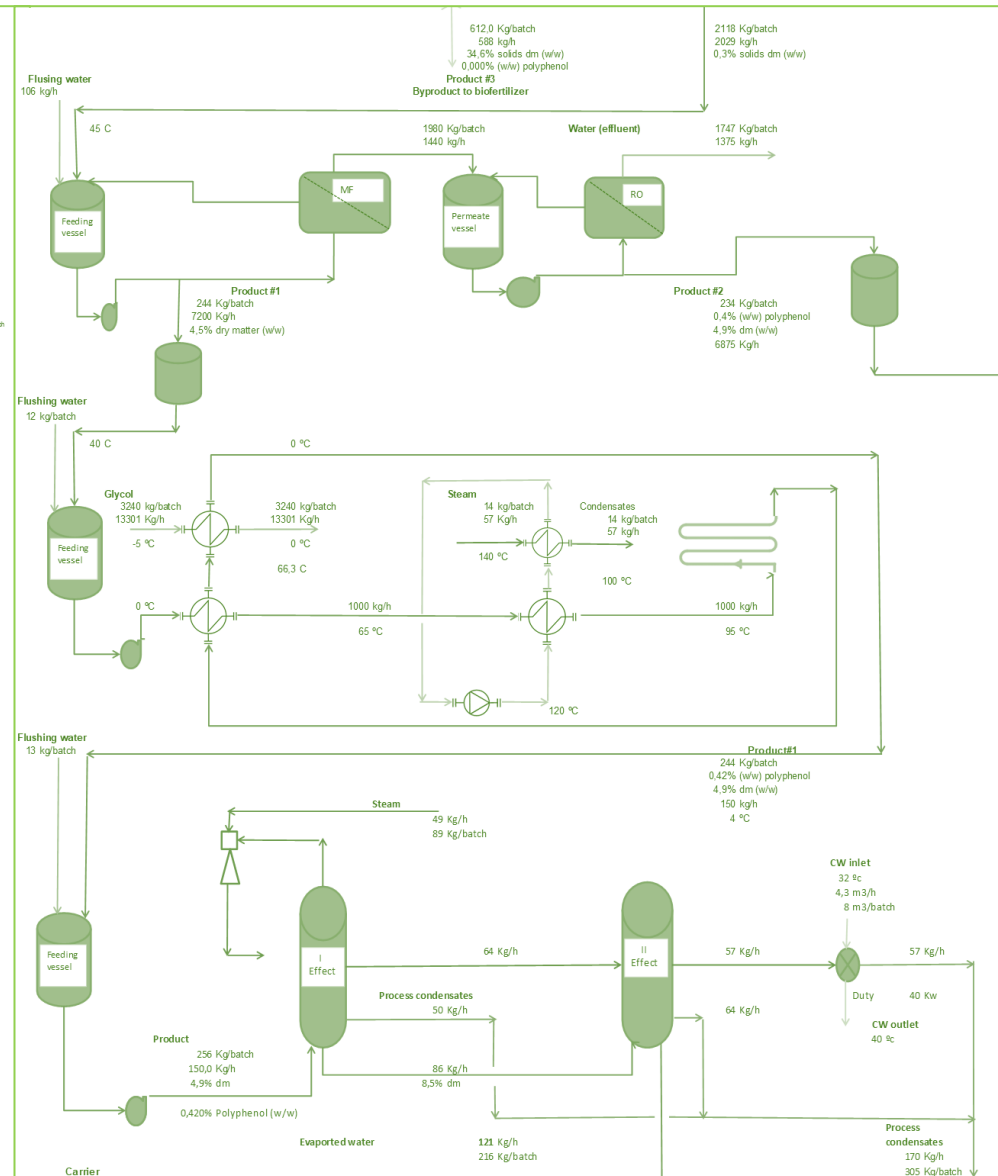
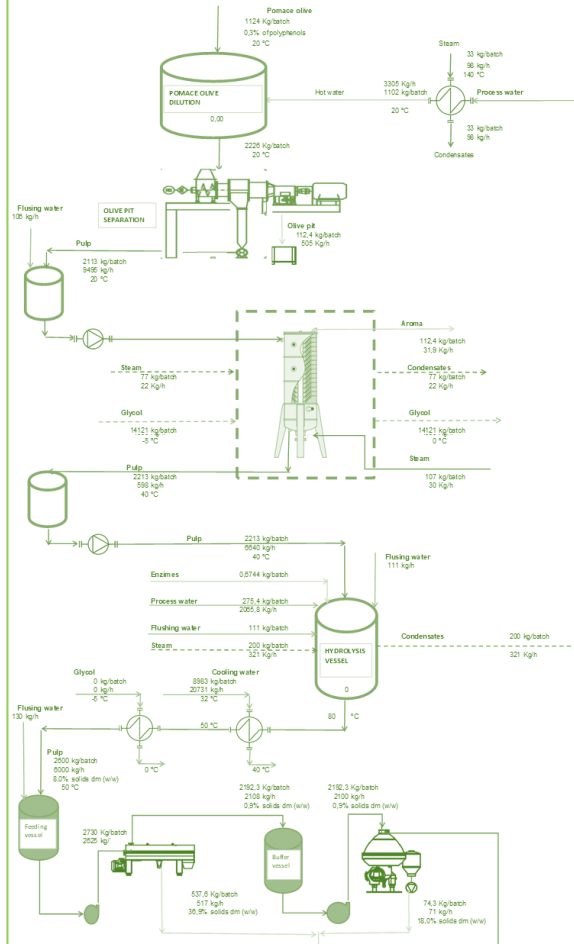
Area: INDALISA
Customer: Olive pomace refinery
Project: INDALISA

Date: 02/06/2021
Rev: 0

Cycle time: 6 h
Working week/year: 17
Batch/week: 23
Batch/year: 391
12,1% occupation

Plant capacity: 439 tpy
Pomace olive: 439 tpy

	Wet format output t/yr	Wet format		Equivalent powder format (after evap.)		Equivalent powder format	
		dm % total	Polyphenol % total	output t/yr	dm % total	output t/yr	Polyphenol % total
Product #1	96	4,5%	0,420%	20,4	25,0%	5,4	95,0%
Product #2	91	4,9%	0,420%	50,2	25,0%	5,2	95,0%
Product #3	229	34,0%	0,000%	71		10,5	
TOTAL	426						



SPP MAXIMUM CAPACITY AND BIOECONOMIC SCALE-UP SIZES

- Scalable pilot plant *demonstrated* operative. Maximum capacity: **440 T/year** olive pomace + **2.350 T/year** fresh rejected tomatoes.
- Small-scale industrial plant *modeled*. Maximum capacity: **1.300 T/year** olive pomace + **7.000 T/year** fresh rejected tomatoes.
- Large-scale industrial plant *modeled*. Maximum capacity: **9.000 T/year** olive pomace + **47.000 T/year** fresh rejected tomatoes.

LARGE-SCALE INDUSTRIAL TECHNO-ECONOMIC FIGURES

FULL-SCALE LIQUID OUTPUTS CAPACITY	OLIVE POMACE	TOMATO
Aroma (Tn/year)	969	1.980
Semi-solids for food or bio-fertilisers (Tn/year)	2.980	4.752
Carotenoids (Tn/year)	-	10.250
Polyphenols (Tn/year)	5.474	4.920

Internal Rate of Return IRR	18,30%
CF/I updated	204%
Pay Back - ROIC	7 years
Investment (I)	37.227.783,98 €
Working capital first 2 years	4.360.810,13 €
Cash Flow (CF) updated	73.314.464,02 €
Annual Updating Rate	4,00%

Direct (qualified) jobs: 47

Indirect jobs (not induced jobs): 235

ZERO WASTE BIOECONOMIC PROCESSING

SPP MAIN FOOD INGREDIENT: *WATER at end-of-pipe*



OLIVE POMACE



REJECTED TOMATOES



Thanks for paying attention