



SPIN – Sustainable Protein

AVISO N.º 15/ C05–i03/2021 - PROMOÇÃO DO PRODUTOS AGROALIMENTARES

Soil: Indicators of its quality and good agricultural practices in the context of climate change - some recent results

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Samora Correia, 21st March 2024



REPÚBLICA
PORTUGUESA



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Summary

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01

Objectives/opportunities



The SPIN Project addresses four opportunities, spread across four sectors, focussed on obtaining healthy and sustainable protein that will help develop new products and keep up with new consumer trends:

Opportunity 1) valorise crickets of the *Acheta domesticus* species

Opportunity 2) to valorise the non-native species *Silurus glanis* (European catfish)

Oportunidade 3) valorizar variedades de chícharo e de grão-de-bico,;

Opportunity 4) to promote the sustainability of the agricultural area through regenerative agriculture, improving the environmental and climatic performance of farms, while at the same time using these farms to obtain protein of bovine origin (beef) that complies with the strictest animal welfare standards.



02

Consortium



Coordination:



Narciso Dias & Filhos, Lda



Carlos Serras Lopes



International partners:



Professor Joana Portugal Pereira



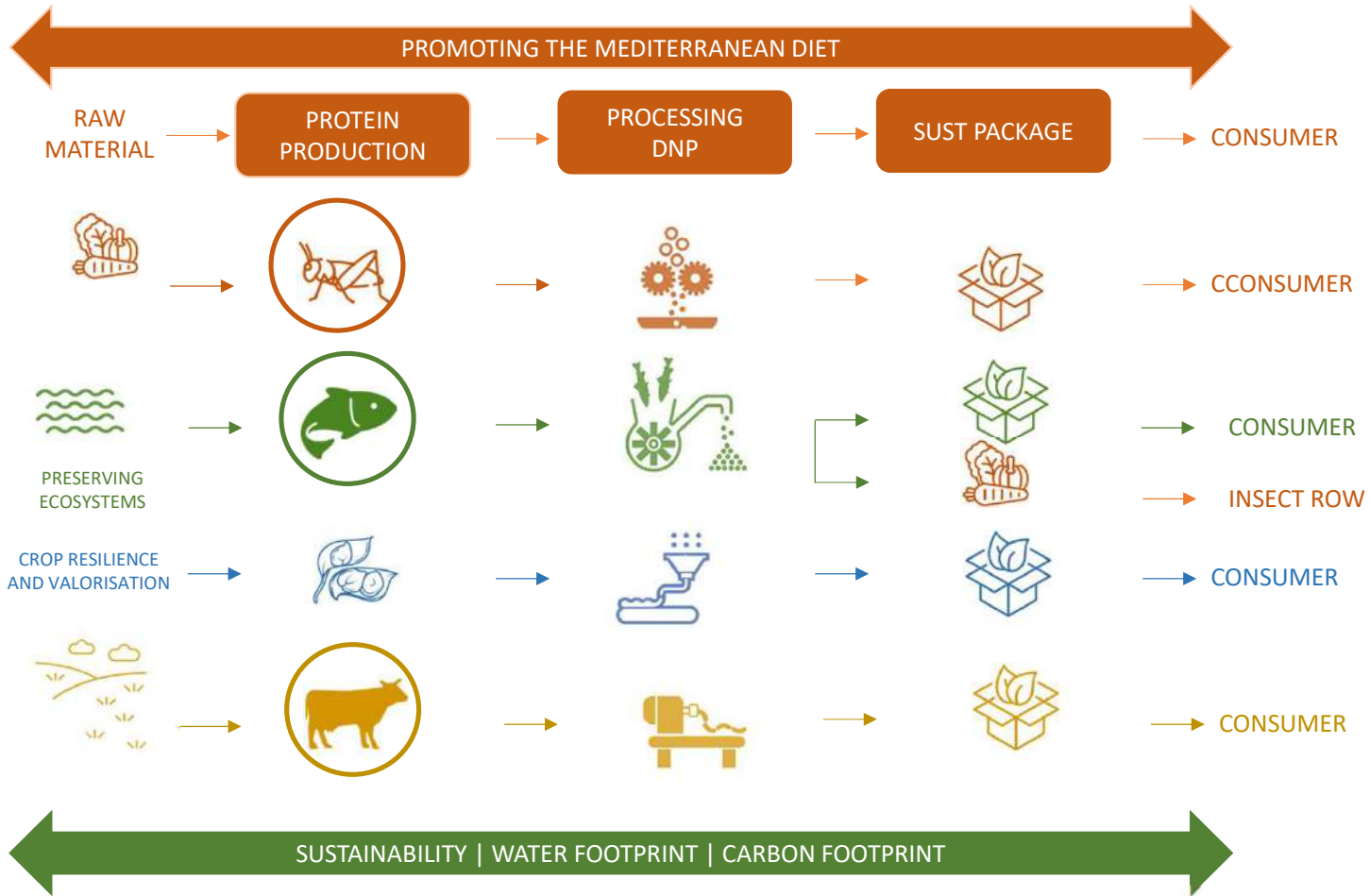
Israel Tejero Montes



03

Activities to be developed





Selection Criteria for Installation of Experimental Plot



Permanent pasture
already installed
(year 2021/2022);

Ease of installation of the
experimental plot taking
advantage of the inter-rows
of the olive grove

Animals (cattle and
chickens) already
present practicing
rotational grazing;

Presence of traditional
olive grove tree cover,
with more recent
densification

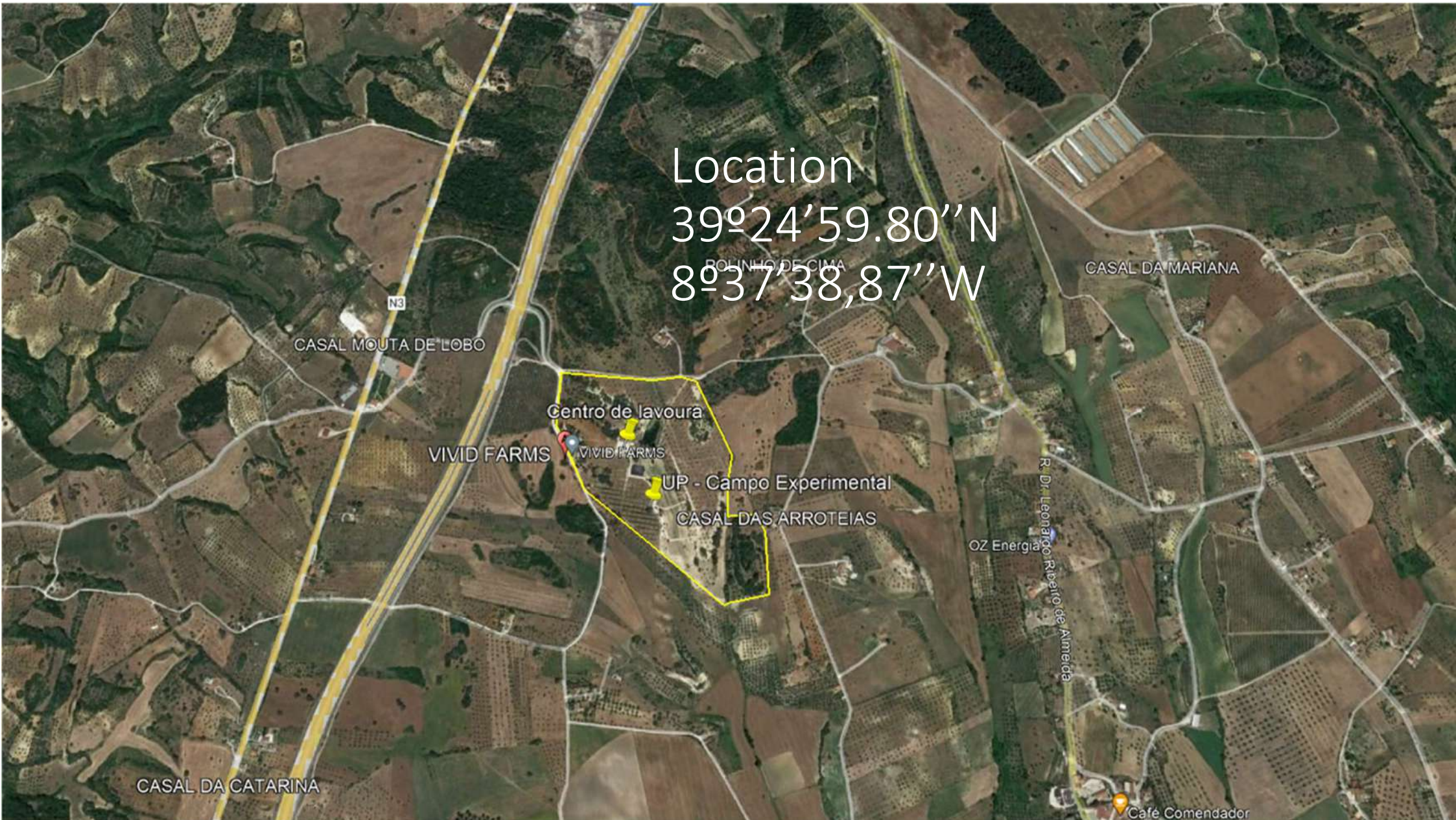


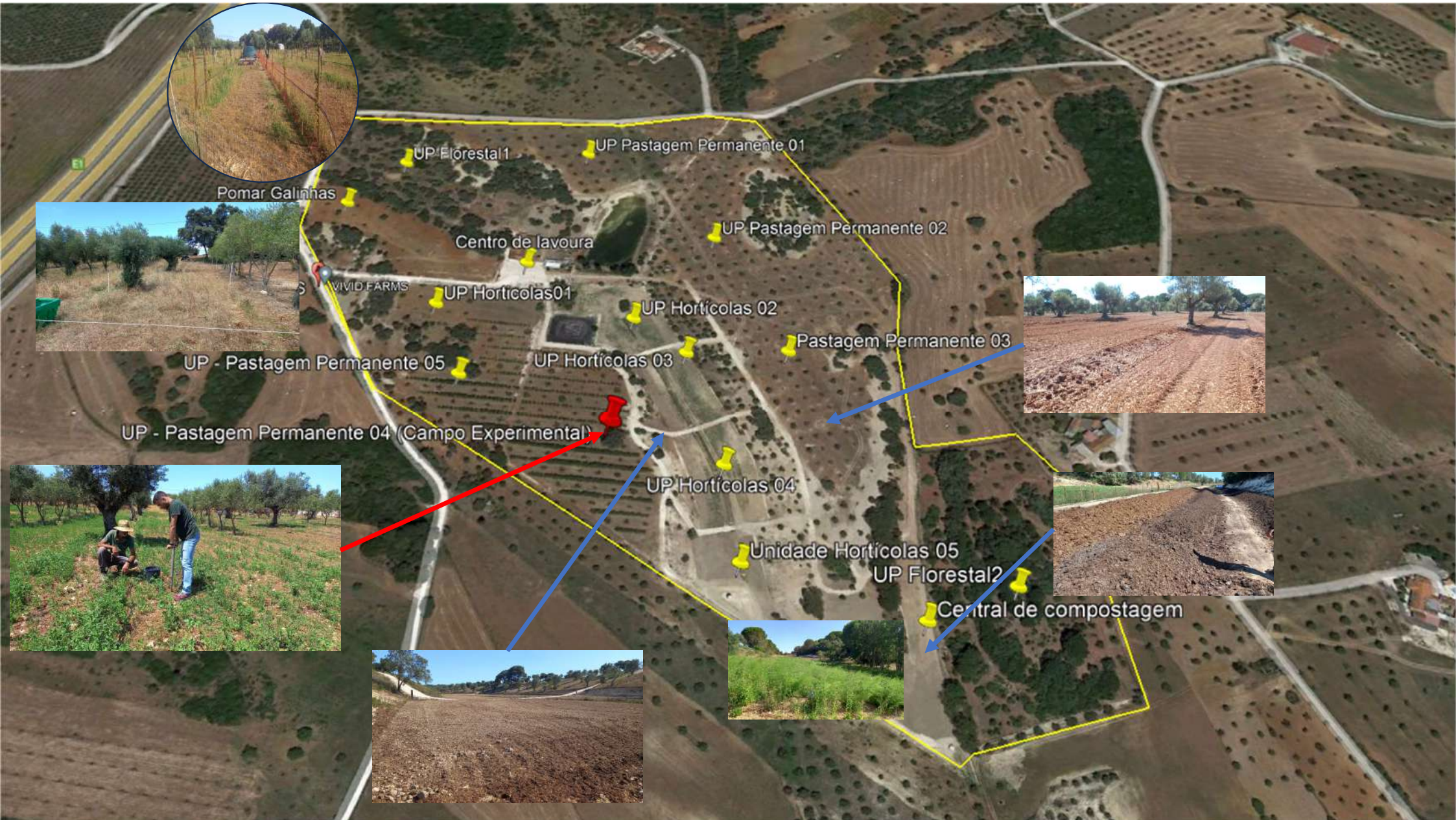
Framework of experimental work in the field of regenerative agriculture

- Reinforcement of the binomial: agricultural production (pasture, fodder), animal production;
- Increased soil fertility by adding organic matter to the soil by grazing cattle and poultry; compost produced on the farm; by-products of other activities;
- Non-application of synthetic fertilizers;
- Use of legumes to capture atmospheric N;
- Increased biodiversity in the air system and on the ground



Location
39°24'59.80"N
8°37'38,87"W





A few notes on parcel management

- Notes:
- Area of each Grazing Box: 1500 m²;
 - Header: 10 animals/box;
 - Cattle grazing followed by chickens in the field;
 - Grazing Type: Rotational;
 - Average grazing cycle length: 3/4 months



Experimental design

- Type of test:
 - Monophatorial;
- Factor to study:
 - Assessment of the impact of organic fertilisers on soil fertility;
- Treatments:
 - T – Witness;
 - IR – Insect residues (*Acheta domesticus*)
 - FC – Fish concentrate (in liquid form)
 - CF – Vivid Farm compound (Obtained on farm)

Experimental design

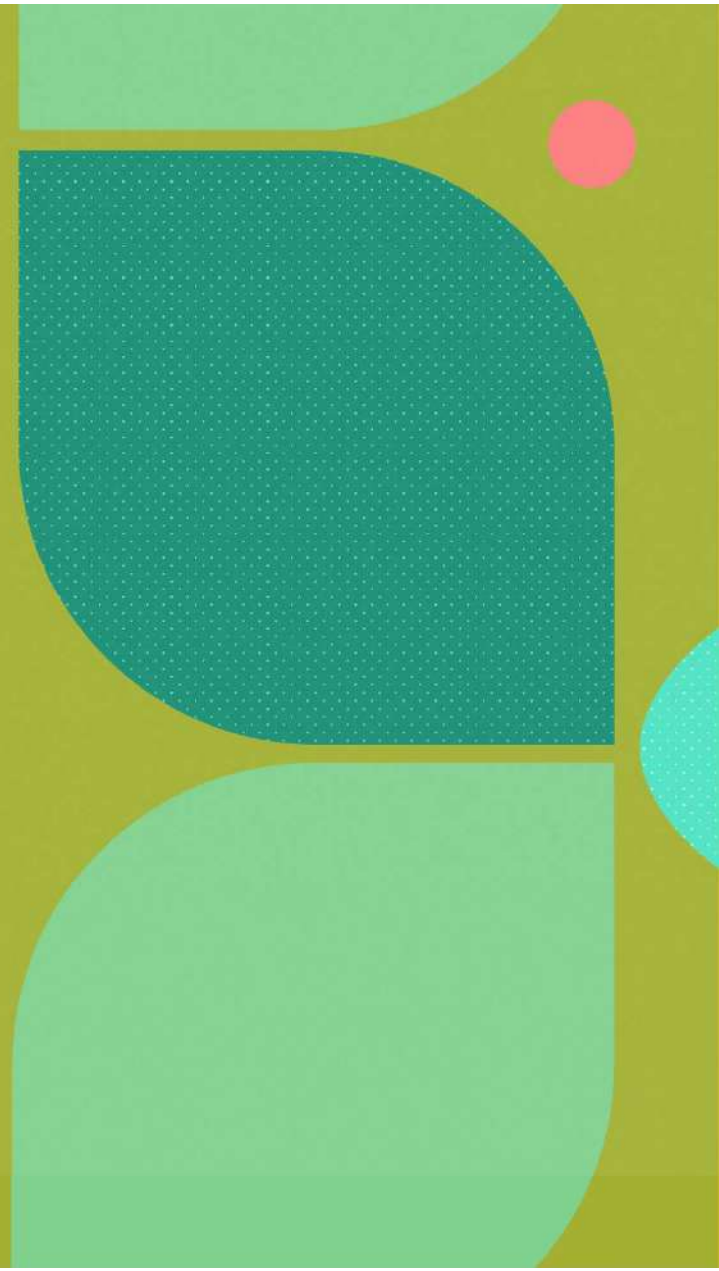
	Bordadura					
	6m					
Azinheira	5m	RP - Resíduos Peixe	RP - Resíduos Peixe	T - Testemunha	RP - Resíduos Peixe	
		T - Testemunha	T - Testemunha	F - Frasse	FP - Composto Farms	
Bordadura		F - Frasse	FP - Composto Farms	FP - Composto Farms	F - Frasse	Bordadura
		FP - Composto Farms	F - Frasse	RP - Resíduos Peixe	T - Testemunha	
		B4	B3	B2	B1	
		Estrada				
total						

Analysis of the products to be applied and definition of the quantities to be applied

Amount of N to be applied: 100kg N
in organic form

Characterization of products to be
applied (Dry-matter; organic matter;
N-organic; other nutrients)

Determination of the quantities to be
applied per experimental plot



Tasks performed

- Estimate the amount of insect waste to be obtained by mid-October;
- Weighing and application of treatments during the week of October 16-20;
- Floristic survey in the experimental plots;
- Initial collection of biomass in the experimental plots in sub-plots of 0.25m².
- Collection of information on the species initially installed and the reseedling carried out in early August



Soil samples

- Methodology:
 - Random collection at 20 points in each of the blocks
 - **Analyses to be carried out:**
 - Summary analysis;
 - Exchange Bases;
 - Particle size analysis;
 - Calcium;
 - Magnésio;
 - N total;
 - N - Nitrates



Experimental design

- Randomized Blocks;
- No. of blocks: 4;
- Experimental plot:
30m²
 - Width – 6m
 - Length – 5m





Physicochemical characterization of soil

Parameters	Units	R1	R2	R3	R4	Average	CI
pH (água)		7,8	8,1	8,1	8,0	8,0	0,11
Organic matter	(%)	3,93	4,76	3,85	3,77	4,1	0,45
Assimilable phosphorus	(mg/kg)	81,9	113,1	44,1	26,8	66,5	37,9
Assimilable potassium	(mg/kg)	447,5	375,5	292,0	269,1	346,0	80,0
Total limestone	(%)	7,7	5,7	8,5	17,3	9,8	5,03
Total Scourge	(%)	0,150	0,246	0,215	0,207	0,205	0,04

Physicochemical characterization of soil (Textural analysis)



Parameters	Units	R1	R2	R3	R4	Average	CI
Sand	25,0	29,0	31,0	33,0	29,5	25,0	3,35
Limo	54,0	54,0	49,0	47,0	51,0	54,0	3,49
Clay	21,0	17,0	20,0	20,0	19,5	21,0	1,70
Texture Class	Clay	Clay	Clay	Clay	Clay	Clay	



Physicochemical characterization of soil



Parameters	Units	R1	R2	R3	R4	Average	CI
Ca Troca	(cmolc/kg)	4,8	4,68	4,07	4,10	4,4	0,37
Mg troca	(cmolc/kg)	1,31	1,23	0,92	0,84	1,1	0,23
K troca	(cmolc/kg)	1,19	1,00	0,72	0,72	0,9	0,23
Na troca	(cmolc/kg)	1,72	1,30	1,25	1,22	1,4	0,23
Titratable acidity	(cmolc/kg)	0,00	0,00	0,00	0,00	0,0	0,00
Soma de bases de troca	(cmolc/kg)	9,01	8,22	6,96	6,88	7,8	1,01
Cationic exchange capacity	(cmolc/kg)	9,01	8,22	6,96	6,88	7,8	1,01

Soil with good chemical fertility. Good Cation Exchange capacity.

Collection of biomass samples in 4 random plots

13/out				
Área	0,25 m ²			
Rep.	PV	PS	PV	PS
	(kg/amostra)	(kg/amostra)	(kg/ha)	(kg/ha)
R1	0,112	0,028	4484	1102
R2	0,080	0,026	3202	1048
R3	0,092	0,036	3684	1437
R4	0,098	0,045	3901	1796
Média	0,095	0,034	3818	1346
DP	0,013	0,009	532	346
IC	0,013	0,008	521	339
CV	13,9	25,7	13,9	25,7



Determination of the moisture content of the Frass (22/09/23)



Determinação do teor de humidade da FRASSE						
Tratamentos	Tara (g)	T+PH (g)	T+PS (g)	MS (g/g)	MS (%)	Humidade (%)
Frassa 1 R1	8,2	40,2	33,3	0,79	78,7	21,3
Frassa 1 R2	8,2	68,2	56,1	0,80	79,8	20,2
Frassa 1 R3	8,3	73,0	60,2	0,80	80,2	19,8
Média					79,6	20,4
DP					0,81	0,81
IC					0,91	0,91
Frassa 2 R1	8,3	41,6	35,4	0,81	81,1	18,9
Frassa 2 R2	8,3	61,4	51,9	0,82	82,1	17,9
Frassa 2 R3	8,3	80,4	68,1	0,83	82,9	17,1
Média					82,1	17,9
DP					0,90	0,90
IC					1,01	1,01

Estimation of quantities and homogenization of the FRASS 22/09/23 in the ESAS



Characterization of fertilizers: Frasse



Determinação do teor de humidade da FRASSE													
Tratamentos	pH	MO (%)	Condutividade (mS/cm)	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	Na (%)	Fe (mg/kg)	Mn (mg/kg)	Zn (mg/kg)	Cu (mg/kg)
Frasse 1 R1	5,9	89,6	5,49	4,03	0,56	0,92	1,56	0,30	0,72	709,2	53,0	112,1	66,0
Frasse 1 R2	6,3	84,6	7,13	4,64	0,80	1,56	2,11	0,44	0,26	894,6	83,6	121,1	66,9
Frasse 1 R3	6,2	87,0	6,22	4,52	0,66	0,98	1,78	0,34	0,27	649,2	64,5	114,9	52,0
Média	6,1	87,1	6,28	4,40	0,67	1,15	1,82	0,36	0,42	751,0	67,0	116,0	61,6
DP	0,19	2,50	0,82	0,32	0,12	0,35	0,28	0,07	0,26	127,9	15,4	4,7	8,3
IC	0,21	2,83	0,93	0,37	0,14	0,40	0,31	0,08	0,30	144,8	17,5	5,3	9,4
Frasse 2 R1	6,3	84,8	5,5	4,83	0,7	1,5	2,0	0,41	0,38	675,0	86,2	109,1	51,0
Frasse 2 R2	6,3	84,6	5,3	4,83	0,7	1,3	1,9	0,41	0,30	764,2	88,3	110,1	48,8
Frasse 2 R3	6,3	83,0	5,5	5,03	0,8	1,5	2,4	0,43	0,19	554,6	85,3	109,3	54,2
Média	6,3	84,1	5,4	4,90	0,71	1,42	2,13	0,42	0,29	664,6	86,6	109,5	51,3
DP	0,02	0,99	0,14	0,12	0,06	0,07	0,27	0,01	0,10	105,2	1,6	0,5	2,7
IC	0,02	1,12	0,16	0,13	0,07	0,08	0,31	0,01	0,11	119,0	1,8	0,6	3,1

Vivid Farms Compost 22/09/23



Characterization of Vivid farms compost



pH (água)		7,6
Matéria Orgânica	(%)	34,1
Fósforo assimilável	(mg.kg-1)	1465
Potássio assimilável	(mg.kg-1)	19087
Calcário Total	(%)	27,7
Azoto Total	(%)	1,63
Azoto Nítrico	(mg.kg-1)	
Cálcio assimilável	(mg.kg-1)	4478
Magnésio assimilável	(mg.kg-1)	2032,0

Fish concentrate – by product

22/09/23



Characterization of Fish Concentrate (by-product)



Parâmetro	Unidade	Concentrado peixe
MS Total	(%)	28,8
pH (água)		6,2
Matéria Orgânica	(%)	22,9
Fósforo na forma P	(%)	0,38
Potássio na forma K	(%)	1,1
Para converter para P2O5 x por 2,2914		
Para converter para K2O x por 1,2046		
Azoto Total	(%)	4,20
Cálcio	(g/kg)	0,40
Magnésio	(%)	0,30
Relação C/N		3,1
C Orgânico Total	(%)	13,0



Calculation of the quantities to be applied



Assume-se que se irá aplicar 100kg/ha de N na forma orgânica										Qdade a aplicar	
Tratamentos	MS	MO	pH	N	Qdade de N	Qdade de N	Qdade de MS	Qdade Mfresca	Total a aplicar	Mfresca	
	(%)	(%)		(%)	(kg/ha)	(kg/30m2)	(kg/30m2)	(kg/30m2)	(kg)	(Kg/ha)	
Frasse	80	87	6,1	4,4	100	0,3	6,8	8,5	34,1	2841	
Conc. Peixe	28,8	23	6,2	4,9	100	0,3	6,1	21,3	85,0	7086	
Composto Vivid	79,9	34	7,6	1,6	100	0,3	18,8	23,5	93,9	7822	



Application of treatments 13/10/23



Distribution of VividFarm Compost



Frass Distribution



Distribution of fish concentrate

Next actions:



- Collection of plant samples in the experimental plots (20/03/24):
- Floristic survey;
 - Biomass assessment
 - Determination of nutrients(N;P,K,Ca; Mg) in the DM of the collected biomass;
- Collection of soil samples for evaluation of pH; Organic matter; P_2O_5 , K_2O ,
- Collection of meteorological elements from the nearest weather station.

*SPIN – Sustainable
Protein
Código do Projeto –
PRR-CO5-i03-I-000192*





Thank you for your attention!





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AVISO N.º 15/ C05–i03/2021 - PROMOÇÃO DO PRODUTOS AGROALIMENTARES

REUNIÃO GERAL DO PROJETO

Duração do Projeto: janeiro de 2023 a setembro de 2025 (33 meses)

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Santarém, 12 de março de 2024

