



Food and Agriculture
Organization of the
United Nations

Salt-affected soils: threats and potentials

Expanding Food Options Through *Tetragonia tetragonioides*: A Solution to Soil Salinization Challenges

INSAS and SUSTAIN



Funded by
the European Union



VNIVERSITAT
DE VALÈNCIA



Valencia, Spain
May 27-31, 2024





Family: Aizoaceae

Origin:, New Zealand, and
the Pacific Islands



Spread across **Africa**, the **Americas**,
Europe, and parts of **Asia**

Cultivated and consumed **worldwide**



Grows rapidly

Potentially
invasive



Salinity and **drought** tolerance

Joint meeting of the International network of salt-affected soils (INSAS) and
the COST Action on the sustainable use of salt-affected lands (SUSTAIN)

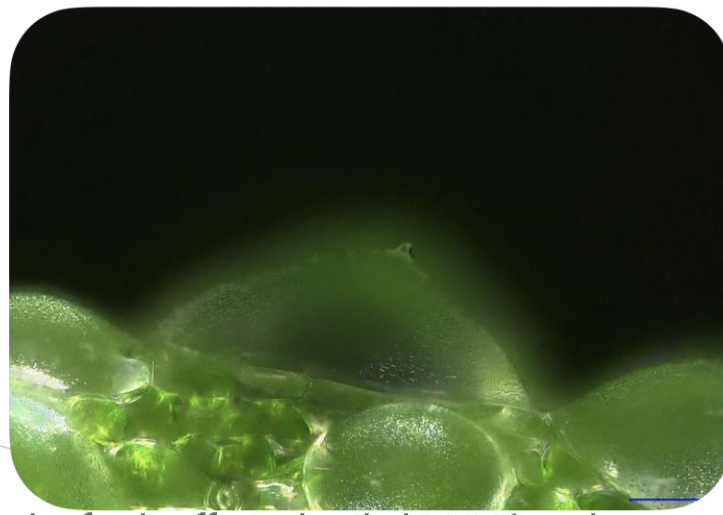
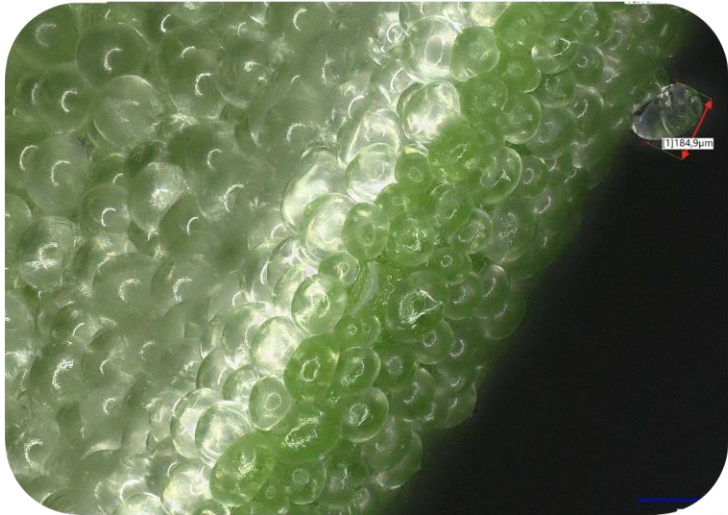
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ADAPTATION



- **Includer** halophytes
- **Bladders cell** (osmotic regulation)



- Reduced **stomatal activity** and **evapotranspiration**

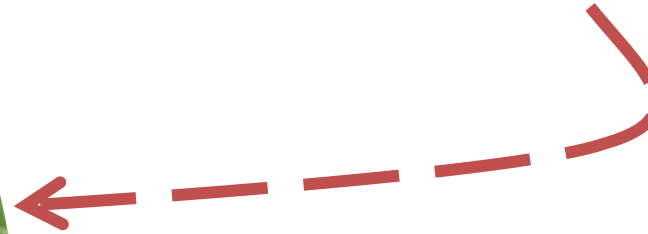
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Edible part:
leaves



corrected soils (INSAS) and
salt-affected lands (SUSTAIN)

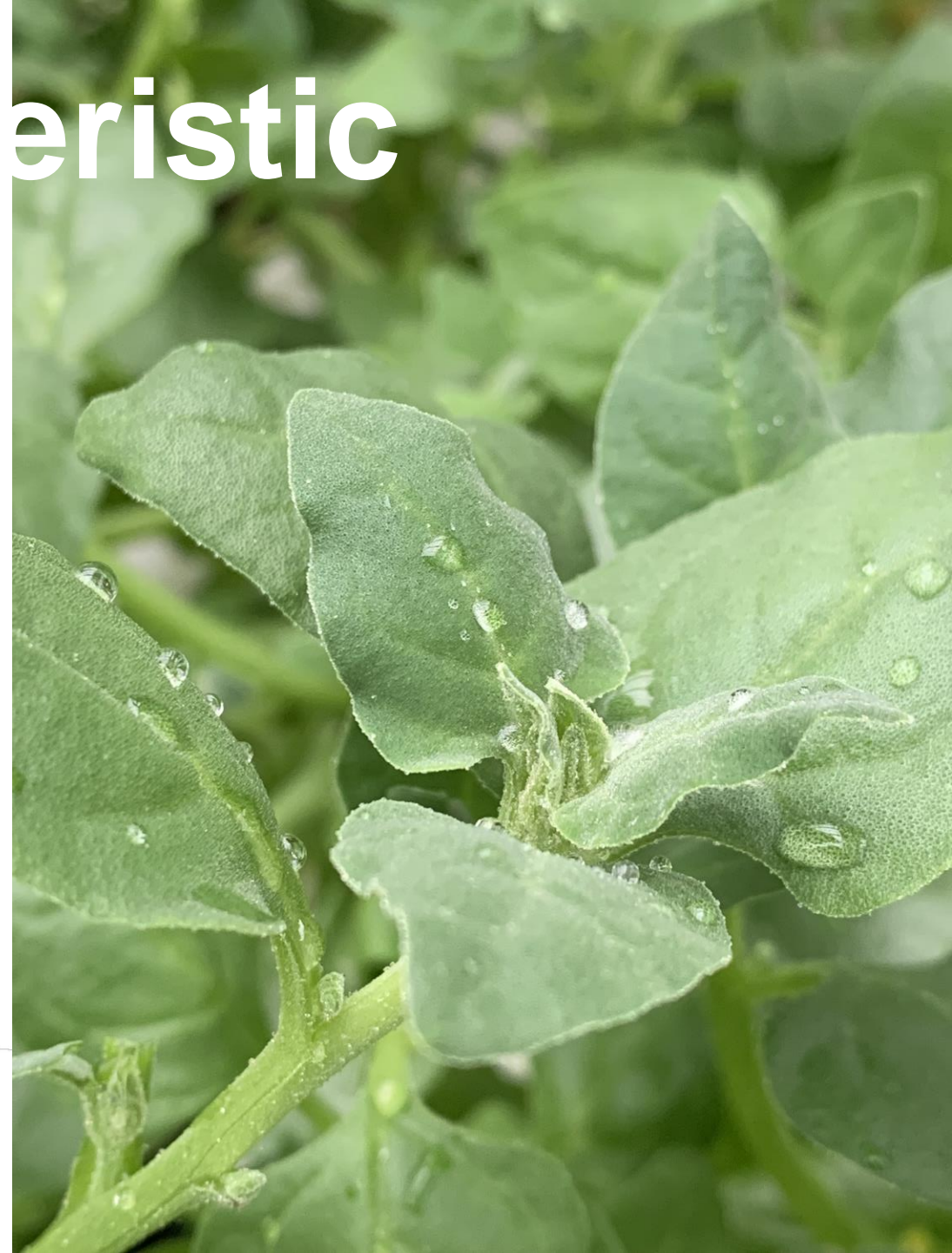
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Nutritional Characteristic

- ★ High levels of vitamin **A**, **B1**, and **B2**,
- ★ Vitamin **C**
- ★ Vitamin **K**
- ★ **Low fat** and **high fibre** content.
- ★ High level of **oxalate**

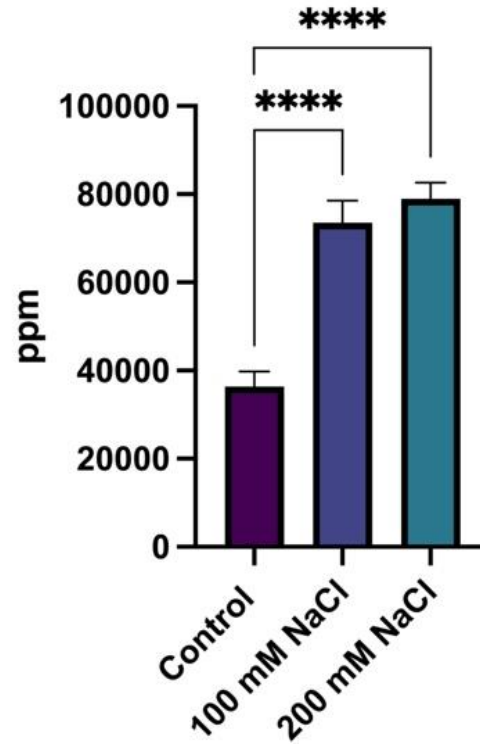
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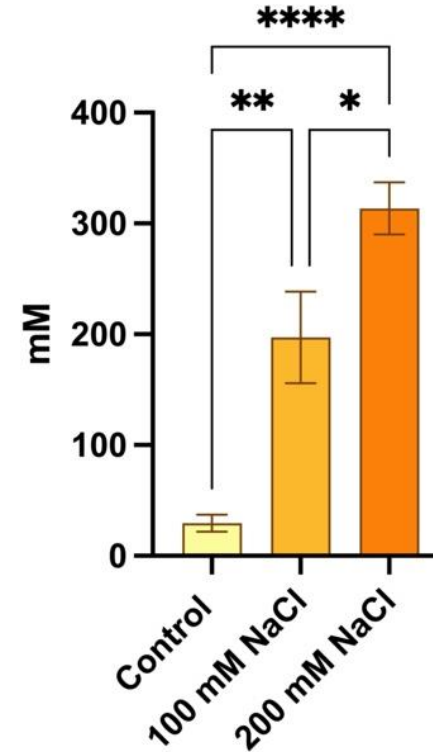
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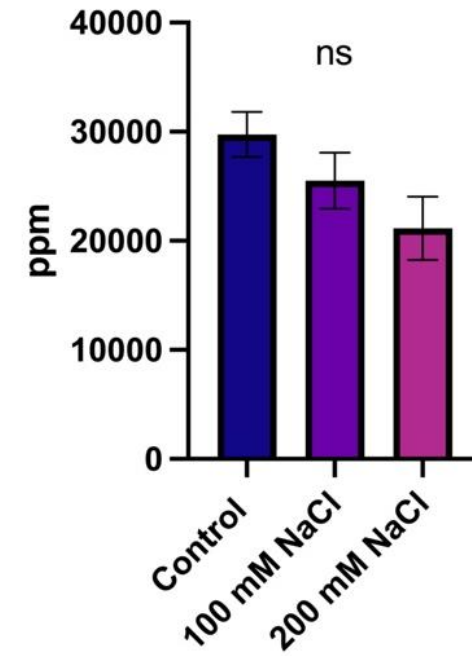
Sodium



Chloride



Potassium



Cu (ppm)	Fe (ppm)	Mg (ppm)	Mn (ppm)	Mo (ppm)	Ni (ppm)	P (ppm)	Sr (ppm)	Zn (ppm)
15,42 ± 1,29	331,82 ± 219,77	8327,49 ± 1465,73	146,83 ± 43,77	0,6 ± 0,43	2,25 ± 0,47	1582,95 ± 748,79	30,7 ± 15,92	57,55 ± 48,45
18,16 ± 5,77	561,52 ± 700,17	6492,11 ± 1837,81	158,08 ± 26,94	0,76 ± 0,59	3,34 ± 2,40	2234,1 ± 955,37	53,27 ± 34,33	65,49 ± 42,38
21,47 ± 7,81	948,76 ± 873,58	6563,87 ± 1277,10	215,37 ± 65,53	0,45 ± 0,23	4,47 ± 2,94	2136,46 ± 443,08	57,58 ± 22,36	64,19 ± 38,63

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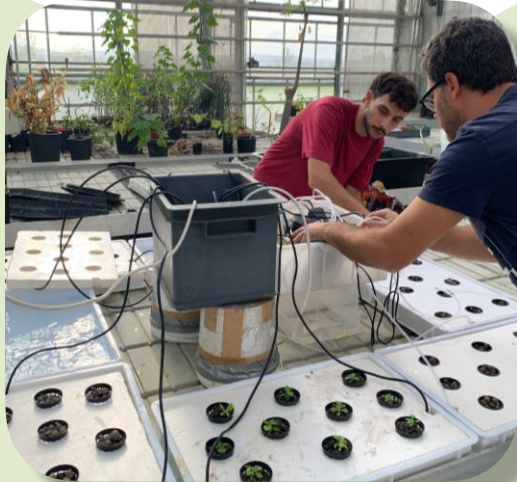


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Plant growth and harvest



the COST Action on the sustainable use of salt-affected lands (SUSTAIN)

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Cooking method



- **Frozen leaves were steamed**
- **Cooking time was set to 5 minutes**
- **15 g per person**
- **0.75 g of extra virgin olive oil**
- **glass of water at room temperature.**



The questionnaire

Consumer test - SALAD project

The purpose of this questionnaire is to gather data on your sensory perception and overall opinion of the product you have just tasted. If you allow the use of the collected data, it will be processed anonymously for the drafting of a final report where we will assess the product's level of appeal. We thank you for your participation, enjoy your tasting experience.

Please fill in all fields

Age				
Nationality				
Gender	Male	Female	Non-binary	I prefer not to say

Do you regularly eat dark greens (spinach, beet...)?	Never	Rarely	A couple of times a week	Almost everyday	Everyday
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Tasting

	1	2	3	4	5	6	7	8	9
Overall rating	Extremely Unpleasant	Very Unpleasant	Moderately Unpleasant	Slightly Unpleasant	Neutral	Slightly Pleasant	Moderately Pleasant	Very Pleasant	Extremely Pleasant
Color and aspect	1 Extremely Unpleasant	2 Very Unpleasant	3 Moderately Unpleasant	4 Slightly Unpleasant	5 Neutral	6 Slightly Pleasant	7 Moderately Pleasant	8 Very Pleasant	9 Extremely Pleasant
Smell, aroma	1 Extremely Unpleasant	2 Very Unpleasant	3 Moderately Unpleasant	4 Slightly Unpleasant	5 Neutral	6 Slightly Pleasant	7 Moderately Pleasant	8 Very Pleasant	9 Extremely Pleasant
Taste, Flavor	1 Extremely Unpleasant	2 Very Unpleasant	3 Moderately Unpleasant	4 Slightly Unpleasant	5 Neutral	6 Slightly Pleasant	7 Moderately Pleasant	8 Very Pleasant	9 Extremely Pleasant
Texture	1 Extremely Unpleasant	2 Very Unpleasant	3 Moderately Unpleasant	4 Slightly Unpleasant	5 Neutral	6 Slightly Pleasant	7 Moderately Pleasant	8 Very Pleasant	9 Extremely Pleasant

Would you be more inclined to prefer the species that you tasted over other leafy greens (spinach, beet, etc.)?	Yes, even if it costs more	Yes, but only if the price is the same	Yes, but only if the price is lower	No
Knowing that the species that you tasted is a crop with low environmental impact (low water consumption and potential for regeneration of saline soils), would you be more inclined to prefer it over other leafy greens (spinach, beet, etc.)?	Yes, even if it costs more	Yes, but only if the price is the same	Yes, but only if the price is lower	No

- **General information** about the tester
(including age, nationality, and gender)
- **Sensory evaluation**
9-point Hedonic to assess taste, flavor, color, aspect, texture, and overall rating
- **Multiple choice questions**
To assess the tester's willingness to purchase the product

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The sample

Participants = 125

Age range = 18 - 80 y

Sex = 56% Female
44% Male

Nr nationality = 20



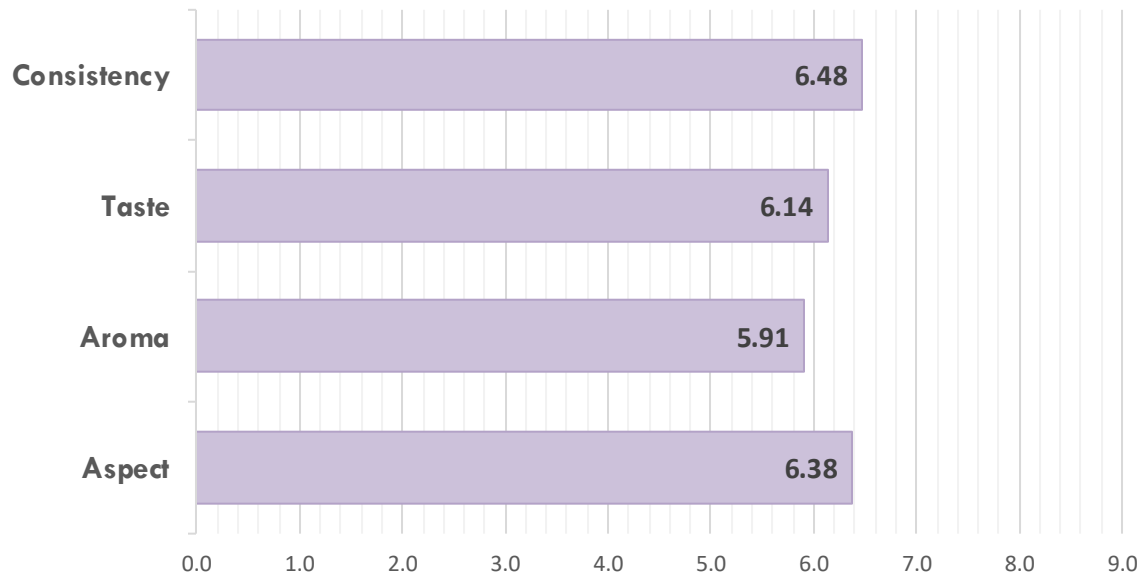
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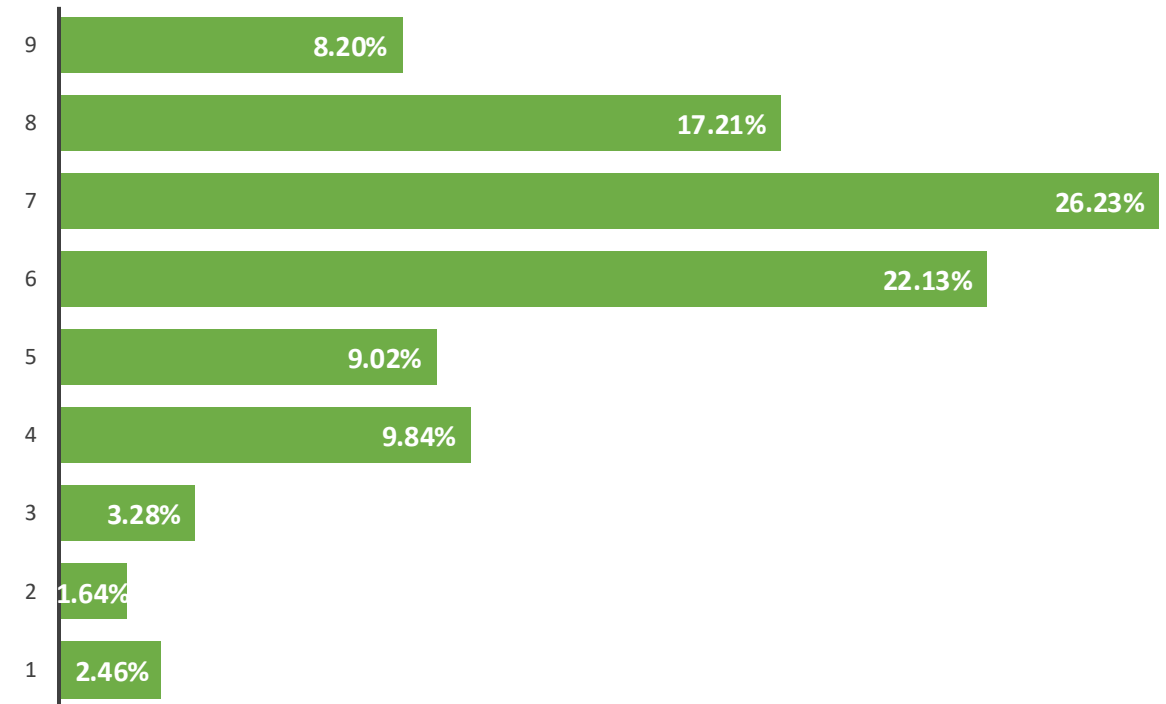


Results:

SENSORY EVALUATION



DO YOU LIKE THE SAMPLE YOU TASTED?

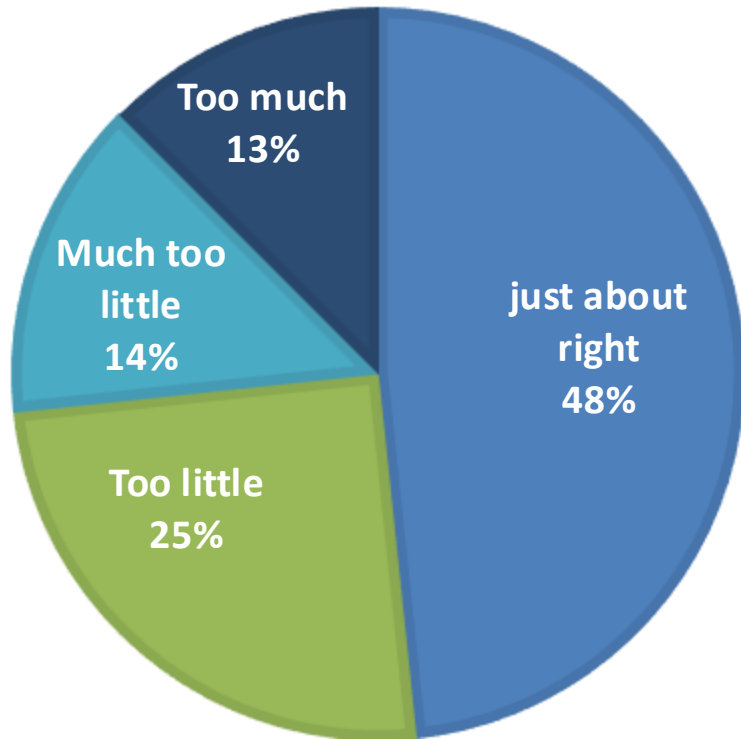


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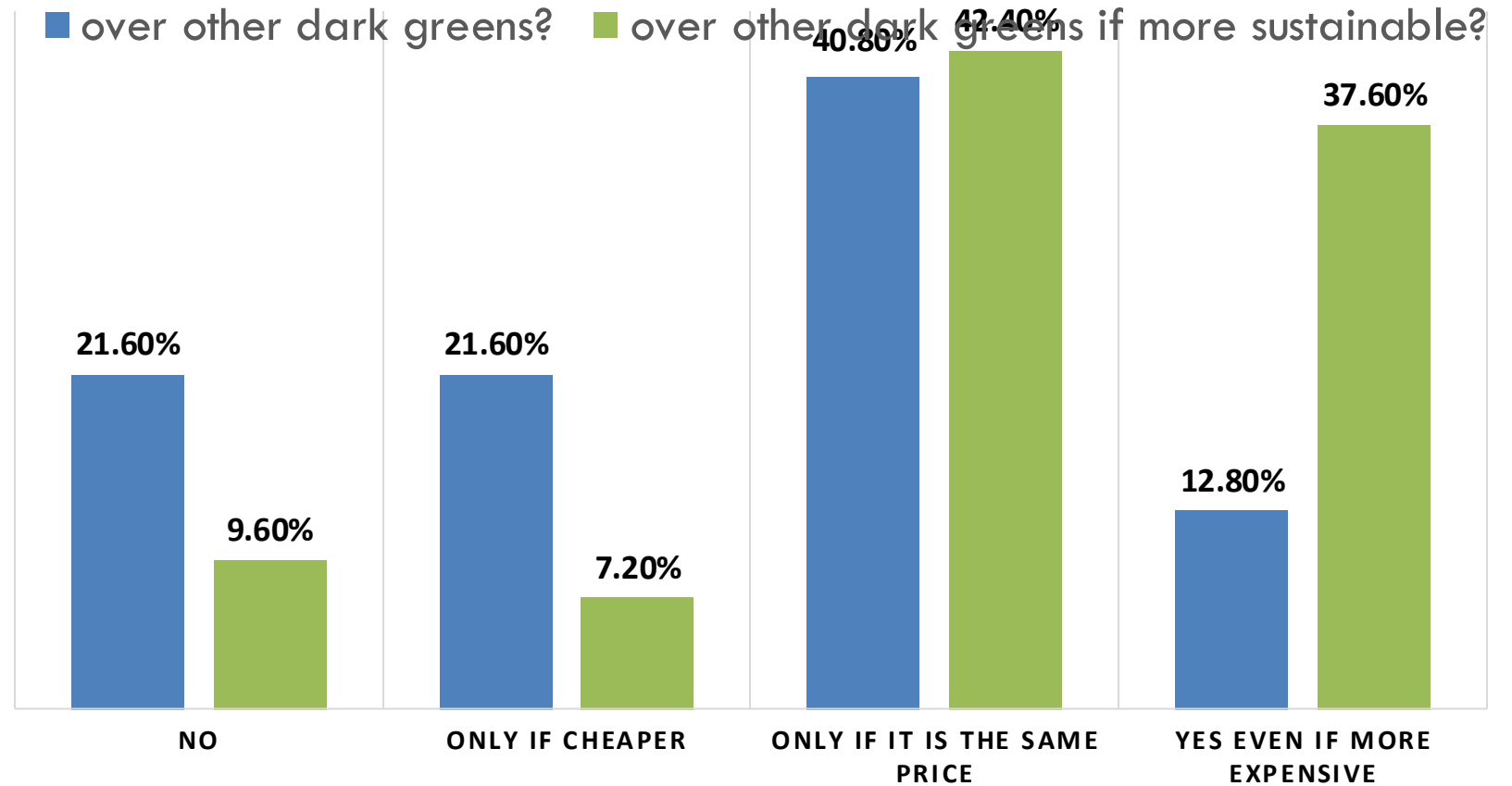
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HOW SALTY IS IT?



WOULD YOU PREFER TETRAGONIA?



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Recipes:



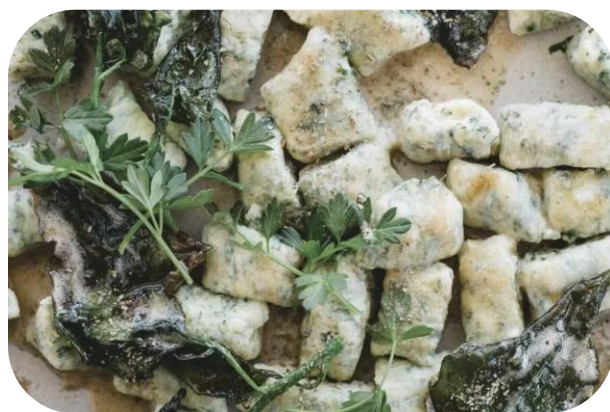
Squid with
New Zealand
Spinach



Frittata with New Zealand
spinach



Wok-fried
mushrooms with
New Zealand
spinach



Green Gnocchi with Cinnamon
Myrtle Burnt Butter Sauce

Stir-fried Sea spinach and
vegetables



Warrigal greens
verde dip with
potato chips



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Thank you

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SUSTAIN
Sustainable use of salt-affected lands



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International Union of Soil Sciences



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Food Quality of the Netherlands