



Exploring the sensory potential of neglected and underutilised food ingredients

Background:

There are at least 7,039 edible plant species, but only around 417 are considered food crops, with the top 15 constituting 80-90% of globally consumed calories [1]. These figures demonstrate the potential fragility of the world's food and nutrition security and how, at least, an elementary diversification could help to build more sustainable and resilient food systems.

Rationale:

The Food and Agriculture Organisation and The United Nations, in their policy frameworks, have identified the underutilised and neglected (NUS) foods as great reservoir of nutritional and agronomic characteristics, which have diminished over time in the commercial cultivars. Forgotten crops, heritage varieties and landraces have been neglected and underutilised by wider food systems [2]. Many of these have been studied from agri-sciences and nutrition perspectives [3]. The study of sensory characteristics of forgotten crops, specifically their flavour, has been overlooked by most researchers. Peas have been depicted as climate smart crops and have therefore been used as a case study in this project [4].

Project title:

This poster is part of a PhD project titled: "Increasing food and nutrition security through the diversification of food supply chains with forgotten edibles".

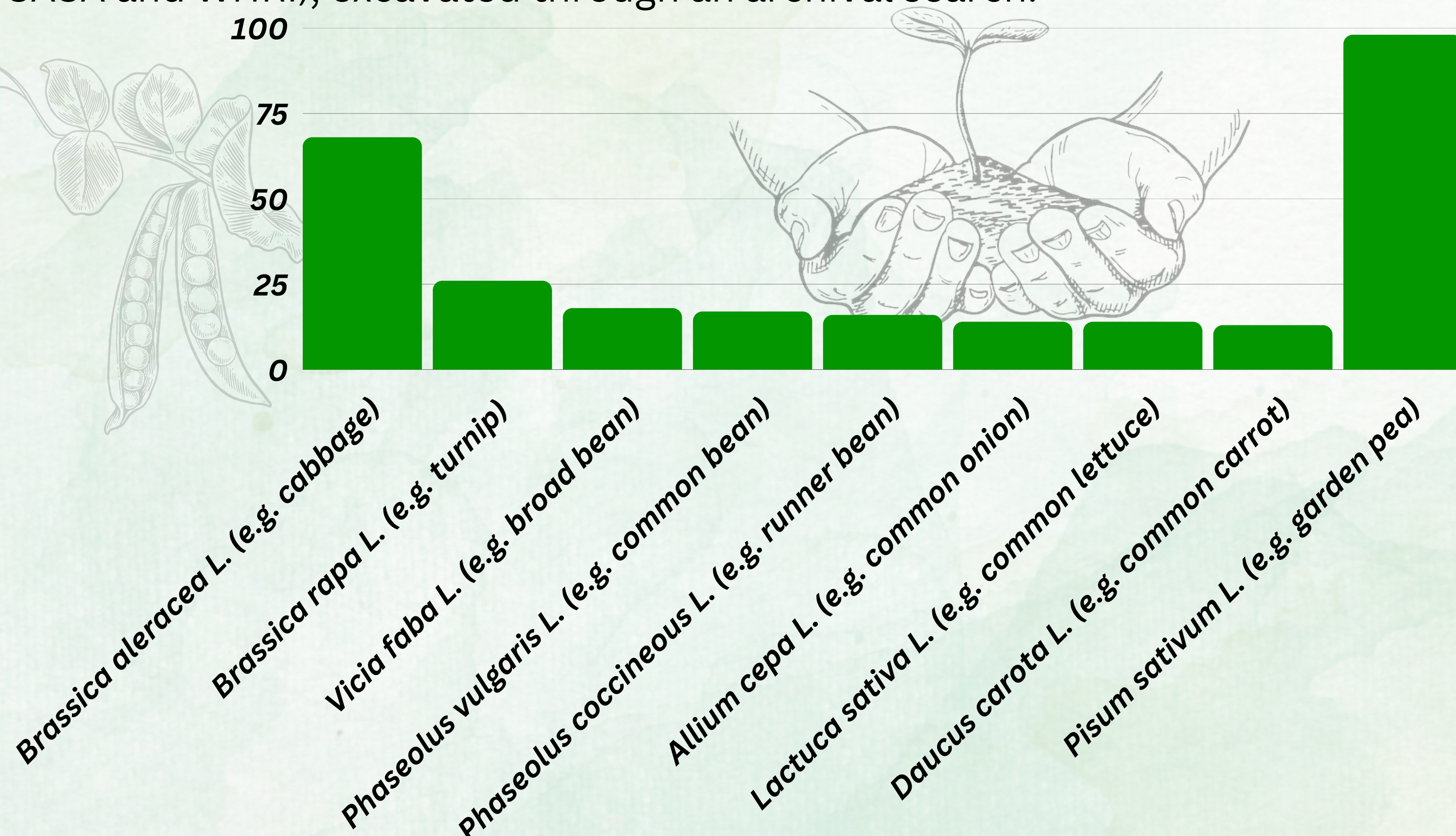
Aim: To critically assess the barriers and facilitators of food systems diversification with forgotten edibles.

Project methodology:

- 1) A systematic literature review of peer reviewed articles on the sensory characteristics, culinary applications, and gastronomic potential of forgotten crops *versus* their commercial relatives, including an archival search of databases.
- 2) 10 forgotten pea (*Lathyrus oleraceus* Lam.) varieties have been sourced from British seed banks and cultivated in 2022 in semi-controlled conditions. The yields were undertaken for processing, where the specimens were sorted, blanched and blast frozen within 2 hours of harvest, similarly to the industrial practices. The sensory characteristics of the prepared samples as well as 3 most popular UK commercial varieties were tested and analysed in 2 ways;
 - a) texture analysis using the TA.XTplus100C Stable Micro Systems' instrument,
 - b) preference and purchase intentions tests with 140+ untrained panellists (affective test).
- 3) Food business case study considering the diversification of supply chains with forgotten edibles, carried out in 2 ways;
 - a) semi-structured interviews with business' representatives,
 - b) systematic document analysis including supply chain mapping.

The findings presented on this poster are a partial fulfilment of the PhD project and only represent a selection of the applied methodologies.

Figure 1: This bar chart represents the numbers of accessions for landrace varieties of commercial crops maintained at 4 key UK seedbanks (HSL, JIC, SASA and WHRI), excavated through an archival search.



Conclusions:

Many forgotten crops and heritage varieties poses greater sensory profiles that their commercial cultivars. These characteristics could be utilised for their revival and reintroduction to food systems through new gastronomic concepts. The correct alignment of these different characteristics is likely to facilitate the uptake of NUS, diversifying the diets and improving food and nutrition security whilst maintaining or reviving lost culinary and dietary heritage [1-4,11].

Key findings from existing literature:

The forgotten varieties of common crops are often underdeveloped by agri-sciences and resemble wilder relatives, with greater variations in size, maturity time, shelf life and various sensory characteristics, including flavour and off-flavours, texture and colour [5].

Examples of forgotten crops with superior sensory characteristics:

Spanish melons (*Cucumis melo* L.), landrace cultivars have outcompeted the commercial cultivars on the basis of flavour and texture characteristics, such as sweetness, fibrosity and firmness [6]. Swedish horticultural landraces, including apple, pear, and pea varieties, have demonstrated superior flavour and texture profiles to their commercial relatives. Their sensory potential could be exploited through new gastronomic concepts [7].



Nutritional
 Sources



Flavour
 Sources

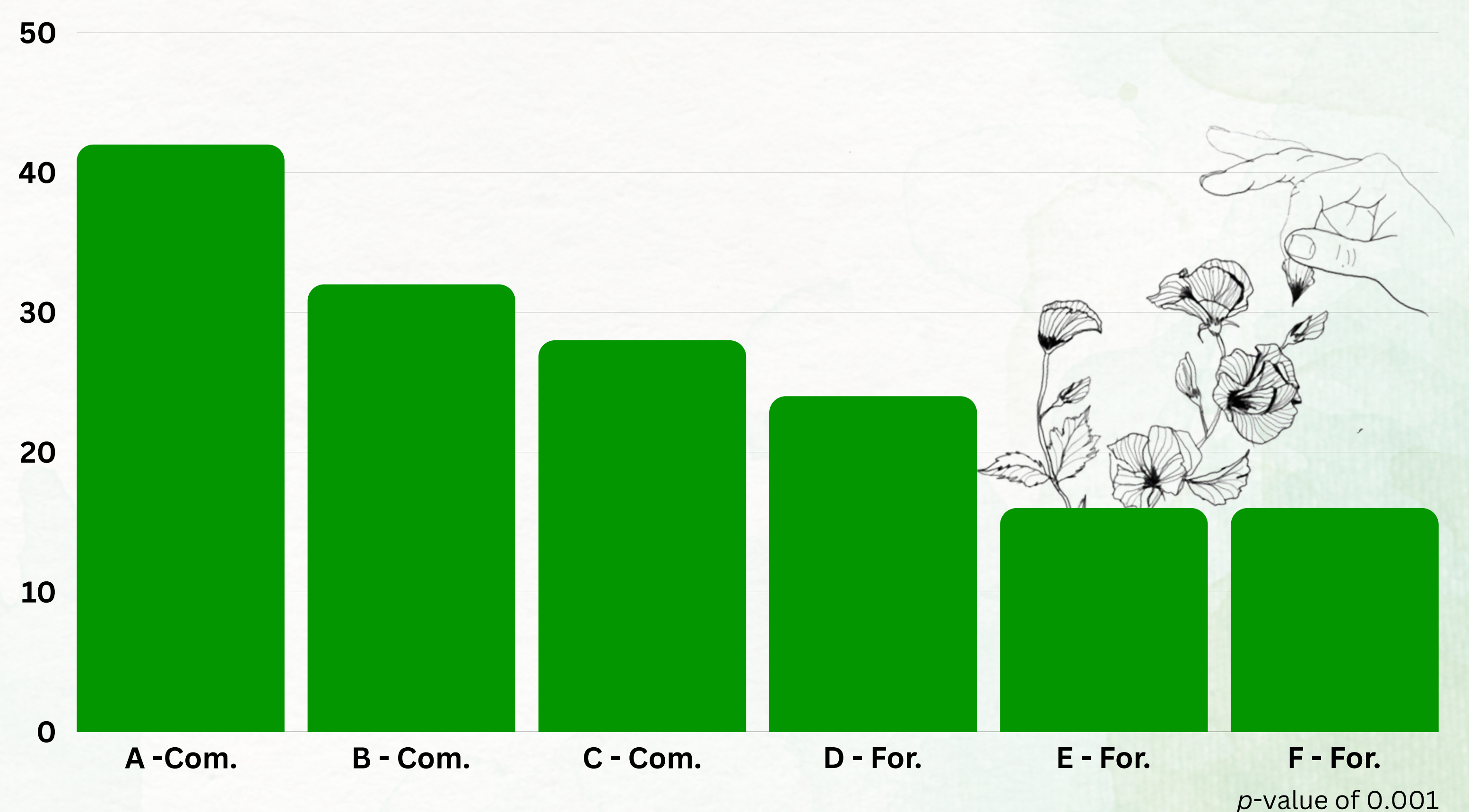
Nutrition:

Many of these so-called forgotten crops have a tendency to be better sources of nutrients, especially in areas effected by nutrition insecurity, as these heritage cultivars possess better agronomic characteristics [8,9].

Limitations:

Despite the positive sensory characteristics, there also is the matter of physiochemical properties that could lead to a lower uptake of certain NUS and LRs. For example, the case of Bambara groundnut (*Vigna subterranea* L.), an indigenous African crop neglected by wider food systems, where "poor cookability" almost diminished the ingredient from less developed regions of Sub-Saharan Africa [10].

Figure 2: As opposed to the findings from the systematic literature review, our sensory analysis indicates that for garden peas, commercial cultivars have a higher purchase chances as opposed to the forgotten cultivars. This is likely to be caused by their uniformity in flavour, size, colour and texture.



Summary of preliminary findings:

Many of these forgotten crops are cultivated and consumed on micro scale in local food systems, often correlated to culinary heritage, orphan traditions and heirloom seeds passed on from generation to generation. In many cases, their sensory, organoleptic, nutritional, and societal characteristics tend to be superior to their commercial cultivars.

The preliminary findings from the sensory analysis indicate that the sensory profile of the tested specimens was 'more interesting' for the forgotten varieties over the commercial cultivars. Some of the key characteristics identified included the "natural" and "intense" flavours. The commercial varieties have been found to taste more "uniform". The texture analysis showed an overall higher level of 'puncture' threshold which is likely to be responsible for the increased consumer panel preference towards some of forgotten varieties over the commercial cultivars. Despite these observations, the purchase intentions data shows that the panellists would be more willing to buy the commercial pea varieties over the forgotten varieties, likely to be caused by the specimens' uniformity.