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Revive and thrive: forgotten crops for resilient Food Systems

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Revive and Thrive: Forgotten Crops for resilient Food Systems

Szymon Lara explores the supply chain challenges and opportunities involved in integrating neglected cultivars and forgotten landraces into modern agriculture. The discussion highlights how diversifying food production can foster sustainable and resilient food systems, enhance agrobiodiversity, and invigorate local agriculture, among other benefits.

Most of modern foods, processed or not, are made from commodity crops, which have been bred for specific agri-food characteristics with minimal considerations towards agri-biodiversity.

The use of commodity crops across food systems has predominantly emerged as a result of the so-called Green Revolution during and around the interwar period. With massive changes to the agricultural spectrum, longer food supply chains were forming, complex food value chains started to appear and allowed for the formation of what we call today the global food system, resulting in high efficiency, standardisation and low-cost food, fixing many food insecurity issues.

Nevertheless, modern food systems are viewed as unsustainable in the longer run, due to intensive agricultural and other resource-exhaustive practices. Although many argue that the stability of food supply is dependant on the modern commodity crops, some also argue that partial diversification of food systems with neglected and underutilised crops is sensible. This is also reflected in market demands, such as the consumer demand for more sustainably produced foods with pressure visible across the UK consumer base. Modern food systems are very dependent on just a handful of commodity crops, homogenised and not fit for maintaining future food and nutrition security^(1,2).

Forgotten Crops

Forgotten crops are vegetables, fruits, grains and other 'ingredients' that have fallen out of fashion and no longer constitute a major proportion of current food systems. The role of forgotten crops is often overlooked by most actors from the global food systems, but their potential has been recognised through multiple food

and nutrition security conglomerates such as the Food and Agriculture Organisation (FAO). Partial diversification of the global food systems with 'forgotten crops' has the potential to increase food insecurity threats and build more resilient and healthy food systems for future generations, however, many barriers to such diversification still persist^(3,4).

Defining what forgotten crops are can be tricky, but the key factor to consider is their minor role in broader food systems. Forgotten crops can include species of crops which are no longer in 'commercial' use but also varieties of crops, often replaced by 'improved' cultivars as well as their wild relatives and landraces. Landraces of crops are different, as those are dynamic population(s) of a cultivated plant that have historical origin, distinct identity and lack formal crop improvement, as well as often being genetically diverse, locally adapted and associated with traditional farming systems, making their utilisation promising^(1,2,6).

In the UK, most of the 'forgotten crops' are formally maintained by various seedbanks, gene banks and research institutions such as the SASA (Science and Advice for Scottish Agriculture), JIC (John Innes Centre) or the MSB (Millennium Seed Bank). Often, these accessions reach thousands, like in the case of forgotten wheat cultivars (*Triticum aestivum* L.) or pea cultivars (*Pisum sativum* L.) maintained by the GRU (Germplasm Research Unit) of the JIC. Some of these neglected cultivars are actively used at small scale but their impact is limited to marginal roles and in local food system only. In the context of the UK, a good example of this is the so called 'bere barley' (*Hordeum vulgare* L.) which is a Scottish landrace crop that is actively cultivated and used across Orkney⁽⁶⁾.

have not taken over. This includes growing crops which have fallen out of fashion elsewhere due to reasons such as yield and agronomic characteristics, or because modern farming practices have yet to reach those areas. These landscapes are great reservoirs of many interesting forgotten varieties and landraces. An example of such area is the Sub-Saharan Africa where forgotten crops like Enset - banana relative (*Ensete ventricosum* L.), and Fonio (*Digitaria exilis* Staph.) can be found, constituting significant parts of those local food systems⁽⁵⁾.

Cultivation of forgotten crops happens on a minimal scale, usually for one's own consumption. In the UK, that would be mainly carried out by 'seed guardians' or by small growers and allotment holders. Elevated business risks, such as: irregular agronomic properties, spontaneous sensory characteristics and restricted access to seeds are main barriers to adaptation of those crops by larger entities. Local communities also constitute a very important part of that process, as those actors facilitate the preservation through local engagement with growers and consumers like in the case of the above-mentioned *bere barley*, where regional businesses are actively utilising those landraces in the production of food, either via the food service sector or through redistribution at the household level^(7,8).

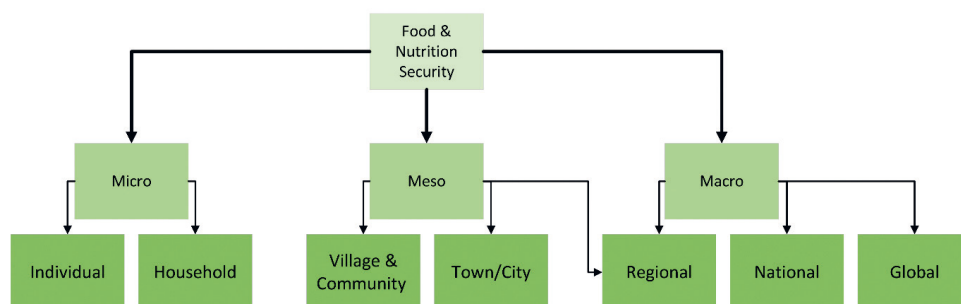
These actors must be aware and understand the nature and potential benefits of diversification of food systems with forgotten crops. Moreover, investors—whether private, public, research, or business-oriented—must have sufficient access to the genetic reservoirs, thus not only considering the physical genetic material but also the historical and botanical information, which can be scarce at times.

The initial characteristics must also be of interest to the investors, this includes the physiochemical and

Figure 1: Food and nutrition security levels.

Existing Supply Chains:

Indigenous food systems are where many modern agriculture practices



sensory properties or agronomic values and nutritional values. Without these elements, in the eye of the investor, the crop might not have the economic advantage and therefore no incentive for revival is created. Commercial grade cultivars seem of a less risky investment for the actors involved as are well established, unlike the forgotten crops. On the other hand, some characteristics of those forgotten cultivars might overcome those found in commercial cultivars, such as flavour, abiotic/biotic stress, incentivising the businesses to charge higher price margins. The underpinning mechanism behind this market demand is somewhat correlated to the perception of 'higher value' which can be exhibited in the forms of sensory perceptions, nutritional qualities, sustainability, and cultural/historical aspects, especially as some of the products could potentially be marketed as 'heritage' or 'traditional' as in the case of the so called 'ancient grains' now actively used across artisan bakeries.

Making the food systems more resilient and sustainable is a long-term goal, and if done properly, it can make an economic sense and that could be the prime motivator for the diversification⁽⁹⁾.

Farmer to Wholesaler – challenges and opportunities

Quantity, standardisation and maintenance are some key issues that small landrace farmers struggle with. Many farmers that use forgotten crops find it difficult to sell their produce and turn profit. Larger retailers have unfeasible expectations but smaller wholesalers tend to be more approachable and better at communicating. Some wholesalers would adapt their business models to be able to utilise those resources most effectively, whilst maintaining a good relationship with the growers and also being able to stay viable when produce is scarce. The gene banks act as midway information stations and in a way, are the key components of these rather unique value chains. From there the initiatives arise and investment from public

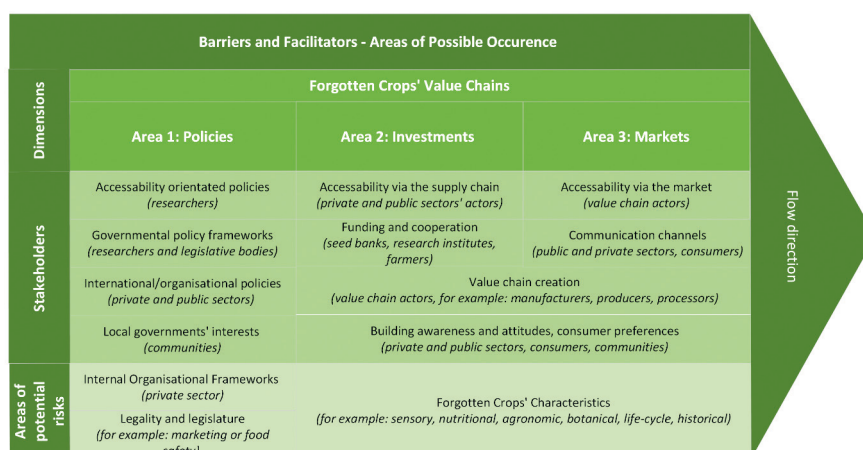


Figure 2: Area forming barriers and facilitators to food systems diversification with forgotten crops.

and private organisations spikes, providing the resources necessary for the evaluation and potential revival of these minor crops. Agriculture, including farmers, producers and distributors of seeds, crops and products are essential for the economic viability of those supply chains and if managed appropriately, could promote agrobiodiversity on a wider spectrum. Local communities are also key actors here, as their gastronomic traditions and culinary heritage together with cropping knowledge are areas of special interest to researchers from academia and businesses alike^(9,10).

Commercial growers as well as small scale growers would be limited to what is available in terms of genetic material. Nevertheless, there are some businesses in the UK that have found few formal ways of acquiring such material and have managed to establish profitable business models that utilise heritage and heirloom varieties of common crops, mainly grains and pulses, usually at the wholesale level and act as platforms for connecting small scale growers that often operate on just a few acres of land with other actors. A key element of such approach is the ability to maintain flexibility and good communication channels to build mutual understanding for all actors involved, and to make sure that other actors along the downstream supply chain can maintain their trust in stable supply and communicate the embodied messages that carry the value, effectively.

Wholesaler to Retailer – challenges and opportunities

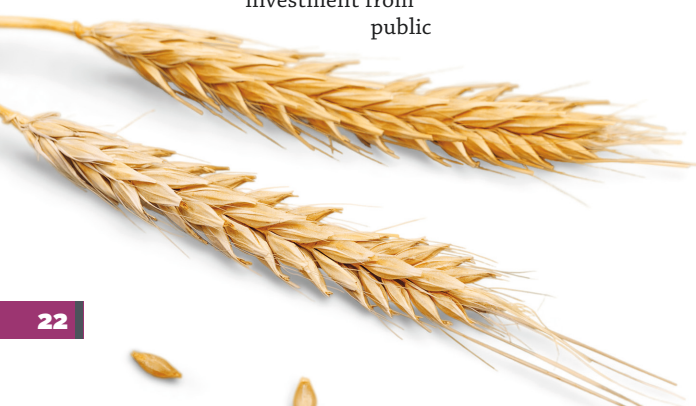
Large scale retailers are susceptible to short supply and mitigate such risks, which forms barriers to diversification with forgotten

crops. The nature of large-scale retailers is dictated through supply predictability, stability and consistency. Although these are also important elements of forgotten crops' supply and value chains, risks in all three aspects are much higher, making it difficult for retailers to adopt such products. On the other hand, small and micro sized enterprises are more resilient to such threats as they operate on trust, with a diversified pool of suppliers and shorter communication channels.

This is the reason why those minor crops and traditional foods find their way through to the food service sector, where their functionality is manifested using 'local', 'seasonal' and 'heritage' labels. Restaurateurs and especially chefs play pivotal roles in maintaining those minor food chains, as through their clever and innovative approach to menu planning and meal creation, the unique characteristics of these crops can be fully appreciated, leading to further demand and therefore, investment and attention drawn into the sector. Chefs and restaurateurs play an important role in establishing new trends through which many 'forgotten crops' have been popularised⁽¹⁰⁾.

Consumer Attitudes

Consumer attitudes have shifted. The diversity in flavour and other sensory characteristics in day-to-day crops (etc. vegetables and fruits) has shrunk significantly since the introduction of commodity crops', as the interesting cultivars and other landraces that would possess different characteristics have disappeared from wider use. Since consumers' pallets have become more 'homogenised', some of those once-traditional flavours, might now seem more alien and as





a result of which, reintroduction of forgotten varieties of standard crops, especially in the raw form, might be tricky. Simultaneously, some might possess sensory characteristics that could potentially outcompete those found in their commodified relatives. Furthermore, there are issues with consistency in the flavour, as many of those minor crops possess 'spontaneous sensory' attributes, making their value chain standardisation more difficult. On the contrary, clever use of these ingredients is crucial and can benefit all the stakeholders, as exemplified by the food service sector mentioned earlier. Products marketed as heirloom, heritage or traditional might benefit from their statuses, therefore it really depends on the form of utilisation of those crops. Forgotten crops are interesting reservoirs for new gastronomic concepts and when used cleverly, can act as vehicles for the transformation of our food systems and have the potential to elevate future food and nutrition security. In these contexts, mapping the various characteristics of these forgotten crops, especially the less researched ones like flavour

and sensory attributes, is likely to help with the establishment of feasible food systems' diversification strategies^(3,4,10).

Ensuring availability and resilience

Feasible reintroduction of forgotten crops into the food value chains is once again composed of multiple interchangeable aspects, grouped into the four main dimensions: markets, value chains, investments, and policies. Governments and global organisations have a significant impact on the way these foods are perceived and how the attention is directed, impacting the flow of funds, information and goods across the food supply chains⁽⁹⁾.

There are many bottlenecks along the supply chain that could act as barriers to the food system(s) transformation, mainly in the form of lack of formal crop recognition, consumer unawareness, elevated cultivation risks and higher costs for all stakeholders involved. All actors along the supply chain must communicate effectively to facilitate the uptake of these forgotten crops, including the producers, retailers,

distributors, food service professionals including chefs, consumers but also policy makers such as food safety authorities and regulatory bodies. Popularisation of landraces and traditional cultivars also poses risks to stable supply, as there could be variability within the crop and changes in the environment. Lack of uniformity in the traits these crops possess might also limit their usability in cooking and meal creation and consumer might not accept the inconsistencies. Both the barriers and the facilitators are shared and can be adapted almost interchangeably through innovative approaches⁽⁵⁾.

The Potential of Forgotten Crops

Neglected cultivars and forgotten landraces pose great potential for the establishment of sustainable, resilient, and long-lasting food and nutrition security. Even in the UK, a partial diversification of food systems to the lesser-known crops, such as some of the mentioned fruits and vegetables, would elevate home production, stimulate local and medium sized agriculture, create jobs and revive the forgotten culinary and societal heritage. Moreover, these crops have the potential to increase agrobiodiversity, as they are less genetically developed, making them more susceptible to intercropping and propagation under less intensive, more traditional agricultural systems, with requirement for lesser application of chemical practices but most of the various characteristics of forgotten crops have yet to be explored fully. ■

Figure 3: Forgotten crops' supply chain with main actors identified.

Article and references available online at onlinelibrary.wiley.com/doi/10.1002/fsat.3803_5.x

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