

Botanic Gardens Conservation International Education Review Volume 15 • Number 2 • November 2018

Addressing food security



BOTANIC GARDENS CONSERVATION INTERNATIONAL

BIGPICNIC SURVEY

As well as in depth research into public opinion on food security issues being conducted through our Partner organisations, BigPicnic is seeking to carry out a large-scale survey to look at what motivates people across Europe and beyond to choose the food they eat. This will help us to develop recommendations to shape the future of research and innovation in areas related to food and food security. The survey should take no more than 10 minutes to complete. We are not collecting any data that can be used to identify you.

Thank you very much for your contribution!

Complete the survey in English: https://www.surveymonkey.co.uk/r/BigPicnic_English Spanish: https://www.surveymonkey.co.uk/r/BigPicnic_Spanish Italian: https://www.surveymonkey.co.uk/r/BigPicnic_Italian German: https://www.surveymonkey.co.uk/r/BigPicnic_German

BigPicnic

CONTRIBUTE TO THE NEXT ISSUE OF ROOTS

HAVE YOU BEEN PART OF RESPONSIBLE RESEARCH AND INNOVATION PROJECT?

The next issue of Roots is all about Responsible Research and Innovation (RRI). RRI describes a new approach to research and innovation that aims to align the outcomes of scientific and technological advances with the values and needs of society by involving diverse groups of people, including citizens, researchers, policy-makers and businesses, throughout the entire process. RRI is a key approach used in the BigPicnic project. We want to hear from botanic gardens, museums and Learning Outside the Classroom sites who have developed and established effective education programmes with RRI in mind.

We are currently looking for a variety of contributions including articles, education resources and a profile of inspirational garden staff.

To contribute, please send a 100 word abstract to **Liliana.derewnicka@bgci.org** by 11th January 2019





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FIRST WORD BIGPICNIC - ADDRESSING FOOD SECURITY

BigPicnic

BigPicnic is an EU funded, Horizon 2020 project that, by bringing together the public, scientists, policy-makers and industry is helping to address the global challenge of food security.



↑ The King of Tooro, His Majesty Oyo Nyimba at the Fort Portal Farmers' Expo ©Rayab Kakaire



↑ University of Oslo visitors voting on the factors that influence apple buying ©Kristina Bjureke

Suzanne Kapelari, Head of The Area of Science, Geography, Computer Science and Mathematics Education at the University of Innsbruck, leans over the table and grabs a discarded chip from BGCI's Biodiversity Education Officer, Gail Bromley's, plate. *"I don't want food go to waste these days, since being in BigPicnic"* - I think of my fridge at home, full of food that we think is the most sustainable we can access - I know what she means.

I am at a meeting, in London, with the BigPicnic Management Board and International Consolidation Group (an advisory board), where we are trying to pull together the project's recommendations for policy makers.

BigPicnic is an EU funded, Horizon 2020 project that, by bringing together the public, scientists, policy-makers and industry is helping to address the global challenge of food security.

The BigPicnic team involves nineteen partner organisations, including botanic gardens, universities, a science shop, an institute for art, science and technology, and an international NGO. Co-ordinated by BGCI, BigPicnic Partners span thirteen countries across Europe and Africa (one partner in Uganda). These partners use a range of travelling exhibitions, activities, science cafés and participatory events, co-created with local people, to generate dialogue and build greater understanding of food security issues.

This collaborative approach aims to give a voice to adults and young people on Responsible Research and Innovation, communicating their views to policy-makers, sharing ideas, and encouraging debate on the future of our food.

The idea of food security is not simple to tackle or define. It encompasses many disciplines and interlinked environmental and social issues. Creating a world where food security is a reality i.e. *"when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life"* (World Food Summit, 1996) is no mean feat.

We clearly have a long way to go considering the fact that, in their 2018 report on The State of Food Security and Nutrition in the World, The Food and Agriculture Organization of the United Nations (FAO) found that the number of undernourished people in the world has been on the rise since 2014. At the same time adult obesity, often also due to inadequate food access, is worsening.

The report also states "new evidence ... highlights that beside conflicts, climate variability and extremes are also a key force behind the recent rise in global hunger. They are also one of the leading causes of severe food crises" (FAO, 2018).

Back in the BigPicnic meeting: *"I noticed that climate change isn't really mentioned"* says Gisèle Yasmeen, Senior Fellow, University of British Columbia (read her article on the policy lessons she has learned through developing the concept of foodscapes on page 17). *"I think we would probably have different results after this summer, because we all experienced it,"* replies Suzanne.



Yes, the world we live in is changing, for better or for worse and we are all beginning to be able to see it happening around us. For example, BigPicnic partners in Warsaw have found that the recent growth of community urban gardens, which support urban agriculture, can be attributed to 'a *generational shift in attitudes*'. As Warsaw enjoys a period of relative prosperity, more people have the ability to devote time to gardening and spending time in shared activities. Whilst in Britain, vegan and vegetarianism are on the rise, with the number of people identifying as vegan increasing four-fold in the past four years and 28% as *"meat reducers"* (The Vegan Society, 2018). It is my hope for BigPicnic that we can harness this positive energy and help policy-makers to develop funding and policy frameworks that will support research and innovation in food security that reflects what the population wants and needs, in Europe and beyond.

So what will our recommendations be? Well, that is what we will be thinking about over the next few months. Some ideas that came up during our meeting included encouraging co-creation across organisations; focusing on deeper engagement with a smaller number of the public rather than shallow engagement with a larger; broadening our idea of what we mean by expertise; engaging communities with climate change by framing it around food; and strengthening multi-stakeholder partnerships to work towards food security together.

In an earlier meeting with Karen Fabbri, Head of Sector, Food 2030 at the European Commission - DG Research and Innovation, she asked about attitude and behaviour change. "Encouraging behaviour change was not really the intention of the project" I said. "Yes, but we do have some evidence for it!" replied Theano Moussouri, senior lecturer at UCL. As a result of a meeting held as part of BigPicnic more stalls have been built at the local market, in Fort Portal, Uganda, to prevent food being sold from the ground. This will go a long way to reducing wastage. The project has also changed the way our botanic garden partners work, helping them to put co-creation and visitors at the heart of what they do and reach new groups, they have never worked with before. To come back to Suzanne's remarks I opened with, the project certainly seems to have changed us personally.

As the project draws to a close, we want to end on a high and celebrate the work towards food security that we and others are doing and support its continuation. In this special issue of Roots we look at how BigPicnic partners and other organisations are tackling this problem. We look at how encouraging farm conservation in India is supporting access to traditional varieties of rice; how minimising human-wildlife conflict in Nepal is important for both food supply and conservation; how food gardens can support the UN Sustainable Development Goals; and how culinary get togethers in Mexico can help communities to reconnect with their food heritage. I hope the articles and resources we highlight will help you join us in trying to work towards a food secure future. ← The BigPicnic partners at the 2nd partner meeting at Royal Botanic Garden Edinburgh, ©BigPicnic

"New evidence ... highlights that beside conflicts, climate variability and extremes are also a key force behind the recent rise in global hunger. They are also one of the leading causes of severe food crises." (FAO, 2018)



↑ Attendees of a BigPicnic food event in Sofia ©University Botanic Garden – Sofia

The project has also changed the way our botanic garden partners work, helping them to put co-creation and the visitors at the heart of what they do and reach new groups, they have never worked with before.

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Authors: Suzanne Kapelari and Theano Moussouri

WHAT IS FOOD SECURITY?

Security

Ensuring all people across the world have access to sufficient food to meet their dietary needs

Food Security

Sovereignty

Empowering people to make their own choices about the food they eat, where it has come from and how it has been produced

Safety

Ensuring people have healthy, nutritious food that is free from contamination or degradation

↑ In BigPicnic various aspects of food sovereignty were addressed right from the start ©BigPicnic

Food security is an umbrella term that has evolved and expanded overtime and its meaning has been adapted to fit the context within which it is used. In collaboration with different communities and stakeholders, BigPicnic's botanic garden partners chose to develop educational activities that address themes mainly related to an idea under this larger issue, which can be described as food sovereignty. Food sovereignty is the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems.

Access

Ensuring all people across the world have access to sufficient food to meet their dietary needs

Food Security

Sovereignty

Empowering people to make their own choices about the food they eat, where it has come from and how it has been produced

Safety

Ensuring people have healthy, nutritious food that is free from contamination or degradation

Heritage

Supporting culinary traditions and acknowledging that they help to shape and are shaped by personal and collective identities

↑ While BigPicnic proceeded cultural aspect of food sovereignty became increasingly important ©BigPicnic

ood security can be defined as existing "when all people, at all times have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FOA, 1996). Although this definition appears quite straightforward the meaning and operationalisation of the concept of food security remains elusive. The concept has evolved and expanded overtime and its meaning has been adapted to fit the context within which it is used. Indeed, its meaning varies across different communities and cultures. The lack of a consistent understanding of the concept is closely associated to the multiple translations and circulations of the term food security across the globe. An Anglophone term, food security, cannot often be directly translated not even in other European languages leading to a lack of shared understanding of the concept. The various meanings attached to the concept mirror the different ways research and public policy have been used to conceptualise and address issues related to food security. Beyond the definition issue, what most of the discussion around food security actually focuses on is food insecurity and how to combat it. Breaking down the component parts of the phenomenon and understanding how they interact to promote or hinder food security requires the concentrated effort of a myriad of local, national and international organisations, policy makers, grass roots community organisations, and experts from disparate fields. It can be seen that food security is a complex and multifaceted concept that is culturally and context specific and is constantly shaped by societal discourse.

From this short introduction to food security, it can be seen that engaging different publics in a discussion about such a complex concept is not a small feat. The BigPicnic project aims to tackle that. "Big Picnic: Big Questions - engaging the public with Responsible Research and Innovation on Food Security" is an EU-funded project that brings together the public, scientists, policy-makers and industry to generate dialogue and build greater understanding of food security. Botanic gardens play a key role in engaging new and existing audiences in this dialogue, through co-created outreach exhibitions, science cafés and other tailored engagement events. At the same time, the co-creation approach together with action evaluation processes (namely, the Team-Based Inquiry (TBI) approach) enables practitioners and botanic gardens as organisations to reflect on and improve their practices.

At the beginning of the project the BigPicnic partners identified three dimensions of food security:

- · Access: ensuring people have access to sufficient food;
- Safety: ensuring that the food people have access to is healthy, nutritious and free from contamination; and
- Sovereignty: empowering people to make their own choices about what they eat, where it comes from and how it is produced.

In collaboration with different communities and stakeholders, the botanic garden partners chose to develop activities that addressed themes mainly related to the dimension of food sovereignty above. Under food sovereignty, every country and people is deemed to have the right to establish their own policies concerning their food and agriculture system, as long as those policies do not impinge on the policies of third countries (Rosset, 2006). According to the Declaration of Nyéléni, the first global forum on food sovereignty (Nyéléni, 2007), "food sovereignty is the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems. It puts the aspirations and needs of those who produce, distribute and consume food at the heart of food systems and policies rather than the demands of markets and corporations." Furthermore, owing to a renewed understanding of global sustainable development, the United Nations member states agreed on joining forces to reach 17 sustainable development goals (SDGs) by 2030. Indeed, food sovereignty seems to address the vast majority of the SDGs (Röckström & Sukhdev, 2016).

The emphasis on culturally appropriate food as highlighted by the Declaration of Nyéléni was echoed in the TBI findings across all the studies carried out by BigPicnic's botanic garden partners. The cultural value of food as well as the notion of food as a form of cultural heritage emerged distinctively. This led us to a re-evaluation of the key dimensions of food security and the inclusion of food heritage in our definition. Outcomes associated with seeing food as cultural heritage, the role of the social context of eating and the power of food in expressing individual and collective identities make a strong case for the cultural and social values attributed to food that impact both directly and indirectly issues of food access and safety.

The new definition encourages us to view food - from its cultivation to its preparation and shared consumption – as a form of intangible cultural heritage. Food can bring people together and create a sense of shared identity, but at the same time, it can mark off cultural difference. It can also work on an individual level as it can evoke very powerful personal memories linked to a sense of identity. It may be the key to understanding how people make food choices and what role botanic gardens can play in connecting the knowledge they have about plants to people's culture and life experiences.

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MODERN AGRICULTURE IS COMPLICATED BOTANIC GARDENS CAN HELP

Agriculture is one of the greatest enemies of biodiversity. Botanic gardens are particularly well-situated to educate an urban audience about both the challenges and possibilities of agricultural innovations to feed humanity and protect the environment. However, the complexity of agricultural technologies and high degree of polarization surrounding innovations like intensive agriculture and genetic modification, challenges gardens to present agriculture to an audience disconnected from agricultural practice. Gardens have a tremendous opportunity to provide comprehensive and accurate information about modern agriculture based on the best available science and within a framework of food security for all.

↑ Brackenhurst, Near Limaru. Kenya. Thousands of acres of tea have replaced the forest in Kenya's hill country. The forest was removed in the early 1900's for the production of mono culture crops of tea and the eucalyptus used to dry it ©Barney Wilczak

For the botanic garden community, there is an important opportunity to help urban dwellers and other citizens understand and appreciate agriculture. A gricultural is the most important factor in the potential disappearance of over half of plant species at risk of extinction during the remainder of this century. For this reason, the botanic garden community, and all those who care about conserving biodiversity, should educate the public about agriculture and help visitors explore avenues that could decrease its negative impacts. Since agriculture provides the food necessary for our survival, we also need to contextualize our outreach in terms of food security. Many gardens focus on specific topics where agriculture and biodiversity intersect uncontroversially such as crop wild relatives and onfarm biodiversity. While these are critically important topics and important areas for botanic garden education, there are many more areas in agriculture that deserve our attention. In particular, the topic of intensive agriculture, including genetic modification, is particularly important when contemplating future scenarios of sustainability and biodiversity loss in the context of feeding our hot and hungry planet.



Botanic gardens are especially well suited to educate our many visitors about agriculture. The challenge of doing so is particularly acute in our highly urbanized society where few people have any close connection with agriculture and misinformation abounds. For example, there is a strong scientific consensus (at about the same level as the consensus supporting global climate change) that the products of genetic modification (GM) pose little or no risk to public or environmental health and have a host of realized and potential benefits, yet the public perceives these technologies as risky if not downright dangerous. The newer gene editing technologies (e.g., CRISPR) have also been deemed safe, but have been banned by the European Union against the advice of their expert science advisors. As the climate changes, we will need to utilize every technique that we can to feed our growing populations, and will need even more tools to alleviate the suffering of the almost one billion undernourished. Since intensive agriculture requires less land to grow crops than less productive versions, it may be a preferred way to grow the food we need while at the same time protecting natural ecosystems and their diversity to the greatest extent possible.

For the botanic garden community, there is an important opportunity to help urban dwellers and other citizens understand and appreciate agriculture. In addition, gardens can teach the ways in which modern genetic methods offer promise for helping to maintain agricultural productivity as the climate shifts while our population increases rapidly. Gardens are faced with the challenge of representing scientific conclusions as well as they can be determined, with agriculture one of the most important areas for consideration.

Since GM crops have been particularly demonized, it may be helpful to review this area in a bit more detail. Those skeptical of GM should know that no academy of sciences or other authoritative body has found them to pose any risk during the more than three decades they have been studied. Millions of people and billions of farm animals have been consuming GM derived food during this period without a single case of any harm to any person or animal confirmed. Moreover, virtually all beer, cheese, and bread that we consume is manufactured using GM organisms as enzymes, along with numerous widely-used medicines, with no one seeming concerned about these uses and no cases of any ill effects reported. ← Botanic gardens can lead the conversation about modern agriculture and its relationship to biodiversity, technology and food security ©Wenceslao Almazan, Cornell Alliance for Science

Botanic gardens are especially well suited to educate our many visitors about agriculture.

Gardens are faced with the challenge of representing scientific conclusions as well as they can be determined, with agriculture one of the most important areas for consideration.



↑ ©Markus Winkler

Biodiversity should be encouraged on individual farms of all types, and botanic gardens are in an ideal position to help with this trend.

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Each occurrence of a transgene differs from all others, so that they could, in fact, have nothing in common that would pose a danger. The transfer of each transgene from one kind of organism to another is different from any other such event, and so there is no valid rationale to conclude that all GM is dangerous as a class. Challenges certainly abound in modern agriculture, including spraying pesticides in quantities where they may have diverse negative effects. As genetic techniques are applied with increased precision to crop breeding, the amounts of these chemicals used can be cut back or even eliminated. Insect and weed resistance issues are critically important in agriculture generally, and need to be considered in every agriculture system, but they are not a unique consequence of the use of modern genetic techniques in plant breeding. The claim that GM plants routinely escape into natural communities or become weeds is unsupported, and is just the sort of issue on which botanic gardens should seek to educate the public.

Biodiversity should be encouraged on individual farms of all types, and botanic gardens are in an ideal position to help with this trend. But the basic assumption that intensive agriculture is always bad for the environment is simply not true. Careful analysis reveals that many extensive cropping systems have lower productivity, which necessitates more land being used elsewhere to produce the same amount of food relative to more intensive agriculture. Since so many critical environmental problems are deeply impacted by landuse extent, especially biodiversity loss and greenhouse gas emissions, the more intensive versions of agriculture that spare land elsewhere are proving beneficial to the whole system across several key environmental metrics.

The situation is indeed complex, but not beyond informed explanation. For any farm, strategies can be employed that will improve the local environment based on the available empirical science. Encouraging on-farm biodiversity has remained traditional in Europe but is practiced to a much lesser degree in North America, Australia, and other regions. There is clearly room for both systemic and on-farm improvement of biodiversity saving practices. When intensive agriculture is practiced, it should be as sustainable and productive as possible, so that adjacent wild areas do not need to be brought into cultivation. To accomplish this will require all of the methods and skills that science has developed, including genetic modification and gene editing techniques, along with all of the strides being made in agroecology and allied disciplines. The point being, we do not have the luxury of choosing single, ideological approaches to agriculture. With 7.6 billion of us on earth now and 2.3 billion additional people coming in the next 30 years, we need to do the very best we can to feed them adequately. A generous global attitude about poverty and hunger will also be needed to reach stability, but if we cannot produce the necessary food, it will get us only so far. For those with empty stomachs, biodiversity conservation has little meaning. A truly sustainable world that protects its biodiversity can only emerge when we produce adequate food for everyone. Any technologies that can help feed people and benefit the environment, such as intensive and GM agriculture, should be encouraged and freely explored. Botanic gardens should take on the challenge to educate the public about such technologies so that they can be considered by society based on the best available science. We have a great opportunity, perhaps even an obligation, to elucidate these subjects for our visitors.

Gardens throughout the world engage visitors to better understand the science behind such topics as global warming, evolution, pollinator decline, and biodiversity loss, and their doing so is considered a general good. Agriculture, a major determinant of sustainability and overall environmental quality, could usefully be added in the same way as these other complex scientific topics of great interest to the public. Despite the considerable emotionality and misunderstanding of complex and polarized topics related to intensive agriculture, and perhaps precisely because of these perceptions, the public needs to be able to depend on botanic gardens as a solid source for comprehensive and accurate information about this critical usage of plants.



In 2014, the Roger Orellana Regional Botanic Garden set up a culture and recreation programme to broaden its range of offerings to the public, fostering understanding and appreciation of the garden and its living collections. One event, the Encuentro Culinario (a culinary gettogether), aims to reintroduce local people to native ingredients from the region. It challenges up-and-coming student chefs to re-imagine regional ingredients in a variety of creative dishes. Here we explore our success in engaging the public with gastronomy and local foods, building on the vital and intimate connection between people and plants.

A JOYOUS PROGRAMME RECONNECTS LOCAL PEOPLE WITH NATIVE INGREDIENTS

The Roger Orellana Botanic Garden (ROBG) is a 2.5 ha garden nestled in the humid tropics of Merida, Mexico, near the north-western tip of the Yucatan peninsula. This region has a rich history, deeply rooted in Mayan culture and culinary tradition. The city of Merida has expanded rapidly over the past decades. As it grew, ROBG has sought to expand its offerings to the public and engage new sectors, to develop the social role of the garden within the community. In 2014, as part of the newly formed culture and recreation programme, *Encuentro Culinario* was begun – an annual event to celebrate and reignite a passion for local ingredients. Each year, a focal ingredient or theme is chosen, and amateur chefs, gastronomy students and professionals are invited to prepare creative dishes based on this. Alongside, there are educational programmes related to the central ingredient or theme, to help the public see and understand the environmental, cultural and nutritional benefits of using local ingredients.



↑ Exhibition of traditional Yucatecan dishes by a group of local woman ©Margarita Clarisa/Jiménez Bañuelos

► Exhibition displaying the different local varieties of corn, squash and beans ©Margarita Clarisa/Jiménez Bañuelos



 ↑ Gastronomy student adding the final floral and fruit details to her plate ©Fototeca CICY
 → Educational seminars are an essential part of Encuentro Culinario ©Margarita Clarisa/Jiménez Bañuelos

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This year marks the garden's fifth *Encuentro Culinario*. The theme of the inaugural year was La Chaya (*Cnidoscolus aconitifolius* (Mill.), I. M. Johnst., Euphorbiaceae, *The Plant List*, 2013), a traditional plant used in Yucatecan cuisine. The second year focused on 'Ancestral Cooking', celebrating traditional ingredients from *solares*, or Mayan home gardens. For the third year, 'De Chile, Mole y Chilmole' celebrated the indispensable diversity of chillies found throughout Mexico and their extensive uses. Year four sought to educate people about the origins of their food, 'From Roots and Stems', focusing on which plant parts we actually eat. This year's theme, *Corn, Beans and Squash: Brothers in the Field and in the Kitchen*, was dedicated to *milpa*, the traditional system of agriculture still practised in the peninsula. *Milpa* incorporates three fundamental crops, also known as the Mesoamerican triad: corn (*Zea mays* L.), beans (*Phaseolus* spp.) and squash (*Cucurbita* spp.).

EDUCATE, RECONNECT

As a botanic garden we are committed to community involvement and education, and through the years the event has evolved in different ways. *Encuentro Culinario* naturally draws an audience that appreciates culinary delights; however, it also provides a unique opportunity for the garden to engage the public in understanding our intimate and crucial relationship with food. As the city of Merida has become increasingly urbanized, people have become distanced from the origin of their food, leading to diets that rely on a narrow range of ingredients and are often nutrient-poor and highly processed. Concern over this has been echoed in international policy to reduce hunger and ensure food security (United Nations, 2018). The *Encuentro Culinario* event serves to educate and reconnect the public with local ingredients that they can grow themselves to supplement their diets and encourages them to branch out in their use of nutritious, sustainable ingredients.

The event also serves to support and reinforce the close ties between food and culture. Traditional Mexican cuisine was recognized in 2010 by UNESCO as part of the Intangible Cultural Heritage of Humanity (UNESCO, 2012; CONABIO, 2018). There is an astounding and emblematic diversity of dishes and flavours originating from Mexico, crucial to its culture and nutritional well-being (Casas, Blancas and Lira, 2016). Yucatecan food is appreciated for its rich ingredients and varied techniques. In addition, there have been welcome recent developments in the region regarding the recognition of food security, food sovereignty and local food systems, as a driver for policy change (CEMDA, 2017).

CHALLENGE AND ACHIEVE

Appraising the last five years of the event, there have been challenges, such as:

- The importance of creating a clear link between the ingredients and themes, and the garden's living collections;
- Reviving and disseminating customs and practices in relation to homegrown food (Terán Contreras, 2010), based on accessible and sustainable practices; and
- The promotion of projects to study and conserve traditional Mayan practices.

Despite the challenges, *Encuentro Culinario* has hit its stride in the fifth year and we are proud of our achievements:

- New and strengthening links with sectors of the public that were previously unaware of the garden;
- Growing interest amongst the public to experience and revive distinctive traditional ingredients;
- Creating a space for the exchange and elaboration of recipes, enriching the cultural and botanical repertoire of participants;
- Demonstrating the importance of plants and their vital link to human culture and nutrition;
- Year-round emphasis on the importance of plants to human nutrition and well-being, not just during the event;
- Sharing the nutritional and economic benefits of diverse local ingredients
 more widely through production of recipe books.

After five years, the logistics of the event run like clockwork, making it a smooth and enjoyable experience for all participants. The garden is now in an excellent position to expand the event and its offerings in the future. Additionally, though the *Encuentro Culinario* has created an increased awareness of some of the issues related to food security, nutrition and local culture, our larger goal is to position the event to leverage real positive change, a movement towards sustainable systems that will provide delicious, nutritious diets for everyone, while respecting the rich and ancient culture of the region.





↑ Showcase of dishes from La Chaya in the garden and in the kitchen ©Fototeca CICY



↑ One of the dishes presented by aficionado in Brothers in the milpa and in the kitchen: corn, beans and squash @Margarita Clarisa/Jiménez Bañuelos

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← The judges talking to the chefs about their process and ingredients during tasting ©Margarita Clarisa/Jiménez Bañuelos



To us, traditional smallholder agriculture is the foundation of food sovereignty allowing communities control over the way food is produced, consumed and locally traded. In India, seed embodies culture, tradition and sacredness. The loss of traditional seed means not only genetic erosion, but also cultural and traditional knowledge erosion. Local farmers are losing their land and traditional seeds.

GREENS believes in on-farm conservation, we have collected traditional rice varieties and developed a live model Food Garden to inspire the next generation and ensure the availability of seeds for farmers. To complement this we have developed an education programme for schools, but our journey has just begun.

↑ Harvest of heirlooms vegetables ©Alexander Amirtham

INTRODUCTION

n South India, especially Tamil Nadu, the farming seasons are still celebrated through annual festivals. One such celebration is the Mullaipari Festival, which takes place in the Tamil month, Adhi (mid-July) and involves the germination of nine grains in a basket or clay mud pot and a ritual performance to request the village goddess for rain and fertility of the land to ensure a rich harvest. There is also the Pongal Festival, in January, which can be traced back to 200BC and which thanks the Sun God for a successful harvest.

Traditional agriculture has been practiced in India for many centuries. Farmers were self-reliant in all their requirements from tools, seed collection and harvesting to storage of crops.

Since the Green Revolution in India during the 1960s and 70s, the situation has changed radically. Farmers are slowly losing control over their seeds. Chemical farming is highly dependent on hybrid seeds, which in turn, rely on fertilizers, pesticides and herbicides. This has depleted the soil health and agro biodiversity. As a result, the traditional land use pattern has changed and many indigenous seeds are being wiped-out.

According to the UN World Urbanisation Prospects 2018, about 34% of the population now live in cities, up 3% since the 2011 census, with smaller size urban clusters increasing rapidly. As a result, the younger generation in India do not know where their food is coming from and do not know how to grow their own food.

THE GREENS APPROACH

GREENS is a small organisation based in Thiruchirappalli, Tamil Nadu, which aims to create a contemporary botanic garden. Three years ago, with very limited funding and no full-time staff, but with a very clear vision of what we wanted to achieve, we began to establish our mother plant collection. We wanted to inspire young people about the importance of the conservation of traditional food through the creation of a *Food Garden* as well as collecting traditional seeds for distribution to farmers to ensure on-farm conservation.

The aim of the *Food Garden* was to develop a living museum to cultivate traditional rice varieties using organic and biodynamic farming practices and to bring young people to the garden to learn about traditional varieties.

First phase

We successfully converted a piece of land into an organic area with systematic soil building; we then collected traditional seeds from farmers and NGOs throughout Tamil Nadu. Next, we created the *Food Garden*, which contains 10 zones with 12 different varieties of traditional rice.

Heirloom seeds were collected and cultivated using the permaculture model. We have also created networks with other heirloom seed collectors, exchanging our seeds to ensure the duplication of our seed collections.

Second phase

This year we expanded our *Food Garden* to include minor millets collected in the same way. During the Green Revolution, millets were seen as inferior crops but, in fact, are highly nutritious and hardy.

Third phase

We have now designed a Nature Conservation Education Programme (NCEP), and plan to invite 50 schools to experience the different food plants and learn about food history and the importance of seed conservation for our future food.

With limited resources, all our activities are relatively low key but we have already seen an impact with local farmers who are cultivating traditional rice varieties from our seed and a local NGO, MPVEDS, who has started cultivating 1 acre of Mappilaisamba rice. Seeds have also been sold to farmers in Chennai (360km away) and Thiruvarur (150km away).

ROLE OF BOTANIC GARDENS

At GREENS, we believe that botanic gardens can play a critical role in agrobiodiversity conversation through their knowledge of the eco-system surrounding them and by working on seed sovereignty, security and livelihood issues with their local communities.

According to Global Policy Watch, smallholder farmers, many of them women, manage over 80% of the world's estimated 500 million farms and provide over 80% of the food consumed in Asia and sub-Saharan Africa, contributing significantly to poverty reduction and food security. As much as 75% of global seed diversity in staple food crops is held and actively used by smallholder farms.

As more small landholders give up agriculture as unprofitable and the next generation lose their skills, botanic gardens need to step into the gap with community seed banks, promotion of organic farming methods and in helping to bridge the gap between consumer and producer.

At GREENS, we still have a very long way to go to create the botanic gardens that we envisage, but we know that we must start somewhere and time is short.

CONCLUSION

It has been estimated that 70,000 plant species are edible however more than 90 percent of crop varieties have disappeared from farmers' fields. Today, 75 percent of the world's food is generated from only 12 plant and five animal species. What happens if something goes wrong with this small handful of species? The ultimate solution is to diversify seed, revitalise small-scale farming and promote seed sovereignty to ensure food security.

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↑ Overview of Traditional paddy model Plot ©Alexander Amirtham



↑ A harvest of Traditional paddy "Mappillai samba" variety ©Alexander Amirtham

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Alexander Amirtham, Executive Director GREENS Biodiversity Sanctuary No 2 ArasamaraStreet, Melapudur, Thiruchirapalli, Tamilnadu, India Mob 94438 51104 email:greenalex@rediffmail.com https://www.greensbiodiversitysanctuary.com Food biodiversity is becoming increasingly threatened by climate change, however, the sustainable development platform outlined by the United Nations Sustainable Development Goals (UN-SDGs) presents a proposal to improve food security and nutrition. Botanical gardens are presented with an opportunity to contribute to the implementation of UN-SDGs by aligning the work of food gardens with the UN-SDGs through educational, conservation, and research programs. The Food Garden at University of British Columbia (UBC) Botanical Garden features a number of initiatives on food security, agroecology, citizen science, and food biodiversity that support the implementation of the UN-SDGs. Here, we explore how specific UN-SDGs are supported by initiatives at UBC Botanical Garden.

↓ Aerial photo of UBC Botanical Garden with views of the Food Garden and the Taylor Learning Plaza ©UBC Studios

FOOD GARDENS GROWING GLOBAL GOALS: SETTING THE TABLE FOR SUSTAINABLE DEVELOPMENT

A ll of us depend on food for our nourishment, health, community and wellbeing. However, food biodiversity is increasingly threatened as a result of a rapidly changing climate, which is a wildcard for the agriculture sector. The UN-SDGs provide a coherent and global plan meant to 'stimulate action over the next 15 years in areas of critical importance for humanity and the planet' (2015, UN General Assembly).

Botanical gardens around the world are working to connect plant conservation to food gardens and food security. The network of botanic gardens is an inspiring and active community, as was evident at BGCI's 10th International Congress on Education in Botanic Gardens in Warsaw, Poland in September. For six days, 300 garden educators from 49 countries, shared information, ideas and hope for action towards conserving plants and biodiversity. The UN-SDG's were addressed in many sessions and workshops and a key call to action from the congress was to rally botanical gardens around coherent and deliberate goals and targets. Multinational and multi-institutional programs such as BigPicnic provide precedence for the ways that botanical gardens can partner, program and mobilize for collective impact.



For many people, food is just something that appears on our plates, in the restaurant and on the shelves of the grocery store. Sadly, the places, people, processes and policies that influence food systems typically go unseen. The large disconnect between food, agriculture, and plants means that for many consumers, particularly those in cities, the impact of food and agriculture on our planet are a NIMBY (not in my backyard) issue. For this reason, food gardens within botanical gardens are critical sites of place-based programming where plant collections, displays, research, education, and outreach programs are adapted to local contexts. As important institutions for ex-situ and in-situ conservation, botanical gardens also provide communities with connections to faraway places and plants.

At UBC Botanical Garden, the Sustainability and Community Programs Department oversees education, outreach, volunteers and sustainability initiatives at the garden. Educational themes connected to both local and global policies play an important role in the garden's tours, workshops, events and community programs. For example, the 2015 UN Year of Soil, the 2017 UN Year of Pulses, and the City of Vancouver's Greenest City Action Plan have heavily influenced program planning. The upcoming 2019 UN Year for Indigenous Languages is currently mobilizing partnerships and programming to highlight biocultural diversity and the links between plant conservation and Indigenous knowledge. The Food Garden at UBC Botanical Garden is a central hub of activities related to food security, agroecology, citizen science, and food biodiversity. The newly opened Taylor Learning Plaza is an outdoor classroom that provides a hands-on teaching space for formal and informal food literacy programs. The installation of new interpretive signs in the Food Garden invites guests to consider a number of topics related to how food is grown, the role of technology in agriculture, local agriculture and more.

Mapping food gardens to the UN-SDGs is an important way to understand how past, present and future programming can be aligned to a global framework. The following table outlines one example of how the *Food Garden* at UBC Botanical Garden aligns to the UN-SDGs. The mapping exercise reveals that the UBC *Food Garden* aligns well to Goal 2 – Zero Hunger, Goal 4 – Quality Education, Goal 11 – Sustainable Cities and Communities, Goal 12 – Responsible Consumption and Production, Goal 13 – Climate Action, Goal 15 – Life on Land, and Goal 17 – Partnerships for the Goals. Gaps and ideas for future action can also be identified through the mapping process.



 ↑ Food bank staff sharing the fresh salad prepared for a Harvesting Food Skills workshop ©UBC Botanical Garden
 ▶ Students learning about water conservation in the food garden ©UBC Botanical Garden



↑ UBC students learning knife skills while preparing fresh salads from the Food Garden ©UBC Botanical Garden



↑ Student teams participate in the Sustainable Communities Field School to learn about organic and fair trade coffee supply chains ©UBC Botanical Garden

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Tara Moreau University of British Columbia (UBC) Botanical Garden Vancouver, BC tara.moreau@ubc.ca Significant individual and collective action is needed to advance sustainability and food security for all. Biodiversity is threatened, the climate is changing and our population is increasing. Having botanical gardens with food production sites align their programs to the UN-SDGs offers many opportunities to support sustainable development from the ground up.



→ Food Garden of UBC Botanical Garden and the outdoor classroom ©UBC Botanical Garden

UN-SDG Goal	How does the UBC <i>Food Garden</i> or Food Programs contribute to specific UN-SDGs?
1. No Poverty	Tours in the Food Garden highlight poverty as a key driver to food insecurity.
2 . Zero Hunger	Food from the garden is harvested by volunteers and is donated to 2 local food banks. A new educational program launched in 2018 (in partnership with a food bank) provides skills for growing, harvesting, cooking, and sharing food.
3. Good Health and Wellbeing	More work to be done here to directly connect food gardens to health and wellbeing.
4. Quality Education	Both formal (UBC classes) and informal (tours and workshops) education occurs in the <i>Food Garden</i> .
5. Gender Equality	More work to be done here.
6. Clean Water and Sanitation	A new drip irrigation system has been installed and is used to talk about water conservation.
7. Affordable and Clean Energy	More work to be done here.
8. Decent Work and Economic Growth	The role of local food in Vancouver's green economy is highlighted through educational programs that specifically target local businesses.
9. Industry, Innovation and Infrastructure	The food sector is discussed on some tours but more work could be done here.
10. Reduced Inequalities	More work to be done here.
11. Sustainable Cities and Communities	<i>Food Garden</i> tours highlight urban agriculture and local government food strategies such as the Vancouver Food Strategy.
12. Responsible Production and Consumption	The <i>Food Garden</i> is a great place to make the connection between food production systems and consumption patterns. Tours, courses and workshops discuss these connections. Events such as the annual Apple Festival create links between consumers and producers.
13. Climate Action	Links between agriculture, biodiversity loss and climate change are frequently discussed on tours and through the Sustainable Communities Field School.
14. Life Below Water	More work to be done here but we have started to talk more about wild salmon as keystone species and as an important Indigenous food source.
15. Life on Land	Nearly 300 food and pollinator plants are grown in the <i>Food Garden</i> and interpretive signs highlight biodiversity and ecosystem services.
16. Peace, Justice and Strong Institutions	More work can be done here.
17. Partnerships for the Goals	The Garden partners with a diversity of organizations including local NGOs (SPEC), governments (City of Vancouver and Metro Vancouver), UBC Faculty and Departments, American Public Garden Association and more.

Table 1 – Mapping exercise to align the Food Garden at UBC Botanical Garden to the 17 UN-SDGs.



My participation in the BigPicnic project has provided an opportunity to reflect on the broader question of food security in a multidisciplinary way. My path through the world of food studies has not been through the world of botanic gardens but, rather, through questions of livelihood and access to public space in urban settings in South and Southeast Asia. Specifically, I have advanced the concept of foodscapes since the early 1990s. This article will focus on some policy lessons learned on this journey, which may be of interest to botanic gardens.

← Small family-owned restaurant in Taipei serving breakfast ©Gisèle Yasmeen

EVOLVING FOODSCAPES: LESSONS FROM THE ASIA-PACIFIC

The opportunity to serve as a member of the International Consolidation Group (or advisory committee) for the Horizon 2020 funded BigPicnic project on food security involving botanic gardens from 13 countries has been an opportunity for me to engage on food issues from a very different perspective than the one I am normally involved with (Moreau and Yasmeen 2018).

It is interesting to reflect on one's career to try to ascertain why a certain path was chosen, or not. I cannot say I had any particular interest in food-related issues during my peripatetic youth; growing up in many different parts of Canada as a young person of French-Canadian and South Asian ancestry.

Then, I recall a few key turning points in my late teens and early 20s that had deep and lasting influences on my interests and how I began to see the world. The first was learning more about the root causes of world hunger and realizing that feeding the world was primarily a question of political priorities. Another revelation had to do with having to cook for myself for the first time in my life and having an epiphany about how much work was related to that undertaking. Studying politics and policymaking at university as well as the cooperative movement and issues of 'basic needs', such as housing, also led to a deeper intellectual understanding of food security and related poverty issues as I came of age.



Feeding Asian Cities

Proceedings of the regional semina

↑ Feeding Asian Cities ©FAO



 ↑ Research Report on Agri-Food Micro, Small and Medium Enterprises in the Philippines, Vietnam and Peru ©Asia Pacific Foundation of Canada
 → The University of British Columbia Botanical Garden's "Food Garden" ©Gisèle Yasmeen

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→ Vietnamese Street Food Vendor ©Gisèle Yasmeen



Two life changing experiential learning opportunities in young adulthood piqued my lifelong interest in food-systems, particularly in Asia. Participating in the World University Service of Canada (WUSC) Seminar in Thailand in the summer of 1985 and, two years later, the Shastri Indo-Canadian Institute Summer Program gave me a glimpse into the food-systems of two very contrasting countries. These early experiences ultimately led to doctoral studies focused on the intersection between public space in cities and food distribution systems in Asia.

When I started advancing the concept of foodscapes in the early 1990s, my focus was on Thailand, where my food-related experiences in the 1980s had been striking, leaving an indelible mark that beckoned for exploration. Women were very present in public space selling food at all times of the day and night (Yasmeen 2006). After completing my Ph.D. I moved onto post-doctoral work in the Philippines and India, which enabled comparative work between the regions of South and Southeast Asia. While the Philippines exhibits similar patterns to those found in Thailand, India generally presents quite a stark contrast where the vestiges of purdah - or the seclusion of women - still has impacts on how food and public space are gendered, though the situation is improving. In all three countries, it was clear that downturns in the economy such as the Asian Economic Crisis in the late 1990s - resulted in vulnerable populations turning to the small-scale food system, whether epitomized by street food vending or domestic catering businesses - as a source of livelihood (Yasmeen 2001). Indeed, the work I subsequently contributed to with respect to Feeding Asian Cities (FAO 2001) and Feeding Cities in Horn of Africa (FAO 2002) suggests that this is a more global pattern.





After a career in government focused on research oversight and administration, I returned to my field of food studies and have begun comparing Canada and the Asia-Pacific with respect to economically and environmentally sustainable livelihoods in the food system. Taking a step back and comparing with my home country after years focused on broader questions of research funding and strategy has helped me reflect on some important policy lessons that emerge from the study of food and food security.

Many Roots readers may associate food security with plant biodiversity given their vantage point, from the world of botanic gardens. Others tend to focus on food availability and supply as well as distribution. For example, a valuechain perspective that maps out activities ranging from food production to food waste management is a useful way to analyse food systems. An under explored area - and one that has particularly captured my attention - is the relationship between food security and the world of work and livelihood, both paid and unpaid, particularly for women. Another policy takeaway is to build food and food security into urban planning and design considerations. This perspective may also be appealing to botanic gardens as key institutions that are part of the world of garden design and landscape architecture.

As a returnee to the field of food studies after many years away, what has become more obvious to me is the convergence in patterns between regions and countries, including synergies between Canada and Asia. This has led me to question myself and the assumptions of my youth. For example, to what extent should we consider stripping away romance and emotion with respect to our conceptualization and analysis of food and foodways? For example, is it realistic to assume that urban agriculture and buying local will feed the world? Likewise, how can we take a more global, systemic, comparative perspective in our collective efforts to co-create a just and sustainable food system? Where are our collective zones of discomfort, for example, with respect to the role of genomics (Yasmeen 2018) and the role of the food business? And last, but certainly not least, what are young people in their 20s interested in and how might this help shape an agenda for future food research? Multidisciplinary and international initiatives such as the BigPicnic play instrumental roles in helping us collectively move forward in commitment to addressing hunger and food insecurity in keeping with the United Nations' Sustainable Development Goals. Botanic gardens are an important part of foodscapes around the world.

 ← Asian Street Food at T & T Grocery Chain (Canada) ©Gisèle Yasmeen

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Food security is a complex issue with many misconceptions around what it actually is. Equipping young people and the communities around them with the skills, knowledge and confidence to tackle food insecurity is key.

Good Food Champions is an academic, year-long professional development programme for teachers that trains participants across all aspects of food 'from soil to plate'. The programme takes a holistic view of food and food security and explores how food can be used as an interdisciplinary context for learning; contributing to national strategies such as Scotland's journey towards becoming a Good Food Nation.

↑ ©Caroline Attwood

There are many misconceptions about what food security is. When you tweet about food security and folk reply but we need to lose weight I'll grow veg in my window box & (no joke) We Brits invented bananas! you know why we need to put food and agricultural science back on the curriculum. (James Wong @Botanygeek)

THE BIG PICTURE

The United Nations' Committee on World Food Security, define food security as 'the condition in which all people, at all times, have physical, social and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life'.

Food security depends on the viability of the whole food chain. This requires a long term strategic vision and industry, government and other parties need to work together at national and international level to achieve this (The Scottish Food and Drink Partnership 2017).

We are facing unprecedented challenges – social, economic and environmental – driven by accelerating globalisation and a faster rate of technological developments (The Organisation for Economic Co-operation and Development (OECD), 2018). In the UK and Europe, the upcoming Brexit will also have a dramatic effect on agriculture and trade. Therefore, it has never been more important to engage the public with where their food comes from. Ironically, across the world, there is enough food produced to feed everyone, yet nutritional needs are not being met. By 2050 the world population is projected to be 10 billion (FAO et al 2017) and a 50% increase in food production will be required to meet this.

SCOTLAND: A GOOD FOOD NATION

Scotland is on a journey to become a Good Food Nation (Scottish Government 2014) and the education, awareness-raising and skills we provide around food is pivotal to achieving this.

The vision of a Good Food Nation is that 'by 2025, people from every walk of life, will take pride and pleasure in the food served day by day in Scotland'. Farming, fishing, food and drink are Scotland's most valuable industries, recognised at home and abroad as a model of collaboration (The Scottish Food and Drink Partnership 2017). The Scottish Government wants food to be a key part of what makes the people of Scotland proud of their country – food which is both tasty to eat and nutritious; fresh and environmentally sustainable (Scottish Government 2014).

FOOD SECURITY AS A THEME IN SCOTTISH EDUCATION

Food and health is now part of the broad general education that all children and young people will experience through Scotland's Curriculum for Excellence (Scottish Government 2014).

To ensure the correct messages around food security reach tomorrow's citizens, we need to provide teachers with the knowledge and skills they require to teach them. This involves building staff capacity, helping them to undertake research and enquiry and engage with parents by setting up learning and industry partnerships and providing resources. Food security is an issue we need to tackle head-on through utilising 'triple-loop' learning.

- **'Single-loop learning'** involves solving problems the problem I'm hungry, I need food, the answer; give me some fish and I eat for a day
- 'Double-loop learning' involves reframing the same problem I'm hungry but eating for one day won't solve the problem, I need to eat regularly so teach me to fish. This overcomes the challenge of recurrent hunger
- **'Triple-loop learning'** goes to problem convergence and considers what else I can eat besides fish (Cybernos 2013)

There is a need to provide information in an engaging and easily accessible format. Delivering education in partnership generates a wider reach as it entices different communities and provides comprehensive information from different angles.



The Good Food Champions programme takes practitioners on a 'soil to plate' journey.



↑ The Good Food Champions visiting Branstons in Abernethy which handle around 350,000 tonnes of potatoes a year ©Moira Stalker

Food security impacts directly or indirectly on all of the 17 sustainable development goals.

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← Discovering more about soft fruit production and the potential impacts of Brexit on the industry ©S Smith

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↑ Gaining hands on knowledge of how the food and farming industry works through farm visits ©S Smith

Facilitating learning in this way helps me as a practitioner to form stronger bonds with my pupils because I talk to them about their lives as we walk, we laugh together, we have fun and respect is built. The Good Food Champions programme takes practitioners on a soil to plate journey: with food security embedded as a theme across all aspects of food education: from planting and harvesting, through manufacturing, to food preparation and eating. Participants engage with local experts and organisations and set up links in their local area to enhance and sustain their own food-related practice. The programme involves talks, visits, presentations and hands-on learning activities, linked to physical, social and economic access to food. So what does this involve?

'At the forefront of this course, I have learned that food and food processes must be sustainable and environmental, social & economic factors must be taken into consideration within the whole process.' Teacher 2018

Good Food Champions provides practitioners with this learning by guiding them through three key aspects of food security, namely:

a. Physical access to food. This involves understanding how food is planted, grown, reared and harvested. It includes knowledge of soil and its importance, together with a knowledge of seasonality and an understanding of how food is produced at scale. Teachers are taken on farm visits and behind the scenes on trips to butcheries, allotments and flour mills.

b. Social access to food. This involves cultivating an appreciation of food and using food to develop social interactions through seeing sharing food as a key part of the day rather than a 'refueling activity'. Engaging children with food and trying new foods is all part and parcel of ensuring social access to food for future generations.

c. Economic access to food. This is a challenging look at food on a budget, looking at how local seasonal produce can be used to put together nutritionally balanced, easy and affordable meals to use in classes or breakfast clubs. Recipes need to consider access to resources and equipment both in school and at home.

The programme has been running for 3 years and the cohorts of teachers involved have undertaken evaluation surveys and interviews 9-months after their involvement to capture the impact of engagement. As identified by Briggs and Walter (2012), through a systematic review, an important feature of good teacher development is sustained Career Long Professional Learning. Although cohorts are small, those involved are more confident and knowledgeable in the topic areas they have covered and have a greater understanding of the food sector by the end. Health and wellbeing and learning for sustainability are highlighted as being key strategies to progress training and utilising learning within the classroom.

'I have a greater awareness of the whole gate-to-plate cycle and the inputs required to grow crops & raise animals. The visits to numerous sites has really enhanced my learning and understanding of sections within the food industry; this knowledge will lead to more informed Food and Health lessons' Teacher 2018

Food security is a long-term issue, which requires long-term solutions. Working as a collaborative group is a key strength of the programme, with each of the organisations involved providing expert input. There are also challenges around the perception of learning for sustainability and the role of food in society. However, the tide is turning at a local, national, and international level. Scotland produces some of the best quality food in the world and much of this is exported to other countries.

Food security dictates that as a nation the UK needs to start eating more of what it produces and part of that involves enabling and enthusing future generations to understand, engage with and celebrate these foods once again.



HORTICULTURAL WORKSHOPS IMPROVE FOOD SECURITY AND WILDLIFE CONSERVATION IN SOUTH ASIA

Chester Zoo supports over 80 conservation projects in 30 countries, with education being a key component. The zoo's Botany and Horticulture Team developed a series of food-growing horticulture workshops in southern Nepal and north-eastern India, aiming to alleviate a growing problem of human–wildlife conflict. Many people rely on the forest for food, but training in vegetable cultivation, mushroom growing, and vermicomposting makes them less dependent on natural resources. They learn to grow more food, diversify their crops, and gain income from selling surplus produce, resulting in fewer clashes with wildlife.

magine waking up one morning to find that your food store, or your main source of income such as your rice crop, has been trampled and eaten by elephants. Or imagine gathering mushrooms or fruits from the forest and coming face to face with a tiger. It might sound terrifying but actually for some people in the remote areas of Assam, India and southern Nepal this is a way of life, and food security is a daily worry. ↑ Valuable ghost chillies being grown with homemade vermicompost medium in Assam, India ©Chester Zoo

→ Elephant damage to a vegetable field in Assam, India, in October 2016 ©Chester Zoo



↑ Visiting the vegetable fields to identify pests and diseases helped make the Pest and disease workshop more relevant ©Chester Zoo

The communities were very aware that using chemicals for plant nutrition and pest control is harmful to both the environment and themselves ... the idea they could use household products like soap, oil and vinegar instead was very well-received.

Over the last three years, the horticulture team has visited both the Assam Haathi and the Living with Tigers projects twice and delivered their training to over 700 people.

→ A typical workshop setting ©Chester Zoo



Chester Zoo has been working with communities in these areas for several years to mitigate human-wildlife conflict and improve food security. The Assam Haathi Project has been running since 2004, and focuses particularly on the clash between communities and elephants. This has become a major problem in Assam over the last twenty years, due to the great increase in the human population, now approaching 30 million, and their encroachment into the elephants' habitat. Assam is home to approximately 6,000 elephants, which represents 10 per cent of the remaining global Asian elephant population. The communities of people that the project aims to work with are very remote and rely largely on food grown locally, so any loss to crops or stored grains can be devastating.

In Nepal, almost half the population lives in poverty and people depend heavily on the forests and natural resources for their survival, from fire wood collection to foraging for food. Thanks to efforts to control poaching, the number of tigers has increased by 63 per cent here, but though this is great news for conservation it is leading to an increase in human-tiger conflict as both rely on the forest. Since 2016, Chester Zoo has been working with communities in the 'buffer zones' of Chitwan National Park and Bardia National Park as part of the Living with Tigers project, a Darwin-funded joint project with the University of Oxford's Wildlife Conservation Research Unit and local NGO Green Governance Nepal. The project team gives practical advice and support, helping people find ways to be less dependent on the forest for their livelihoods and creating ways to mitigate the human-tiger conflict, while conducting vital research into the spatial distribution and ecology of the species in the region.





WORKSHOPS

It was recognised that the Botany and Horticulture Department at Chester Zoo could provide valuable training to encourage communities to be more self-sustainable and increase their food security. Starting in 2015, a series of workshops was developed with the aim of giving people the confidence to grow produce at home, improving productivity for those already growing vegetables, and providing those communities with additional revenue opportunities like growing oyster mushrooms or producing vermicompost.

The first workshop was titled, *Love your soil and it will love you back* and covered basic soil knowledge, soil improvement methods, vermicomposting, and plant nutrition. The second was *Pests and disease* and covered different ways of controlling these through good horticultural practice, companion planting, homemade fungicides and pesticides, and crop rotation. The third workshop was a step-by-step guide on how to grow oyster mushrooms with rice straw on a small scale.

The workshops were a mix of theoretical and practical sessions held over two days. They took place in schools or community halls, with the help of a local translator. The soil and mushroom growing workshops were covered on the first day and were followed by a field visit to look at any pests and diseases that were causing problems locally. On the second day, when the *Pest and disease* workshop was held, everyone was able to discuss what they had seen the day before and what would be appropriate control methods. Demonstration vermicompost containers and mushroom growing bags were also constructed on the second day, for the participants to take home.

COMPOST AND CONTROL

Over the last three years, the horticulture team has visited both the Assam Haathi and the Living with Tigers projects twice and delivered their training to over 700 people. The *Pest and disease* workshop and the training on how to vermicompost have been most popular.

All the communities were very aware that using chemicals for plant nutrition and pest control is harmful to both the environment and themselves but they didn't know there were any alternatives. The idea that they could use household products like soap, oil and vinegar to control pests and diseases instead was very well-received. ← The participants supplied the rice straw and the project provided mushroom spawn during the practical sessions in growing Oyster mushrooms ©Chester Zoo

Food security isn't something that's thought about on a day to day basis here in the UK, but by sharing the zoo's project work and stories of reallife struggles and successes we have been able to engage people and raise awareness about the threats rural communities face.

Yad Bahadur Mahato participant from Chitwan workshop, Nepal



↑ During the vermicompost practical sessions containers were created with vegetable waste material supplied by the participants and worms supplied by the project ©Chester Zoo

→ Maile Belanger and Anna Furse from the Botany and Horticulture Department, with Toran Bahadur Adhikari in his vegetable field in Nepal ©Chester Zoo



↑ A happy farmer with the proceeds from the oyster mushroom training ©Chester Zoo

"I learnt very useful knowledge about using bio-pesticides and will follow this method to keep my environment healthy." Participant from Chitwan workshop, Nepal

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Vermicomposting has proved to be extremely successful. One community member in Assam had been unable to grow chillies, but having learnt how to make a growing medium by means of vermicomposting and using a homemade pesticide, he was then able to grow the valuable ghost chilli (which is used to scare off elephants) and then sell any surplus vermicompost soil medium to others.

The community members in Nepal have also benefited from the training. Toran Bahadur Adhikari says: "I gathered my courage and expressed the willingness to receive some farming support because I wanted to try something new. In March 2018, after receiving the kit consisting of seeds of 10 types of vegetable, I started sowing in the backyard of my house, toiling hard following the instructions given in the training. I took care of the garden like it was my own child – watering the seeds at regular intervals, feeding them with organic manure from time to time and keeping the garden clean. By the third week of April, my efforts were rewarded. I planted almost all of the seeds and sold a few of them to my neighbours. There was a boom in my field within two months. I used the surplus income generated from the vegetables to cater to the other household needs."

TRY THIS AT HOME

Following the success of those workshops in Nepal and India, the zoo's horticulture team decided to hold a series of informal sessions over the summer within Chester Zoo itself. Visitors were invited to come and find out how worms were helping to save tigers in Nepal and elephants in India. Once the children were enticed by the worms, the staff could move on to discuss composting and pesticide use, showing the visitors an array of techniques used in the projects and here in the UK. These sessions made our participants think about how they deal with food waste and the use of pesticides, and gave them some ideas on what improvements might be achieved locally.

Food security isn't something that is thought about on a day to day basis here in the UK, but by sharing the zoo's project work and stories of real-life struggles and successes we have been able to engage people and raise awareness about the threats rural communities face. Best of all, the project has helped to bring about some positive changes to people's lives in India and Nepal.

GOING BANANAS – A FOOD SECURITY PRACTICAL FOR SCHOOLS

At the Eden Project in Cornwall, we aim to engage our visitors with the many ways we are reliant on plants. As part of our work to raise awareness of food security issues across the globe, we have developed a practical investigation for young people. This uses research currently being carried out by scientists at the Eden Project and the University of Exeter, to enable teachers to engage their students with a real world problem. Developing the ability of young people to work scientifically is an essential aspect of ensuring that sustainable solutions to the global challenge of food security are found.

The Eden Project is a botanic garden, educational charity and visitor attraction in Cornwall, which has been open to the public since March 2001. We aim to connect people with each other and the natural world and in doing so build a better brighter future. Food is an important focal point for us for a variety of reasons, not least because it brings people together and links them with environments and plants from across the globe. Simply put, food comes from plants, we all need to eat and with the global population in excess of 7.5 billion, providing adequate nourishment for all of these people represents a massive challenge. Our food security is threatened due to a number of factors, including conflict, pests and diseases, and climate change. Eden has an important role to play in communicating issues related to food security to both the general public and school students, of whom over 48,500 visited last year.

Food security is an important concept in the current UK science curriculum for children aged 11 to 14 as well as in the new GCSE Biology exam specifications. Therefore, developing a good understanding of both the issue and some of the possible solutions is important, for young people, both for making progress towards qualifications and in developing a wider appreciation of the challenge facing society.

↑ A cross section of a banana pseudostem, showing discoloration of the vascular tissue due to disease ©Rachel Warmington



↑ Trainee teachers examining their crude allium extracts ©Ed Walsh

→ Trainee teachers being taught in the Invisible Worlds Lab at Eden Project by Robbie Kirkman ©Ed Walsh



↑ A banana in the Malaysian garden in the rainforest biome at Eden Project ©Rachel Warmington



 ↑ Agar plate showing zone of inhibition of growth of baker's yeast caused by crude extract of elephant garlic ©Ed Walsh
 → Trainee teachers preparing crude extracts of alliums ©Ed Walsh

'It was inspiring to see how science lessons can be made more topical and relevant, with real life links to science.'



As a topic, food security is not always easy to teach in a way which appeals to students, so the approach developed in our Going Bananas project offers an effective and engaging method to tackle this subject whilst, at the same time, improving a student's ability to work scientifically by bringing cutting edge research into their classroom.

Eden Project is currently working with the University of Exeter researching Fusarium wilt of banana plants. Fusarium wilt is caused by a soil borne fungus (*Fusarium oxysporum forma specialis cubense*) and can devastate a harvest, affecting a staple food for millions of people. Part of the research involves looking at the effect of intercropping alliums with bananas to inhibit the growth of the fungus, and any additional effects on the soil microbiome. By utilising this work, the education team have developed an innovative and accessible microbiology practical, which allows students to replicate some of the research in their own schools and in doing so develop a clear understanding of how science can provide sustainable solutions to real world problems.



As part of the schools programme, students visit Eden Project's Invisible Worlds Lab and replicate the work of the research scientists, extracting the active chemicals from common allium plants and testing their inhibitory effect on the growth of baker's yeast (a substitute for *Fusarium oxysporum*) on an agar plate; using a technique known as well diffusion. The students are then able to take their plates back to their school laboratories where they continue the investigation.

One of the advantages of this method is that it requires no equipment beyond which would be available in a standard school setting (though if a school does have a wider range of apparatus available it opens up other opportunities) and consistently provides meaningful results after an incubation time of just 24 hours. A unique aspect of this practical investigation is that, although themed on food security, the practical work together with accompanying teacher notes and student resources are designed to address the needs of teachers and their students far beyond just the subject content. Participation in the investigation is designed to raise student attainment and ability to pass exams by developing their ability to work scientifically - an idea explicitly stated in the national curriculum. It enables them to develop lab and mathematical skills related to practical lab work. This investigation also gives teachers a route through which to revitalise the role of practical work in the classroom. In July 2018, we delivered this investigation to trainee teachers and in so doing provided them with the expertise and resources to deliver the project to their own classes and embed it into their schemes of work.

This practical is a springboard into many potential lines of enquiry into sustainable methods for ensuring food supply, something that is a major global challenge. Eden Project uses this investigation to bring the topic of food security into the forefront of the minds of teachers and students. The practical work provides a tangible hook through which students can develop their knowledge base around this topic. It is important that we show young people how careers in STEM and, more specifically, horticulture are cutting edge and will provide solutions to real world challenges such as maintaining food security.

We would like to acknowledge Ed Walsh's assistance in developing the materials for this practical.



This investigation gives teachers a route through which to revitalise the role of practical work in the classroom.



↑ A microscope image of the macroconidia of Fusarium oxysporum f. sp. cubense ©Rachel Warmington

The practical is a spring board into many potential lines of enquiry into sustainable methods for ensuring food supply, something that is a major global challenge.

← Robbie Kirkman filling a well in an agar plate with allium extract ©Ed Walsh

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SNAPSHOTS: BIGPICNIC



THE BIGPICNIC JOURNEY

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↑ The Greek BigPicnic team ©Magda Paraskeva

The members of the Greek team of BigPicnic first met many years ago. In 2006, Eleni had already designed and created the Balkan Botanic Garden of Kroussia (BBGK), Andreas had designed and implemented environmental education programmes for BBGK, and Dimitris settled in the garden working as a site manager. Their collaboration for three years was fruitful. The adventurous spirit of Dimitris, as another Odysseus, led him on his necessary trips, but he always kept the garden at heart. Instead of Penelope, however, a new journey awaited him. BigPicnic! The project rejuvenated the team, which was now aiming for new horizons, with new labours and new challenges.

What were these new horizons?

Food security, RRI (Responsible Research and Innovation), building new networks, Greek superfoods.

Their new roles?

Eleni took the group under her aegis, Andreas assumed the role of the mentor, and Dimitris took over the role of implementer.

What did they learn during this 2.5 year-long voyage?

To break problems apart and get to the heart of the issue; to be more sensitive and aware of people and situations; to use systematic, effective, playful, co-creative procedures of approaching and analysing the issues in a "polytropic" way.

And what did they accomplish?

- They helped to co-create the BigPicnic Community of Practice: an open network that will be constantly on the rise (!) and will look optimistically and ambitiously to the future.
- They turned BBGK into an esteemed venue for debate on food security in Greece.
- They established a local Greek network of individuals and collectives involved with food security.

Above all, the three companions co-created, with the active participation of many others, co-creation tools! And they saw them working efficiently, and impressively! They have been more committed to food security, loyal to the global ecological mantra, 'think global, act local', by aiming at popularizing Greek superfoods. They have already been able to diffuse and incorporate all of the BigPicnic experience, knowledge and tools into other projects.

But real learning means change. What personal change has happened on the BigPicnic journey? They changed their way of working. It became more thoughtful, co-creative and socially responsible. The involvement of the public is now more systematic, rational and effective. Lastly, but perhaps most importantly, for each member of the group, the BigPicnic experience became embedded in their character. It became part of their behaviour and everyday life. It made them better people!

*multimodal

(https://www.nytimes.com/2017/11/02/magazine/the-firstwoman-to-translate-the-odyssey-into-english.html)



"FOODOPIA"-TOGETHER WE CAN CHANGE OUR FUTURE!

AUTHOR

Birgit Schlag-Edler

Botanical Garden of the University of Vienna and University of Innsbruck

How important is food security to the younger generation?

Are adolescents aware of this topic? As part of our work for BigPicnic, over a period of two years we collaborated with students aged 12-14 from the NMS Sacre Coeur in Vienna. During that period, we exchanged opinions and knowledge in a series of workshops. We started by visiting the students at their school location for co-creation sessions and then invited the students to come to us for several workshops on food related topics the students chose themselves. At the end of the school year, they planted herbs and vegetables from their vertical garden into our raised beds, which would then be harvested in autumn. During the harvesting workshop, we tasted different breads and produced homemade pesto. In our last workshop, we discussed the way our food travels while mixing and tasting a variety of smoothies.

During the process, we designed their Foodopia story, a core element of our BigPicnic exhibition Diversity on your plate. As a result of a series of workshops and discussions around the topics nutrition, food trends and food security the students came up with the idea of this utopian story that shows their visions of the future of food in 2050 and possible solutions to the threat of food shortage due to climate change. It was fascinating to capture the thoughts of these young people and see their visions evolve. Climate change, the growth of population and pollution were on their minds. We gathered their worries as well as possible solutions in interviews, group discussions and written and drawn feedback.

Science and the confidence in its findings as well as the need for behaviour change in the context of food choices were the main issues. In their utopian story, a team of scientists finds the key to end food insecurity. Together with their art teacher, they worked on the comic strip inspired layout.

This story also led to an installation at the exhibition where we asked visitors to leave comments about how we can change our behaviour and choices in connection with food as well as the environment, on a blackboard. We collected a variety of comments and solutions during the exhibition thanks to the inspiring story.

Furthermore, the work of the students in the project led to changes in the students' lives at school. After workshops on the topic of sugar and processed food, the teachers involved started to consider the food offered at school. Together with the school's doctor, they managed to change the supply from sugary snacks and drinks to healthier options with more vegetables and fruit as well as whole grain sandwiches. This change was very well received by the students.

This close collaboration enabled a deep impact on the students' lives, empowered them to raise their voices and take part in discussions about their future.

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A BIG PICNIC WITH A STORY

AUTHORS

Gwendolyn Pronk and Hanneke Jelles

Hortus Botanicus Leiden

.....

↑ Bringing generations together helped to create a warm and welcoming environment ©Hortus Botanicus Leiden

Collaboration is an important aspect of BigPicnic. This encouraged Hortus Botanicus Leiden to call upon the 26 members of the Dutch association of botanical gardens (Nederlandse vereniging van botanische tuinen (NVBT)), asking them to incorporate the theme of plants and food into their programming for 2018. Eleven gardens joined, and used the title Plant and eater as the focal point for all of their activities that year. From exhibitions to talks, to science cafés and much more.

PICNIC

To conclude their programming for the 2018 thematic year, most of the partners organised a picnic on 2nd September 2018. Each garden programmed the event slightly differently, as befitting their own goals and resources, but always around the theme of Plant and eater.

STORYTELLERS

In Leiden, the picnic was designed as a picnic that told a story. 150 older people with disabilities and their carers came to spend their Sunday enjoying the sun, greenery and a delicious (vegetarian) lunch. As they went through the garden, they met various storytellers. As they were in small groups, they could listen for as long as they wanted. The storytellers all invited interaction from their visitors, and encouraged them to tell their own stories as well. In addition to this group, general visitors could order a packed lunch and join to listen. Amongst the storytellers was a children's author, who aimed to encourage grandparents and grandchildren to enjoy stories together. Others spoke on a variety of topics that would be recognisable for the older visitors and trigger memories, hoping to, in turn, trigger interest in plants and their role in our food: e.g. on grains, pollinators, potatoes, etc. All themes that had come out of previous science cafés and co-creation sessions.

AMBIANCE

Musicians helped to create a cozy atmosphere. Comedian, Dorine Wiersma, walked around with her guitar and sang about gluten and student musical association, Spelendergrijs, surprised picnickers with acapella songs. Visitors could also enjoy the Plant and eater exhibition that had been realized through co-creation with various parties and Marlene Damen. The alderman for health, youth services and welfare for the Leiden municipality gave the opening welcome.

During the evaluation we concluded that the storytellers were very well suited to mixed groups, where some visitors want to hear as much as they can, while others just wanted to enjoy being outside.

The combination of old and young - the singing students, the regular picnickers, the children around the cargo bike where the children's book author stood - all contributed to a positive, happy atmosphere where everyone felt welcomed, open and safe to share information.

In 2020 the Dutch botanical gardens will continue to collaborate, this time around the theme will be health and plants. We are exploring the option of a combined science café in late summer. In the collaborative grant proposals the experiences gained through BigPicnic have proven very valuable.





EU PROJECT BIGPICNIC INITIATES THE ACQUISITION OF A NEW TARGET GROUP FOR THE SCHOOL BIOLOGY CENTRE HANNOVER

AUTHOR

Stefanie Lange

School Biology Centre Hannover

↑ Participants of the Rucksack Schule in the vegetable garden of SBZH ©SBZH

As part of BigPicnic, the School Biology Centre Hannover (SBZH) developed teaching materials and activities with and for the participants of the *Rucksack Schule* programme for use in their, so-called, thematic training courses as well as in teaching general subjects at primary schools. The key elements were jointly developed in several co-creation workshops.

The *Rucksack Schule* is an education programme in Hannover in which parents have the opportunity to actively participate in the school activities. It is aimed at parents and primary school children, the majority of whom have a migration background. The programme deals with curriculum topics and promotes multilingualism, language competency and interculturality.

We held several co-creation workshops with the staff and participants of *Rucksack Schule* in early 2017. These led us to aligning our area of focus on food security and sustainable nutrition. In May 2017, the participants visited the SBZH for two pilot events about various topics such as (wild-)herbs, gardening, plant propagation, etc. Another milestone in cooperation was a joint-led stand during the environmental forum at the SBZH, in September 2017. As a result of this 300 *Rucksack Schule* participants and their families came to this event, which takes place every 2 years, for the first time (in total more than 4000 people attended the event). In the run-up to the event, the participants had written down their thoughts and opinions on food security and healthy nutrition. In this way, we collected the voices of nearly 100 members of this new target group. In November 2017, there was another joint stand during a symposium organised by the German Nutrition Society, Lower Saxony Section.

In February 2018, the participants of the *Rucksack Schule* took part in our 2nd science café on *Responsibility of science and politics for food quality - Food labelling: Protection of consumers against misleading and deceptive labelling.* The content was the result of a co-creation workshop held at the beginning of 2017.

In September 2018, another group of participants took part in our next science café entitled Food is communication: Food cultures and nutrition for a world with a future.

After the end of the BigPicnic project, the teaching materials developed through this collaboration will continue to be available. The *Rucksack Schule* activities can be borrowed and used free of charge and include worksheets and information about plants and SBZH, including activities and tours.

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WHAT DID THE BOTANICAL GARDEN OF BERGAMO LEARN FROM BIGPICNIC?

AUTHORS

Gabriele Rinaldi and Francesco Zonca

Bergamo Botanical Garden

↑ Bergamo Botanical Garden exploring the mobile cart exhibit

The BigPicnic project has given to Bergamo Botanical Garden a great chance to reflect. It has deeply influenced our cultural and educational policy. At the beginning, we saw our role as delivering information on the relationship between food and biodiversity, but thanks to the BigPicnic partnership we have realised we must educate both ourselves and our audience to become more aware of the massive environmental impact that food, agriculture and our daily choices have on biodiversity and its conservation. Now we feel more responsible and our exhibitions, educational programmes for schools, events for families and other activities, take into account the concept of food security and its implications.

We realised we have the ability to create a bridge between research and citizenship and provide opportunities for sharing. Science cafés have proved to be very useful and effective, because they allow dialogue between different groups of people who otherwise do not have many opportunities to interact. During the project, we supported conversations between consumers, agricultural producers, lawyers, beekeepers, international cooperation operators, the general public, high school and university students, beauticians, sellers, politicians, and more. We have noted, for example, that bread sellers and consumers, do not often discuss the product, the quality of flour, the food supply chain, or sustainability and researchers are not aware of what civil society regards as preferable or more acceptable to research.

Science cafés, as a format, are very engaging; researchers involved in the process have always been pleased to have joined in and the satisfaction and participation of the public is often high, because their role is active and the action of sharing diverse points of view can enrich everyone.

The co-creative approach allowed us to involve representatives of our target groups from the design steps in meetings where everyone around the table had equal roles and the freedom to express their own point of view. This helped us to develop activities such as workshops and exhibitions that are more responsive to the expectations of our audience.

When we organised our temporary exhibition on safe, responsible and biodiverse food, we involved teenagers, pharmacists, nutritionists, artists, teachers and other people from the beginning. We also involved students in the whole process of developing a mobile cart exhibit. This cart is equipped with drawers, compartments, worktops, and other tools that allowed the visitors to interact and discover graphics, images, conceptual summaries, food products and messages about food security.

BigPicnic has allowed us to create new connections with new audiences, such as the diverse organisations that bring together lawyers, traditional agricultural producers, socially engaged agricultural producers, sellers, ethical purchasing groups and international NGOs. In summary, it has enriched Bergamo Botanical Garden's public engagement; the impact and the quality of the activities we run and our social relevance.

BRIGHT THINGS - GREAT RESOURCES

FOOD SECURITY INTERACTIVE WORK-SHEETS AT BERGAMO BOTANICAL GARDEN

Bergamo Botanical Garden created different worksheets to engage a range of audiences with food security, enabling them to express themselves and take various challenges. The worksheets are related to the food security topics our garden is focusing on throughout BigPicnic.

The worksheets help to make people aware of some aspects of food security such as plant biodiversity, sustainability, labelling and ecological footprints. These tools have also allowed us to collect data directly from the public; gaining an understanding of their perceptions, their knowledge, their needs and expectations when they think about food security. We used the worksheets at events both in and outside the garden.

HOW DO THEY WORK?

The first worksheet is about food plant biodiversity: "A challenge – How many plants have you eaten in your life?" We invite people to discover and choose from over 300 different common names of plants. People can put a cross next to the plant name, add a plant not shown and count how many plants they have eaten and compare their score with other visitors. The list of plants can be changed and modified according to the audiences' needs.

The second worksheet is about the impact of food on the planet: "Calculate your footprint... at lunch or dinner". People can figure out their own ecological, water and carbon dioxide footprints of a single meal of the day. The worksheet includes different columns: 15 different common foods, each with different figures according to the portion size and weight and boxes to calculate the footprints in grams of CO², in litres of water, m² of land needed to produce the single food and of the whole meal. People are very surprised to discover how big their impacts are. This helps to increase awareness of ecological footprints.

The last worksheet is about labelling and gives the public the chance to share their opinion about what they would like to read on the label for fresh food, drinks and packaged food.



©Bergamo Botanical Garden

This has allowed us to collect data about people's perceptions of food and their needs when they choose what to buy to eat.

We found these worksheets simple to use and easy to collect data to help us get to know our audiences better.

The three worksheets are available to download from the BigPicnic website: https://www.bigpicnic.net/resources/ food-security-interactive-worksheetsbergamo-botanical-garden/

We invite you to try the worksheets and share your opinion with us!

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RESOURCES

UN Sustainable Development Goals

If botanic gardens want to have a positive impact in working towards food security, it is important that we think strategically about how our work contributes to toplevel policies and frameworks, like the UN Sustainable Development Goals.

https://www.un.org/sustainabledevelopm ent/hunger/



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FOOD SECURITY STATS

The State of Food Security and Nutrition in the World

The FAO publishes an annual report looking at food security. This is the second to map progress against the UN SDGs. This helpful website summarises



graphs and graphics looking at important measures of food security such as malnutrition and its causes, damage and loss in agriculture and climate resilience.

the report with

http://www.fao.org/state-of-foodsecurity-nutrition/en/

FAO, IFAD, UNICEF, WFP and WHO. 2018. The State of Food Security and Nutrition in the World 2018. Building climate resilience for food security and nutrition. Rome, FAO.

FOOD SECURITY NEWS

Sci Dev Net: Food security

Research related to food security is moving quickly and it is helpful to stay upto-date. This section of the Sci Dev Net website compiles global news related to food and global development.

https://www.scidev.net/global/agriculture/ food-security/

WORKING TOWARDS FOOD SECURITY

FAO publications

The FAO publishes regular reports about scientific and social issues related to food security. As such, its archive of publications offers a great resource for those looking for current research linked to food and food production including the importance of pollinators and the importance of partnerships for resilience.

http://www.fao.org/publications/en/



BGjournal: Botanic gardens and food security

Botanic gardens' role in supporting global food security is unquestionable. This issue of BGJournal illustrates some

of the many ways botanic gardens are working in this area, from developing community food gardens to conserving Crop Wild Relatives.

https://www.bgci.org/files/Worldwide/BGj ournal/bgjournal_10.2_lowres.pdf

EDUCATIONAL RESOURCES

BigPicnic resources

BigPicnic

As part of BigPicnic we are developing a range of resources to support other organisations to deliver similar projects. The resources page contains information about all of the approaches we are using in BigPicnic: RRI, co-creation, exhibitions, science cafes and Team-Based Enquiry

https://www.bigpicnic.net/resources/

The Crunch Handbook

The Crunch was a year of engagement experiences about food, health and the planet, created by the Wellcome Trust. Through a number of activity strands the programme engaged the UK population, including adults, children and families, in conversations about food security. This handbook summarises the results as well as the tools they used to start the dialogue, many of which could be adapted to a botanic garden setting.

https://www.sciencecentres.org.uk/projec ts/crunch/

Global Food Matters: An appetite for engaging with research

The Wellcome Trust see interaction and engagement with the public as being an essential part of research and innovation. In this project they used various methods to discuss community engagement with health research, with a focus on food systems, health and the environment. This report outlines the results of the conversations as well as the engagement methods used.

https://wellcome.ac.uk/sites/default/files/ wtp059719_0.pdf

Global food security educational resources

Global Food Security facilitates new interdisciplinary research to address food system challenges, and provides a platform for working in partnership with a wide variety of stakeholders and users, both internationally and in the UK. Their educational resources include a number of activities that can be used with a range of audiences, these include ideas to support public debates.

https://www.foodsecurity.ac.uk/challenge /educational-resources/

Royal Society of Biology: Food and food

These resources developed by The Royal Society of Biology in partnership with Global Food Security and the Biochemical society provide lesson plans to help teach young people 14+ about food and food security, looking at both biology and geography curricula.

https://www.rsb.org.uk/getinvolved/biology-for-all/free-activity-resou rces/food-and-food-security

Building the zero hunger generation

This is a resources portal from the FAO to support educators in preparing lessons related to global food security. The aim is to introduce children to these major issues as a means of instilling ideas about sustainability which they will take with them throughout their lives and careers.

http://www.fao.org/building-thezerohunger-generation/en/





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BIGPICNIC FINAL FESTIVAL

Wednesday 27th February, 2019. Royal Botanic Garden of Madrid, Spain



Join us to celebrate the findings of BigPicnic!

This event will bring together policy-makers, scientists and educators to showcase the approaches and outputs of the project. As well as discussions and debates the programme will include training sessions and an exciting Main Event.



For more information visit https://www.bigpicnic.net/events/bigpicnic-festival/