



**VALUING
NATURE
PROGRAMME**

Sharing Stories, Sharing Collections: Valuing Biodiversity in Wales

A Report by Poppy Nicol

Host: Amgueddfa Genedlaethol Caerdydd/National Museum Cardiff, Amgueddfa Cymru/National Museum of Wales.

Home: Sustainable Places Research Institute, Cardiff University.



Sustainable Places
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*Sefydliad Ymchwil
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Executive Summary

The aim of the *Valuing Nature* research programme is to better understand and represent the complexities of the natural environment in decision making. This report presents the findings of one of the 2017/18 *Valuing Nature* placements funded by the *Natural Environment Research Council* as part of the *Valuing Nature* research programme: *Sharing Stories, Sharing Collections*.

As a partnership between *Cardiff University* and *Amgueddfa Cymru-National Museum Wales (AC-NMW)*, the placement has two core aims. First, to investigate ways in which *AC-NMW's* economic botany collection and associated activities can **improve societal understanding and valuing of biodiversity**. Second, to investigate how *AC-NMW's* economic botany collection and associated activities can address *AC-NMW's* **public duty of well-being** in accordance with the Well-Being of Future Generations Act (Wales) 2015. These placement aims contribute to the *AC-NMW* Vision commitments: **prosper, experience, learn, participate**.

In order to address these core aims, the placement has three objectives: first, investigation of the current economic botany collection working closely with the *National Museum Cardiff* Botany team; second, public consultation and co-production of a framework for value with participants that links value to stakeholders' interests and preferences; and third, identification of how economic botany collections can strategically build value in society through future activities and innovations.

The placement employs an integrated and holistic approach whereby the environmental, economic, societal and cultural value of ecosystem services are considered. In this approach, value is understood to refer to nature's benefits to society - including monetary and non-monetary dimensions and ecosystem services are defined as the many and varied benefits that human gain from the natural environment.

Part one of this report presents an overview of *AC-NMW's* current economic botany collection. Part two considers why the collection matters to Wales and the future generations of Wales. Part three presents the methodological approach employed. Part four presents the findings of the public consultation. Drawing upon the findings, part five identifies the potential for innovations that strategically build societal value within economic botany and bio-cultural collections in museums generally. Four key themes emerge: **research, learning, curation** and **digitisation**.

Introduction

This report draws upon the *Natural Environment Research Council (NERC) Valuing Nature* placement undertaken by Dr. Poppy Nicol between November 2017-March 2018. As a collaboration between *Cardiff University School of Social Sciences* (home institute) and *Amgueddfa Cymru-National Museum Wales (AC-NMW)* (host institute), the placement aims to enhance understanding of how *AC-NMW* can strategically build the societal value of the economic botany collection through an inter-disciplinary approach.

The placement has two core aims. First, to investigate ways in which *AC-NMW's* economic botany collection and associated activities can **improve societal understanding and valuing of biodiversity** (whereby value is understood to refer to nature's benefits to society - including monetary and non-monetary dimensions). Second, to investigate how *AC-NMW's* economic botany collection and associated activities can **address AC-NMW's public duty of well-being** in accordance with the Well-Being of Future Generations Act (Wales) 2015.

In order to address these aims, the placement has three objectives. First, to investigate the current economic botany collection and produce an **overview of the collection**. Second, to facilitate co-production of a **framework for value** that links value to stakeholders' interests and preferences via public consultation. Third, drawing upon the co-produced framework for value, to identify how economic botany collections can strategically build value for society through future activities in the form of a set of **innovations**. As an outcome, this report supports *AC-NMW* understanding of how future activities associated with the economic botany collection can further societal understanding and valuing of biodiversity and address the Museum's duty of well-being.

The findings of this work demonstrates how reinvigoration of research and curation around the economic botany collection and investment in learning and digitisation has the potential to support delivery of the four *AC-NMW* Vision commitments: **prosper** (acting as stewards of our cultural and natural heritage for the future generations of Wales); **experience** (telling inspiring stories through exhibitions and events); **learn** (promoting lifelong learning and public understanding of health and well-being) and **participate** (involving people and communities in shaping and taking part in our work and building sustainable, effective partnership networks and collaborations).

Part 1

1.1. Amgueddfa Cymru-National Museum Wales'

Economic Botany Collection

Economic botany is a term that refers to a group of plants that have recognised societal benefit. This includes **medicinal plants, food products, dyes, tannins, gums, resins, fibres and timber**. The *Amgueddfa Cymru-National Museum Wales (AC-NMW)* economic botany collection contains over 5,500 plant-based specimens, together with 12,000 timber specimens. Categories within the collection include medicinal plants; food products; dyes and tannins; gums, resins and fibres; and seeds.

The *AC-NMW* economic botany collection has been gradually built up since the *National Museum Cardiff's* foundation in 1905. It features specimens from around the world, with a significant number from India, South-east Asia and East Africa. Collection specimens were collected by Botany curators and other plant enthusiasts and also acquired from botanical gardens and exchange clubs including *Royal Botanic Gardens, Kew; Singleton Educational Gardens and Singleton Park Botanic Gardens, Swansea; Roath Park, Cardiff; The Alpine Garden Society, Watson Botanical Exchange; Botanical Exchange Club of the British Isles; Welsh Plant Breeding Station and Cambridge International Agricultural Botany Station*. Many specimens came to the Museum in the 1920's and 1930's when Britain was seeking new raw materials to develop trade and industry. Since the 1970s, most acquisitions have been collected for specific exhibitions at *National Museum Cardiff*. In 2007, *AC-NMW* acquired a *Materia Medica* collection donated and catalogued by Prof. Terence Turner (*Cardiff University Department of Pharmacy and Pharmaceutical Sciences*).

The economic botany collection and *Materia Medica* collection are managed by the Botany team, within the Department of Natural Sciences at *National Museum Cardiff*.



Photos from L-R clockwise: Specimens from Terence Turner's *Materia Medica* and the *AC-NMW Economic Botany Collection: sorghum and sugar cane*.

1. 2. What is Economic Botany?

Plants have been essential for the health and well-being of people throughout history, whether as medicine, food, fabric, building materials or fuel. Cultivation, distribution, trading and consumption of plants and development of plant-based products has supported the health and well-being of communities - whether as medicine, food, fabric or fuel.

Plants and plant-based economies have further driven the global movement of peoples, the rise of trade routes, the expansion of empires and the growth of economies around the world. The gaining of knowledge about indigenous food crops, forage plants, timber products, fibre plants and medicinal plants was a key driver in the process of colonisation and the rise of empires (Reveal 1992). Indeed, the cultivation and commodification of plants and plant-based products strengthened the power of nation states and empires (Brockway 1979; Livingstone 2013).

As Pleasant (2014) highlights, plants served more than direct economic needs. The collection of bio-cultural material in the nineteenth century was based upon furthering imperial prosperity and imperial citizenship. According to Mackay (1996:39) “the work of the collectors was part of a broader effort in the era of early industrialisation to systematise and rationalise assessments of the non-Western world so as to streamline the process of exploitation.” Classification systems enabled colonialists to ‘claim’ botanical resources (Pleasant 2014:247) whilst taxonomies displaced traditional plant knowledge “erasing indigenous plant names and usurping Native claims to ownership and control of their natural resources” (Pleasant 2014:245). Economic botany, with its emphasis on plant raw materials, processed by human labour, enshrined this system in the museum space (Cornish and Nesbitt 2014:276). However, the use of plants for the health and well-being of communities may not necessarily be exploitative.

1.3. Bio-cultural Collections

More recently, economic botany collections are being revisited and re-interpreted as **bio-cultural collections**. Amidst growing interest in sustainable livelihoods and forms of local ecological knowledge (Pleasant 2014:245), bio-cultural collections are recognised as “rich resources of ethno-biological data and cultural heritage” (Salick, Konchar and Konchar 2014:12). Dierig et al (2014:116) suggest ethnobiology “has changed from being primarily descriptive, or a tool for bio-prospecting by external parties, to being a discipline that is applied to the betterment of the societies within which it works.”

According to the Ethnobiology Working Group (2003), bio-cultural collections represent dynamic relationships among peoples, biota, and environments. Bio-cultural collections include: herbarium, xylarium and zoological specimens; unprocessed economically useful plant and animal parts; plant and animal products and processes; ethnographic materials and cultural artefacts; DNA collections; live collections; palaeo-ethnobotanical and zoological materials; bio-cultural documentation. Researchers involved in the Mobile Museum Project for example suggest bio-cultural collections are “of growing interest to researchers and scholars in a wide range of disciplines from ethnobotany to design history, as well as to diverse communities and museum curators worldwide” (Mobile Museum 2018).

Part 2

2.1. Why do Economic Botany and Bio-cultural Collections matter?

The economic botany collection is largely recognised by the *National Museum Cardiff* Botany team as a useful tool for **engaging** the public in botany through **learning** and **outreach**.

- ***A tool for engagement***

For some members of the Botany team, the economic botany collection acts as a gateway to the world of botany. For example, the economic botany collection is described as “a potentially wonderful tool for outreach, allowing us to talk to the public about plants and the importance of plants.” The team reflects, “it is useful for people to see how plants can be used...it helps explain the relevance of plants.” The collection also has pragmatic value as a tool for engagement. The collection contains a range of ‘robust’ 3D objects that can be used for handling making the collection particularly useful for outreach activities - “it comes out during open days...it gives people inspiration.”

- ***A tool of the past?***

The majority of *AC-NMW* economic botany collection specimens were acquired in the early twentieth century. During this time, the focus of economic botany collections in general was about collecting and exhibiting specimens from places that were far away and, to the majority of the public, unfamiliar. A large proportion of the early twentieth century specimens contained within the collection includes commodity crops such as cocoa, coffee, cotton and rubber. As the team reflects, the collection contains “plants of economic importance...things that we can exploit economically.” It also offers insight into the history of production and trade as a result of the diverse range of commodity crops acquired from around the world.

More recent acquisitions have been described by the Botany team as collected on an “ad-hoc” basis. From the 1970s onwards, collecting was focussed on acquisition for specific exhibitions such as the *‘Beans on Toast’* exhibition (2013). Whilst there is debate over whether “economic botany” is a term of the past with questionable relevance for today, the Botany team feel that the collection remains an important resource for present and future generations but needs to be developed and updated.

- ***A tool for future generations?***

Conversations with the *AC-NMW* Engagement team suggest there is a need for further investigation of the object biographies of accessed specimens, as well as biographies of collectors and collection approaches. The views of external stakeholders, including the participants of the workshops facilitated as part of this placement, highlight the need for digitisation.

Currently, the majority of the Botany team consider the primary role of the economic botany collection to be engagement and education. Through learning and outreach activities, the collection can support public valuing and understanding of the critical role of plants in society and contemporary threats facing biodiversity. It has further potential to support understanding of the value of plants through history and act as source of inspiration for future generations.

Whilst the economic botany collection is undoubtedly a collection of historical significance, it also contains information of potential significance for the future. The following section considers how the economic botany collection has the potential to:

1. support valuing and understanding of biodiversity, and;

2. support delivery of AC-NMW’s public duty of well-being

3. contribute to fulfilment of AC-NMW’s Vision Commitments: prosper, learn, experience and participate.

2.2. Agri-biodiversity and Economic Botany

“Agricultural biodiversity is a broad term that includes all components of biological diversity of relevance to food and agriculture, and all components of biological diversity that constitute the agricultural ecosystems, also named agro-ecosystems: the variety and variability of animals, plants and micro-organisms, at the genetic, species and ecosystem levels, which are necessary to sustain key functions of the agro-ecosystem, its structure and processes.”

(UN Convention on Biological Diversity 2010)

At present, agri-biodiversity is threatened with compounded levels of extinction. Globally, crop genetic resources are estimated to be disappearing at a rate of 1- 2% per annum (Shand 1997). Between 25-33% of all plant species are threatened by extinction (Dierig et al. 2014:107). Today, around thirty crops provide 95% of human food energy needs, four of which (rice, wheat, maize and potatoes) account for over 60% of energy intake (FAO 2015). Yet over 5,000 plant species have been domesticated and grown as food crops (ETC 2009:10). Indeed, it is estimated that there are 250-300,000 potentially edible plant species in the world (FAO 2018). Biodiversity and agricultural genetic diversity can be supported by conserving natural plant communities and growing a wider range of crops for food, fuel, fibre and medicine.

Agricultural biodiversity is the outcome of interactions amongst genetic resources, the environment and farming practices over millennia. Agricultural biodiversity includes the following dimensions:

1. **Genetic resources** for food and agriculture;
2. Components of biodiversity that support **ecosystem services**;
3. **Abiotic factors**;
4. **Socio-economic** and **cultural** dimensions.

Whilst agricultural biodiversity plays a key role in feeding and nurturing people (Shand 1997), more broadly, biodiversity is essential to maintain **ecosystem services** and allow **adaptation to changing conditions** - including climate change. Wild relatives of crops have evolved to environmental challenges and could provide resistance to pest and disease as well as resilience to changing climates. There is also further potential for nutritional qualities of wild or rarely cultivated species.

Plant collections are particularly critical in the midst of an era where biodiversity is being eroded. Plant collections have the crucial societal role of developing understanding and valuing of **biodiversity** through raising public awareness of:

- the history of the **production, distribution and trade** of food, fibre, fuel and fodder;
- the role of plants in maintaining **ecosystem services**;
- the use of plants in **adaptation to changing conditions** - including climate change;
- how plants sustain **livelihoods** and **health and well-being**.

As outlined above, plant collections including economic botany, bio-cultural and herbarium collections provide opportunities for developing **understanding and valuing of the role of biodiversity** and in supporting **health and well-being**. In 2015 the Welsh Government passed the UK's first legislative framework that enshrines health and well-being goals into national law. This presents a unique opportunity to reconsider and reevaluate the *AC-NMW*'s economic botany collection.

2.3. The Well-Being of Future Generations Act (Wales) (2015)

The Well-Being of Future Generations Act (Wales) (2015) states that 44 public bodies in Wales including the Local Authorities, the NHS, Fire and Rescue and *AC-NMW* must work together towards seven well-being goals and five ways of working together. The work of these public bodies in meeting the Act will be advised and assessed by the Commissioner for Future Generations. According to the Act, all public bodies must carry out sustainable development defined as “the process of improving the economic, social, environmental and cultural well-being of Wales by taking action” (Welsh Government 2015:5). The Act outlines seven well-being goals which provide a framework for public bodies to fulfil the aims of the Act:

Figure 1. Well-being Goal

Goal	Description of the goal
A prosperous Wales	An innovative, productive and low carbon society which recognises the limits of the global environment and therefore uses resources efficiently and proportionately (including acting on climate change); and which develops a skilled and well-educated population in an economy which generates wealth and provides employment opportunities, allowing people to take advantage of the wealth generated through securing decent work.
A resilient Wales	A nation which maintains and enhances a biodiverse natural environment with healthy functioning ecosystems that support social, economic and ecological resilience and the capacity to adapt to change (for example climate change).
A healthier Wales	A society in which people’s physical and mental well-being is maximised and in which choices and behaviours that benefit future health are understood.
A more equal Wales	A society that enables people to fulfil their potential no matter what their background or circumstances (including their socio economic background and circumstances).
A Wales of cohesive communities	Attractive, viable, safe and well-connected communities.
A Wales of vibrant culture and thriving Welsh language	A society that promotes and protects culture, heritage and the Welsh language, and which encourages people to participate in the arts, and sports and recreation.
A globally responsible Wales	A nation which, when doing anything to improve the economic, social, environmental and cultural well-being of Wales, takes account of whether doing such a thing may make a positive contribution to global well-being.

(Welsh Government 2015:6)

2.4. Five Ways of Working Together

The Well-Being of Future Generations Act outlines five ways of working in order to achieve the seven well-being goals.

Figure 2. Five Ways of Working



Long-term	Integration	Involvement	Collaboration	Prevention
The importance of balancing short-term needs with the needs to safeguard the ability to also meet long-term needs.	Considering how the public bodies well-being objectives may impact upon each of the well-being goals, on their objectives, or on the objectives of other public bodies.	The importance of involving people with an interest in achieving the well-being goals, and ensuring that those people reflect the diversity of the area which the body serves.	Acting in collaboration with any other person (or different parts of the body itself) that could help the body to meet its well-being objectives.	How acting to prevent problems occurring or getting worse may help public bodies meet their objectives.

(Welsh Government 2015:7)

According to the *New Economics Foundation* think tank, the concept of well-being comprises two key elements: feeling good and functioning well - “feelings of happiness, contentment, enjoyment, curiosity and engagement are characteristic of someone who has a positive experience of their life. Equally important for well-being is our functioning in the world” (2008a:1). The 2015 Act presents a significant opportunity for *AC-NMW* Collections to be used in new ways that support these positive and beneficial qualities for the people of Wales.

Moreover, reinvigoration of work around the economic botany collection has the potential to address four key challenges highlighted by the Future Generations Commissioner:

- **Climate change** – focusing on reducing emissions and tackling impacts;
- **Economic change** – shifting to an economy that is fit for the future;
- **Population change** – tackling the challenges and opportunities of an ageing population, the changing composition of our communities, and the importance of early years and adverse childhood experiences;
- **Citizen disengagement** – championing public participation and involvement in decision making.

(Summary of Draft Strategic Plan, Future Generations Commission 2017:3)

2.5.Amgueddfa Cymru-National Museum Wales and the Well Being of Future Generations Act (Wales) (2015)

All public bodies in Wales have a public duty to improve “the social, economic, environmental and cultural well-being of Wales” (Welsh Government 2015:1) and work towards the seven well-being goals. For *AC-NMW*, the Well-being of Future Generations Act provides an important role in directing future activities associated with the *AC-NMW* economic botany collection. It also has implications for other bio-cultural and economic botany collections around the world.

AC-NMW's Vision was developed within the framework of the emerging Well-Being of Future Generations (Wales) Act (2015). It was informed through engagement and consultation with staff, volunteers and stakeholders. Within their *Operational Plan* (2018-2019), *AC-NMW* recognise four key commitments in order to deliver the seven goals of the Well-Being of Future Generations (Wales) Act:

Prosper:

- Acting as stewards of our cultural and natural heritage for the future generations of Wales;
- Thriving, sustaining and diversifying our resources;
- Building our cultural tourism offer.

Experience:

- Building and maintaining welcoming physical and digital spaces;
- Telling inspiring stories through exhibitions and events.

Learn:

- Developing the skills of staff and the people who use our services;
- Promoting public understanding of health and well-being through museum programmes and spaces;
- Promoting and delivering learning for life.

Participate:

- Building sustainable, effective partnership networks and collaborations;
- Involving people and communities in shaping and taking part in our work.

(Amgueddfa Cymru-National Museum Wales 2018:5)

The following section presents the methodological approach employed during the placement in order to investigate how the current economic botany collection has the potential to contribute to *AC-NMW's* **duty** of well-being and **vision** for inspiring people, changing lives and making a difference to Wales.

Part 3

3.1. Methodological Approach

As outlined, this placement has been guided by three aims. The methodological approach implemented in order to meet the three placement objectives is based upon the principle of **co-production**. According to Slay and Stephens (2013:3), co-production is about “a relationship where professionals and citizens share power to plan and deliver support together, recognising that both partners have vital contributions to make in order to improve quality of life for people and communities.” The *New Economics Foundation* suggests co-production provides an appropriate framework for systemic change (2008b). *AC-NMW* have embraced the principles of co-production in the new galleries at *St. Fagans National Museum of History* and is a leading museum in the promotion of inclusive and participatory practice. This placement employs a co-production methodological approach in order to re-imagine the role and function of *AC-NMW*'s economic botany collection.

A range of internal and external stakeholders were introduced to the collection and invited to contribute to a framework of values based on their interests and preferences, drawing upon the seven well-being goals of the Well Being of Future Generations Act (2015). This methodological approach is based upon the principle that working with the public will support insight into the public value of the economic botany collection. Consultation included a series of workshops with community groups and one-to-one discussions with a range of internal and external stakeholders, including representatives from a range of institutions and organisations (including other public institutions, advocacy groups) and a number of self-employed freelance artists.

During the workshops, the researcher and members of the Botany team introduced participants to the Botany Department collections including the Herbarium, Botanical Illustrations collection, Materia Medica and economic botany collection. Following this, participants were invited to discuss the collection in terms of: what interested them in the collection, what they would like to see more of in the collection and how, if at all, they would like to engage further in the collection. Feedback was recorded on post-its and note paper. Following the *Cardiff University School of Social Sciences* research ethics process and the *Economic and Social Research Council* Research Ethics Framework (ESRC 2015), ethical approval was obtained from *Cardiff University School of Social Sciences* Ethics Committee. This placement also followed the *AC-NMW* Code of Ethical Research Practice. Informed consent was sought from all those involved.

3.2. Internal Stakeholders

23 discussions were held with members of Botany, Learning, Fine Art and Conservation and Research Team (*National Museum Cardiff*); curators and volunteers at *National Wool Museum* and curators, conservators, gardeners and weavers at *St. Fagans National Museum of History*.

3.3. External Stakeholders

18 discussions were held with external stakeholders including representatives from: *Food Cardiff*; *Federation of City Farms and Community Gardens*; *Cardiff and Vale UHW*; *Sustainable Places Research Institute*; *Cardiff University School of Pharmacy and Pharmaceutical Sciences*; *National Botanic Garden of Wales*; *Bute Educational Centre*; *WRAP Cymru*; *A2 Connect*; three food historians, and; three artists including a textile artist, fine artist and ceramicist.

3.4. Workshops

48 people participated in 7 workshops:

- Youth Forum (5 people aged 18-25);
- Gardening group (7 people);
- National Wool Museum (10 weavers, spinners, gardeners);
- Women Connect First Golden Age group (15 people);
- Bute Park Education Centre staff and volunteers (8 people);
- Botanical Artists (4 people).



Photos clockwise from top left to right: Consultation in the Herbarium with local gardening group; Consultation with Roath Botanical Artists; National Botanic Garden of Wales Apothecary Garden; National Wool Museum Dye Garden.

Part 4

Findings: Well-being and Biodiversity in the Collection

The *AC-NMW* economic botany collection and *Materia Medica* contain over 5,500 specimens of plants and plant-based products. Part four draws upon the workshop and stakeholder discussions conducted during the placement. Drawing upon the seven goals of the Well Being of Future Generations Act, it demonstrates the diverse and multiple values held within a bio-cultural collection. Some of these values are only recently being discovered or perhaps are yet to be discovered. Some of the most interesting *AC-NMW* economic botany specimens that especially triggered the imaginations of the workshop participants are presented to give a flavour of the rich potential of the collection.

4.1. Prosperous Wales: plant-based fibres

“Sharing – it is like a bank of money.” (Youth Forum workshop participant)

The economic botany fibre collection contains a range of plant-based fibres including hemp, cotton and plant-based products including coconut coir string, rush brushes and palm baskets. With growing awareness of the harmful effects of plastic and biosynthetic materials, the collection offers insight into a range of plastic-free, plant-based fibres. What specimens within the collection could support a more prosperous Wales? - defined as an innovative, productive, low carbon society according to the Well Being of Future Generations Act (2015).

4.2. Healthier Wales: daffodil diversity

“Anything you can do to open up eyes to plants.”

“A healthier Wales. A natural Wales.” (Women Connect First and National Wool Museum workshop participants)

Some Daffodil (*Narcissus pseudonarcissus*) varieties contain the substance galantamine, used in the treatment of the early stage of Alzheimer’s disease. Different daffodil varieties contain different concentrations of galantamine. Results show that daffodils grown in the Black Mountains contain far more galantamine compared to the same varieties planted in Pembrokeshire at sea level (JNCC 2013). What other plants have potentially healing compounds? The economic botany collection contains over 700 medicinal plant specimens. Some of these plants could contain undiscovered active substances, potentially of medicinal value.



Photos (L-R): Coconut coir specimen, Daffodils growing in the Black Mountains.

4.3. Resilient Wales: *Hen Gymro* wheat variety

“Being resilient is about knowing what is around you and knowing how to see it.”

“The trigger that makes you want to learn.” (National Wool Museum workshop participants)

The economic botany seed collection contains the seeds of many wheat, oat and barley varieties developed by the Aberystwyth Welsh Plant Breeding Station (WPBS) from the 1920s. The collection includes a specimen of a wheat sheaf of the now rare *Hen Gymro* (Old Welshman), a South West Wales wheat variety that was cultivated into the 1920’s. *Hen Gymro* was capable of thriving in what were considered ‘unfavourable’ growing conditions:

“... in South-West Wales many farmers persisted in growing the old variety Hen Gymro (Old Welshman)...The old variety, season by season, was better able to produce millable grain, particularly under adverse ripening conditions. The long, slender, and tough straw made first-rate thatching material.”

(T.J. Jenkins, Head of Breeding at WPBS 1929 Source: Brockwell Bake Wheat Portal 2018)

With predicted changing climates and the need for more ecological, low-input approaches to growing, perhaps some of these old grain varieties might be relevant for future generations.

4.4. Vibrant cultures: dye plants

“Exhibiting the fantastic collection more widely. Link for Wales with other cultures. A way of linking in with other cultures.”

“Info here from the colonial past. Info relevant to global links. Make it accessible!” (Botanical Art group participants)

Plants have been used as dyes for millennia. The economic botany collection contains a range of samples of wool dyed using plants. Plants used include: indigo, sandalwood, privet, madder, eucalyptus, elderberry and woad. With growing awareness around the potentially harmful dyeing processes of mainstream fashion industry, perhaps the collection could provide inspiration for ecological future generations designers and crafts-people in Wales.



Photos (L-R): Hen Gymro wheat sheaf from the AC-NMW economic botany collection; samples of wools dyed with walnut, madder and indigo from the AC-NMW economic botany collection.



4.5. Cohesive communities: spices

“Cooking brings people together, sharing ingredients and sharing company. Everyone eats. Whether Arabic, Indian.”

“Social exchange (volunteering) supports well-being and social interaction.”

“More events and access would be great. Talks?”

“The number of people in Wales who don’t speak to people in a day. Supporting mental health through being involved.”

“Children don’t know where plants come from. This material could help them learn.”

(Gardening Group, Women Connect First and National Wool Museum workshop group participants)

Many plant species have medicinal properties in addition to their flavour. Cinnamon is one of the oldest aromatic spices used by humans, dating back to 2,800 BC. For a time it was more expensive than gold! Cinnamon has anti-inflammatory and anti-spasmodic properties. In some cultures it is used to treat digestive problems and relieve nausea. Cinnamon quills are derived from the inner bark of a small, bushy evergreen tree native to the forests of Southern India and Sri Lanka. The species’ old name, *Cinnamomum zeylanicum* indicates the origins of cinnamon origins - almost 90% is still produced in Sri Lanka, along with Madagascar, Mauritius, the Seychelles and the West Indies. Participants in the workshops demonstrated great interest in spices and foods used in cuisines by different cultures around the world. This suggests offering more opportunities to share knowledge around plant-based cuisines and diets.

4.6. Globally responsible Wales: seeds of the future

“Green is holding it all together.”

“Green is at the heart of this.” (National Wool Museum workshop participants)

The Museum’s economic botany collection contains over 2,700 seed specimens. This includes seeds saved from local areas (including a number of Cardiff Parks, the Cardiff and Barry Docks and the surroundings of South Wales); botanic gardens (including *Royal Botanic Gardens, Kew, Singleton Educational Gardens* and *University of Wien*); research stations (including *The Welsh Plant Breeding Station* and *Cambridge International Agricultural Botany Station*) and botanical exchange clubs (including the *Alpine Garden Society* and *Botanical Exchange Club of the British Isles*).

According to the Aichi Target 13 (Convention on Biological Diversity 2010): "by 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimising genetic erosion and safeguarding their genetic diversity." Could these seeds contain important genetic information for the future?



Photos: Cinnamon zeylanicum (from the Gold Coast) and seed box both from the AC-NMW economic botany collection.

4.7. Equal Wales: the People's Collection

Findings highlight public interest in learning more about the *AC-NMW* economic botany collection. Prior to the workshop, most participants were not aware that the *AC-NMW* economic botany collection existed. However, the workshops stimulated interest amongst participants in learning more about the scope of the collection. Many were keen to learn more about the collection and opportunities for engaging with it and responding to it.

"It is for Wales, for everyone."

(Gardening group participant)

Several participants highlighted the need for further information on the economic botany collection both within the *National Museum Cardiff* and online. There was a general feeling that the *AC-NMW* website needs to be populated with more information about the economic botany collection and how to find out more, as well as developing the calendar of events and activities connected to the economic botany collection within the *National Museum Cardiff* and *AC-NMW* sites. As one participant suggests:

"There needs to be more information about the Herbarium and the collections. Opportunities to come and visit. Sharing"

(Bute Park participant)

Use of the economic botany collection also depends upon public awareness, not only that the collection exists, but that it is also free at the point of access and that people can get in contact with Curators to view the collection.

"Knowing how it is there online – there needs to be a brief description title, type and who to contact."

(National Wool Museum workshop participants)

Participants noted challenges in terms of accessing the collection but also presented potential opportunities for overcoming these challenges:

"It is not wheelchair accessible. You could make a film about 'behind the scenes' and accessing the stacks."

(Bute Park participant)

Others were keen to return to have a closer look at the specimens contained within the economic botany collection and how they were used in the past or could be used in the future.

"Passing on info...should be sharing information."

(Youth Forum participants)

As a collection of *AC-NMW*, the economic botany collection belongs to the people of Wales. What would you like to see?

This consultation is still ongoing and if you have any ideas, please contact:

heather.pardoe@museumwales.ac.uk.

Part 5

5.1. Innovations

This section presents a range of innovations in terms of **research, learning** and **curation** for museum bio-cultural and economic botany collections in general. According to Salick, Konchar and Nesbitt, the role of plant collections includes: **conservation; interpretation; education; advocacy** (2014:3). Koerten and van den Besselaar (2015:396) suggest: “traditionally, natural history museums usually have two tasks, based on the specimen collections they have...[Task one] is to open up and present their specimen collections to the public as a form of public education. The second task is to make the systematic collection of specimens available to scientists for research.” Koerten and van den Besselaar (2015:39) further suggest natural history collections should be treated as ‘data-infrastructures’ “making them fit for tracking changes in biodiversity richness.” Drawing upon Koerten and van den Besselaar (2015), it is suggested vital work for any bicultural or economic botany collection includes 1. **opening up the collection** for public education and 2. increasing specimen **data infrastructure** for research.

5.2. Research Innovations

Innovative investigation of bio-cultural specimens and collections could be supported through:

1. **Research networks:** developing links with higher education researchers and higher education research groups/institutes/departments and other cultural institutes, particularly those with bio-cultural and economic botany collections will support collaboration and exchange of best-practice.
2. **Collaborative research:**
 - **Historical research:** exploring the uses of plants in the past and the history of the collection in terms of collectors, collecting and links with other collections.
 - **Socio-cultural research:** exploring past and present use of plants and the stories held within the collection with diverse communities.
 - **Genetic research:** investigating whether the collection contains any *International Union for Conservation of Nature (IUCN)* rare plants and/or any viable, useful genetic information, including investigating links between wild and domesticated plants.
3. **Digitisation:** Digitisation of collections and linking collections to international catalogues including the *Index Ethnobotanices* (this index lists institutions housing bio-cultural collections and a directory of expertise) will support collaboration.
4. **Arts-led research:** Artists can be catalysts, agents, agitators and activists. Working with **artists** can contribute to the shaping of knowledge and understanding of the natural and social world.
5. **Citizen-science:** Involving the public in research on the collection, for example, in the form of crowd-sourcing.

Innovations in research outlined above require resources, including investment in digitisation processes and staffing of curators/researchers/research programmes. Museums are increasingly under funding pressures and can find it difficult to allocate limited resources to particular programmes. However, the future potential of bio-cultural and economic botany collections suggests there would be significant benefits in harnessing their value further for future generations.

5.3. Learning Innovations

Bio-cultural collections present opportunities to foster inter-generational learning through facilitating engagement with specimens and the cultures and places they connect with. This could be supported by:

1. **Learning Programmes:** developing a learning programme for schools and inter-generational learning programmes in the form of seminars, talks and programmes. These events could engage contemporary plant-based economies (including agriculture, horticulture, food, health, craft and the arts), as well as using the collection to catalyse dialogue around future plant-based economies (for example, biomimicry, bio-inspiration in contemporary design).
2. **Inter-disciplinary collaboration:** working with other public institutions and organisations supports learning in different ways across the ages.
3. Working with **creative practitioners** to enable creative ways of learning about botany through art.
4. Developing interactive and animated **digital content** around the collection.

Jones and Hoversten emphasise the importance of “telling compelling stories” in curation, whether through written or spoken interpretation (2004 in Wyatt 2014:140). According to the Ethno-biology Working Group: “developing curricula and programmes based upon examining artefacts or replicas of artefacts from ethno-biological collections, as well as conducting research using collections or exploring traditional crafts featuring ethno-biological raw materials, can enhance students’ cultural exposure and their respect for traditional ecological knowledge and the conservation of resources. These activities also develop multidisciplinary skills, and encourage students to think about place-based knowledge and how plants and animals are used in different cultures around the world, as well as in local communities “ (2003 in Adams and Fritz 2014:347).

5.4. Curation Innovations

Curators support both discovery and enhancement of **values** held within the collection. Curatorial excellence could be supported by:

1. **Digitisation:** Online databases and meta-databases give people around the world access to bio-cultural collections.
2. **Collaboration:** Collaboration is aided by time and effort spent building up multi-scalar and inter-disciplinary networks. Links with higher education institutes and exchanges with other cultural institutes enhance curation, supports investigation of the collection. Inter-disciplinary collaborations between historians, natural scientists, social scientists, anthropologists, artists and indigenous communities support innovative insight into the histories and biographies of specimens and collections. According to Crouch et al. (2014: 263) [curators] “should reorient their role(s) toward participation in a networked community of institutions who learn from each other and who in collaboration can potentially deliver more than the sum of their parts.”
3. **Conservation:** investigation into the optimum storage conditions for specimens is key in order to support viability and maintenance of genetic information. This could be supported through links with Conservation higher education courses and student placements. *Royal Botanic Gardens, Kew* have links with a range of postgraduate taught courses, for example, with the *Institute of Conservators*.
4. **Handling collections:** specimen longevity could be supported by developing a handling collection alongside the archival collection.

5.5. Well-being Goals and the Economic Botany Collection

Drawing upon findings of the consultation, Figure 3 presents some of the key findings and potential innovations for economic botany collections in response to the *Well Being of Future Generation Act* (2015) seven goals.

Figure 3. Well-being Goals and the Economic Botany Collection

Goal	Innovations
A prosperous Wales	Sharing the value of economic botany collections more widely.
A resilient Wales	Enabling research on plants and plant-based products to support understanding of biodiversity and maintenance and enhancement of biodiversity and healthy functioning ecosystems.
A healthier Wales	Fostering greater understanding of the role of plants and ecosystems in physical and mental health.
A more equal Wales	Enabling access to the economic botany collection - physically and digitally.
A Wales of cohesive communities	Connecting people through sharing cultures and practices around the use of plants.
A Wales of vibrant culture and thriving Welsh language	Developing an intergenerational learning programme that includes learning about the use of plants around the world, past and present.
A globally responsible Wales	Learning more about plants, the places from which they come and the cultural contexts within which they are or were used.

In Wales, the requirements of the Well Being of Future Generations Act presents unique opportunity for *AC-NMW* to become a global innovator, basing future work of the economic botany collection around the health and well-being of future generations.

Figure 4. Five ways of working and the Economic Botany Collection

Long term	Integration	Involvement	Collaboration	Preventing problems from occurring or getting worse
Creating a long-term plan for collections and accompanying archival material to safeguard the collection for future generations.	Creating an integrated vision for collections that involves cross-departmental and sectoral working.	Involving the public in conversations around collections. Using innovative ways to engage meaningfully with the public.	Develop national and international networks to share best practice.	Taking measures to support longevity of collections.

Conclusion

Drawing upon the findings of the consultation, this report identifies a number of innovations in terms of research, learning and curation for bio-cultural and economic botany collections. As this report demonstrates, there is clear interest in the *AC-NMW* economic botany collection amongst the public and enthusiasm to engage and learn more about it. Inter-disciplinary collaboration with higher and further education institutes, schools, community groups, cultural institutes and other centres of learning presents great opportunity to share and enhance the value of the collection. Such innovations will improve the role of the collection in supporting public valuing and understanding of biodiversity and the health and well-being of future generations.

This placement has highlighted how the work of the *Amgueddfa Cymru-National Museum Wales* can become globally renowned for its bio-cultural collection - forging **inter-disciplinary collaborations** with higher education institutes and other cultural institutes; developing dynamic and inspiring **inter-generational learning programmes**; applying **innovative and participatory approaches to digitisation**; and, facilitating **research-driven curation** based upon the health and well-being of future generations and the valuing and understanding of biodiversity.

A collaborative, dynamic, innovative and participatory approach to future work around the economic botany collection will support *AC-NMW*'s Vision commitments: **prosper, experience, learn, participate** and take forward the Museum's ground-breaking work in participatory and inclusive approaches.



Photo: National Museum Wales, Cardiff.

References

- Adams, Catrina and Fritz. 2014. "Using bio-cultural collections for education." In: Salick, Jan, Katie Konchar, and Mark Nesbitt (Eds) *Curating bio-cultural collections: a handbook*. Royal Botanic Gardens, Kew: Kew Publishing. Chapter 25: 347—363.
- Amgueddfa Cymru-National Museum Wales. 2018. *Operational Plan 2018-2019*. Cardiff: AC-NMW.
- Bio-cultural Collections Working Group. 2018. <http://ceeb.econbot.org/>
- Brockway, Lucile. 1979. *Science and colonial expansion: The role of the British Royal Botanical Gardens*. New Haven, Conn: Yale University Press: Academic Press.
- Brockwell Bake Wheat Portal. 2018. *Hen Gymro*. <http://www.brockwell-bake.org.uk/wheat/hub.php?ID=41>
- Cornish, Caroline. and Nesbitt, Mark. 2014. "Historical perspectives on Western ethnobotanical collections." In: Salick, Jan, Katie Konchar, and Mark Nesbitt (Eds) *Curating bio-cultural collections: a handbook*. Royal Botanic Gardens, Kew: Kew Publishing. Chapter 20: 271-293.
- Crouch, N et al. 2014. "Multicultural perspectives on bio-cultural collections." In: Salick, Jan, Katie Konchar, and Mark Nesbitt (Eds) *Curating bio-cultural collections: a handbook*. Royal Botanic Gardens, Kew: Kew Publishing. Chapter 19: 263-266.
- Dierig, D., Blackburn, H. Ellis, D. and Nesbitt, M 2014. "Curating seeds and other genetic resources for ethnobiology." In: Salick, Jan, Katie Konchar, and Mark Nesbitt (Eds) *Curating bio-cultural collections: a handbook*. Royal Botanic Gardens, Kew: Kew Publishing. Chapter 8: 107-126.
- ESRC. 2015. *Framework for Research Ethics*. <https://esrc.ukri.org/files/funding/guidance-for-applicants/esrc-framework-for-research-ethics-2015/>
- ETC. 2009. *Who Will Feed Us: Questions for the Food and Climate Crises*. Ottawa: ETC Group.
- Ethnobiology Working Group. 2003. *Intellectual imperatives in Ethnobiology: NSF Biocomplexity Workshop Report*. Missouri Botanical Garden, St. Louis. www.econbot.org/pdf/BSF_brochure.pdf
- FAO. 2015. *Biodiversity for a World without Hunger*. Commission Factsheet. Rome: FAO.
- FAO. 2018. *What is happening to agribiodiversity?* Rome: FAO. <http://www.fao.org/docrep/007/y5609e/y5609e02.htm>. Accessed 17 July 2018.
- Future Generations Commission. 2017. *Draft Strategic Plan*. Cardiff: Office of the Future Generations Commissioner for Wales.
- JNCC. 2013. *Treating Alzheimer's disease with daffodils*. <http://jncc.defra.gov.uk/page-5721>
- Koerten, Henk and Peter van den Besselaar. 2015. *Crowdsourcing and Citizen science in biodiversity research*. London: SYNTHESYS.
- Livingstone, David N. 2013. *Putting science in its place: geographies of scientific knowledge*. Chicago: University of Chicago Press.
- Mackay, David. 1996. "Agents of empire: the Banksian collectors and evaluation of new lands." In: David P. Miller and Peter. H. Reill (Eds) *Visions of Empire: Voyages, botany, and representations of nature*. Chapter 3: 38-57.
- Mobile Museum. 2018. <https://www.royalholloway.ac.uk/geography/research/mobile-museum/home.aspx> Royal Holloway, University of London.
- New Economics Foundation. 2008a. *Five Ways to Wellbeing* London: NEF.
- New Economics Foundation. 2008b. *Co-production: A Manifesto for Growing the Core Economy*. London: NEF.
- Pleasant, Jane. 2014. "Indigenous Perceptions of bio-cultural collections." In: Salick, Jan, Katie Konchar, and Mark Nesbitt (Eds) *Curating bio-cultural collections: a handbook*. Royal Botanic Gardens, Kew: Kew Publishing: Chapter 17:245-258.

Reveal. 1992. *Gentle conquest: The Botanical Discovery of North America with Illustrations from the Library of Congress*. Washington DC: Starwood.

Salick, Jan, Konchar, Katie and Nesbitt, Mark. 2014. "Bio-cultural collections: needs, ethics and goals." In: Salick, Jan, Katie Konchar, and Mark Nesbitt (Eds) *Curating bio-cultural collections: a handbook*. Royal Botanic Gardens, Kew: Kew Publishing. Chapter 1 (2014): 1-13.

Salick, Jan, Katie Konchar, and Mark Nesbitt. 2014. *Curating bio-cultural collections: a handbook*. Royal Botanic Gardens, Kew: Kew Publishing.

Shand, Hope. 1997. *Human Nature: Agricultural Biodiversity and Farm-Based Security*. Ottawa, Ontario: RAFI.

Slay, Julia and Lucie Stephens. 2013. *Co-production in mental health. A literature review*. London: NEF.

UN Environment. 2010. *Convention on Biological Diversity. Aichi Biodiversity Targets. Strategic Plan 2011-2020*. Montreal: UN Environment. <https://www.cbd.int/sp/targets/>

Welsh Government. 2015. *Well being Future Generations Act: The Essentials*. Cardiff: Welsh Government.

Wyatt, Andrew. 2014. "Living plant collections and ethnobotany in botanic gardens." In: Salick, Jan, Katie Konchar, and Mark Nesbitt (Eds) *Curating bio-cultural collections: a handbook*. Royal Botanic Gardens, Kew: Kew Publishing. Chapter 10: 143-150.



VALUING NATURE PROGRAMME

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