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## Experiencing agro-biodiversity: a project for an app for the botanical garden of the University of Modena

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**Abstract:** The botanical garden is here considered as a place to educate the visitors, especially young people and their families, students and teachers, about agro-biodiversity, in order to inform them about landraces that characterised and still characterise the rural territory of Modena through multiple channels, physical and digital, combined in one integrated program. A specific work is intended to concern the botanical garden fruition, through the realisation of educational visit itineraries that add a new virtual dimension to the classical observation of plant species in the botanical garden. The realisation of an app, through the use of the augmented reality, allow to convey information about historical and contemporary diffusion of landraces in the landscape of the Modena area, providing a symbolic context in which young people is stimulated to preserve memory and local identity through a valorisation of diversity, also in cultural terms.

**Keywords:** Modena; botanical garden; agro-biodiversity; education; rural landscape; information and communication technology.

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Claudio Cadei is a Cultural Anthropologist, engaged in the study and promotion of cultural heritage, audio-visual and web communication. He worked as content curator for the multimedia exhibition of the University of Modena and Reggio E. 'Rural landscape, food for the future: transformations and sustainability (2015)' and for the exhibition 'The places of food: industrial history of food transformation and commercialisation in Modena'. He is currently working at the creation of the web portal of Italian university museums network for the University of Modena and Reggio E. As a freelance, he collaborated to the realisation of several documentaries, founding in 2009 SMK Videofactory. He took part in activities of action-research in Burkina Faso. He participated to other ethnographic inquiries in Uganda (2006), Central Alps (2012/3, E.C.H.I. program in collaboration with the Archive of Ethnography and Social History of Lombardia) and in his hometown, Bologna (2008–2011).

Giada Gatto received her Bachelors degree in History of Art, University of Tuscia, her Masters degree in LIS, University of Roma 'Tor Vergata' and her Master in Cataloging of Cultural Heritage, University of Modena. She is a fully qualified consultant in photographic archives. Actually, she is working for Italian university museums network at the University of Modena and Reggio E. One of her publications is: 'La valigia di Mary Poppins: la fotografia su Web', (2011), in Cavallaro, C. (Ed.): *Books seem to me to be pestilent things. Studi in onore di Piero Innocenti per i suoi 65*.

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## 1 Introduction

The education to agro-biodiversity is becoming more and more popular in the last years thanks to an acknowledgment of its importance in the formation of citizens' consciousness: to develop a widespread awareness among the community about which landraces, i.e. local traditional endangered species and in particular ancient wheat, characterised and still characterise our local rural territory, with specific reference to a recent Italian law (L. 194/2015). This can contribute to the collective identity, giving new meaning to the rural landscape, and to the improvement of the choices of the individual as a consumer (Altieri et al., 2015). Yet the instruments for the teaching of agro-biodiversity are still being drafted (Piotto et al., 2010) and the botanical garden of Modena can strengthen his role in a multidimensional education.

Botanical garden is in charge of the preservation and the enhancement of biological diversity concerning plants and landraces, dealing with all related knowledge and methodological issues, also by means of their activity in a specific research and

experimentation framework (Dallai et al., 2014). In addition to the typical functions of museums (conservation, research, education and valorisation), the botanical garden is able to hybridise different disciplinary areas and differentiated scientific practices. These forms of knowledge, skills and experiences configure this site as the ideal platform to plan site-specific programs about biological heritage and its relationship with memory and everyday life of local communities.

In order to improve the fruition of resources about agro-biodiversity in the botanical garden we intend to develop a tool to exploit the possibilities provided by the use of the augmented reality, in order to convey information about landraces and their historical and present diffusion in the Modena area, providing a symbolic context in which young people can situate the information they get starting from the visit to the botanical garden (Keramidas, 2014; Seligmann, 2014). The project involves the construction of an app called *biodiversi@MO*, acting as an interface between visitors and the information offered by the museum about local agro-biodiversity, enriching some features of augmented reality during the on-site visit and, on the other hand, providing the opportunity to explore the botanical garden even out of his physical space. Concerning the visit itineraries, the project identifies specific pathways with signs on-site at differentiated levels of detail; this multiplication of possibilities in visiting the Garden gives an image of the complexity of the ecological relations in which plants are embedded and, at the same time, fulfils the curiosity of the visitor thanks to a thematic customisable approach (Chatzidimitris et al., 2013; Guimar and Figueiredo, 2015). The signage will also feature elements that activate interactions with media products (audiovisual, info graphic, etc...) accessible via mobile devices. Some tablets are at the disposal of visitors who want to explore the botanical garden, which otherwise can access to the contents through their personal mobile devices, including smartphones (Ludden, 2014).

The app *biodiversi@MO* is primarily a container of information that allows you to visualise not perceptible relations, contextualising the species of a region from the ecological point of view, bringing to the visitor some elements of the landraces and the local culture that refers to those species. At the same time the app is a system of interactions with the botanical garden space, motivating the user to express a higher degree of participation; the involvement can have continuity through time thanks to specific activities and workshops directed by the garden staff inspired by the idea of learning by doing.

One of the features that more represent the involvement of the visitor is a custom gallery, associated with an on-line cloud, in which the user is meant to upload photos, notes and other text information. This personalisation of the visit brings to experience the meaning of the work of documentation about agro-biodiversity, in particular about some specific landraces of our territory, appropriating in an emotional way an ethic of critical observation of reality. Just as it works in the construction of emotional maps, the producing of a personal storyboard, in particular about the use of these landraces, gives the user the evidence of his path, helping him to judge positively his acquisition of knowledge. As a trace of a lived experience, this path is thought to live on as narrative of an individual relationship with the botanical garden, shareable via social networks.

## 2 Objectives

The main objective of the app *biodiversi@MO* is to spread the knowledge of agro-biodiversity and affirm its value for the protection and the diffusion of some local landraces into the anthropic ecosystems, especially referred to the specific meaning for the human being and his nutrition. The focus on the origin of the food aims to spread an ‘actively constructed’ knowledge of the role of landraces both as immediately consumable food and as raw materials successively transformed. This implies the acquisition of a certain familiarity with these plants and the skill of recognising them on the ground thanks to their specific botanical and agronomic characteristics.

Although agro-biodiversity is a quite central theme in the actual public debate, the real opportunities to transmit knowledge about the variety of landraces that characterise our territory are rare and occasional. Starting from the spreading of a generic and abstract speech about the importance of the agro-biodiversity, it is time to condense it into localised speeches, which can convey references and expertise. Scientific structures, such as the botanical garden in Modena, can contribute to the creation of a more situated and context-aware knowledge (Mazzotti and Malerba, 2013; Smith, 2013): at present they manage a large number of lists and databases on agro-biodiversity, they realise targeted projects to increase the level of knowledge about edible species and they deal with their protection in case of risk of extinction. We think it is important to invent new communication interfaces between these repositories of data and users, including educational institutions (Corradini and Campanella, 2013; Kelly, 2014). The app *biodiversi@MO* intends to respond to these social needs, setting specific objectives:

- 1 To place the botanical garden of Modena at the centre of local and regional networks for education and enhancement of agro-biodiversity, introducing a shared system of best practices for schools and citizenship.
- 2 To experiment teaching and educational methods with a high degree of interactivity, through the use of innovative technologies, equipping the botanical garden with instruments and solutions that take advantage of augmented reality; such technological tools are not only suitable for the realisation of this project, but highly compatible with further projects.
- 3 To improve the efficiency of educational projects, using technology to create a kind of diffused learning method, able to break down the physical barriers of the museum thanks to a continuous exploration.
- 4a To offer to the visitors, in particularly to the students, a first-hand experience of the scientific method, due to the consideration of statistical indicators for measuring agro-biodiversity that are used to assess the degree of threat of a species.
- 4b To offer to student’s theoretical and practical knowledge about the consultation of databases, guiding them in the search for information.

### 3 Site selection

The choice of the botanical garden as a reference for the design of such an app was determined primarily because of some museum's specificities (Dallai et al., 2015).

- 1 Quality and variety of the data: the botanical garden, characterised by the presence of plants cultivated *ex situ*, is able to provide a representation of agro-biodiversity. To this purpose, it is crucial the presence of a collection of *in vitro* living plants in the micropropagation laboratory, which is a useful source of information to give shape to the contents of the app related to the preservation and the increment of agro-biodiversity. In addition, the collections of *exsiccata* preserved in the *herbaria* of the botanical garden represent a valuable historical heritage of scientific interest a selection of which will be used to build the app.
- 2 Meaningfulness of the location: the reasons for the choice of the botanical garden as the site of the project come also from its extraordinary historical-monumental value both for the history of the city of Modena and for the history of the university. This glorious past of the museum will find its place in the audio/video guide that will be realised for the app project. The garden is particularly connected to the history of the city of Modena as an integral part of the 'Giardino Ducale Estense' who had been commissioned by the Duke of Modena Francesco I d'Este in contiguity with the big palace he had built in the early 1600, after Modena became capital of the Este Duchy. The connection with the history of the university derives from the allocation of part of the Ducal garden cultivation and demonstration of medicinal plants commissioned in 1758 by the Duke Francesco III, who thus fostered the creation of the botanical garden, whose existence was ratified in the reform of university wanted by the Duke in 1772. The availability of a large area of about one hectare allowed the development of the botanical garden, especially during the first half of the 19th century, with the construction of the ducal greenhouses, still existing, built by Duke Francesco IV d'Este. Specific attention will be given in the app to the fact that the Ducal garden and the botanical garden constitute the most relevant natural heritage of the old town.

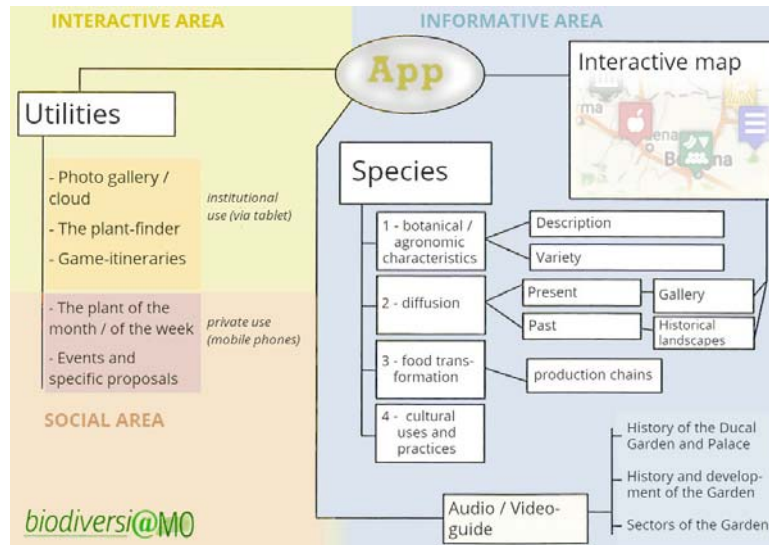
### 4 The organisation of the contents

The app has different functions, split in three areas:

- 1 an informative one, related to the knowledge of the plants and to the main itineraries of the garden
- 2 an interactive one, referring to the construction of a personal storytelling and the use of a game-approach
- 3 a social area, to create a continuous flux of information for young people, families, teachers about the garden activities.

These areas define three different operative modes, the first aimed at giving scientific information in a growing scale of complexity and the other two based on a more consistent interaction with the individual and the social identity of the visitor. While the properly-called ‘interactive’ mode is focused more on the on-site fruition, the ‘social’ one allows the user to stay update with the cultural life of the garden.

**Figure 1** Plan of the app (structure and features) (see online version for colours)



#### 4.1 The contents – I. Information area

Part I Species cards: for each species concerned by the project it is possible to explore a sphere of information, which is divided into four areas:

- a Botanical and agronomic characters (divided into: anatomy, physiology and plant life stages displayed through images, short films and animations; classification according to scientific systematic etc.).
- b Diffusion, in a diachronic perspective (the past will be documented by the images of historic agricultural landscapes and their virtual reconstructions, accessible through a gallery of images and connected to the interactive map on the regional resources on agro-biodiversity).
- c Food transformation, in which we highlight the food products obtained by that plant (thanks to videos which displays the various steps and operations of transformation and manipulation of the plant or its 'product' to obtain food).
- d Cultural uses (testimonies of material culture such as pictures and descriptions of historical *herbaria*, prints, drawings, paintings and intangible cultural relics, such as proverbs, legends, stories of traditions and customs related to food plants).

Still parts of the informative section are:

Part II Interactive map of the resources related to agro-biodiversity, with institutional realities connection (sites and cartography of the Emilia Romagna region), landscape and nature reserves, local experiences of valorisation.

Part III Audio/video guide: informative part that tells the visitor the story of the botanical garden, its urban and cultural context, if considered that it takes part into a larger structure of great historical value, the Giardino Ducale Estense, directly connected with the two oldest and most significant Este buildings of the town: the Este Dukes Palace and the Little Palace in the Ducal garden dating from XVIII century. The multimedia guide includes three sections:

- historical contextualisation of the botanical garden within the Ducal garden
- the history and development of the botanical garden and the criteria for the disposition of plants over the centuries
- the garden's section: continuity and ruptures in the organisation of the space.

#### *4.2 II. Interactive area*

Interactive functions allow a personalised access to different sections of the information section, with the result of building a personal storyboard of the virtual tour.

It provides the possibility to create personal photo-galleries within the botanical garden or all over the territory, interesting for the diffusion of the landraces, which are automatically saved on a cloud and can be shared via an automatically generated link.

The normal search functions take the aspect of the game thanks to the 'edible plant-finder'; this function allows users, even the youngest, to find in the space of the botanical garden the plants that characterise the agro-biodiversity of the territory of Modena.

Game-itineraries (on the idea of the game-books) put the user in front of the multiple choices to build his own itinerary following a thematic approach, which also becomes a personal mode of doing the exploration of the museum, connecting with the idea of storyboard.

#### *4.3 III. Social area*

Whereas the functions here above mentioned determine a more structured use of the app, other features concern an external everyday use thanks to the smartphones of the occasional visitors, if they desire to keep in touch with the botanical garden: these functions are aimed at the creation of a continuous relationship with young people, teachers and families, by giving regular updates about events and initiatives promoted by the museum. Other information can be provided about events in the others botanical gardens, especially interested on the preservation and diffusion of the landraces, with specific attentions to the botanical gardens inserted in the Italian university museums network (<http://www.pomui.unimore.it>; Corradini, 2015). Another optional periodic update could be a kind of 'plant of the week/month', which consists of a thematic data package, which aims gradually to let grow the interest of the user about local agro-biodiversity thematic path.

## 5 Devices and targets

The app is supposed to be released in two different versions: a ‘full version’ of the app will be available on the tablets available in the botanical garden, to offer the richest possibility of visit. The ‘mobile’ version of the app, available for download on portable devices, enables the occasional user to access basic information on the species, the environments and the landscapes concerned by the project. The app provides an offline operative mode that allow the visitor to locate (physically and virtually) the resources regarding local agro-biodiversity. The user will be able to access those contents, derived from the ‘full’ version, enabling data traffic or connecting to a wireless network. All those on-line contents can also be accessed from a personal computer via a web app.

The mapping of local resources related to local agro-biodiversity is on the one hand an invitation to the botanical garden, but extends its range to the entire territory of Modena, connecting in possible routes the visit of others museums (natural reserves, museums of rural life, food museums). As explained above, some features of the portable version will update the user on the thematic events organised by the museum.

The project of different versions of the app derives from the effort of multiplying the targets of such a cultural product and of improving the involvement of different audiences in the botanical garden’s activities. Though the app is configured to be used an autonomous tool, we consider that the most proficient and virtuous uses of it will be the ones that will exploit the contents to build specific education activities, in particularly teachers. The app will provide them with basic knowledge on agro-biodiversity related to the cultivation, dissemination and use of landraces, starting from their *ex situ* presence in the botanical gardens and then moving on to their spread in Modena area. Thus we expect to attract their interest and to stimulate their creativity through the use of images, sensitising them towards the conservation of agro-biodiversity and encouraging them to better nutrition behaviour in order to protect their health.

## References

- Altieri, M., Nicholls, C. and Ponti, L. (2015) *Agroecologia: una via percorribile per un pianeta in crisi*, Edagricole, Milano.
- Chatzidimitris, T., Kavakli, E., Economou, M. and Gavalas, D. (2013) ‘Mobile augmented reality edutainment applications for cultural institutions’, *Fourth International Conference on Information, Intelligence, Systems and Applications (IISA)*, July 2013, pp.1–12.
- Corradini, E. (2015) ‘The common interdisciplinary itineraries of the Italian university museums network. A challenge for sharing scientific education’, in Haggag, M. and Gesché-Koning, N. (Eds.): ‘*Squaring the Circle? Research, Museum, Public: a Common Engagement Toward Effective Communication*’, *Proceedings of the ICOM International Committee for Education and Cultural Action (CECA) and ICOM International Committee for University Museums and Collections (UMAC), 45th CECA and 13th UMAC Annual Meeting*, Alexandria, Egypt, 9–14 October 2014, Bruxelles, Imprimerie de la Centrale d’achats de la Ville de Bruxelles [pour] CECA et UMAC, pp.105–111.
- Corradini, E. and Campanella, L. (2013) ‘The multimedia technologies and the new realities for knowledge networking and valorisation of scientific cultural heritage. The role of the Italian university museums network’, *Proceedings of the International Conference on Sustainable Cultural Heritage Management*, in Marchegiani, L. (Ed.), Roma, Aracne, pp.283–297.



- Dallai, D., Barbieri, G., Buldrini, F. et al. (2014) 'Botanic garden and territory: an education project on botanical collections and vegetal biodiversity in the territories of Emilia', *Proceedings of the 109. Congresso Nazionale della Società Botanica Italiana*, Firenze, 2–5 Settembre 2014), p.180 [online] <http://www.societabotanicaitaliana.it/uploaded/2225.pdf> (accessed 14 January 2016).
- Dallai, D., Buldrini, F. and Maffettone, L. (2015) 'L'Orto Botanico di Modena dal collezionismo storico alle attività per la conservazione biologica', *Atti del XXII Congresso ANMS - Il patrimonio culturale dei musei scientifici Museologia Scientifica, Memorie*, April, Vol. 14, pp.60–64.
- Guimar, F. and Figueiredo, M. (2015) 'Augmented reality and storytelling in heritage application in public gardens: Caloust Gulbenkian Foundation Garden', *2015 Digital Heritage*, Vol. 1, pp.317–320.
- Kelly, L. (2014) 'Learning in 140 characters: the future of museum learning in a digital age', in Proctor, N. and Cherry, R. (Eds.): *Museum & the Web – Selected Papers from Two International Conferences, Museum & the Web*, Los Angeles, pp.63–72.
- Keramidas, K. (2014) 'Interactive development as pedagogical process: digital media design in the classroom as a method for recontextualizing the study of material culture', in Proctor, N. and Cherry, R. (Eds.): *Museum & the Web – Selected Papers from Two International Conferences*, USA, Museum & the Web, Los Angeles, pp.260–27.
- Ludden, J. (2014) 'Responsive design: how museums can thrive in the universe of desktops, tablets, smartphones and more', in Proctor, N. and Cherry, R. (Eds.): *Museum & the Web – Selected Papers from Two International Conferences*, Museum & the Web, Los Angeles, pp.289–294.
- Mazzotti, S. and Malerba, G. (Eds.) (2013) 'I musei delle scienze e la biodiversità: atti del 20. Congresso ANMS, Ferrara, 17–19 Novembre 2010', *Museologia scientifica memorie*, Vol. 9.
- Piotto, B., Giacanelli, V. and Ercole, S. (2010) *La conservazione ex situ della biodiversità delle specie vegetali spontanee e coltivate in Italia. Stato dell'arte, criticità e azioni da compiere*, ISPRA, Roma.
- Seligmann, T. (2014) 'Learning museum. A meeting place for pre-service teachers and museums', *Journal of Museum Education*, Vol. 39, No. 1, pp.42–53.
- Smith, C. (2013) '(Re)Engineering cultural heritage contexts using creative human computer interaction techniques and mixed reality methodologies', *Advanced Research and Trends in New Technologies, Software, Human-Computer Interaction and Communicability*, IGI Global, Hershey, Pennsylvania – USA.

### Most relevant apps

- Chicago Botanic Garden, *GardenGuide* [online] <http://www.chicagobotanic.org/app> (accessed 6 October 2016).
- Kew Royal Botanic Gardens, *Kew* [online] <http://www.kew.org/discover-kew-app> (accessed 6 October 2016).
- New York Botanical Garden, *NYBG in Bloom* [online] <http://www.nybg.org/app/> (accessed 6 October 2016).
- Orto Botanico di Padova, *Orto botanico di Padova* [online] <http://www.ortobotanicopd.it/app> (accessed 6 October 2016).
- Singapore Botanic Gardens, *Singapore Botanic Gardens Navigator* [online] <https://www.nparks.gov.sg/mobile-applications> (accessed 6 October 2016).