

From botany to agriculture: The scientific network linking Great Britain, Spain and Italy in the late eighteenth century*

by Martino Lorenzo Fagnani

Abstract

This article analyses the contacts between Great Britain, Spain and the Italian States through which naturalists and agriculturists oriented their botanical knowledge towards the enhancement of crops and related products in the late eighteenth and early nineteenth centuries. The British agricultural revolution and the studies conducted in botanical gardens and scientific societies meant England and Scotland were perceived as good models for Spain and Italy, despite the obstacles of language and geographical distance. Study journeys, the exchange of seeds and the circulation of specialized texts offered the Mediterranean experts useful means of refining their knowledge. This article examines the flow of information through a series of case studies, of how knowledge was absorbed and adapted, and the degree of articulation and reciprocity in the networks involved, aiming to pave the way towards future debate.

Agricultural science began to emerge as a well-defined discipline in the late eighteenth and early nineteenth centuries. Peter Jones has rightly talked about ‘the evolution of the “encyclopaedic” spirit of the Enlightenment across the watershed of the French Revolution and the Napoleonic imperium in Europe’ while ‘visions of total social transformation receded and were replaced with more pragmatic concerns’.¹ Having taken this path of ‘emancipation’, agricultural science nonetheless was strongly and enduringly shaped by other, more autonomous disciplines, such as aspects of the natural sciences, and various traditions of technical knowledge and economic thought, contributing to the composite nature which still, in part, characterizes it today.

Much has been said about the British contribution to agricultural science in the second half of the eighteenth century, when Great Britain was taken as an agricultural model for all of Europe.² However, as highlighted by Mauro Ambrosoli, the British model was part of

* I would like to thank Esther García Guillén, Irene Fernández de Tejada de Garay, Abel Blanco Asenjo and Gloria Pérez de Rada Cavanilles of the archive of the Madrid *Real Jardín Botánico* for their competence and their kindness in assisting me. I also thank Professor Paul Warde, Professor Henry French and the anonymous referees for their helpful comments.

¹ P. M. Jones, *Agricultural Enlightenment: Knowledge, technology, and nature, 1750–1840* (2016), p. 225.

² The British agricultural revolution has a central role in the classic E. J. Russell, *A History of Agricultural*

an articulated system of circulating expertise, technical knowledge and seeds. It was by no means fully indigenous to British soil. For example, the English model owed much to the knowledge brought by Huguenot farmers, gardeners, horticulturists and nurserymen from south-eastern France after the revocation of the Edict of Nantes in 1685, and before that, from Flanders and Holland. Seeds for novel fodder crops were extensively imported into England from the Continent, as evidenced by their common names, which often contained adjectives of origin such as 'French' or 'Dutch'. A sufficient local supply of seed was only established thereafter. Later, the roles partially reversed and England became the example for the Continent.³

Spain and Italy, for their part, saw the development of a widespread interest in disciplines such as botany, geology and chemistry, as well as some economic writers interested in improving agriculture, such as Campomanes, Jovellanos and Genovesi. However, in Spain and Italy significant barriers existed to the widespread application of new knowledge and principles. Foreign examples were an important stimulus to change, as happened after 1750 with the spread of methods (crushing and pulverizing the soil as efficiently as possible, sowing in rows, etc.) and agricultural machinery (seed drill and horse-drawn hoe, designed by the Englishman Jethro Tull, 1674–1741).⁴ Furthermore, in the first 15 years of the nineteenth century, Italy benefited from the massive influence of Napoleonic policies on agricultural science,⁵ while Spain – animated by the politician Manuel Godoy and later by the regime of Joseph Bonaparte – pursued certain plans, such as a network of 24 'acclimatization gardens' and training for their directors which they would in turn provide to local landowners, although these schemes were not fully implemented.⁶ Nonetheless, while the influence of the French naturalists and *agronomes* on Spain and Italy has been the subject of a good number of studies,⁷ the same

Note 2 continued

Science in Great Britain, 1620–1954 (1966), which also analyses the long-term consequences. Other cornerstones of historiography on these topics are: E. Kerridge, *The Agricultural Revolution* (1967); A. J. Bourde, *The influence of England on the French agronomes, 1750–1789* (1953). Equally interesting are the contributions in B. A. Holderness and M. Turner (eds), *Land, labour and agriculture, 1700–1920: essays for Gordon Mingay* (1991).

³ M. Ambrosoli, *Scienziati, contadini e proprietari: Botanica e agricoltura nell'Europa occidentale, 1350–1850* (1992), pp. 354–5, 374–5.

⁴ N. Hidden, 'Jethro Tull I, II and III', *AgHR* 37 (1989), pp. 26–35; Ambrosoli, *Scienziati, contadini, proprietari*, p. 372.

⁵ M. L. Fagnani, 'L'agraria "italiana" prima e dopo Napoleone: Percorsi formativi di una scienza', *Società e storia* 169 (2020), pp. 457–91; M. L. Fagnani, 'Agricultural science in Napoleonic universities: Didactic and research in Pavia, Bologna and Padua', *Nuncius: J. Material and Visual Hist. of Science* 34 (2019), pp. 575–601; L. Brassart, 'Improving useful species: A public

policy of the Directoire Regime and the Napoleonic Empire (1795–1815) in Europe', *Historia agraria: Revista de agricultura e historia rural* 75 (2018), pp. 93–113.

⁶ A. González Bueno and R. Rodríguez Nozal, *Plantas americanas para la España ilustrada: Génesis, desarrollo y ocaso del proyecto español de expediciones botánicas* (2000), pp. 14–16; A. González Bueno, Gómez Ortega, Cavanilles, Zea, *Tres botánicos de la Ilustración: la ciencia al servicio del poder* (2002). See also: E. Llopis, 'La agricultura, 1790–1840: De la crisis a la gran oleada roturadora', in A. Morales Moya (ed.), *1802: España entre dos siglos: ciencia y economía* (3 vols, 2003), I, pp. 177–214.

⁷ For example, J. Horan, 'Napoleonic cotton cultivation: A case study in scientific expertise and agricultural innovation in France and Italy, 1806–1814', in D. Phillips and S. Kingsland (eds), *New perspectives on the history of life sciences and agriculture* (2015), pp. 73–91; J. Horan, 'King Cotton on the Middle Sea: Acclimatization projects and the French links to the early modern Mediterranean', *French Hist.* 29 (2015), pp. 93–108; J. Horan, 'Fibers of empire: Cotton cultivation in France and Italy during the age of Napoleon'

cannot be said of the British influence. The circulation of knowledge, scientific and technical texts, seeds and machine models from the North Sea to the Mediterranean basin has received relatively little attention.

An important exception is the aforementioned contribution of Ambrosoli on contacts between England and Italy. Tull himself was influenced by agricultural techniques and machinery used in Italy and southern France, albeit in a more rudimentary form: he was able to see them during his Grand Tour in the early 1710s.⁸ However, the reception in Spain and Italy of British agricultural improvements was much more extensive, and could relate to somewhat hidden connections that were not always obviously agricultural, while other agricultural improvements were not destined to become an enduring component of agricultural science. From the end of the Napoleonic wars to the end of the nineteenth century, new expert knowledge also opened up a gap between hopes for a professionalised agricultural science and the ordinary practice of farmers.⁹ Indeed, it is no simple matter to extract these currents and exchanges from a host of works in the entangled histories of natural sciences and agriculture.

Nevertheless, more in-depth analysis has been conducted on the network of provincial academies that sought to support many individual farmers and agriculturists in different areas of Europe. Good examples are the French provincial academies studied by Daniel Roche,¹⁰ and the well-functioning network of agricultural academies and societies that developed in the Republic of Venice from the 1760s, studied by Michele Simonetto.¹¹ In the case of Spain, the extensive network of *sociedades económicas de amigos del país* (developed from the 1770s) did not prove to be of great benefit to local experimentation.¹² However the influence of British knowledge on Spanish and northern Italian networks has not been a focus of attention. Some recent studies have also partially addressed the connections between British and Italian economic thought, which also related to agricultural issues.¹³

Note 7 continued

(PhD thesis, Florida State University, 2013); A. García Belmar and J. R. Bertomeu Sánchez, 'Constructing the centre from the periphery: Spanish travellers to France at the time of the chemical revolution', in A. Simões, A. Carneiro and M. P. Diogo (eds), *Travels of learning: A geography of science in Europe* (2003), pp. 143–88.

⁸ Ambrosoli, *Scienziati, contadini, proprietari*, pp. 360–1.

⁹ P. Warde, *The invention of sustainability: nature and destiny, c.1500–1870* (2018), pp. 228–64.

¹⁰ D. Roche, *Le Siècle des Lumières en province: Académies et académiciens provinciaux, 1680–1789* (2 vols., 1978); D. Roche, 'Natural history in the academies', in N. Jardine, J. A. Secord and E. C. Spary (eds), *Cultures of natural history* (1996), pp. 127–44.

¹¹ M. Simonetto, *I lumi nelle campagne: accademie e agricoltura nella Repubblica di Venezia, 1768–1797* (Treviso, 2001).

¹² L. M. Enciso Recio, 'Los cauces de penetración

y difusión en la Península: Los viajeros y las sociedades económicas de amigos del país', in *Historia de España*, XXXI (i) (Madrid, 1988), pp. 3–56; P. Ruiz Torres *Reformismo e Ilustración* (2008), pp. 475–98.

¹³ For example, see: S. A. Reinert, 'The Academy of Fisticuffs: political economy and commercial society in Enlightenment Italy' (Cambridge MA, 2018); R. Faucci, *A history of Italian economic thought* (2014). For a more comparative point of view, see also: L. Maddaluno, 'De facto policies and intellectual agendas of an eighteenth-century Milanese agricultural academy: Physiocratic resonances in the Società Patriotica', in S. L. Kaplan and S. A. Reinert (eds), *The economic turn: recasting political economy in Enlightenment Europe* (2019), pp. 395–438. More generally, on the history of Italian agriculture, E. Rossini and C. Vanzetti, *Storia dell'agricoltura italiana* (1987); E. Sereni, *Storia del paesaggio agrario italiano* (1961). Readings particularly attentive to the international context are those of Antonio Saltini, *Storia delle scienze agrarie* (4 vols, 1984–89), II and III, recently republished with a different subdivision.

Exchanges between Great Britain and Italy in the second half of the eighteenth century have also drawn attention from the history of botany, but with the exception of Ambrosoli, given little space to the influence of that discipline on the development of agricultural science.¹⁴

This article will use a series of case studies to elaborate further the role of Great Britain in the development of agricultural science in Italy and Spain. We can concentrate on three specific ‘conceptual sets’ where developments in Britain had the most to offer: training, seeds and texts. The case studies provide insight into how the circulation of expertise, seeds and texts was shaped by an international network of training. In particular, they show the importance of British influence in the processes by which agricultural science developed, although not yet fully recognized as such, within other branches of science and technology.

It will be seen that these processes were far from simple and straightforward. It is first of all necessary to distinguish between direct contributions to agricultural science and indirect ones. The latter comprise training, seeds and texts that were originally intended for promoting progress in other technical sectors or for the training of professionals in fields unrelated to agriculture. A good example may be that of Angelo Gualandris, who will be discussed in greater detail below. He was a naturalist sent by the Republic of Venice across Europe to England to deepen his knowledge of geology and mineralogy with the aim of applying it to mining consultancy once back in Italy. However, later on, this knowledge, combined with a strong interest in agriculture demonstrated by Gualandris in his youth and during the trip ‘sponsored’ by the Republic, ended up contributing more to his growth as an agriculturist than as a mining expert (working as an agricultural inspector not for the Republic, but for the nearby ‘Austrian’ Lombardy).

As already discussed, some knowledge gleaned from Britain may also be better understood as coming through a ‘British filter’ than originating on the island. A case in point is the potential of the great ocean explorations for the improvement of European agricultural science. Of course, Renaissance botanists from many parts of western Europe had already acquired a good understanding of non-European plants and left a corpus of knowledge that was well in use at the beginning of the eighteenth century, providing the foundation for all subsequent improvements of botany as an increasingly well-defined science. Furthermore, Spanish colonies in the Americas and clergy in Spain provided a major channel for the introduction and spread of New World plant species in Europe. However, relying on this solid base of knowledge, during the eighteenth century there was a new ‘exploratory wave’ in the Americas as well as in the Pacific area often associated with colonies and their surrounding areas. British explorers and naturalists played a significant role, as will be discussed in greater detail.¹⁵

¹⁴ For example, see L. Ciancio, ‘*Tuis impulsus consilii*: Antonio Turra, the Vicenza Academy of Agriculture and the reception of Linnaeus’ thought in the Venetian Terraferma’, in M. Beretta and A. Tosi (eds), *Linnaeus in Italy: The spread of a revolution in science* (2007), pp. 169–98.

¹⁵ For some examples of the vast historiography on this topic see Marie-Noëlle Bourguet: ‘L’exploratore’, in M. Vovelle (ed.), *L’uomo dell’Illuminismo* (1992), pp. 283–351; ‘La collecte du monde: Voyages et histoire naturelle (fin XVIIIe – début XIXe siècle)’, in C. Blanckaert,

C. Cohen, P. Corsi and J.-L. Fischer (eds), *Le Muséum au premier siècle de son histoire* (1997), pp. 163–96. See also: M.-N. Bourguet and P.-Y. Lacour, ‘Les mondes naturalistes: Europe (1530–1802)’, in D. Pestre and S. van Damme (eds), *Histoire des sciences et des savoirs* (3 vols, 2015), I, pp. 255–81; I. Del Campo, *Introducción de plantas americanas en España* (Madrid, 1993). About the British case, see the classic L. H. Brockway, *Science and colonial expansion: the role of the British Royal Botanic Gardens* (1979).

However, it is important to remember that before practical uses or techniques for the acclimatization and dissemination of ‘exotic’ plant species were developed in Europe, the major question for late seventeenth- and early eighteenth-century botanists was taxonomy, a problem seemingly resolved by Linnaeus and quickly adopted by the British, who were disinclined to follow Tournefort’s classification system.¹⁶ It seems likely that the adoption of the Linnaean system facilitated botanical exchanges both within the international ‘scientific community’ and between botanists and agriculturists and their suppliers: nurserymen and gardeners whom I will discuss in the following pages. Although there was no lack of ‘interpretations’, criticisms and contaminations with vernacular names in the use of Linnaeus’ classification, most of the sources I have analysed show a high level of acceptance of the ‘new rules’.¹⁷

What emerges from the case studies below, based on largely unpublished handwritten and printed documentation, is the complex catalogue of knowledge, expertise and plants that provided the basis for the more mature nineteenth-century agricultural science. As a result, particularly of the wartime events and political instability that characterized the last decade of the eighteenth century, the innovations of the British centres could often not be immediately implemented on the Continent. Exceptions were not lacking, but what accumulated in Spain and especially in Italy in the late eighteenth century was above all ‘cognitive’ and material assets, which – taking up Jones’s lesson on the continuity of the agricultural Enlightenment – provided the background for broader experimentation and enhanced progress during the nineteenth century.

I

One route by which England influenced Spain and Italy was by the provision of training centres for experts who went on to play an important role in agricultural science. In the case of Madrid, a significant example is given by the brothers Claudio (1774–1842) and Esteban (1776–1813) Boutelou. Descended from a family of esteemed French gardeners who arrived in Spain during the reign of Philip V, under Charles IV the Royal House, as part of a wider policy of funding training abroad, financed their botanical, agricultural and horticultural studies in France (1789–92) and England (1793–96). They worked at the Trianon and Kew Gardens and met important botanists, such as Jean-Baptiste de Lamarck, Charles-Louis L’Héritier de Brutelle and James Edward Smith. Returning to their homeland in 1797, they applied their

¹⁶ S. Müller-Wille, ‘Systems and how Linnaeus looked at them in retrospect’, *Annals of Science* 70 (2013), pp. 305–17; S. McMahon, ‘Boundary work: “National quarrels and party factions” in eighteenth-century British botany’, in D. M. Knight and M. D. Eddy (eds), *Science and beliefs: from natural philosophy to natural science, 1700–1900* (2005), pp. 43–61. See also the classic work E. Mayr, *The growth of biological thought: Diversity, evolution, and inheritance* (1982), pp. 162–95. On the diffusion of the Linnaean system in Spain,

J. Sarrailh, *L’Espagne éclairée de la deuxième moitié du XVIII^e siècle* (Paris, 1954), pp. 441–7.

¹⁷ In Italian and Spanish sources, the binomial nomenclature was often accompanied by vernacular names when it comes to studies on native plants. A good example of this type of ‘fluidity’ can be found in C. Bellardi, *Catalogo primo de’ vegetali economici che si coltivano nel R. Orto Agrario dell’Università di Pavia* (Pavia, 1809).

technical experience and knowledge of the species cultivated abroad to the development of Spanish gardening, arboriculture and agricultural science.¹⁸

Claudio joined the staff of the Madrid Royal Botanic Garden (*Real Jardín Botánico*) and held positions of increasing responsibility: senior gardener, deputy director and professor of agriculture. He was also a gardener and arborist of Buen Retiro Park. During the 'foreign' regime of Joseph Bonaparte (1808–13), he was responsible for the Madrid Garden, but later the Bourbons removed him from the capital due to his collaboration with the previous occupation regime.¹⁹ Esteban was instead a senior gardener in the Aranjuez Garden, where he studied the acclimatization of exotic trees. He was also a professor of agriculture and rural economy at the Madrid Garden. When the acclimatization garden of Sanlúcar de Barrameda on the coast of Cadiz was opened in 1806, he became its director. This appointment allowed Esteban to study the local agriculture and especially viticulture, for which he introduced modern oenological terminology in Spain.²⁰

References to their English years and a certain propensity to take British studies as a model frequently surfaced in the brothers' studies and writings in the following years. For example, describing the food and forage crop *Brassica napobrassica* (L.) Mill. – the swede, or rutabaga – their *Tratado de la huerta* referred both to Claudio's accounts on wild specimens that he had analysed near Dover and to the Scotch-English botanist Philip Miller's opinion in considering the plant a species in its own right and not a variety of *Brassica oleracea* L.²¹ In describing then the broad bean (*Vicia faba* L.) – among which the Windsor variety was indicated as the one with the largest, softest, roundest and flattest bean – the *Tratado* pointed out its use in England and other parts of Europe as a food for horses.²²

In an 1808 issue of the *Semanario de agricultura y artes*, Esteban published an article on the production of liquors, a 'branch really important for our trades and agriculture', but rather neglected by the Spanish. Esteban took the opportunity to praise a nobleman from Jerez de la Frontera, Don Jacobo Gordon (possibly of Scottish descent), who not only undertook to

¹⁸ F. J. Girón, 'Nueva savia para el Viejo Continente: El Jardín del Príncipe en Aranjuez, Rambouillet y la quimera de Norteamérica', in L. Sazatornil Ruiz and F. Jiménez (eds), *El arte español entre Roma y París (siglos XVIII y XIX): Intercambios artísticos y circulación de modelos* (2014), pp. 375–401; M. Luengo Añón, 'Claudio Boutelou Agraz', in *Diccionario biográfico español*, website of the *Real Academia de la Historia* [hereafter DBE]: <http://dbe.rah.es/biografias/19091/claudio-boutelou-agraz> [accessed 29 July 2020]; M. Luengo Añón, 'Esteban Boutelou Agraz', in DBE: <http://dbe.rah.es/biografias/19094/esteban-boutelou-agraz> [accessed 29 July 2020]; F. Luque Janodet, 'Un acercamiento al interés por la viticultura en el siglo XIX: a propósito de la traducción a francés del Ensayo sobre las variedades de la vid común que vegetan en Andalucía de Simón Clemente y Rubio', *Anales de filología francesa* 27 (2019), pp. 515–31.

¹⁹ During the reign of Ferdinand VII (1813–33), Claudio continued to play a central role in the

development of Spanish agricultural science, its application, and its teaching, especially in Alicante, Malaga and Seville.

²⁰ Cf. E. Boutelou, *Memoria sobre el cultivo de la vid en Sanlúcar de Barrameda y Xerez de la Frontera* (1807). An 'Idea de la práctica enológica de Sanlúcar de Barrameda' was added to the 1808 edition. See also: J. L. Pan-Montojo, *La vitivinicultura en España (1750–1988)* (Madrid, 1989); F. Bajo Santiago, 'El nacimiento del léxico científico-técnico del vino en España: Esteban de Boutelou', in M. T. Echenique Elizondo and J. P. Sánchez Méndez (eds), *Actas del V Congreso Internacional de Historia de la Lengua española. Valencia, 2000*, II (Madrid, 2002), pp. 1899–1914.

²¹ C. Boutelou and E. Boutelou, *Tratado de la huerta o método de cultivar toda clase de hortalizas* (2nd edn, 1813), pp. 80–1.

²² *Ibid.*, pp. 245–52.

perfect distillation practices, but referred to English agricultural improvements to enhance Andalusian crops. Indeed, he had brought a wide selection of agricultural machinery and tools from England, 'the most appreciated ones in that country', including a particularly strong mould-board plough.²³

On a subsequent occasion, Esteban analysed large Andalusian *cortijo* estates, their crops and the way they organized production.²⁴ Among other 'political economy' writers, he referred to Arthur Young and his *Annals of Agriculture*, quoting a passage from the article 'On the Necessity of Avoiding All Public Regulations Relative to the Size of Farms' (1786).²⁵ In particular, Esteban cited the support expressed by Young for modern agricultural machinery, which many instead criticized as an alleged cause of unemployment. Young specified that a plough was more functional than a spade and employed less manpower, but it also left more people free to work in activities other than agriculture, such as manufacturing and commerce. Young concluded:

The fewer men required to cultivate the earth, the more numerous may be those classes unconnected with agriculture, because the greater is the neat produce which goes to market. Every mode, according to this reasoning, of simplifying the operations of agriculture by means of large occupations is perfectly harmless in respect to population; for while the soil is well cultivated, the produce will find the way to market, and will certainly be consumed; and you can do no more than consume it, if you had a farmer's family in every field.²⁶

Esteban supported this reasoning and provided a partially adapted translation into Castilian. Esteban was therefore quite familiar with Young's writings and his important journal, yet another demonstration that the British models were esteemed by the two Boutelou brothers, who cherished their training in England. In 1817, Young's name resurfaced in Claudio's *Elementos de agricultura*, which praised the tireless work of the Englishman in studying European agriculture on his travels and promoting it in his motherland, and Young's suggestion of chairs in agriculture in every university.²⁷

Two Italians who had part of their scientific and technical training in England were Paolo Balsamo (1764–1816) and Angelo Gualandris (1750–88). Balsamo left Sicily in 1787 for a long scientific voyage that embraced peninsular Italy, France, Flanders and England, where he lived from the beginning of 1789 to the middle of 1790. His international education was funded by the Bourbon authorities and was to specialize in agricultural science, having just been appointed professor of agriculture at the Academy of Studies in Palermo at a time when formal education in agriculture in both Italy and more widely in Europe remained very limited.²⁸

²³ E. Boutelou, 'Observaciones sobre la distilación de los aguardientes en Xerez y Sanlúcar de Barrameda', *Semanario de agricultura y artes dirigido a los parrocos* [hereafter SAA], 4 Feb. 1808, pp. 65–73, in particular p. 66, note 1; Sociedad Económica Matritense (ed.), *Agricultura general de Gabriel Alonso de Herrera, corregida según el texto original* (4 vols, 1818–19), I, p. 349.

²⁴ E. Boutelou, 'Observaciones sobre las grandes labores de Andalucía, e ideas sobre las utilidades y perjuicios que resultan al Estado y a la Agricultura de

la excesiva extensión de los grandes cortijos' (part 1), SAA, 21 Apr. 1808, pp. 241–52.

²⁵ The article 'by the editor' is in *Annals of Agriculture and Other Useful Arts* [hereafter AA] VII (1786), pp. 510–24.

²⁶ Ibid., pp. 520–1.

²⁷ C. Boutelou, *Elementos de agricultura* (1817), I, pp. vii–viii.

²⁸ F. Brancato, 'Balsamo, Paolo', in *Dizionario biografico degli italiani* [hereafter DBI] V (Rome, 1963).

In England, in addition to purchasing and sending agricultural machinery to Sicily on the orders of the Board of Studies (*Deputazione degli Studi*), Balsamo befriended Young and wrote some articles for the *Annals of Agriculture*. For example, he wrote an article-letter from Sutton, Suffolk, titled 'Thoughts on Great Cities' in which he expressed his support for Young's opinion that great cities helped agriculture: 'They, as you rightly observe, consume a good deal of the earth's products, and as such cannot fail to encourage the farmer, and consequently to promote the welfare of agriculture'. In particular, the population gathered in the cities – as opposed to the same number scattered in country villages – encourages luxury, which 'increases in proportion to the number of individuals united together' and, 'in spite of all the loud complaints of the moralists against it, must be acknowledged very useful to society'. In fact, it guarantees a large consumption of agricultural and other products, thus favouring rural society, manufacturing, crafts and commerce.²⁹

A more practically orientated article-letter that Balsamo wrote for the *Annals* was 'On the Advantages of Introducing Grasses in a Course of Arable Crops'. It supported the benefit of leaving fields fallow in the crop cycle, underlining how the meadows enrich the soil and make the subsequent cultivation of cereals more profitable, as well as providing good nourishment for the livestock. In particular, this was linked to his careful studies of a Dunstall Hall farm near Wolverhampton in the West Midlands, where he collected extensive data on the management of the estate – acres dedicated to each crop, head of cattle raised by species, products sold annually, etc. – and commented on them, proposing a long list of observations in support of his thesis.³⁰ This allows us to note how Balsamo's training, which began on the Continent and continued in England, gave him the capacity to assess agriculture from different viewpoints: political-economic and technical-scientific.

Balsamo started to teach in 1791 after returning to Palermo. In his lessons and writings, he took as a model both the modern and enterprising management of the English countryside and that nation's liberalism. He supported the unification of small properties into large cultivation units. Disregarding large absentee owners and small tenant farmers, he focused everything on large tenants who – as direct farmers or by leasing part of the land to small farmers – would champion greater productivity of land and employment, better living conditions for workers, and a consequent increase in food prices and a new impulse for trade.³¹

England was also a model of efficiency in the management of estates and for the resourcefulness of its landowners, as Balsamo underlined after some discouraging inspections in the Sicilian countryside in the 1790s and 1800s. In 1809 he still made reference to his time spent in England twenty years earlier, his study of agriculture in the English countryside, and his contacts with Young, landowners and farmers.³² While this demonstrated the importance of

²⁹ P. Balsamo, 'Thoughts on Great Cities', AA XIII (1790), pp. 465–82. Balsamo lived for most of his stay in William Green's house, a neighbour and friend of the Young family: G. Giarrizzo, 'Paolo Balsamo economista', *Rivista Storica Italiana* 78 (1966), pp. 5–60, in particular pp. 14–15.

³⁰ P. Balsamo, 'On the Advantages of Introducing Grasses in a Course of Arable Crops' with 'An Account

of the Expences and Profit of Mr. Miller's Farm, of Dunstall-Hall, near Wolverhampton', AA XIV (1790), pp. 1–19.

³¹ P. Matarazzo, 'L'Accademia di agricoltura di Palermo. Stato e feudalità a confronto nel tardo Settecento', *Studi storici* 43 (2002), pp. 1003–27; Giarrizzo, 'Paolo Balsamo economista', pp. 36–40.

³² P. Balsamo, *Giornale di viaggio fatto in Sicilia e particolarmente nella contea di Modica* (1809), pp. 173–85,

the English influence in his training as an agriculturist and economist, it also showed that Sicilian agriculture was continuing to experience serious difficulties.

Let us now turn to Angelo Gualandris. He had a medical education at the University of Padua, where he joined Pietro Arduino, professor of agricultural science, and Arduino's brother Giovanni, superintendent of agriculture. They were two of the most important men in the agrarian reforms implemented by the Republic of Venice since the 1760s. Thanks to them, Gualandris became an important member of the Agricultural Academy of Padua. After graduating, he undertook a long geological, botanical and agronomic journey through Europe from 1775 to 1777, sponsored by the Deputies to the Mines of the Republic. Starting in the Belluno area, the journey took him to Switzerland, Germany, France and England. He then returned to Italy via Turin.³³

The English interlude lasted from October 1776 to March 1777, a much shorter period than the years of training of the Boutelou brothers and Balsamo, however Gualandris made his months in Britain very fruitful. In London he met the naturalist Johann Reinhold Forster, who, together with his son George, had accompanied James Cook on his second voyage around the globe (1772–75).³⁴ Forster put Gualandris in contact with numerous scientists in different fields, including Joseph Banks, not yet president of the Royal Society, but already a renowned botanist who had participated in Cook's first voyage (1768–1771).³⁵

Gualandris was able to attend some meetings of the Royal Society and study Banks's scientific collections. From the Forsters' description of the 1772–75 voyage, he gained interesting information on the practical uses of some plants. For example, when they showed him a fabric used by Tahitians made of 'New Zealand' flax fibre (*Phormium tenax*, J. R. Forst. and G. Forst), Gualandris considered it 'completely new' but resembling hemp. Most of all, he evaluated it as 'an important article of economy' if imported into Europe, since its cultivation apparently required less attention than that of *Cannabis sativa* L. Moreover, the Forsters spoke to him of mulberry cultivation and silkworm breeding, also describing a variety of Chinese worm that can feed on the leaves of any tree and produce a strong and shiny silk. It can be hypothesized that it was a species of the genus *Antheraea* (Hübner, 1819), producing tussah silk. Furthermore, Gualandris visited the Royal Society for the Encouragement of Arts, Manufactures and Commerce, being impressed by its collection of agricultural machinery – of which the Academy of Padua had the penultimate edition of the catalogue – and in particular by a simple straw cutter designed by a farmer. He appreciated the incentive that the institution gave to farmers' creativity, with prizes for the best projects.³⁶

In this regard it should be noted that in the late eighteenth century the Venetian experts – although they were no longer at the crest of European technology – had very little to learn from

Note 32 continued

pp. 265–6. See also Giarrizzo, 'Paolo Balsamo economista', pp. 54–60.

³³ F. Baraldi, 'Gli studi geologici di Angelo Gualandris nelle opere pubblicate e nei documenti inediti conservati nell'Archivio storico dell'Accademia Nazionale Virgiliana di Mantova', in N. Azzi, F. Baraldi and E. Camerlenghi, *Angelo Gualandris (1750–1788): Uno scienziato illuminista nella società mantovana di fine*

Settecento (2018), pp. 9–77.

³⁴ Letter from London, 16 Jan. 1777, in A. Gualandris, *Lettere odeporiche* (1780), pp. 243–66.

³⁵ For a biography of Banks (1743–1820) see the entry by John Gascoigne in *Oxford Dictionary of National Biography* [hereafter ODNB] VI (2004).

³⁶ Letter from London, 16 Jan. 1777, in Gualandris, *Lettere odeporiche*, pp. 247–9, 255–6.

the foreign silk trade.³⁷ So what then was the reason for the conversation between Gualandris and the Forsters about hypothetical alternatives to the normal silk production chain? Gualandris might have been in search of alternative products, thinking of the frequent waves of mulberry disease that hit the Italian States. Some areas of the Republic of Venice had experienced such waves first-hand, for example in the late 1750s and the early 1770s. The damage they caused to the cultivation of mulberry trees and consequently to the entire silk production chain was felt throughout the Republic and agricultural academies were mobilized to analyse the phytopathological aspects and to propose both remedies and methods to stem the spread.³⁸ Sometimes it was unfavourable climatic conditions that damaged the production chain: this was the case of the weather in the Verona area in 1763 and 1777.³⁹ Moreover, beyond the mulberry disease, and with regard to the more general management of silk production, many less important agricultural writers and farmers, who knew the best local practices, attended the meetings of the Venetian agrarian academies and could comment wisely about the novelties printed in the Venetian newspapers.⁴⁰ Therefore, the fact that Gualandris turned his attention to textile fibres during his stay in England could be interpreted all the more as motivated by specific objectives, such as the one hypothesized above – as well, of course, as personal curiosity.

Unfortunately, the best Venetian farmers were hampered by general economic conditions that changed only during the Napoleonic occupation of Italy as the result of complex socio-political circumstances.⁴¹ Nonetheless, what the conversation with the Forsters demonstrates to us is that Gualandris's interest was already oriented towards the issues of agriculture and derivative products, despite the fact that his mission was primarily focused on mining. Problems specific to the Venetian territories led him to look for possible alternatives in sources that were 'external' to the traditional silk production system of the Republic.

Gualandris later moved to Derbyshire, where he was mainly interested in mines and geological questions. However, he did not fail to study the countryside and gather information

³⁷ On the importance of the silk trade in Italy, see: C. Poni, *La seta in Italia: Una grande industria prima della rivoluzione industriale*, eds. V. R. Gruder, E. Leites and R. Scazzieri (Bologna, 2009); G. Federico, *An economic history of the silk industry, 1830–1930* (1997).

³⁸ For instance, see: C. Bettoni, *Progetto per preservare i gelsi dall'epidemia mortalità, aumentandone l'entrata* (Brescia, 1776); M. Locatelli, *Su la corrente malattia de' gelsi* (1773).

³⁹ A. M. Girelli, *Il setificio veronese nel '700* (1969), pp. 98–9 with note 26; P. G. Zanetti, 'L'orto agrario di Padova e l'agricoltura nuova', *Rivista di storia dell'agricoltura* 36 (1996), pp. 5–67, in particular p. 11; Simonetto, *I lumi nelle campagne*, pp. 170–1.

⁴⁰ This peculiarity of the Venetian network is analysed in depth and with numerous case studies in Simonetto, *I lumi nelle campagne*. A particularly interesting case of concentration of knowledge through the attentive reading of technical texts from all over Europe is given by the agriculturists who animated the *Società d'Agricoltura Pratica* (Society of Practical Agriculture)

in the city of Udine in Friuli, eastern region of the Republic of Venice. See also A. Tonutto, *L'Accademia di Udine dalla caduta della Repubblica di Venezia all'unione del Friuli al Regno d'Italia (1797–1866)* (1997); L. Cargnelutti, 'Nota biografica', in A. Zanon, *Lettere a Fabio Asquini (1762–1769)*, ed., L. Cargnelutti (1982), pp. 423–6; L. Morassi, 'La Società d'Agricoltura Pratica di Udine (1762–1797)', in A. Tagliaferri (ed.), *Atti del convegno Venezia e la Terraferma attraverso le relazioni dei Rettori* (1981), pp. 361–70.

⁴¹ In this period the Venetian silk sector suffered from the Napoleonic wars, the alternation of French and Austrian control after 1797, the Continental Blockade, but also indiscriminate cutting of mulberry trees in some areas. For example, see: A. Zannini, 'Sempre più agricola, sempre più regionale: L'economia della Repubblica di Venezia da Agnadello al Lombardo-Veneto (1509–1817)', *Ateneo Veneto* 9 (2010), pp. 137–71, in particular p. 167; M. L. Ferrari, 'Quies inquieta: Agricoltura e industria in una piazzaforte dell'Impero asburgico' (Milan, 2012), p. 67.

on agricultural practices.⁴² He recorded that the land was favourable for cereal growing, especially wheat. After one or two years of cultivation, it was left fallow and sheep were allowed to graze during the summer. He gathered information on ploughing and fertilizing techniques, but also on the typical organization of stockbreeding on farms: for 100 acres, the farmers usually kept six horses, between 40 and 100 sheep, and some cattle. He collected information on the habits of rural society: bread and cheese were the main foods. In times of scarcity the bread was made from a mixture of wheat and barley flour. Two other widespread crops were potatoes and turnips, the former for human consumption and the latter for sheep and cattle. He noted that, unlike other areas in England, *Brassica rapa* L. subsp. *oleifera* (DC.) Metzg. was not grown in this region for the production of oil.⁴³

Later, from 1783 to 1788, Gualandris was in Mantua as a professor of botany and natural history at the local Gymnasium and director of its garden, but also agricultural inspector and a main member of the Agriculture Class of the Academy of Sciences and Fine Letters.⁴⁴ He died of a fever at the end of 1788, but in those few years he promoted numerous projects to enhance agriculture, inspired by his travel and particularly by the progress made in England. For example, in the mid-1780s the Agriculture Class launched a study of the Mantuan territory, gathering information on crops and manufacturing, types of property and the conditions of rural society. In the summer of 1786, Gualandris personally carried out a survey of the countryside, pinning down the details obtained from direct observation and interviews with farmers and landowners. He used his results to develop an extensive series of projects, including reforestation, improvement of pastures and livestock, recovery of olive growing on the hills, and enhancement of mulberry cultivation and silk manufacturing. The slow pace of bureaucracy in Austrian Lombardy and the end of Gualandris's life left most of the projects uncompleted.⁴⁵

What I am interested in emphasizing as regards Gualandris's investigations is his recording of the existence in the Mantua area of precisely methods and crops already applied in England and on the Continent not ten years earlier.⁴⁶ Considering his direct study of the lands, analysis of peasant habits and consultation with specialists, we can immediately note a connection between the experience in London and Derbyshire and his methods of work in Mantua. Gualandris's survey in 1786 was more engaged than his fact-finding journey to England, where he had been very interested in cultivation practices, agricultural machines, types of farming, and textile manufacturing. His work in Mantua had the goal of proposing plans to strengthen the agricultural and manufacturing sector in the area and was therefore more systematic and methodical.

With regard to mulberry cultivation and silk manufacturing, the Forsters' accounts not only foreshadowed the interest shown by Gualandris in 1786, but also the advice that he provided to

⁴² Letter from Old Bath of Matlock, 21 Feb. 1777, in Gualandris, *Lettere odeporiche*, pp. 266–300.

⁴³ *Ibid.*, pp. 269–70.

⁴⁴ Baraldi, 'Gli studi geologici di Angelo Gualandris', pp. 12–17; Archivio di Stato di Mantova, Liceo ginnasio Virgilio – parte I, 79, list of the *Liceo* teaching staff for the years 1774–1895.

⁴⁵ Accademia Nazionale Virgiliana – Archivio

Storico [hereafter ANV – AS] /30, fascicoli 1784, 1785. E. Camerlenghi, 'Le perlustrazioni fatte nel Mantovano e i progetti politici agrari', in Azzi, Baraldi and Camerlenghi, *Angelo Gualandris*, pp. 159–74.

⁴⁶ For example, even in Switzerland: Letter from Bern, 29 Oct. 1775, in Gualandris, *Lettere odeporiche*, pp. 77–91.

a landowner and entrepreneur near Mantua: the Dowager Marchioness Castiglioni of Casatico (1735–1803). In addition to investing in cereal-growing and viticulture, the Marchioness distinguished herself for research and inventions in the field of textile materials and techniques. For example, her studies on the use of vinegar instead of oil in the processing of flax fibre and wool were highly regarded at the Academy of Mantua, as was the design of some textile instruments that earned her membership in the Agriculture Class in 1775. In addition, in the late spring of 1788 she agreed to carry out some experiments that the Class commissioned her on feeding silkworms on dried mulberry leaves so that production could continue during bad years for the trees.⁴⁷ We can guess the weight of Gualandris' advice also in experiments on the 'alternative' or 'flexible' feeding of silkworms. He had developed an interest in the tussah silkworm, having learned from the Forsters that it feeds on more than one plant, suggesting greater adaptability than the common silkworm, which only eats mulberry leaves. While his interest certainly regarded the different food needs of the two species, there were many other variables at play, such as environmental conditions and difficulties in importation. It is thus not surprising that he made no recorded attempts to introduce any species of the genus *Antheraea* into the Mantua area.⁴⁸

Furthermore, knowing the Marchioness's interest in textile machines, it can also be suggested that Gualandris shared with her what he had seen in the collection of the Royal Society for the Encouragement of Arts, Manufactures and Commerce. As early as 1769 it included many textile machines, such as brocade looms, stocking frames and spinning-wheels. Among them were a 'reel for winding silk from the cocoons', for which a certain Mr Verrier had won 40 pounds on 14 June 1762, and a 'silk reel' presented to the Society by John Pownall Esq. There was also a 'complete frame and reel with a bason [*sic*] and furnace of the proper size to make silk, agreeable to the present best method of working in Italy', which placed Italian expertise in silk processing among the best in Europe.⁴⁹ When Gualandris visited the collection between 1776 and 1777, it had surely grown: his study of the machines allowed him to broaden his knowledge on the matter, which was of value in his work for the Academy and for the Marchioness.

II

Great Britain played an important role in providing Spain and Italy with the wide range of plants that would constitute the material substrate on which to conduct agricultural studies in the nineteenth century.

⁴⁷ ANV – AS/8, fascicolo Borsa Matteo, the secretary of the Academy to the Marchioness, May 1787; ANV – AS/32, fascicolo 1788, the Marchioness to the secretary, 20 May 1788. On the friendship and the correspondence between Gualandris and the Marchioness, as for a short biography of the latter, see N. Azzì, 'Datemi vostre nuove elettrizzanti: Lettere dal carteggio di Angelo Gualandris e Maria Teresa Cristiani Castiglioni (1768–1788)', in Azzì, Baraldi and Camerlenghi, *Angelo Gualandris*, pp. 79–157.

⁴⁸ However, interest in Spanish varieties of silkworms was expressed by Count Alfonso Castiglioni, landowner and botanist in Brianza, to one of the main professors of the Madrid Garden, Casimiro Gómez Ortega: Archivo del Real Jardín Botánico de Madrid [hereafter ARJB] /I, 20, 2, 8, Castiglioni to Gómez Ortega, 26 May 1787.

⁴⁹ *A Catalogue of the Machines and Models in the Repositories of the Society for the Encouragement of Arts, Manufactures and Commerce* (1769), pp. 3–4.

For Spain, in addition to the seeds sent to the Madrid Garden by Joseph Banks and the physician and botanist John Hope of the University of Edinburgh,⁵⁰ an excellent example is provided in the second half of the 1790s by Charlotte Jane Stuart (1746–1800), wife of John Stuart Marquis of Bute, future member of the Royal Society and last British ambassador to Spain before the interruption of diplomatic ties in 1796–1802. The Marquis's family had already shown interest in sponsoring both scientific explorations and agricultural experiments. His father cultivated a great interest in natural sciences and agricultural studies. In 1770, he had financed Alberto Fortis from Padua and Domenico Cirillo from Naples in their scientific expedition to a number of Dalmatian islands. He also published the *Botanical Tables Containing the Families of British Plants* in 1785 and contributed to the scientific research of Scottish universities.⁵¹

For her part, the Marchioness supplied the Madrid Garden with seeds from England and other areas, such as North America and British India. There was a great variety of trees that could be useful in forestry: several species in the genera *Pinus* L., *Betula* L. and *Quercus* L., important in timber production or for reforestation.⁵² Other plant species supplied by the Marchioness had food potential for their fruits and berries. There were, for example, a variety of 'pequeñísimo' [very small] melon (*Cucumis melo* L.), the bitter berry (*Prunus virginiana* L.), the American persimmon (*Diospyros virginiana* L.) and the deerberry (*Vaccinium stamineum* L.), although the sour taste of its berries does not make it the most palatable of the genus *Vaccinium*. There was also a plant with utility in the dye house: the *Indigofera caerulea* Roxb from the Indian subcontinent.⁵³ The botanists of the Madrid Garden were aware of

⁵⁰ For example, see the list ARJB/I, L.S. 4 1785: there are seeds sent both by Hope (6 front and back) and by Banks (from 2 front to 5 back, from 52 back to 53 front). About Hope (1725–1786), see the concise but accurate biography on the website of the Royal College of Physicians of Edinburgh, available: <https://www.rcpe.ac.uk/heritage/college-history/john-hope> [accessed 23 July 2020].

⁵¹ On the role of the Butes both in European diplomacy and in the patronage of science, see: K. W. Schweizer, 'John Stuart, third Earl of Bute (1713–1792)', in *ODNB* LIII (2004); R. Thorne, 'John Stuart, first Marquis of Bute (1744–1814)', in *ODNB* LIII (2004); M. H. Lazarus and H. S. Pardoe, 'Bute's *Botanical tables*: dictated by Nature', *Archives of Natural History* 36 (2009), pp. 277–98. Italian historiography too has analysed the influence of the family: L. Braidà, *L'autore assente. L'anonimato nell'editoria italiana del Settecento* (2019), pp. 51–2; P. Bianchi, 'Nella specola dell'ambasciatore. Torino agli occhi di John Stuart, Lord Mountstuart e Marchese di Bute (1779–1783)', in E. Piccoli and F. De Pieri (eds), *Architettura e città negli Stati sabaudi* (Macerata, 2012), pp. 135–60; L. Ciancio, 'Fortis, Alberto', in *DBI* XLIX (Rome, 1997); G. Pizzamiglio, 'Introduzione', in A. Fortis, *Viaggio in Dalmazia*, ed., E. Viani (1987), pp. i–xxxii, in particular pp. ii and xiii; G. Torcellan, 'Alberto Fortis

(nota introduttiva)', G. Giarrizzo, G. Torcellan and F. Venturi (eds), *Illuministi italiani* (7 vols, 1965–71), VII, pp. 281–307, in particular pp. 288–9. On the contribution of three British noblewomen to botany, see: Nicole LaBouff, 'Public science in the private garden: Noblewomen horticulturalists and the making of British botany, c. 1785–1810', *Hist. Science* (2020), currently only available online: <https://journals.sagepub.com/doi/full/10.1177/0073275320961908>.

⁵² On the growing sensitivity about the damage caused by deforestation in southern Europe in the late eighteenth and early nineteenth centuries, Warde, *Invention of sustainability*, pp. 325–7.

⁵³ The seeds sent by the Marchioness were planted a few years later, in 1799 and 1800: ARJB/I, L.S. 17 1799, *Indigofera caerulea* (no. 1023), 29 back, *Cucumis melo* (no. 1061), 30 back; ARJB/I, L.S. 22 1800, *Prunus virginiana* (no. 1830), 55 back, *Diospyros virginiana* (no. 1890), 57 front. There are no details on the melon: it was probably a variety that had interested the staff of the Madrid Garden, otherwise a widespread species in the Mediterranean area. On the food uses of varieties of *P. virginiana*, see D. E. Moerman, *Native American food plants: An ethnobotanical dictionary* (2010), pp. 200–2. On the dyeing uses of *I. caerulea* to obtain a delicate shade of indigo, see *The Monthly Rev.* LXXI (1813), p. 400. On its area of origin see: P. S. Nagar,

the importance of a contact such as the Marchioness, which allowed plant species from the Spanish colonies to be supplemented with others from Kew Gardens and areas that had been or were still under British influence. For the dispatch of seeds, but also of seedlings and dried samples, carried out with zeal and cleverness, in 1796 the Marchioness was appointed official correspondent of the Garden.⁵⁴ Obviously, contact with the Marchioness of Bute did not yet represent a conscious choice to specialize in plant husbandry, as would begin to happen in the Madrid Garden in the first decade of the nineteenth century. However, the British contributed to the material component on which the staff of the following years would work. In this, we can see a parallelism with what happened at the Paris *Jardin des plantes*: the botanical heritage accumulated during the Old Regime – when it was still the *Jardin du roi* – provided materials for the experiments in agriculture, forestry and the processing of derived products during the Revolution and Napoleonic imperium.⁵⁵

For Italy one may cite cases of English contributions to the ‘scientific centre’ of Brera in Milan, where the garden for the teaching at the Gymnasium was sometimes also used for experiments on ‘economically valuable plants’ by the Patriotic Society.⁵⁶ The botany lessons of Fulgenzio Vitman (1728–1806) were planned based on the relevance of plants in the arts and agriculture alongside their medical and pharmaceutical uses. We see them in the documentation representing the economic garden of the *Theresianum* in Vienna as a model: highlighted alongside cereals, flax, hemp, asparagus, lettuce, and various species of the genus *Brassica*, were dye plants, fodder plants and others useful in crop rotation. There was also no lack of interest in vegetables suitable for cosmetics and perfumery.⁵⁷ While not classifiable as true agricultural science, Vitman’s botany was based on practical applications. This was clear in his imports of seeds and plants from the rest of Europe,⁵⁸ with England also contributing. For example, in December 1786 a long list of ‘hardy plants suitable for the climate of Lombardy’ was sent from London on behalf of the otherwise unidentified nurseryman William Malcolm of Kennington, Surrey. The list included the almond tree (*Prunus dulcis* [Mill.] D. A. Webb), the filbert (*Corylus*

Note 53 *continued*

Floristic biodiversity of Barda hills and its surroundings (2005), p. 211; S. Sharma and B. Tiagi, *Flora of north-east Rajasthan* (1979), pp. 128–9. About the deerberry and its uses, see the entry by James R. Ballington in R. E. Gough and R. F. Krcak (eds), *Blueberries: A Century of Research* (1995).

⁵⁴ ARJB/I, 8, 6 – 6, first draft of the letter of appointment to the Marchioness, 1796; 9, 3 – 7, second draft, 24...; ARJB/I, 11, 3, drafts of the staff meeting, 10 Sept. 1796; ARJB/I, 11, 3, drafts of the staff meeting, 3 Sept. 1796.

⁵⁵ Emma C. Spary, *Utopia’s Garden: French natural history from Old Regime to Revolution* (2000); *ead.*, *Eating the Enlightenment: Food and the Sciences in Paris, 1670–1760* (2012); *ead.*, *Feeding France: New sciences of food, 1760–1815* (2014).

⁵⁶ A. Visconti, ‘Il giardino botanico della Società Patriotica di Milano (1776–1796)’, *Museologia scientifica*

14 (1998), pp. 263–9.

⁵⁷ Archivio di Stato di Milano [hereafter ASMi] – Studi p.a./2, fascicolo Botanica, three dateless documents entitled respectively: *XV Cattedra (annale) di botanica*, *Hortus oeconomicus Collegii Imperialis Theresiani in suas classes divisus*, *Systema botanica tradenda in Universitate Viennensi*. See also M. T. Monti, ‘Promozione del sapere e riforma delle istituzioni scientifiche nella Lombardia austriaca’, G. Barsanti, V. Becagli and R. Pasta (eds), *La politica della scienza: Toscana e stati italiani nel tardo Settecento* (1996), pp. 367–92, in particular p. 379.

⁵⁸ A. Visconti, ‘La fondazione dell’Orto Botanico di Brera e gli anni della direzione dell’abate vallombrosano Fulgenzio Vitman (1728–1806)’, *Atti della Società italiana di scienze naturali e del Museo civico di storia naturale in Milano* 153 (2012), pp. 27–48, in particular pp. 34–7.

maxima Mill.), the date-plum (*Diospyros lotus* L.), and the river birch (*Betula nigra* L.).⁵⁹ The first two are known above all for the dietary use of their nuts, while the date-plum – ‘cousin’ of the American species procured by the Marchioness of Bute for the Madrid Garden – has fine-grained wood and sugary fruits. Its fruits would be studied in north-eastern Italy by the botanist and agriculturist Giovanni Mazzucato to produce sweeteners after Napoleon’s 1806 Continental Blockade against British shipping, which limited the arrival of sugar cane from the colonies and created an urgent need for surrogates.⁶⁰ As for the river birch, originally from North America, it could supply both good timber and a sweet syrup from its processed sap.⁶¹ The filbert was also of North American origin, while the almond and the date-plum were already acclimatized in some areas of Italy.

It is difficult to know which plants on the long list were bought from Malcolm, but it is interesting to note that his fame reached as far as Milan.⁶² He stood out among nurserymen. First of all, as Kathleen Clark recently hypothesized, his 1771 nursery catalogue was probably the first of its kind to use Linnaean system of nomenclature. Additionally, Michael Symes, as Clark reports, suggested identifying the mysterious Malcolm as the Duke of Norfolk at Workshop Manor.⁶³

The scientific modernity of his communication strategy and his likely prominent social status would have been two important factors in establishing his reliability also on the Continent. If contacts with Malcolm had been initiated only a few years earlier, we might have assumed the intermediation of Ludovico Barbiano of Belgiojoso, imperial plenipotentiary in London. For example, in 1779 the Milan Chamber Magistrate and the Patriotic Society – of which Belgiojoso was a strategic partner – asked him for some seeds of the so-called ‘Siberian barley’ (probably *Hordeum distichon* L.) for use in experimental crops in the Alpine valleys.⁶⁴ However, Belgiojoso’s diplomatic term in London began in 1769 and ended in 1783, before the 1786 list was compiled. The list was probably the work of Antonio Songa, imperial consul in London and

⁵⁹ ASMi – Studi p.a./2, List of hardy plants suitable for the climate of Lombardy sold by William Malcolm & Son of Kennington Surry near London, 26 December 1786. The almond tree is registered as *Amygdalus dulcis*.

⁶⁰ About Mazzucato’s experiments on date-plum, see M. L. Fagnani, ‘Studying “useful plants” from Maria Theresa to Napoleon: Continuity and invisibility in agricultural science, northern Italy, the late eighteenth to early nineteenth century’, *Hist. Science* 59 (2021), pp. 373–460.

⁶¹ See the entries in J. S. Fralish and S. B. Franklin, *Taxonomy and ecology of woody plants in North American forests (excluding Mexico and subtropical Florida)* (2002), and in D. H. Les, *Aquatic dicotyledons of North America: Ecology, life history, and systematics* (2017).

⁶² The first catalogue of the plants cultivated in the Brera Garden was published many years later, in 1812. It reported – among several other species – the presence of the date-plum and the river birch, but not the almond tree nor the filbert. About the lack

of a complete report before the 1812 catalogue, see E. Banfi and A. Visconti, ‘L’Orto di Brera alla fine della dominazione asburgica e durante l’età napoleonica’, *Atti della Società italiana di scienze naturali e del Museo civico di storia naturale in Milano* 154 (2013), pp. 173–264. Banfi and Visconti have reported and commented the full list proposed in the 1812 catalogue (pp. 194–264).

⁶³ K. Clark, ‘What the nurserymen did for us: The roles and influence of the nursery trade on the landscapes and gardens of the eighteenth century’, *Garden Hist.* [hereafter *GH*] 40 (2012), pp. 17–33. See also Malcolm, William *Catalogue of hot-house and greenhouse plants, fruit and forest trees, flowering shrubs, herbaceous plants, tree and kitchen garden seeds, perennial and annual flower seeds, garden mats and tools* (1771).

⁶⁴ A. Visconti, ‘Il trasferimento delle piante nella Lombardia austriaca negli ultimi decenni della dominazione asburgica’, *Altre modernità* 10–11 (2013), pp. 39–51, in particular p. 42.

close correspondent with the Patriotic Society, with whom he shared news, seeds and scientific texts.⁶⁵ 'Austrian' Milan – fully dedicated to the enhancement of sciences, arts and agriculture – could maintain contacts with Great Britain thanks to Songa, taking advantage of the European network of diplomacy in Vienna and the international scientific community.

III

In addition to training experts in agriculture and providing highly useful seeds, Great Britain also influenced the development of Spanish and Italian agricultural science through treatises and technical texts, which were both read in their original version and translated and adapted to the needs of the target audience. It is no coincidence that, at the end of 1782, Jacobo María de Spinoza, member of the *Real Audiencia* of Catalonia, underlined in some of his reflections how England was one of the most active players in Europe in strengthening the agricultural sector, promoting the application of science and technology to it. For example, he recalled the books of the economist Joseph Massie, who was also interested in British agricultural productivity and whose fame had reached Catalonia.⁶⁶

As far as the technical texts were concerned, the adapted translations into Castilian of French versions of the English originals played a significant role. Two examples will be provided here: the works of British agriculturists Thomas Hale and Jethro Tull.

Between 1765 and 1795 the Castilian version of *A Compleat Body of Husbandry* by Hale (1756–58) was published in many volumes in Valencia. The translator was the politician and agrarian scholar José Antonio Valcárcel,⁶⁷ who in turn had worked on Dupuy-Demportes' *Le gentilhomme cultivateur*, a French adaptation of the original version. However, such 'chains' skewed the original message: in the specific case of Hale, although the horse as a working animal was one of the cornerstones of the English 'new husbandry', the Spanish experts continued to prefer the traditional ox, therefore Valcárcel criticized the use of the horse in agricultural works in its translation-adaptation.⁶⁸

Henri Louis Duhamel du Monceau, engineer and agriculturist, translated Tull's *The New Horse-Houghing Husbandry* (1731) into French in 1750. Duhamel's translation, while correcting

⁶⁵ N. Raponi, 'Barbiano di Belgiojoso, Ludovico', in *DBI* VI (Rome, 1964). The signature on the list of hardy plants appears to be 'Antonio Songa', a name frequently found among Patriotic Society correspondents. See Biblioteca Nazionale Braidense, AF XI, 37–38, for copies of all letters written by the secretary from 1781 to 1790.

⁶⁶ Archivo Histórico Nacional de Madrid – Estado/3238, 339, Papel que para mejorar la agricultura, industria y fabricas catalanas escribía el fiscal de lo civil de la Real Audiencia de Barcelona Don Jacobo María de Spinoza, 21 Dec. 1782. On Massie's life (d. 1784) there is very little information. See also P. Mathias, 'The social structure in the eighteenth century: a calculation by Joseph Massie', *ECHR* 10 (1957), pp. 30–45.

⁶⁷ Valcárcel (1720–1801) was born in Burgos, but at some time he moved to Valencia and remained

there until his death. He had been a member of the local economic society since 1778 and wrote numerous texts on agriculture, manufacturing and trade. There is not much more information about him than that he proposed himself to the Valencian administration for several bureaucratic and financial assignments: A. González Bueno, 'José Antonio Valcárcel', in *DBE*: <http://dbe.rah.es/biografias/20105/jose-antonio-valcarcel> [accessed 29 July 2020].

⁶⁸ T. Hale, *A compleat body of husbandry* (4 vols, 1756–9); J.-B. Dupuy-Demportes (ed.), *Le gentilhomme cultivateur ou corps complet d'agriculture* (8 vols, 1761–4); T. Hale, *Agricultura general y gobierno de la casa de campo*, trans., J. A. Valcárcel (10 vols, 1765–95), in particular, see IX (1770), p. 438.

some passages in Tull's work and introducing improvements in the use of some of the machines described, recognized the practical advantages of its systems, in particular the introduction of forage crops. It was a very different work from the original. In turn, the politician and interpreter Miguel Joseph de Aoiz translated – adapting it to the needs of the new public, of course – the French version of Duhamel into Spanish, to which were also added two chapters of *Kitab al-Filaha*, an agriculture treaty by the Andalusian Abu Zakariya Ibn al-Awwam, who lived in the twelfth and thirteenth centuries.⁶⁹ The two chapters were translated from Arabic by the Lebanese royal librarian Miguel Casiri⁷⁰ and Count Pedro Rodríguez de Campomanes, future minister and member of the Council of Castile.⁷¹

Even more than in the case of Hale, Tull's original message came to the Spanish readers in modified form. However, the basic agrarian principles remained, even partly updated and corrected through Duhamel's intervention, 'brought closer' to the Spanish reality through the adaptation of Miguel Joseph de Aoiz, and even enriched with a historical and anthropological perspective through the translation of Ibn al-Awwam's work. Therefore, the British treaties had the merit of introducing agrarian novelties into the Iberian Peninsula, albeit domesticated and partly deprived of the possibility of challenging traditional practices.

To find original British scientific and technical texts, we need to search in specialized libraries. It is significant that at the death in 1804 of the great botanist Antonio José Cavanilles, director of the Madrid Garden, some interesting British publications were included in his personal library, among many others from all over Europe.⁷² For example, there were the *Botanick Essays* of the Scottish surgeon and botanist Patrick Blair (d. 1728), a member of the Royal Society of London.⁷³ Printed in the English capital in 1720, the first part of the *Essays* described the structure of flowers and the plants' fruiting, while the second discussed their generation and nourishment. Blair was not directly interested in the enhancement of agriculture, but in his scientific thought, plants were considered in their practical use, and not necessarily medical. Writing about the classification of plants in the *Pharmaco-Botanologia* – which Cavanilles did not have – Blair had focused on the genera *Abies* and *Pinus* (firs and pines) to describe their practical uses even outside of medicine and pharmacy, to which he devoted most of the space. For example, he noted that the pine's 'kernels are much esteemed in Italy, being look'd upon as more delicious than almonds', while its rosin, like that of the fir and larch, had numerous uses in manufacturing and mechanics. He mentioned the importance of fir wood in the construction of buildings, ships and various instruments.

⁶⁹ K. Matteson, *Forests in revolutionary France: Conservation, community, and conflict, 1669–1848* (2015), pp. 65–72; L. Argemí i d'Abadal, 'Agronomía y revolución agraria en España (1750–1820)', in L. Argemí i d'Abadal and E. Lluch (eds), *Agronomía y fisiocracia en España (1750–1820)* (1985), pp. 1–43, in particular pp. 9–13. On the translator (1699–1753), see C. González Caizán, 'Miguel José de Aoiz de la Torre', in DBE: <https://dbe.rah.es/biografias/31308/miguel-jose-de-aioiz-de-la-torre> [accessed 29 July 2020].

⁷⁰ On Casiri (1710–1791), important arabist and lexicographer linked to the Royal Library of El Escorial,

see F. Martín Escudero, 'Miguel Casiri de Gartia', in DBE, <http://dbe.rah.es/biografias/18260/miguel-casiri-de-gartia> [accessed 29th July 2020].

⁷¹ On Campomanes's economic thought and his patronage of Spanish agriculture, see Ruiz Torres, *Reformismo e Ilustración*, pp. 484–6.

⁷² ARJB/XIII, 1, 33, 1, *Índice de los libros de historia natural existentes en la biblioteca de Don Antonio Josef Cavanilles*.

⁷³ See the entry by Anita Guerrini in ODNB VI (2004).

Forestry information was more accurate for all evergreen conifers, for example regarding the care of seeds, transplanting seedlings, management of soils, etc.⁷⁴

Cavanilles possessed two treatises by another important botanist, Philip Miller (1691–1771), director of the Chelsea Garden and correspondent of the Florentine Botanical Society, which in 1783 would merge with the agriculture Academy of Georgofili. The titles in the Spanish library were *Figures of the Most Beautiful, Useful, and Uncommon Plants Described in the Gardeners Dictionary*, in the 1777 London edition. Furthermore, Cavanilles had the 1785 French translation of the *Gardeners Dictionary Containing the Methods of Cultivating and Improving the Kitchen, Flower, Fruit and Pleasure Garden*, first published in London in 1731. Miller always applied his botanical knowledge to ‘plants of economic value’. For example, he selected the cotton seeds planted in British Georgia and studied the cultivation and colouring properties of the rose madder (*Rubia tinctorum* L.).⁷⁵

In Cavanilles’s library there were also the six volumes of *Voyage dans l’hémisphère austral et autour du monde*, the 1778 French translation of the report of the second journey of James Cook.⁷⁶ It contained naturalistic, geographical and environmental information on the lands explored by Cook, but also details on customs and economic activities, including the crops and food habits of the indigenous people. Again it was a translation-adaptation. But at least there was only the transition from English to French without a further one into Castilian.

In any case, oceanic explorations during the eighteenth century focused more and more on the possibility of exporting and importing crops – through suitable selection and acclimatization experiments – between the motherland and the colonies. As a rich historiography has shown, on the threshold of the French revolution the Paris *Jardin du roi* had many plant species from the Americas and Asia, gathered and studied following scientific expeditions such as those of Bougainville (1766–69) and La Pérouse (1772–76 and 1785–88). Many species also came from international missions in which France participated. This was the case of the expedition to the Viceroyalty of Peru (1777–88) coordinated by the Madrid Garden, in which the French botanist Joseph Dombey also took part by order of Minister Turgot. As for the British Empire, Joseph Banks is a good example of this ‘globalized’ interest in economically valuable plants. For example, in 1793 he organized the transport of the breadfruit (*Artocarpus altilis* [Parkinson ex F. A. Zorn] Fosberg) from Tahiti to the British West Indies where it became a staple food which made up for the lack of other plantations of food plants. The concept of scientific travel supported by geographical explorations had been represented by Banks also during the first voyage of Cook, not by coincidence sponsored by the Royal Navy and the Royal Society. And again, the Scottish botanist and surgeon Archibald Menzies, following George Vancouver on

⁷⁴ P. Blair, *Pharmaco-Botanologia or an Alphabetical and classical dissertation on all the British indigenous and garden plants of the New London Dispensatory* (7 ‘decads’, 1723–27), I, pp. 6–8. See also McMahon, ‘Boundary work’, pp. 52–61.

⁷⁵ A. Paterson, ‘Philip Miller: A portrait’, *GH* 14 (1986), pp. 40–1; H. Le Rougetel, ‘Gardener extraordinary: Philip Miller of Chelsea (1691–1771)’, *J. Royal Horticultural Soc.* 96 (1971), pp. 556–63. See also P. Miller, *The method of cultivating madder as it is now practised*

by the Dutch in Zealand... with their manner of drying, stamping and manufacturing it for use... to which is added The method of cultivating madder in England from many experiments made in the course in thirty years on the culture of that useful plant (1758).

⁷⁶ J. Cook, T. Furneaux, J. R. Forster and G. Forster, *Voyage dans l’hémisphère austral et autour du monde, fait sur les vaisseaux de roi, l’Aventure et la Résolution, en 1772, 1773, 1774 et 1775* (6 vols, 1778).

the 1791–95 voyage around the world, noted the uses that indigenous people of different areas made of local plants.⁷⁷ We can therefore understand the interest that travel reports could have for Cavanilles and for the Madrid Garden, which organized important scientific expeditions in Latin America and which received botanical species from all around the world.⁷⁸

The British texts fitted in Cavanilles's rich international library, establishing his background in plant physiology and shaping his increasingly well-defined concept of 'applied botany'. In 1795–97, he published his *Observaciones sobre la historia natural, geografía, agricultura, población y frutos del Reyno de Valencia* (*Observations on Natural History, Geography, Agriculture, Population and Goods of the Kingdom of Valencia*), an account of his explorations of the Valencia area. The focus of the work was on agriculture and manufacturing, with a study on the organization and customs of rural society.

From 1797 to 1801, Cavanilles published articles on agriculture and applied science in various journals. He wrote about the downsides of rice growing, about citrus and chufa (*Cyperus esculentus* L.) cultivation. He also wrote about the cultivation and processing of plants for textile fibres, such as *Agave americana* L., *Stipa tenacissima* L. and *Abutilon theophrasti* Medicus, on which Cavanilles was conducting experiments at the time. For the *Anales de historia natural* (*Annals of Natural History*), of which he was co-editor, he wrote about elastic resin and the plant species that produce it.⁷⁹ We can hypothesize that Cavanilles's transition from systematic botany to an increasingly applied botany⁸⁰ owed a great deal to the influence of English texts on agriculture, horticulture, and the processing of derived products. These themes emerged – albeit with a more ethnographic and anthropological point of view – also in the *Voyage of Cook*. In this perspective, the value of English literature contributed to shaping the role of Cavanilles as a 'link' between traditional botany and the agrarian orientation that the Madrid Garden would assume under the direction of Francisco Antonio Zea (1804–08).⁸¹

⁷⁷ Bourguet, 'L'explorateur', pp. 283–351; C. Deschamps-Lang, 'Joseph Dombey au Pérou et au Chili, 1778–1784', in Y. Laissus, *Les naturalistes français en Amérique du Sud, XVIe–XIXe siècles* (1995), pp. 157–66; D. Powell, 'The voyage of the plant nursery, H.M.S. Providence, 1791–1793', in *Economic Botany* 31 (1977), pp. 387–431; I. Laboulais-Lesage, 'L'usage des récits de voyage dans les dictionnaires de géographie du XVIIIe siècle: le cas des notices américaines', in G. Bertrand (ed.), *La culture du voyage N: pratiques et discours de la Renaissance à l'aube du XXe siècle* (2004), pp. 147–79.

⁷⁸ L. López-Ocón Cabrera, *Breve historia de la ciencia española* (2003), pp. 200–17; Del Campo, *Introducción de plantas*.

⁷⁹ A. J. Cavanilles, 'Observaciones sobre el cultivo del arroz en el Reyno de Valencia y su influencia en la salud pública', in *Memorias de la Real Academia Médica de Madrid* I (1797), pp. 99–128; A. J. Cavanilles, 'De los naranjos', SAA, 24 Jan. 1799, pp. 49–56; A. J. Cavanilles, 'Del cultivo de las chufas', SAA, 1 May 1800, pp. 273–5; A. J. Cavanilles, 'Sobre el cultivo de algunas especies

de malvas y uso económico que se puede hacer de sus fibras', SAA, 16 May 1800, pp. 305–9; A. J. Cavanilles, 'Observaciones sobre algunos vegetales que producen resina elástica', in *Anales de Historia Natural*, 2 (1800), pp. 124–8; A. J. Cavanilles, 'Del cultivo de las chufas', in *Anales de Ciencias Naturales*, 3 (1801), pp. 234–6.

⁸⁰ M. L. Fagnani, 'From "pure botany" to "economic botany" – changing ideas by exchanging plants: Spain and Italy in the late eighteenth and the early nineteenth century', *Hist. European Ideas* (2021), currently only available online: <https://doi.org/10.1080/01916599.2021.1921007> [accessed 4 May 2021], pp. 3–4.

⁸¹ On Zea's scientific and pedagogical thought, alongside his direction of the Madrid botanical garden, see: D. E. Soto Arango and M. A. Puig Samper Mulero, 'Francisco Antonio Zea (1766–1822). Las facetas de un científico criollo', in E. Cervantes (ed.), *Naturalistas proscritos* (2011), pp. 61–72; D. E. Soto Arango, 'Francisco Antonio Zea y la enseñanza de la agricultura en el Real Jardín Botánico de Madrid', *Historia crítica* 16 (1998), pp. 43–60.

In Italy, the reception of British texts was sparser, both in natural sciences and agricultural techniques, but fruitful cases were not lacking. The Venetian intellectual Francesco Grisellini, founder in 1764 of the long-lived agrarian magazine *Giornale d'Italia*, made his debut in the literature in 1763 with the *Nuova maniera di seminare e coltivare il formento* (*A New Way of Sowing and Cultivating Wheat*), which described the sowing machine designed by Jethro Tull. The success was very great, so much so that the text was republished, even adding notes by the Florentine Academy of Georgofili. Grisellini thus began his copious production of agricultural texts: monographs, adapted translations, dictionaries and articles.⁸² Grisellini also supplied Italy with the adapted translation of Hale's *A Compleat Body of Husbandry*, but as in the case of Valcárcel, the reference model was again the French translation-adaptation by Dupuy-Demportes and not the original in English.⁸³ Once again, however, its innovations – 'filtered' through French and Italian interventions – became widely used in Mediterranean lands.

Turning our attention to Milan, the shop of the Swiss bookseller and printer Jacques Bayle Barelle offered a limited selection of texts in English. Among Samuel Richardson's novels *Clarissa* and *Pamela* and one of the most popular travel books at the time, the *Voyage Round the World* by Admiral George Anson, the 1785 catalogue contained a very useful publication for science and technology applied to agriculture: the three volumes of the 1771 *Essays and Observations Physical and Literary* read by the Philosophical Society of Edinburgh, which in the meantime had become the local Royal Society.⁸⁴ In a 'forum' that embraced also botany, anatomy, medicine, meteorology, and chemistry, in Volume III of the *Essays* there were the description of some experiments on the use of marl in agriculture, written by physician James Ainslie,⁸⁵ an article by a certain George Clark on the advantages of the shallow ploughing, 'kept within three inches of the surface', and criticism thereof by Lord Kames.⁸⁶ In particular, Kames – besides being an important jurist and philosopher among the founders of the Society – was interested in agricultural improvements, dealing with them in his social treatise *Historical Law-Tracts* (1758) and in the *Gentleman Farmer* (1776).⁸⁷

⁸² On the multifaceted Grisellini (1717–1787) and his journalistic activity, see: G. Torcellan, 'Francesco Grisellini (nota introduttiva)', in Giarrizzo, Torcellan and Venturi (eds), *Illuministi italiani*, VII, pp. 93–120; G. Fumi, 'Francesco Grisellini (nota introduttiva)', in S. Zaninelli and G. Fumi (eds), *Scritti teorici e tecnici di agricoltura* (3 vols, Milan, 1989), II, pp. 187–99; P. Preto, 'Grisellini, Francesco', in *DBI* LIX (2002); M. Lastrì (ed.), *Biblioteca georgica ossia Catalogo ragionato degli scrittori di agricoltura, veterinaria, agrimensura* (1787), p. 68.

⁸³ It was *Il gentiluomo coltivatore o Corpo compiuto d'agricoltura ad uso della nazione italiana* (23 vols, 1769–83), originally planned as a 26-volume series, at least according to Lastrì (ed.), *Biblioteca georgica*, p. 68.

⁸⁴ *Catalogue des livres françois, italiens, latins et anglois qui se trouvent chez Jacques Barelle libraire à Milan* ([Milan], 1785), p. 267. About Jacques and his connections with Karl Joseph von Firmian, Hapsburg plenipotentiary minister in the Duchy of Milan

see R. Pasta, 'Mediazioni e trasformazioni: operatori del libro in Italia nel Settecento', in *Archivio Storico Italiano* 640 (2014), pp. 311–54, in particular pp. 342–3. About the Society of Edinburgh, its history and its publications: R. L. Emerson, 'The Philosophical Society of Edinburgh 1748–1768', in *British J. Hist. of Science* 14 (1981), pp. 133–76.

⁸⁵ J. Ainslie, 'An Essay on Marle', in *Essays and Observations Physical and Literary read before the Philosophical Society of Edinburgh* (3 vols, 1771), III, pp. 1–55.

⁸⁶ George Clark, 'The advantages of shallow ploughing', and Lord Kames (Henry Home), 'Observations upon the foregoing paper concerning shallow ploughing', in *Essays and Observations... Edinburgh*, III, pp. 56–67 and 68–79.

⁸⁷ On Lord Kames's life (1696–1782) and thought, there are many important historical studies. Among them, see: J. McCosh, *The Scottish philosophy:*

The presence of the *Essays* in Bayle Barelle's shop acquires a particular interest if we consider that Jacques's son, Giuseppe, would be the first professor of agricultural science at the University of Pavia (1804–11), during Napoleonic rule. His education was heavily influenced by the books on natural sciences and the technical manuals of agriculture sold by his father,⁸⁸ Giuseppe Bayle Barelle may have somehow also benefited from the *Essays* of the Royal Society of Edinburgh. He read Italian, French and Latin, but it is hard to say if he knew English too. However, it cannot be ruled out that he understood it sufficiently or that someone at his father's shop could translate it for him.

IV

The British interest in the western Mediterranean environment, natural resources, and agriculture was also expressed in visits to those lands. The context was generally that of the Grand Tour done for reasons of leisure and healthcare, but travels to the Continent were also undertaken for study and research. Examples include the journeys of Arthur Young in France, Catalonia,⁸⁹ northern and central Italy in the late 1780s, or the travel of James Edward Smith in 1786 taking him to the major cities on the Italian peninsula.⁹⁰ Tull himself, as commented before, visited southern France and Italy on his journey through Europe in the early 1710s: he was looking for relief for his poor health in the warm Mediterranean climate, but he drew inspiration from those lands also for deepening his agricultural knowledge.

Although an extensive and excellent historiography exists on these writers, there is more work to be done on the precise motivations that led Young, Smith, Tull, and other British naturalists or agriculturists to visit the Mediterranean countries. Writers like Young were clearly interested in comparative studies and one would like to know more about the potential for scientific and technical progress that these educated and highly skilled travellers imagined might exist in lands and villages rich in natural resources, but socially backward and poor (the exemplary case is Young's observations in north-eastern Spain). However, these journeys also express a sort of 'reciprocity' between Great Britain and the Mediterranean basin, in the sense that it was not only the former giving something to the latter through their leadership in terms of natural and agricultural sciences, but also the potential of the latter to constitute an excellent field laboratory for British experts. In this article, I have tried to demonstrate this by highlighting the richness of eighteenth-century Spanish botanical gardens, featuring the enduring legacy of the Arab

Note 87 continued

Biographical, expository, critical from Hutcheson to Hamilton (1875), pp. 173–83; W. C. Lehmann, *Henry Home, Lord Kames, and the Scottish Enlightenment: A study in national character and in the history of ideas* (1971).

⁸⁸ Fagnani, 'L'agraria "italiana" prima e dopo Napoleone', pp. 463–7.

⁸⁹ A. Young, *Travels during the Years 1787, 1788, and 1789 undertaken more particularly with a view of ascertaining the cultivation, wealth, resources, and national prosperity of the Kingdom of France* (2 vols, 2nd edn,

1794), II, pp. 317–18.

⁹⁰ R. M. Capel Martínez, 'Il "tour" iberico: costumi, avventure, ricordi e opinioni dei viaggiatori inglesi nella Spagna del Settecento', *Dimensioni e problemi della ricerca storica* (1995), no. 2, pp. 139–67; J. Edmondson and C. Smith, 'The Linnean Society's Smith Herbarium: A resource for eighteenth-century garden history research', *GH* 27 (1999), pp. 244–52; G. Douglas, 'Italy in the Linnean collections: A review of the biological specimens, books and manuscripts linking Italy with Linnaeus and the Linnean Society of London', in Beretta and Tosi (eds), *Linnaeus in Italy*, pp. 31–46.

agricultural revolution and equally long-lasting connections with the Italian States. Moreover, regarding the latter, there is scope for more research on connections within these regions, not least the mutual influence between Spain and Bourbon southern Italy in terms of botany and agriculture, in addition to the role of these exchanges in the definition of an 'agricultural botany' that was the base of the more mature agricultural science of the nineteenth century.

As Balsamo commented on English agriculture in the *Annals*, British travellers such as Young and Smith expressed both positive and negative opinions on what they had seen in Italy, then publishing their notes in English and French. It was therefore a large European network in which scientific knowledge, expertise, seeds, texts, even machines circulated with the aim of contributing – consciously or not – to a modern, up-to-date agricultural science. However, as the cases presented here show, some countries were more advanced from this point of view and represented a role model for others, which faced more difficulties as a result of their political, social and economic conditions. The contribution offered by Great Britain to the agricultural science of the western Mediterranean basin was therefore of great importance, despite being hidden amongst studies generally seen as belonging to the natural sciences or natural history, as with the cases of Madrid and Milan, where the organization of botanical gardens and scientific book collections by means of British seeds and texts contained great potential for agriculture and forestry. Even travels like those of Gualandris, linked to mining issues and to gaining a deeper knowledge of geology and mineralogy, included an in-depth study of European agriculture and rural society, with particular regard for the English countryside.

This 'hybrid' nature was, on the other hand, peculiar to a time of epistemological definition for agricultural science. However, if full awareness of this branch of learning was missing in Italy and Spain, the circulation of knowledge and materials in those countries laid the groundwork for later more 'conscious' agriculturists. We have seen this in Cavanilles, the 'link' between classic Spanish systematic botany and Zea's agricultural botany. The books accessible to the young Giuseppe Bayle Barelle, who would become a fully fledged professor of agricultural science, state the idea even better. In this still fluid branch of knowledge, however, Great Britain was perceived to have the clearest ideas, with a wide appeal throughout Europe. This was demonstrated by the widespread circulation of the texts of Tull and Hale in France and from there to Spain and Italy. As I have pointed out, Grisellini was consecrated as a specialized journalist thanks to his commentary on English agronomic writings, albeit through the filter of the French translation. The Academy of Georgofili approved Grisellini's work on Tull's seeding machine and produced its own annotated edition, which reiterated with numerous references – notes, comments and inserts – the British contribution to the enhancement of agriculture.⁹¹

This article has also sought to highlight the potential of travel literature in providing experts with new models for strengthening agriculture and manufacturing.⁹² This is seen in the

⁹¹ F. Grisellini, *Nuova maniera di seminare e coltivare il formento...* (3rd edition, 1765). See, for example, pp. 2–3, note a, in which the editors praise the network of agricultural societies and academies spread in England, Scotland and Ireland.

⁹² See also G. Bil, 'Tangled compositions: Botany, agency, and authorship aboard HMS *Endeavour*', *Hist. Science* (2020), currently only available online: <https://journals.sagepub.com/doi/full/10.1177/0073275320971109> [accessed 16 January 2021].

information reported by the Forsters to Gualandris on the tussah silkworms and on the 'New Zealand' flax, which could have provided textile fibres by economizing on the breeding of the former and on the cultivation of the latter, probably against the background of the aforementioned liabilities of mulberry cultivation and the silk chain. We have seen how Gualandris was quite convinced of this potential, but their application in the Republic of Venice was not implemented due to a range of variables: environmental factors; the possibility of coexistence with local productions, on which the agriculturists of the various areas of the Republic could have given the most competent judgment, supported by the network of agricultural academies; the government's willingness or lack thereof to undertake new experiments.

The development of more ambitious projects in Italy had to await the establishment of the Napoleonic empire, which favoured better circulation of knowledge and species along with major institutional, social and economic changes. Despite this fact, the Napoleonic period and the subsequent conservative reaction – both in Italy and in Spain – were also characterized by complex political and military events that delayed for several decades effective improvement of the agricultural system via appropriate reforms.⁹³

⁹³ About the Spanish situation, see also: López-Ocón Cabrera, *Breve historia de la ciencia española*, pp. 226–48; and J. L. Pan-Montojo, *Apostolado, profesión y tecnología: Una historia de los ingenieros agrónomos en España* (Madrid, 2005).